

GROUNDWATER TECHNOLOGY

Groundwater Technology, Inc.

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**PHASE II
SUPPLEMENTAL RCRA FACILITY INVESTIGATION
(RFI) WORK PLAN
CONTAINER STORAGE BUILDING 83
TEXACO RESEARCH CENTER
BEACON, NEW YORK
NYS DEC ID # 3-1330-48/3-0
EPA ID# 091894899**

*Phase II
Johns memo also*

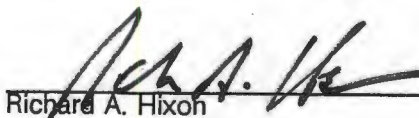
November 23, 1993

Submitted to:

Mr. Steven Peterson
Texaco, Inc.
P.O. Box 509
Beacon, New York 12508

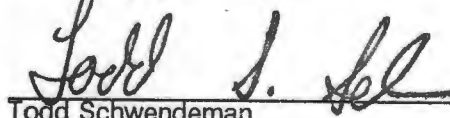
GROUNDWATER TECHNOLOGY, INC.

Written/Submitted by:


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Project Hydrogeologist
Project Manager

GROUNDWATER TECHNOLOGY, INC.

Reviewed/Approved by:


Todd Schwendeman
Northeast District Manager

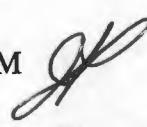
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Michael D. Zagata
Commissioner

MEMORANDUM

TO: Paul Patel, Corrective Actions Section, BHC&LM

FROM: John Petiet, Corrective Actions Section, BHC&LM 

SUBJECT: Data Evaluation for the Phase II RFI at Container Storage Building 83 at
Texaco Research Center, Beacon, Dutchess County

DATE: October 30, 1995

I have reviewed the data for the above-referenced project report, dated September 1995. Overall, the data quality appears to be very good. My specific comments follow below:

Overview

Supplemental field work was performed during the phase II investigation of this RFI. Four additional soil borings were taken to delineate the presence of volatile and semivolatile organic compounds. These borings were spaced at regular intervals in the area between building 83 and building 58. The soil sample with the highest FID reading from each borehole was analyzed by the lab. In addition, a visible seep along the north bank of Fishkill Creek in the vicinity of building 83 area was also sampled during this investigation. This water sample and the upgradient monitoring well (BR-1) were the only aqueous samples collected during this phase of the investigation.

Soil Samples

The data quality for the soil samples is very good. Analysis was performed for TCL volatiles, TCL semivolatiles, and TAL metals. For the volatiles, all samples were analyzed within the proper holding times, initial and continuing calibration was acceptable, and all the internal standard area counts and retention times were also within QC limits. The surrogate recoveries for every volatiles soil sample were within the QC limits. Also, the matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference values (RPDs) were fine for both the low level and medium level analyses. No QC problems were encountered with the soil volatiles analysis.

The semivolatiles QC was also very good. Samples were analyzed within the proper holding times and initial and continuing calibration were generally fine. The response factors (RF) for naphthalene and methylnaphthalene were slightly high and may have caused a high bias for sample B83-SAC3. No other calibrations problems were noted. The internal standard areas counts and retention times were all within the QC limits. The surrogate recoveries were all within the QC limits except for some samples in which they were diluted out. The MS/MSD percent recoveries and RPDs were quite good, but again these samples were partially diluted out. No target analytes were found in the blanks, but some TICs were present. The data quality is fine.

The metals data is also quite good. Samples were analyzed within the proper holding times and no calibration problems were reported. The duplicate values (RPDs) exceeded the 35% QC limit for soils for calcium, lead, manganese, and zinc. This appears to be due to the non-homogeneity of the soil. This data should be considered as "estimated". Only zinc was out of limits for the matrix spike recoveries. I would consider the data to be usable.

Aqueous Samples

Samples were analyzed for volatiles by method 8010/8020 instead of by GC/MS using method 8240, TCL base neutral semivolatiles, and no metals analysis was performed. For the volatiles, samples were analyzed within the proper holding

times. Initial calibration was acceptable, and the surrogate recoveries were also within the QC limits. The MS/MSD data was also fine for both the percent recoveries and the RPD values. The data quality is very good.

For the base neutral semivolatiles, samples were analyzed within the proper holding times. Calibration, internal standard area counts, and retention times were all acceptable. Surrogate percent recoveries and MS/MSD percent recoveries, and RPDs were all within the QC limits. No contamination was found in the blanks. This data quality is fine.

If you have any questions concerning my comments, please see me or call me at (518) 457-9255.

cc: A. Straus, EPA Reg. II
R. Aldrich, NYSDEC Reg. 3

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1.0 INTRODUCTION

1.1 Background

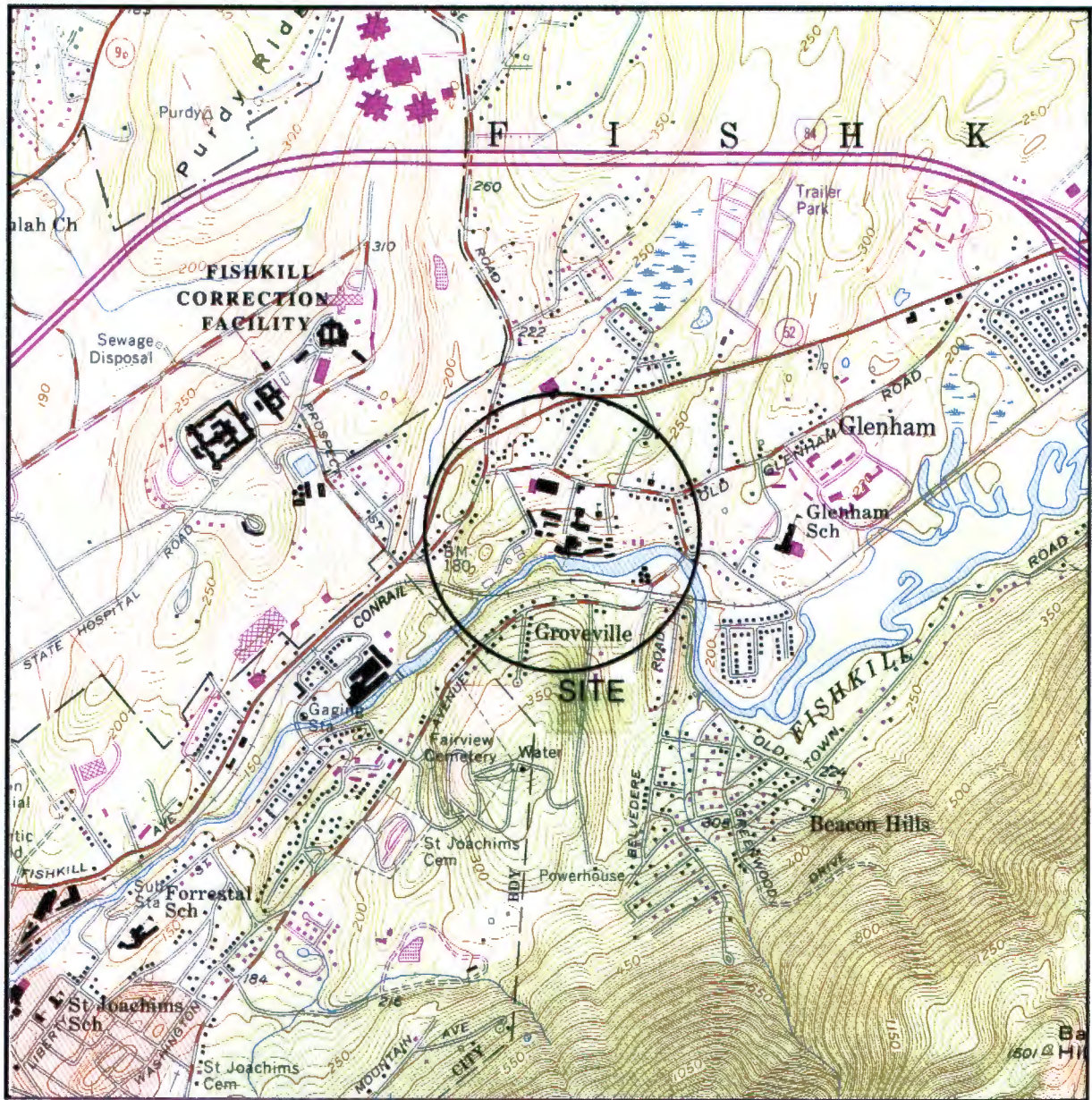
Texaco Inc. operates the Texaco Research Center Beacon (TRCB) which is located in the Town of Fishkill, Dutchess County, New York (Figure 1). Texaco, Inc., has filed for, and received a Hazardous Waste Management Permit for TRCB from the New York State Department of Environmental Conservation (NYS DEC, ID #3-1330-48/3-0) As a condition of the permit, certain tasks were required. A RCRA Facility Investigation (RFI) Work Plan (Task IV, Groundwater Technology, 1992) was prepared for the Container Storage Building 83 Area in accordance with the permit conditions stated in Module III (E)(5). The work plan was reviewed and approved by the United States Environmental Protection Agency (EPA) and NYS DEC. A Facility Investigation Report (Task VII) was also submitted in satisfaction of permit Module Condition III (E)(5), on March 12, 1993 (Groundwater Technology, Inc., 1993).

1.2 Site Location and Description

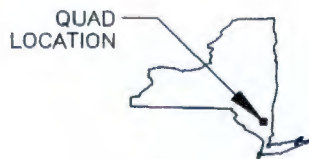
Texaco Research Center Beacon (TRCB) is a Texaco, Inc. owned and operated facility located on approximately 50 acres of land in the Town of Fishkill, New York (Figure 2). TRCB is an on-shore, non-production, non-transportation laboratory complex engaged in research, development and technical services related to petroleum products and energy. Petroleum and coal products, solvents and various chemicals are used at this facility in connection with the research functions. TRCB is located in Dutchess County, Town of Fishkill, immediately east of the City of Beacon. The facility occupies land both north and south of the Fishkill Creek on property zoned "Planned Industrial" by the County of Dutchess.

Texaco, Inc. operates a Hazardous Waste Storage Area at the TRCB. This area is also referred to as the Container Storage Building 83 or Building 83 (Figure 3). A NYS DEC Part 373 operating permit for this area has been issued to Texaco, Inc.

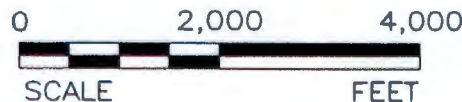
The Building 83 area is located north-northeast of Building 58, southwest of Building 52 and adjacent to a roadway and loading dock. Building 83 is a roofed structure, open on three sides with a wall located along the south edge of the building. The building is used to shelter the following operations and equipment:



SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
WAPPINGERS FALLS, N.Y. QUADRANGLE
7.5 MINUTE SERIES
DATE: 1956 PHOTOREVISED: 1981



SCALE 1:24,000



**GROUNDWATER
TECHNOLOGY**

1245 KINGS ROAD
SCHENECTADY, NY 12303
(518) 370-5631

DESIGNED:

MBC

DETAILED:

MET

CHECKED:

MBC

SITE LOCATION MAP

CLIENT:

TEXACO INC.

LOCATION:

BEACON
NEW YORK

DRAWING DATE:

3/8/93

FIGURE:

1

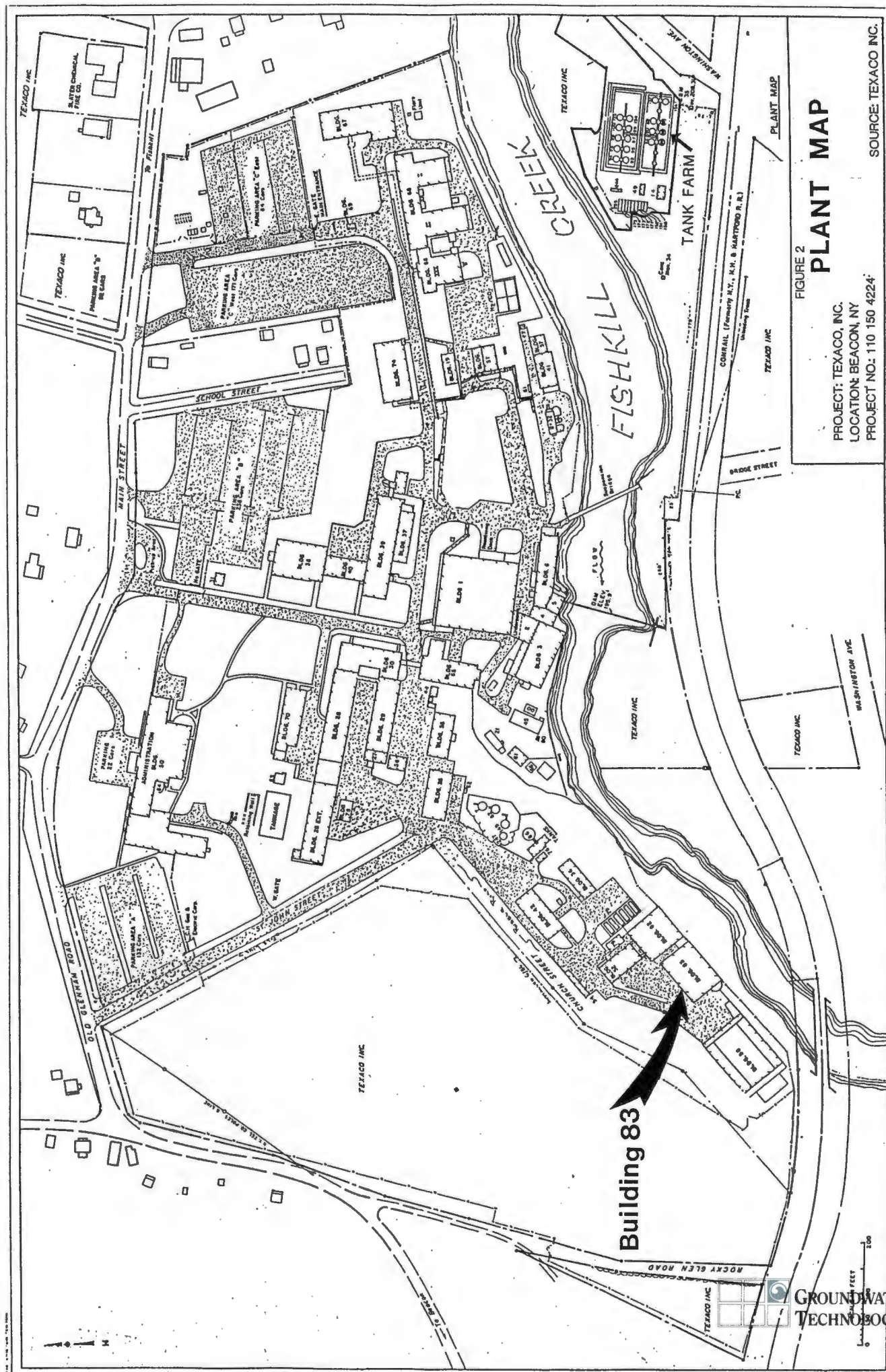


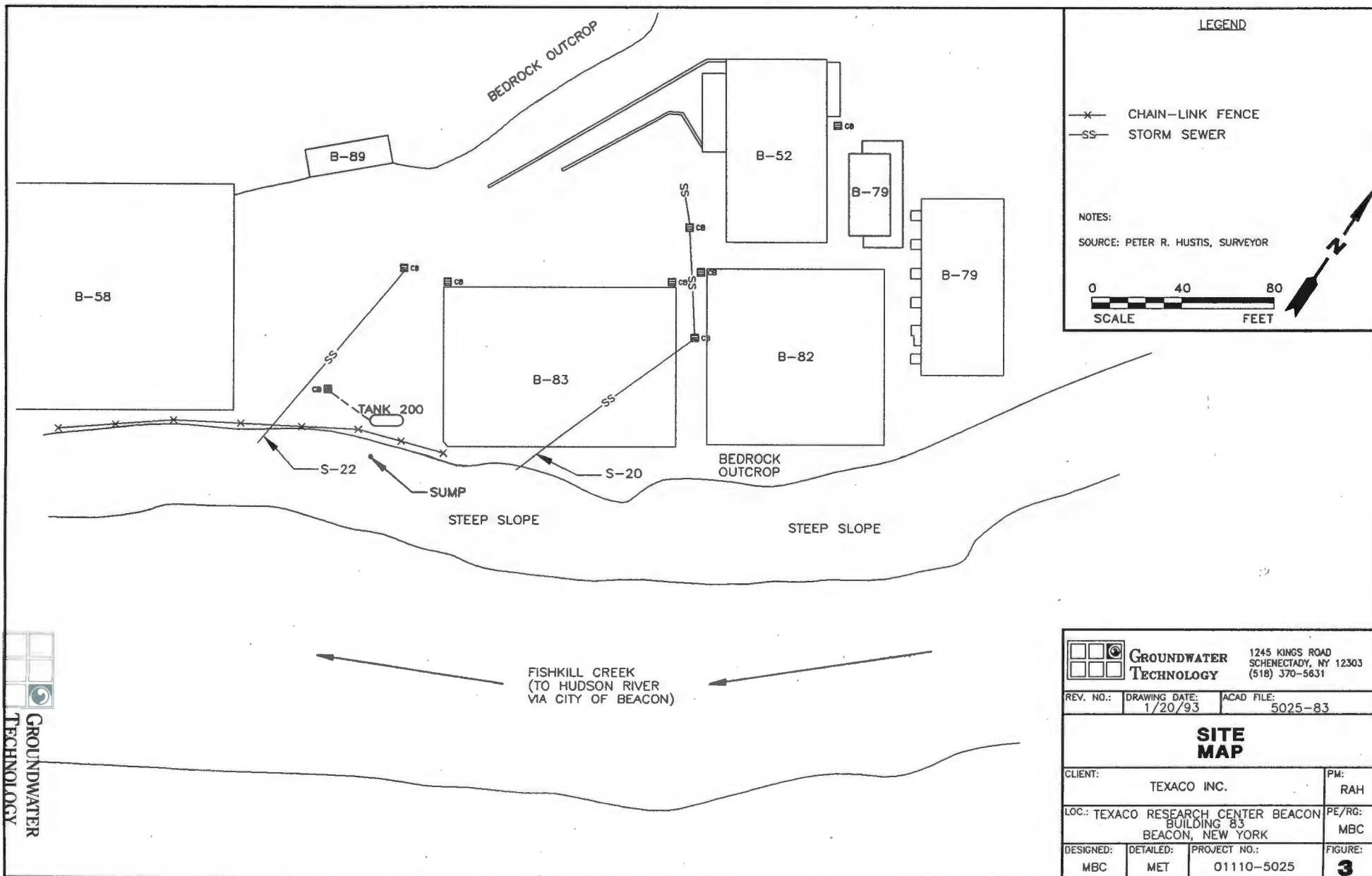
FIGURE 2


PLANT MAP

PROJECT: TEXACO, INC.
 LOCATION: BEACON, NY
 PROJECT NO.: 110 150 4224

SOURCE: TEXACO INC.

Building 83



 GROUNDWATER TECHNOLOGY		1245 KINGS ROAD SCHENECTADY, NY 12303 (518) 370-5831	
REV. NO.:	DRAWING DATE:	ACAD FILE:	
	1/20/93	5025-83	
SITE MAP			
CLIENT:		PM:	
TEXACO INC.		RAH	
LOC.: TEXACO RESEARCH CENTER BEACON		PE/RG:	
BUILDING 83		MBC	
BEACON, NEW YORK			
DESIGNED:	DETAILED:	PROJECT NO.:	FIGURE:
MBC	MET	01110-5025	3

- Storage of drummed wastes including hazardous wastes (solvent mixtures), non-hazardous wastes, and incompletely identified wastes awaiting testing. The maximum estimated drum storage in this area does not exceed 33,000 gallons.
- Storage of safety cans containing spent halogenated and non-halogenated solvent mixtures. A maximum of 300 gallons of storage in safety cans may be stored in this area.
- Manual transfer of waste solvents from safety cans to drums and pumped transfer from drums to Tank 266.
- Storage of waste solvent in Tank 266. The maximum storage of waste in Tank 266 is 6000 gallons.

The Building 83 covered shelter and spill containment pit was constructed in 1981 over existing concrete and bituminous pavement. The roof area is 70 ft. by 100 ft. and the minimum eave height of the corrugated sheet metal roof is 14 ft. above the pavement. Any large spills that occur will flow towards the west edge of the building and drain into the drainage trenches that lead into the spill containment pit in the northwest corner, or will be contained within the curbed border of the building. Inside dimensions of the containment pit are 14 ft. by 20 ft. by 3.5 ft. high; the slab is ten-inch reinforced concrete and walls are six-inch reinforced concrete. The containment pit walls and floor have been lined with a chemical-resistant epoxy.

Curbing around the building and a ramp at the west entrance would allow 3,175 gallons of liquid to pool on the floor of the building. The containment pit, the drainage trench, and the floor provide a total containment volume of 10,690 gallons.

A more complete description of the waste storage and handling practices employed at the Building 83 Area may be found in the Facility Investigation Report (Groundwater Technology, Inc., 1993).

1.3 History of Operation (Building 83 Area)

The general area presently occupied and adjacent to Building 83 was formerly a drum storage area. Most of the drum storage occurred in the vicinity of Building 58. Building 58 was constructed in the mid-1950's and Building 83 was constructed in the early 1980's. Prior to its existence, the Building 83 area was an open compound northeast of Building 58. The entire area was surrounded by chain link fencing. The grounds consisted of a general work/drum storage area. Prior to the existence of Building 83, the drums were stored vertically and horizontally on drum pallets on a concrete pad and uncovered ground.

1.4 Previous Investigations

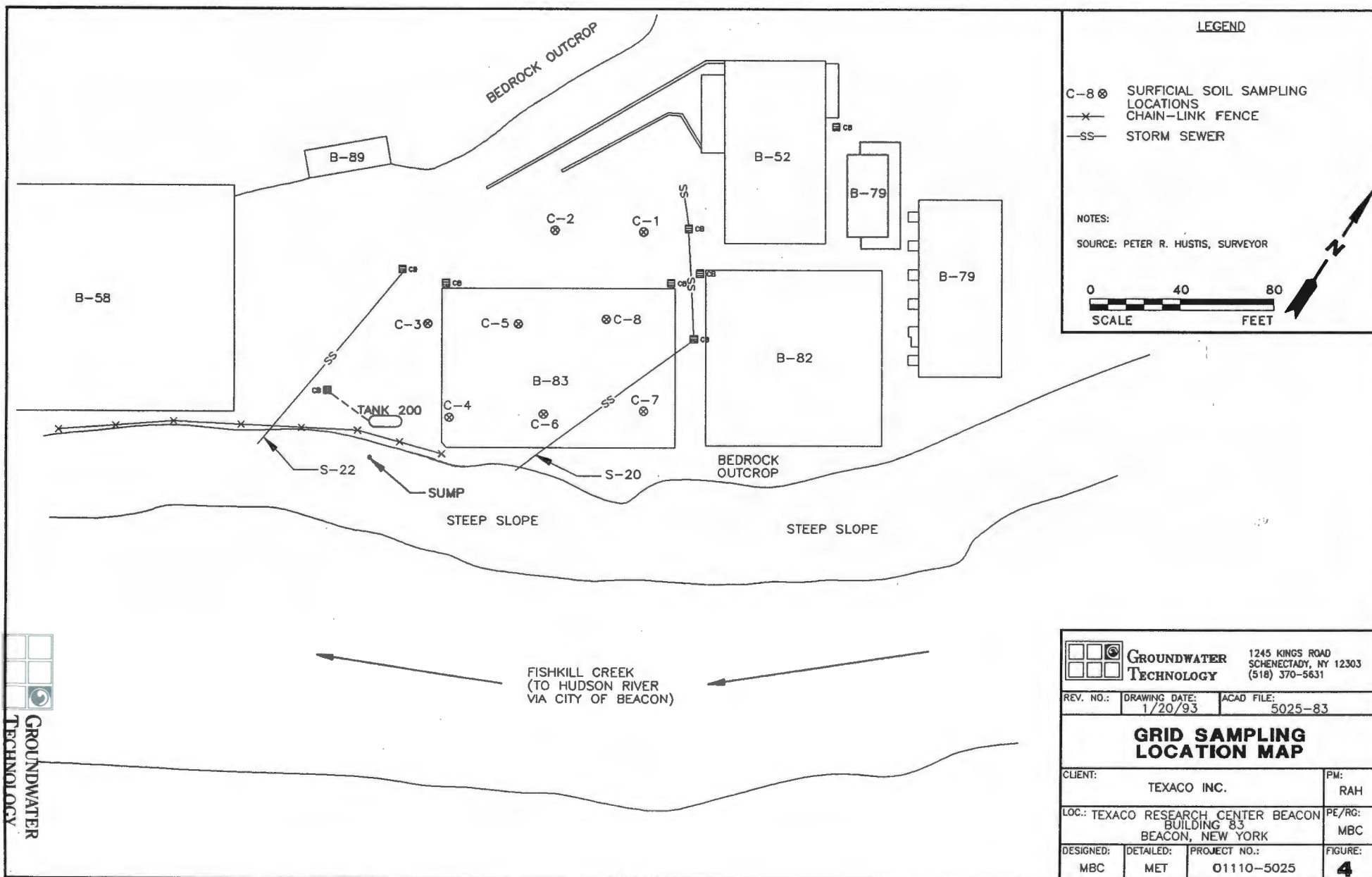
Potential impacts to soil and groundwater at the Building 83 site were first detected during construction of the building. A field book entry from December 23, 1981 indicated, "oily groundwater present in pier excavation". Additionally an entry dated December 28, 1981 stated, "oil still in excavation for Building 83". No information was available in facility records or in the NYS DEC Oil and Hazardous Material Spill Database, reviewed at New Paltz, New York, regarding the possible origin or specific chemicals that may have produced the oily sheens.

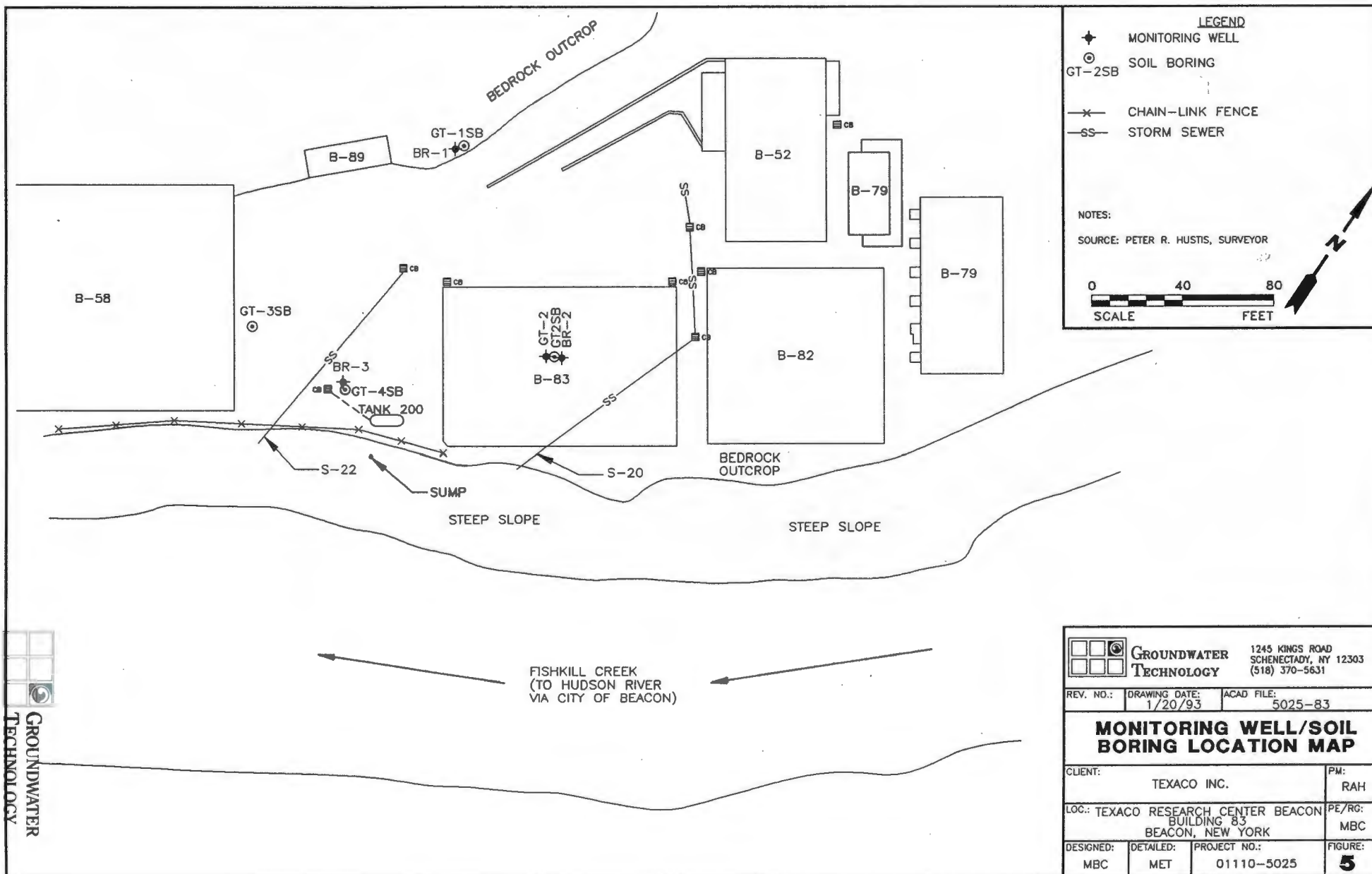
However, the Building 83 Area is listed as a Solid Waste Management Unit/Area of Concern (SWMU/AOC) in the Hazardous Waste Management Permit. This is as a result of the former processes involving drum storage and handling in the vicinity of the (previously uncovered) concrete pad that now forms part of the Building 83 floor.

Relevant information and data relating to the background, potential releases, and receptors, pertinent to the Building 83 Area at the TRCB in Beacon, New York were collected and have been presented as the Task I Report, dated May 29, 1991 (Groundwater Technology, Inc., 1991A). A Task II Report outlining the Pre-investigation Evaluation of Corrective Measures, dated June 26, 1991, was also completed (Groundwater Technology, Inc., 1991B).

Work steps completed to investigate subsurface conditions in the Building 83 Area were presented in the Task VII Facility Investigation Report (Groundwater Technology, Inc., 1993). Work steps completed during the RFI included:

- Surficial soil sampling and shallow soil borings at grid locations (Figure 4).
- Sampling of sumps and storm drains (Figure 4).
- Completion of deeper soil borings and one overburden groundwater monitoring wells (Figure 5).
- Completion of bedrock monitoring wells (Figure 5).
- Surveying of borings and monitoring well locations.
- Gauging and sampling of monitoring wells.





Key findings of the investigation are summarized as follows:

- Laboratory analyses of soils in the vicinity of Building 83 indicated that trace levels of VOCs were distributed in a limited area beneath the spill containment pad of the building. No volatile organic compounds were detected in overburden soil borings completed upgradient and adjacent to Building 83.
- Analyses of soils at the Building 83 Area indicated that semi-volatile organic compounds in soils were distributed over a wider area than VOCs. The highest concentration of semi-volatile compounds were detected under the slab of, and proximate to the western corner of Building 83. The distribution of these compounds was apparently the result of former drum storage and handling practices on an unpaved surface.
- No groundwater discharges were noted in potential seep areas during the inspection of the north bank of the Fishkill Creek proximate to Building 83. Hence bank seepage was not considered an active route of transport of chemicals detected in soil and groundwater on-site during the investigation. However, the possibility that seepage may occur during periods of high ground water level and precipitation was not eliminated.
- Water samples from the collection sump on the bank of Fishkill Creek during the investigation contained levels of VOCs and semi-volatile compounds slightly in excess of NYS DEC Groundwater Standards. These compounds were consistent with the compounds detected in soils underneath and adjacent to the Building 83 slab, and appeared to be transported to the sump as the result of underdrain collection of groundwater. Water collected in the sump is then pumped uphill to Tank 200, and hence to TRCB's wastewater treatment plant.
- Water from the storm drain contained only unknown semi-volatile compounds, for which NYS DEC has only general organic guidance values. No target compounds were detected in excess of NYS DEC Groundwater Standards.
- Only one of the overburden well locations investigated yielded sufficient groundwater for sampling. However, a volatile and semi-volatile organic compounds were detected in groundwater in this overburden well and bedrock wells located inside and adjacent to Building 83. The concentrations exceeded the NYS DEC Groundwater Standards for VOCs and for semi-volatile compounds. These compounds were also similar to the compounds detected in soil borings under Building 83. A sheen or emulsion of hydrocarbons was noted on groundwater samples collected from the overburden monitoring well. This well is closest to the excavation area where sheens were noted during construction of Building 83. This area was formerly used for drum storage and handling and appears to be the source of volatile and semi-volatile compounds in groundwater.
- No VOCs were detected in the background well. Semi-volatile compounds detected were predominantly bis(2-ethylhexyl)phthalate. Similar levels of bis(2-ethylhexyl)phthalate are frequently introduced during the sampling process (sampling gloves, preservative bottles, pump tubing, etc), or are detected in laboratory method blanks, and are usually regarded as laboratory artifacts.

Based on the findings of the RFI, the following recommendations were made for additional investigation or corrective action:

- A few semi-volatile compounds were detected in soils at levels above the direct ingestion standards specified by EPA's Health Effects Assessments Summary Table, as referenced in NYS DEC's Determination of Soil Clean-up Objectives and Clean-up Levels (1992). These levels are recommended for the protection of sensitive individuals (i.e., children) based on a lifetime exposure scenario. However, direct ingestion was not viewed as a viable exposure pathway for the Building 83 Area. No volatile compounds were present at levels that appeared to present a direct ingestion hazard. Therefore, no additional investigative or corrective action was recommended on these criteria.
- A few of the semi-volatile PAH compounds in soils slightly exceeded NYS DEC's (1992) criteria for groundwater protection. However, these same compounds (chrysene, benzo(b)- and benzo(k)- flouranthene) were not detected in groundwater. These compounds do not appear to have leached to the groundwater either as a result of their chemical properties, or because the pavement in this area restricts precipitation infiltration, or both. The total of semi-volatile compounds in soil fell below the 50 ppm guidance value for this criteria. No volatile compounds were detected at levels that indicated a potential for further degradation of groundwater. Based on these criteria, no investigative or corrective actions were indicated.
- In order to determine if a potential route of contaminant transport may exist during high water table periods, it was recommended that the seep areas should be examined in conjunction with future site inspection or corrective actions. Samples should be collected for analysis if groundwater discharge is observed.
- The sump was observed to intercept underdrain flow that might otherwise seep at the stream bank or discharge as basal flow. It was recommended that the pump system in the sump should be examined routinely and kept operational to prevent overflow of the sump.
- The stormwater drain did not appear to act as a route of transport for chemical compounds from the source area. No petroleum hydrocarbons or target compounds were detected in the storm drain, and therefore no further actions were recommended.
- The level of bis(2-ethylhexyl)phthalate detected at the background well was suspected to be a sampling artifact, and re-sampling this well to confirm the results was recommended.
- Potential corrective actions to reduce the possibility of future chemical spills from impacting the underlying soils and leaching into the groundwater were discussed in the report.

NYS DEC reviewed the RFI report, and forwarded comments in a letter dated September 28, 1993. The data presented in the report was accepted with the following conditions:

- A discrepancy with respect to the direction of North indicated on various maps was noted.
- Additional investigation of several areas was requested by NYS DEC, including a different upgradient well location.
- Additional east/west definition of the groundwater plume was requested, while the inaccessibility of some areas was acknowledged in the letter.
- It was requested that the seeps on bank of the Fishkill Creek be sampled if discharge was present.

1.5 RFI Phase II Objectives

The items requested by NYS DEC were clarified in a telephone communication between Mr. Steven Peterson of Texaco, Inc. and Mr. Paul Patel of NYS DEC on November 17, 1993. The discussion produced consensus on the following:

- The existing well (BR-1) adequately represents "background" groundwater quality, and should be resampled to confirm the background water quality.
- Additional definition of the groundwater plume in overburden between Building 83 and Building 58 will be attempted, recognizing that a minimal saturated thickness of overburden has been encountered at most boring locations proximate to Building 83. It was determined that the plume had been adequately defined to the east of Building 83 by soil borings completed during the RFI, and therefore that additional wells in this portion of the facility were not necessary.
- Seeps on the north bank of the Fishkill Creek should be sampled when discharge occurs, most likely during spring thaw, to determine if a potential route of contaminant transport exists during this condition.

The following sections of this work plan outline the procedures proposed for achieving the objectives determined by Texaco, Inc. and NYS DEC.

2.0 SAMPLING AND ANALYSIS PROCEDURES

2.1 Health and Safety Planning

A site-specific Health and Safety Plan (HSP) has been prepared which establishes policies and procedures to protect workers, Texaco employees, and the general public from potential hazards associated with the sampling work at the Building 83 Area. The HSP has been prepared in accordance with the Occupational Safety and Health Administration (OSHA) "Hazardous Waste Operations and Emergency Responses" regulations cited in 29 CFR 1910.120. The HSP will be reviewed and signed by all Texaco personnel and its subcontractors who are involved in the sampling activities. A copy of the HSP will remain on site during the field activities.

2.2 Data Quality Objectives

Generally, it is expected that by design of separate data quality requirements for field sampling and laboratory analysis, any problems found in the system can be isolated with respect to the cause. In addition, the data quality requirements are also designed to provide an indication of the variability inherent to the overall system. A review of project specific performance objectives for field and laboratory sampling is included in a following section of this report (Section 3.2 and 3.3).

The data generated must be of sufficient quality to support the project objectives listed earlier:

- Analyze groundwater at BR-1 to confirm "background" groundwater quality for the Building 83 Area.
- Delineate the groundwater plume in the overburden between Building 83 and Building 58.
- Characterize the water quality at seeps discharging along the north bank of the Fishkill Creek.

Field and laboratory procedures are described in the following sections of the report to ensure that the data collected during the project is consistent with these objectives. A complete description of sampling, decontamination, and quality control procedures is contained in the Quality Assurance Project Plan (QAPjP; Groundwater Technology, Inc, 1992).

2.3 Soil Borings

Additional soil boring locations were selected to delineate the presence of volatile and semi-volatile organic compounds in overburden groundwater. The locations of the borings were spaced similarly to the grid used for the previous RFI work scope at the Building 83 Area. These spacings provide the ability to detect circular contaminant zones with radii of 20 feet at a 90% level of probability (Gilbert, 1987). The locations of the soil borings are shown on Figure 6.

Surface pavement will be drilled to allow access to sampling equipment. A hydraulically-driven probe sampler will then be advanced to refusal at each boring location (8 to 10 feet depth estimated). Soil samples will be retrieved at two-foot intervals. Sampling equipment will be decontaminated between intervals.

Soil samples will be immediately be transferred to suitable containers (generally 100 mL). The samples will then be field screened utilizing a flame ionization detector. Volatile ionizable organic compound concentrations in the headspace. The soil samples with the highest FID levels will then be field analyzed using a portable gas chromatograph. Semi-volatile polyaromatic hydrocarbon (PAH) compounds.

At least attempt
Bedrock and/or
GW Table.

Analytical procedures are further described in a following section of the work plan (Section 2.7).

2.4 Groundwater Gauging and Sampling

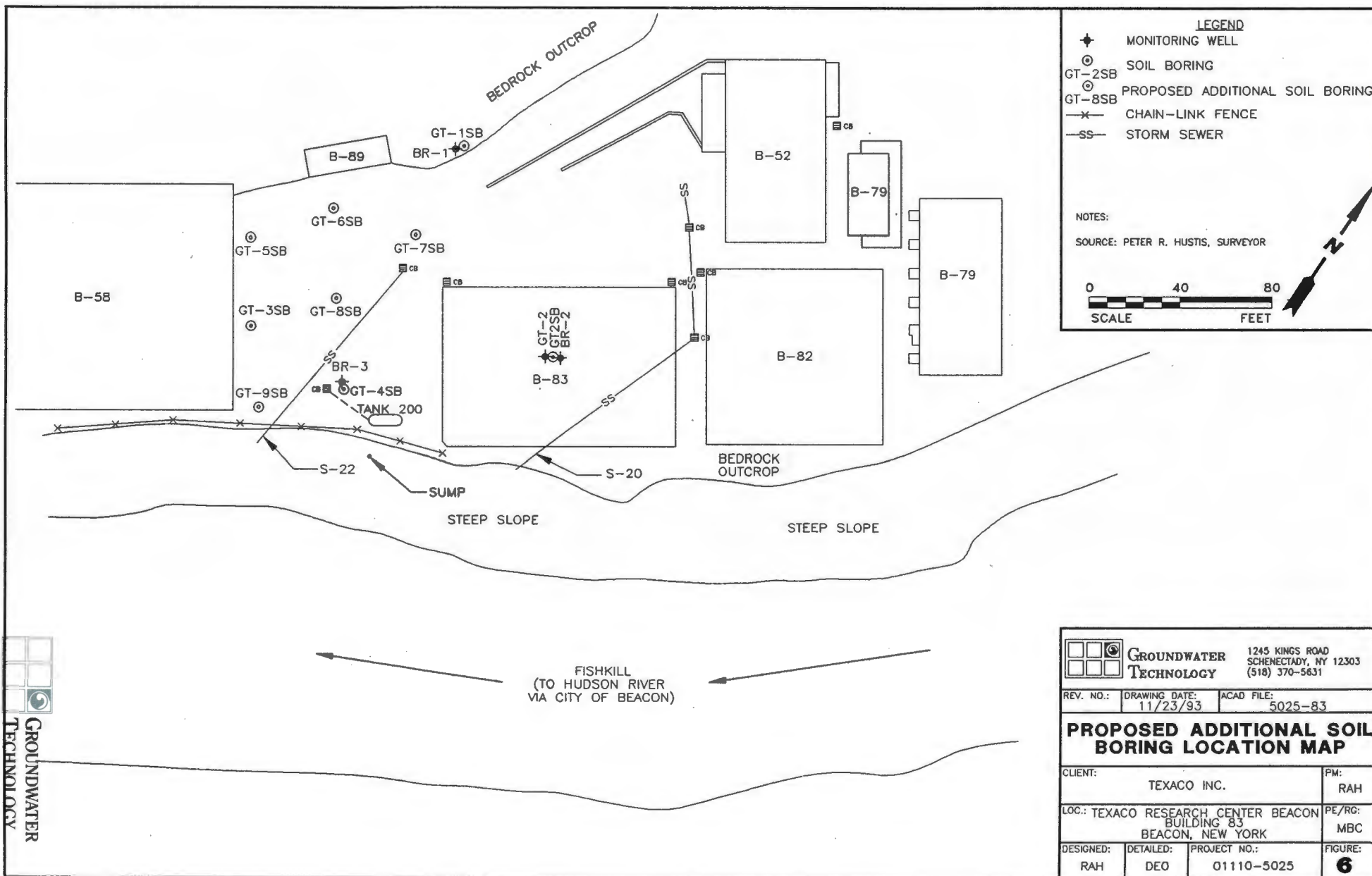
If saturated soil conditions (groundwater) are encountered at each proposed location (GT-9SB), a temporary well casing or sampling point will be installed. Water will be pumped using a peristaltic pump. These samples will then be field analyzed using the FID method. (PAH) compounds.

Nothing said to
indep. Lab?
is it necessary?

The depth to groundwater in each temporary sampling point and in the existing monitoring wells in the Building 83 Area will be measured relative to ground surface.

The water level measurements will be used in conjunction with the total depth to the existing Well BR-1 to calculate three to five well volumes necessary for purging. Temperature, Ph, and specific conductance will also be measured and employed to determine the amount of well evacuation. When these parameters are observed to vary significantly, the well will be sufficiently

Lab
Sampling?



flushed. A teflon bailer will be used for well evacuation and sampling. Samples from BR-1 will be analyzed at a laboratory for volatile and semi-volatile organic compounds.

2.5 Boring Elevation and Location Survey

Locations of the boreholes will be measured with a tape to existing structures. If temporary sampling points have been installed, surface elevations and locations will be determined by a licensed surveyor. These locations will then be transferred to the existing site map.

If seep discharge is collected on the north bank of the Fishkill Creek, the seep will be marked and then surveyed for location and elevation by a licensed surveyor.

As GW
into seep -
VOC!!

2.6 Sampling of Water From Seeps

Visible seeps along the north bank of the Fishkill Creek will be sampled depending upon precipitation and availability of storm water run-off in order to obtain additional water quality data in the vicinity of the Building 83 area. Samples will be collected using a teflon bailer or sampled directly utilizing specially prepared sample vials in accordance with NYS DEC RCRA Guidelines. The sampling equipment will be decontaminated as described in a following section (Section 2.8). These samples will then be forwarded to a laboratory for volatile organic and semi-volatile organic analyses.

as close to the source
as possible to minimize
contamination

2.7 Field and Laboratory Analytical Procedures

Field and laboratory analyses will be performed in a manner consistent with project data quality objectives, and with the Project QAPjP (Groundwater Technology, Inc., 1992). This section summarizes field and laboratory practices and includes a summary of sampling to be completed for the project.

Field analytical equipment used will include the Flame Ionization Detector (FID) and portable gas chromatograph (PGC).

The FID will be calibrated and operated as follows:

- Connect the Probe/Readout Assembly to the Sidepack Assembly by attaching the sample line and electronic jack to the Sidepack.
- Select the desired sample probe (close area sampler or telescoping probe) and connect the

probe handle. Before tightening the knurled nut, check that the probe accessory is firmly seated against the flat seals in the probe handle and in the tip of the telescoping probe.

- Move the Instr/Batt Switch to the test position. The meter needle should move to a point beyond the white line, indicating that the integral battery has more than 4 hours of operating life before recharging is necessary.
- Move the Instr/Batt switch to the "ON" position and allow a 5 minute warm-up.
- Turn the pump switch on.
- Use the Calibrate Adjust knob to set the meter needle to the level desired for activating the audible alarm. If this alarm level is other than zero, the Calibrate Switch must be set to the appropriate range.
- Turn the volume knob fully clockwise.
- Using the Alarm Level Adjust knob, turn the knob until the audible alarm is activated.
- Move the Calibrate Switch to X1 and adjust the meter reading to zero using the Calibrate Adjust (Zero knob).
- Open the Hydrogen Tank Valve 1 or 2 turns and observe the reading on the Hydrogen Tank Pressure Indicator
- Open the Hydrogen Supply Valve 1 or 2 turns and observe the reading on the Hydrogen Supply Pressure Indicator. The reading should be between 8 and 12 psi.
- After approximately one minute, depress the Igniter Button until the hydrogen flame lights. The meter needle will travel upscale and begin to read "Total Organic Vapors". Caution: do not depress igniter for more than six seconds. If flame does not ignite, wait one minute and try again.
- The instrument is ready for use. NOTE: If the ambient background organic vapors are "zeroed out" using the Calibrate Adjust knob, the meter needle may move off-scale in the negative direction when the OVA is moved to a location with lower background. If the OVA is to be used in the 0 to 10 ppm range, it should be "zeroed" in an area with very low background. A charcoal filter (Part No. 51--95-1) can be used to generate the clean background sample.
- Set the CALIBRATE Switch to the desired range. Survey the areas of interest while observing the meter and/or listening for the audible alarm indication. For ease of operation, carry the Sidepack Assembly positioned on the side opposite the hand which holds the Probe/Readout Assembly. For broad surveys outdoors, the pickup fixture should be positioned several feet above ground level. When making quantitative readings or pinpointing, the pickup fixture should be positioned at the point of interest.
- When organic vapors are detected, the meter pointer will move upscale and the audible alarm will sound when the setpoint is exceeded. The frequency of the alarm will increase as the detection level increase.

The PGC will be employed to analyze for volatile and semi-volatile organic compounds. The procedures to be used are as follows:

- Two blanks must be analyzed prior with the PGC to sample analysis. The first, a column syringe blank, measures any contamination in the analytical system (injection syringe or PGC). The second, a reagent blank requires the analysis of a 30 MI aliquot of reagent water. Both blanks should have less than detectable values for all target compounds. However, if the reagent blank should contain detectable levels of target compounds, blank subtraction or the use of another reagent source is recommended.
- Calibration standards will be prepared for several of the volatile and semi-volatile analytes detected in the RFI sampling. Calibration standards should be analyzed over the linear range of the detector. An initial calibration standard of 50 ppb should be analyzed and entered into a project specific library. A second standard should be analyzed to verify the calibration. Acceptance criteria for a calibration standard is $\pm 25\%$ of the true value mean. Continuing calibration verification standards (CCVs) should be analyzed twice daily at a minimum to insure instrument control. It is recommended that CCVs be analyzed at a frequency of 10%-20% of sample analysis.
- For volatile organic compounds in soil, a water extraction procedure (low level 8240) followed by a modified EPA method 3810 (Static Headspace) analysis will be performed. If water samples are analyzed for volatile organic compounds, the modified EPA 8360 analysis will be performed.
- For semi-volatile organic compounds in soil, a methylene chloride extraction will be performed to transfer petroleum hydrocarbons to the solvent. A small (2.0 microliter) aliquot of the solvent will then be injected directly into the PGC. Dilutions will be made depending on the petroleum concentrations present. The syringe will be cleaned with methylene chloride between samples to prevent cross-contamination.

All samples to be submitted for laboratory analysis will be forwarded to GTEL Environmental Laboratories (GTEL) in Milford, New Hampshire. GTEL was selected based on their NYS DEC and ELAP certifications, past performance evaluations, analytical ability, sample tracking, instrument capabilities, personnel qualifications, and deliverable packages.

Laboratory analytical procedures will be utilized in accordance with the following reference manuals:

- "NYS DEC ASP - Category B Protocols", December, 1991.

These methods cover the compounds that may be found on-site (Table 1). All methods are selected to get the most accurate representation of the sampling point possible. Method detection limit selection is based on the real assessment and analytical characterization data quality objectives. The methods selected specify the frequency and acceptance criteria for all associated quality control samples.

TABLE 1
PROJECT ANALYTICAL PROTOCOLS

Analytical Parameter	Method Reference	Data Objective
Volatile Organics, Semi-volatile Organics	FID (Headspace)	Sample screening
Volatile Organics, Semi-volatile Organics	NYS DEC ASP - Category B (EPA 8010/8020 and 8270 B/N ¹)	Characterization, confirmation (seep and groundwater quality)
Volatile Organics, Semi-volatile Organics	PGC (Modified EPA 3810 static headspace for volatiles; methylene chloride extraction and direct injection for semi volatiles, B/N)	Area Delineation (soils, groundwater if present)

¹ B/N = Base/Neutral Fraction

The field and laboratory analyses to be completed during the project are summarized as Table 2.

2.8 Decontamination Procedures

Where possible, disposable or dedicated sampling equipment will be used as specified in previous sections (i.e., Teflon bailers). Equipment that must be used to collect multiple samples will be decontaminated as follows:

1. Wash and scrub with a Liquinox® and water solution;
2. Tap water rinse;
3. Rinse with 1% HNO₃ ultrapure (10% for stainless steel trowels);
4. Tap water rinse;
5. Rinse with pesticide grade or better Methanol;
6. Rinse with pesticide grade or better Hexane;
7. Thoroughly rinse with demonstrated analyte free water. The volume of water during this rinse must be at least five times the volume of the solvents used;
8. Thoroughly rinse with demonstrated analyte free water;
9. Air dry; and
10. Wrap in aluminum foil for transport.
11. Water draining from decontamination procedures should be collected and stored in 55 gallon drums for disposal or treatment.

**TABLE 2
SAMPLE LOCATIONS AND ANALYSES**

General Sampling Area	Location and Symbol	Number of Samples	Analyses	Total Number of Analyses
Soil Borings	GT-5SB - GT-9SB (2 ft. intervals)	Approx. 20 (soil)	Ionizable Compounds (Headspace, by FID)	Approx. 20
	GT-5SB - GT-9SB (Sample with highest recorded FID levels)	5 (soil)	Volatiles and Semi-Volatiles by PGC	10
	GT-5SB - GT-9SB (Overburden Groundwater)	1 - 5 (water)	Volatiles and Semi-Volatiles by PGC	2 - 10
"Background" Groundwater	BR-1	1 (water)	Volatiles and Semi-Volatiles (NYS DEC ASP Category B)	2
Seeps (North Bank of Fishkill Creek)	SE - 1 (SE - 2, if present)	1 - 2 (water)	Volatiles and Semi-Volatiles (NYS DEC ASP Category B)	2 - 4
QA/QC Samples	Field Duplicate	1 (water)	Volatiles and Semi-Volatiles (NYS DEC ASP Category B)	2
	Trip Blanks	1 (water)	Volatiles (NYS DEC ASP Category B)	1
	MS/MSD	1 (water)	Volatiles and Semi-Volatiles (NYS DEC ASP Category B)	2
	Column Syringe Blank	Approx 5 (air; solvent)	Volatiles and Semi-volatiles by PGC	10
	Reagent Blank	5 (Air)	Volatiles by PGC	5
	Continuing Control Standards	2	Volatiles and Semi-volatiles by PGC	4
TOTAL NUMBER OF ANALYSES				60 - 70

3.0 QUALITY CONTROL/QUALITY ASSURANCE

3.1 Field Custody Procedures

A sample is the physical evidence collected from the site on the environment. An important part of Groundwater Technology's investigation is the control and tracking of the collected evidence. This includes the ability to trace the possession and handling of samples from the time of collection through analysis and final disposition. This documentation of the history of the sample is referred to as the chain-of-custody. All field personnel must keep detailed records of all site activities and review all site notes prior to leaving the site.

All necessary sample bottles will be shipped by the laboratory. The chain-of-custody will begin with the laboratory relinquishing sampling bottles to Groundwater Technology's Environmental Site Assessment Specialist. Sample bottles needed for a specific sampling task will then be relinquished by the Environmental Site Assessment Specialist to the sampling team after the Environmental Site Assessment Specialist has checked the integrity of the bottles and assured that the proper bottles have been assigned to the task to be conducted. The Environmental Site Assessment Specialist will also check to make sure that all documentation concerning the decontamination of the sample containers are in accordance with the procedures outlined described as follows in this document. Proper chain-of-custody shall be maintained for traceability.

Immediately after sample collection, each sample bottle will be sealed with an individual custody seal. The samples will then be placed into an insulated cooler for shipment to the laboratory. Groundwater Technology field chain-of-custody records completed at the time of sample collection will accompany the sample cooler placed inside the cooler in a zip-lock bag. The cooler is then sealed for shipment to the laboratory. The samples will be properly relinquished on the field chain-of-custody record by the sampling team. Each cooler will contain sufficient ice and/or ice packs to insure proper temperature is maintained, and will be packed in a manner to prevent damage to sample containers. The Environmental Site Assessment Specialist or Sample Documentation Coordinator will initial and place a custody seal on each sample cooler. All samples will be shipped to the laboratory within 24 hours after they are collected via an overnight courier.

Upon arrival at the laboratory, the Sample Custodian at the lab must maintain possession of the chain-of-custody samples and all records documenting that possession. Upon receipt of samples, the Sample Custodian removes the chain-of-custody from the sealed cooler and must sign the shipping report accompanying each sample and records the date and time. Samples received are verified to match those listed on the chain-of-custody, and the custody seals inspected. A copy of this record becomes part of the report file. The custodian must sign the Chain-of-Custody "Received By" laboratory space. The samples are then secured under lock and key in refrigerated storage.

After each extraction or analysis of a sample fraction, the custody record must be signed by the analyst, indicating the date and time of completion, which samples were used, and to which location they were returned.

By signing the custody record, the individual affirms that he or she was completely responsible for the sample fraction during the period of time it was not in the secure storage.

The laboratory will maintain sample information records in a LIMS (Laboratory Information Management System) computer system. The sample receipt and data entry activity (called "login") is reflected in a daily report, which is immediately entered into the master logbook. This chronological file contains all samples.

Each laboratory manager gets a report of pertinent analyses not yet completed in the LIMS from the login activity. The tracking continues until the LIMS registers the completion of the invoice mailing.

Equipment Blank?

3.2 Field Quality Control Checks

The intent of the internal quality control program is to detect potential problems at the source and if necessary, trace the sample's analytical pathways for introduction of contamination. The quality control data generated in the field will be used to monitor sampling technique reproducibility and cleanliness. Quality control data generated by the laboratory will not only monitor reproducibility (precision) in laboratory methods and cleanliness, but accuracy in analyzed samples submitted for analysis.

The field quality control checks monitor the data quality as it is affected by field procedures and conditions. The degree of effort (number of check samples per total samples taken) is stated in this section for each category. The acceptability criteria are outlined in Table 3. All field quality control samples are submitted blind to the laboratory.

TABLE 3
FIELD DUPLICATE, PRECISION AND FIELD CONTROL FREQUENCY

PARAMETER	WATER: DUPLICATE PRECISION %RPD	SOIL: DUPLICATE PRECISION %RPD	QUALITY CONTROL FREQUENCY (ALL PARAMETERS)
VOLATILE ORGANIC COMPOUNDS	20 %	20 %	1 TRIP BLANK (VOA ONLY) 2 MATRIX SPIKE DUPLICATES 2 FIELD DUPLICATES
SEMI-VOLATILE ORGANIC COMPOUNDS	25 %	25 %	10 COLUMN SYRINGE BLANKS (PGC) 5 REAGENT BLANKS (PGC) 2 CONTINUING CONTROL STANDARDS (PGC)

The function of each quality control sample is described as follows:

Trip blank - Reagent water prepared by the laboratory and sealed in the proper sampling container. It is henceforth handled as other samples except that it is not opened or preserved (other than chilling). This sample focuses on external sources of contamination and sampling container quality and cleanliness. For each shipment of at least 20 samples, one trip blank will be submitted. A minimum of one trip blank will be submitted for each batch of glassware (plastic included) received by the field crew from the laboratory.

Blank water generated for use in this project must be "demonstrated analyte free". The recommended criteria for making this determination is as follows:

- Volatile Organics <10 ppb
- Semi-volatile Organics < CRQL

However, specifically for the common laboratory contaminants listed below, the allowable limits are three times the respective CRQLs (methylene chloride, acetone, 2-butanone, phthalates).

Duplicate - Blind field duplicates (as opposed to duplicate containers full of sample intended as backup) are sequential or collocated grab samples collected to monitor field precision (actually entire measurement system precision). One duplicate will be taken and submitted per matrix type, as described in Section 2.7.

Column Syringe Blank - Measures any contamination in the analytical system during PGC analyses (injection syringe or PGC column).

Reagent Blank - Reagent water to be used for volatile extractions will be analyzed to determine the presence of artifactual compounds. The reagent water should be replaced if contaminated.

3.3 Laboratory Quality Control

Quality control data generated by the laboratory will not only monitor reproducibility (precision) in laboratory methods and cleanliness, but accuracy in analyzed samples submitted for analysis.

The internal quality control checks to be routinely implemented by the lab include the following:

- **Replicates** - A minimum of 5% of all samples will be duplicated (unspiked) in the lab.
- **Matrix samples** - Volatile organic samples will be matrix spiked with the suggested matrix spike compound at a frequency of one per twenty samples per matrix or every fourteen days, whichever occurs most frequently. A matrix spike duplicate will be prepared simultaneously. Control limits for matrix spike performance are listed in Table 4.
- **Surrogate spikes** - Surrogate compound spikes are placed into all samples and all matrices for organic analysis prior to sample prep. The control limits are outlined in Table 5.
- **Blanks** - Blanks will be analyzed at a minimum one every twelve hours or twenty samples, whichever is more frequent. These blanks are referred to as method blanks.

The acceptability limits for method blanks is to be below the contract required quantification limits or less than 1/10 of the lowest sample in the batch. Up to five times the CRQL will be allowed for methylene chloride, acetone, 2-butanone, and phthalates if such level is above the contract required quantification limit.

- **Quality Control Standards** - Quality control standards (often referred to as spiked reference materials) traceable to the U.S. EPA or generated from concentrates prepared separately from calibration standards, will be included at a rate dependent on sample matrix and lab performance with matrix spikes. The minimum is one QC standard to validate the initial calibration. For organic analyses after every 12 hours of operation, a QC or mid-range standard will be analyzed to verify that the Calibration Check Compounds are within 25% of the initial calibration curve for volatiles analysis (40% for semi-volatiles analysis). Additionally, for organics the system response for System Performance Check Compounds must be verified to be above the minimum levels as described in the method SOP.
- EPA or NBS traceable standards will be run at least quarterly. The acceptability limits will be 90 - 110% for inorganic QC samples and as determined by the EPA for organic analyses.
- **GC/MS Tune** - Once every 12 hours the GC/MS tune must be verified as per the EPA Method. This tune is followed by the calibration verification, a method blank, and the internal standard response and retention time check before resuming sample analysis.

- GC/MS Internal Standard Response and Retention Times - Immediately after calibration verification the internal standard response must be verified to be within 50% to 200% of the response for the previous verification, and the internal standard retention times must be within 30 seconds of the previous verification run.
- Control Required Quantitation Limits (CRQL) will be reported as per NYS DEC ASP 12/91 protocols for volatile and semi-volatile organic compounds (see NYS DEC ASP, 12/91, Page 31)

TABLE 4
LABORATORY QUALITY CONTROL:
PERCENT SPIKE RECOVERIES

FRACTION	MATRIX SPIKE COMPOUND	WATER	RPD	LOW/MEDIUM SOIL	RPD
VOA	1,1-DICHLOROETHENE	61 - 145	10	59 - 172	22
VOA	TRICHLOROETHENE	71 - 120	14	62 - 137	24
VOA	CHLOROBENZENE	75 - 130	13	60 - 133	21
VOA	TOLUENE	76 - 125	13	59 - 139	21
VOA	BENZENE	76 - 127	11	66 - 142	21
BN	1,2,4-Trichlorobenzene	39 - 98	28	28 - 107	23
BN	Acenaphthene	46 - 118	31	31 - 137	19
BN	2,4-Dinitrotoluene	24 - 96	38	28 - 89	47
BN	Pyrene	26 - 127	31	35 - 142	36
BN	N-nitroso-di-n-propylamine	41 - 116	38	41 - 126	38
BN	1,4-Dichlorobenzene	36 - 97	28	28 - 104	27

TABLE 5
LABORATORY QUALITY CONTROL:
PERCENT SURROGATE SPIKE RECOVERY LIMITS

FRACTION	SURROGATE COMPOUND	WATER	LOW/MEDIUM SOIL
VOA	TOLUENE-d ₈	88 - 110	84 - 138
VOA	4-BROMOFLUOROBENZENE	86 - 115	59 - 113
VOA	1,2-DICHLOROETHANE-d ₄	76 - 114	70 - 121
BN	Nitrobenzene-d5	35 - 114	23 - 120
BN	2-Fluorobiphenyl	43 - 116	30 - 115
BN	Terphenyl-d ₁₄	33 - 141	18 - 137

4.0 DATA REDUCTION, VALIDATION, AND REPORTING

4.1 Field Data Collection and Reduction

Groundwater Technology field personnel will log all field measurements, observations, and field instrument calibrations in bound, waterproof field notebooks. Notebook entries will be dated, legible, and contain accurate and inclusive documentation of an individual's project activities and all other pertinent information. Because the logbook will be used to write reports, it will contain only facts and observations. Language will be objective, factual, and free of personal feelings or other terminology that may prove inappropriate. Each individual making an entry into the field notebook will date and sign their entry.

It is anticipated that the data reduction for this investigation will be minimal and will consist primarily of tabulating analytical results.

4.2 Laboratory Data Collection and Reduction

The data reduction scheme used in the lab for each of the measurement parameters, including the formulas used for calculating concentrations for both water and soils, will be that stated in the standard operating procedure for the analytical method used. The "method reference" column of Table 1 lists the analytical methods for each measurement parameter. All NYS DEC ASP analyses will utilize a bound notebook into which will be recorded the following items, at a minimum:

- a) analyst,
- b) date,
- c) sample number (lab #), and
- d) analysis set-up conditions, e.g., dilutions, auto-sampler position number, or other instrument specifics not covered by an SOP.

For instrumental analysis, this analysis notebook will be instrument-specific and referred to as an instrument log. For other types of analysis, this analysis logbook will also contain all raw data collected by the analyst.

The volatile and semi-volatile organic analysis involves electronic data handling, resulting in values bearing the conventional units, already corrected for dilutions. The analysis will need to round the answers appropriately and sometimes sum columns of data. For extractable organics, sample volume, and amount of injection enter into the calculation. In this case the electronic data handling system will report in-solution concentration, and the analyst will apply the corresponding correction using the sample volume recorded

on the extractions lab bench sheet, and the injection volume recorded in the analysis logbook. The resulting run factor and how it is derived will be transcribed onto the In-process data form to assist in the validation process.

For all analyses, the data will not be blank-corrected and will be flagged if blanks do not meet acceptability criteria. Additionally, any result that is less than ten times the value of the blank will be considered suspect.

Chemists and technicians will be responsible for the measurement/analysis of any specific parameter, and for any calculations associated with the determination of parameter concentrations. All calculations are listed in the referenced method ("method reference" column of Table 1). The chemists and their supervisors will be responsible for reviewing all results, applying calculation checks on a minimum of 10 percent of the results on each report. These individuals will be responsible for determining whether or not the results are acceptable, though the ultimate authority to determine acceptability will be with the laboratory's Director of Quality Assurance. The laboratory section manager will be responsible for the final review of all data and for the proofing of reports prior to submittal of the reports to Groundwater Technology.

Final reports will be typed from the in-process report forms approved by the supervisor after the review of all supporting data. The in-process forms along with all hardcopy data output and other case records will be stored together in a single secure location indexed by project number for at least five years. This location will be in Groundwater Technology's Schenectady, New York office.

All data will be cross-checked for correctness by GTEL's QA Director for reported values, detection limits, percent moisture and dilution factors (if applicable), after data has been reduced and transcribed into the final reporting format. The procedure to be used in the final cross-check of the data in the final report format will be as follows:

1. obtain the laboratory data or field notebooks and final reports
2. compare the sample numbers and description
3. compare the sample date and time (if provided)
4. compare all positive results with those reported in the laboratory report, and
5. laboratory data will be checked for corrections with mathematical calculations.

4.3 Laboratory Validation

A complete record of each sample's history will be available for documenting its progress from the time of sample collection to arrival at the laboratory and through the laboratory from sample receipt to reporting. Data validation will include the use of dated entries, signed by analysts and supervisors, on worksheets and logbooks used for all samples, the use of sample tracking and numbering systems to logically follow the progress of samples through the laboratory, and the use of quality control criteria to reject or accept specific data (see Section 3.2 and 3.3).

The validation procedures for volatile and semi-volatile organic compounds are outlined below. These complete procedures are contained in "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988, and will be performed by the Groundwater Technology Project Manager.

VOLATILE AND SEMI-VOLATILE COMPOUND PROCEDURES

The requirements that will be checked in validation are listed below:

- I. Holding Times (Lab holding times only)
- II. Blanks
- III. Surrogate Recovery
- IV. Matrix Spike/Matrix Spike Duplicate
- V. Field Duplicates
- VI. Compound Identification
- VII. Compound Quantitation and Reported Detection Limits
- VIII. Overall Assessment of the Data for the Case

4.4 Reporting of Data and Outliers

The laboratory will report volatile and semi-volatile organic compound as delineated in Exhibit B, Category B, pages B-37 through B-67 in the NYS DEC 1989 ASP, revised 12/91. This data package will be presented as an Appendix to the Building 83 RFI Phase II Report.

Outliers will be identified at the data validation stage by the Project Manager. Outliers are unusually large or unusually small values in a population of observations. It is necessary to eliminate outliers during QC data review because of the skewing effect which can destroy the effectiveness of the QC data.

When any particular value is suspected to be an outlier, the following steps will be taken:

- (a) Other data from the same sample will be checked to see if they are also anomalous.
- (b) The Project Manager will interrogate any individuals involved in generating the anomalous value. This will include questioning the field crew and the analyst(s).
- (c) If samplers demonstrate standard competency in the sampling procedure used at the time the sample with the anomalous value was obtained, then sampling error will be dismissed as a possible cause of the outlier.
- (d) The analyst(s) will be asked to examine his notes and calculations and, if possible, to rerun the sample for the specific parameter in question. The sample will be rerun even if the holding time has been exceeded, but the rerun value will be used for purposes of comparison only.

All analytical data (field and laboratory) will then be summarized in the RFI Phase II Report with appropriate qualifications as indicated by review of field and laboratory performance. Unusable data will be identified by the process described above.

Analytical data will be compared to NYS DEC Guidance Values for soil and groundwater, so that recommendations may be submitted for monitoring or corrective action, if indicated, at the Building 83 Area.

5.0 REFERENCES

1. Gilbert, Richard O., 1987, Statistical Methods for Environmental Pollution Monitoring, Van Nostrand Reinhold, New York, New York, p. 122.
2. Groundwater Technology, Inc., "Task I Report: Description of Current Conditions, Building 83 Area, Texaco Research Center, Beacon, New York", May 29, 1991 (1991A).
3. Groundwater Technology, Inc., "Task II Report: Pre-investigation Evaluation of Corrective Measures, Building 83 Area, Texaco Research Center, Beacon, New York", June 26, 1991 (1991B).
4. Groundwater Technology, Inc., "Task III, Volume II: Quality Assurance Project Plan (QAPjP. RCRA Facility Investigation. Texaco Research Center, Beacon, New York", July 9, 1992.
5. Groundwater Technology, Inc., "Task VII: Facility Investigation Report, Container Storage Building 83. Texaco Research Center, Beacon, New York", March 12, 1993.