C. RYAN

GERAGHTY & MILLER, INC.
Environmental Services

64787

Ground Water *Engineering* *Hydrocarbon* *Remediation* *Education*

June 11, 1993

Ana Gloria Ramos, P.E.
Designated Coordinator
Tutu Environmental Investigation Committee
P.O. Box 364269
San Juan, Puerto Rico 00936-4269

Re: Technical Approach for Monitoring Well Installation at Western Auto Underground Storage Tanks, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands

Dear Ms. Ramos:

In response to the May 20, 1993 letter to you from Jack Dema, legal counsel for Four Winds Plaza Partnership, Geraghty & Miller, Inc. has prepared this letter describing the technical approach for the installation of Monitoring Well MW-16 as proposed in Technical Memorandum II, Tutu Service Station Investigation. This monitoring well was proposed to be installed southeast of the underground storage tanks (USTs) located west of the Western Auto service bays at Four Winds Plaza (see enclosed Figure 1).

Mr. Dema's May 20 letter raised the following concerns:

- Elevation of potentially "perched" water near the USTs.
- Water quality of the perched water.
- Extent of the tank excavation (now backfilled) and possible drain fields.
- Elevation of and depth to ground water in the Tutu bedrock aquifer.
- Installation of a double-cased well to eliminate the possibility of introducing potential contaminants from the perched water zone to the underlying bedrock aquifer.

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The Tutu Environmental Investigation Committee (TEIC) and Geraghty & Miller believe these concerns are important and need to be addressed. Accordingly, Geraghty & Miller has reviewed the previous soil boring data developed by Four Winds' consultant, Caribbean Hydro-Tech, and a summary is presented below. Based on the previous work and Mr. Dema's concerns (listed above) Geraghty & Miller has expanded the proposed scope of work near the Western Auto USTs to include a geophysical survey, two piezometers (proposed Piezometers P-1 and P-2), and one monitoring well (proposed Monitoring Well MW-16). As originally proposed, another monitoring well (proposed Monitoring Well MW-17) is also planned to be installed in front (east) of the Four Winds Plaza building.

PREVIOUS WORK

Geraghty & Miller has reviewed letter reports dated November 28, December 4 and 12, 1992 and analytical data submitted by Caribbean Hydro-Tech, Inc. to Clifford Crooke of the U.S. Virgin Islands Department of Planning and Natural Resources (DPNR). Copies of letters, analytical data, and field notes included in Four Winds Plaza Partnership's Supplemental Response to USEPA's request for information are enclosed. Geraghty & Miller prepared Table 1 (enclosed) which summarizes the detected compounds in soil, ground-water, and sand-backfill samples collected by Caribbean Hydro-Tech.

Caribbean Hydro-Tech identified three underground storage tanks west of the Western Auto service bays (see Figure 1). Two above ground tanks are also present in this area. Table 2 provides a summary of the size, usage, and current status of these tanks. During November 25 through December 11, 1992 Caribbean Hydro-Tech installed eight shallow soil borings (TW-1 through TW-8) each having a total depth of 4 feet or less. At three soil boring locations (TW-1, TW-4, and TW-6) soil samples were collected for laboratory analysis. Analytical parameters included volatile organic compounds (VOCs) using EPA Method 8010/8020, polynuclear aromatic hydrocarbons (PAHs) using EPA Method 8100, petroleum hydrocarbons (PHCs) using Method 9073, and oil and grease using an unspecified analytical method.

At two soil borings (TW-2 and TW-5) where water-saturated gravel fill was encountered, Caribbean Hydro-Tech collected ground-water samples using a disposable bailer. Because this sampling method may include contaminated soil suspended in the aqueous sample, analytical results may be indicative of a combination of contaminant concentrations in soil and ground water, rather than ground-water alone. A ground-water sample from a properly installed sampling point (i.e., piezometer or monitoring well) would be more representative of ground-water quality.

The contents of the three USTs were sampled by Caribbean Hydro-Tech. Tank No. 1 and the "Ramp Tank" (Tank No. 3) were apparently filled with sand. Tank No. 2 was found to contain approximately 2.5 feet of hydrocarbon liquid on December 2, 1993. Caribbean Hydro-Tech collected a sample of this liquid for analysis of VOCs using EPA Method 601, PAHs using EPA Method 610, oil and grease using an unspecified method, and PHCs using an unspecified method. The highest VOC concentration detected in this sample was 1,1,1-trichloroethane at 700 micrograms per liter (ug/L). Petroleum compounds were also reported in this sample from Tank No. 2 (see Table 1).

It should be noted that the Caribbean Hydro-Tech sampling in November and December 1992 was not intended to meet USEPA Contract Laboratory Protocol (CLP) procedures. In our review of the data, it was apparent that strict CLP quality assurance (QA) and quality control (QC) is not possible with the available data. However, even basic QA/QC procedures were not performed, including: (1) chain of custody documentation, (2) collection of blind field replicates to assess sampling and laboratory accuracy and reproducibility, (3) specification of analytical methods used for petroleum hydrocarbons and oil and grease, (4) documentation of preservatives used, if any, and (5) collection of equipment and/or field blanks. Since CLP procedures were not used and no matrix spike or matrix spike duplicates were collected and analyzed, the effect of matrix interferences cannot be assessed. Typically, matrix interferences cause poor recoveries of spiked concentrations and the reported results would then be qualified as estimated because the actual concentrations may be higher. Considering this sampling performed by Caribbean Hydro-Tech was not intended to meet CLP requirements and the lack of QA/QC procedures and

documentation, the analytical results should be assumed to be accurate only for preliminary screening purposes.

PROPOSED WORK

The main objective of the proposed work at the Western Auto USTs is to determine the impact of the USTs on ground-water quality. The previous work performed by Caribbean Hydro-Tech in November and December 1992 indicates that a release of petroleum compounds and 1,1,1-trichloroethane has occurred which impacted soil and ground-water quality. The proposed scope of work is intended (1) to supplement and adequately document the previous findings, (2) to determine if "perched" ground water exists in the tank excavation area, and (3) to determine the hydraulic relationship and distribution of contaminants between the perched water and the ground-water in the bedrock unit. The proposed scope of work for the investigation of the Western Auto USTs includes a geophysical survey, installing and sampling two piezometers, and two monitoring wells, is presented in detail below.

GEOPHYSICAL SURVEY

Geraghty & Miller proposes a ground penetrating radar (GPR) geophysical survey in the paved area west of the Western Auto service bays and south of the loading dock (Figure 2). The objectives of the GPR survey will be to confirm the location of the USTs and delineate the extent of the gravel-filled excavations associated with the three USTs. Additionally, the GPR survey will be used to locate potential pipelines, underground utilities, trenches, drainfields, and any other subsurface features which will assist in the proper location of test borings and monitoring wells. Geophysical information will also be used to help characterize geological conditions (i.e., top of bedrock and depth to the water-table).

A grid system consisting of perpendicular lines with a 5-foot spacing would be used for the survey (Figure 2). Both 500 megahertz (MHz) and 300 MHz antennas would be used to complete the survey. The 500 MHz antenna has high vertical and horizontal resolution, and is

typically used to delineate the location of USTs, pipelines, and other shallow targets. The 300 MHz antenna has a greater depth of investigation, and is usually used to evaluate geological conditions underlying a site. The results of the GPR geophysical survey will be used to optimize the location of three soil borings which will be used to install two piezometers and one monitoring well.

INSTALLATION OF TWO PIEZOMETERS

To determine if perched water exists and its elevation and water-quality, Geraghty & Miller proposes to install shallow piezometers near Caribbean Hydro-Tech's borings TW-2 and TW-5 to measure water levels and to confirm the reported aqueous analyses . Borings TW-2 and TW-5 encountered 3 feet of gravel fill beneath the asphalt with a reported water table at 1.5 feet below land surface (bls). An aqueous sample collected by Caribbean Hydro-Tech from this location on November 25, 1992 had reported concentrations of benzene (2.8 ug/L), ethylbenzene (11 ug/L), toluene (3.6 ug/L), xylenes (17 ug/L), PHCs (430,000 ug/L) and oil and grease (450,000 ug/L). Caribbean Hydro-Tech noted "an oily sheen, odor, and discoloration" in this ground-water sample. An aqueous sample collected by Caribbean Hydro-Tech at Boring TW-5 had reported concentrations of ethylbenzene (7.8 ug/L), toluene (1.1 ug/L), total xylenes (24 ug/L), fluorene (760 ug/L), naphthalene (730 ug/L), 2-methylnaphthalene (1100 ug/L), PHCs (90,000 ug/L), and oil & grease (110,000 ug/L).

Geraghty & Miller proposes to install Piezometer P-1 near the location of Boring TW-2 and Piezometer P-2 near the location of Boring TW-5 (see Figure 2). Because the perched water is reported to be 1.5 bls, no soil sampling is proposed at these locations.

If saturated soils are not encountered at these locations, a soil sample will be collected instead of installing a piezometer. The piezometers will consist of two feet of 2-inch diameter schedule-40 polyvinyl chloride (PVC) screen installed from 3.0 to 1.0 feet bls. A 0.020-inch (i.e., 20-slot) screen opening will be used with a Grade 1 silica sand pack installed in a minimum 4-inch diameter borehole. Solid schedule-40 PVC casing will be extended from 1.0

feet bls to the land surface. The sand pack will be installed from 3.0 to 0.8 feet bls. The remainder of the annular space will be sealed with a portland cement-bentonite grout. The PVC casing will be capped with a sanitary seal cap equipped with an internal expanding rubber gasket. A flush-mounted locking steel protective casing will be cemented over each piezometer to prevent unauthorized access.

INSTALLATION OF MONITORING WELLS

To evaluate the ground-water elevation and ground-water quality in the Tutu aquifer, Geraghty & Miller proposes to install Monitoring Well MW-16 (see Figure 2). This monitoring well should be located near Boring TW-1 in which 4 feet of compact red clayey soil was encountered. Analysis of soil collected at TW-1 had no detectable results for VOCs and PAHs; only PHCs at 32,000 micrograms per kilogram (ug/kg) and oil & grease at 40,000 ug/kg were reported in this sample (see Table 1). The lack of detectable VOCs and PAHs and the low permeability of this clay soil make this area less likely than areas of saturated gravel to contribute contaminants to the bedrock unit during drilling into the bedrock. Even though this drilling location does not appear to have impacted soils, the installation of a monitoring well at this location will be double-cased. After a 10-inch diameter boring is advanced to bedrock using the hollow stem auger method, approximately 4 to 5 feet of 6-inch diameter steel casing will be grouted in the borehole to seal off the unconsolidated soils from the bedrock unit during further drilling. After allowing the grout to set for 24-hours, drilling will proceed into bedrock via the steel casing using a 6-inch diameter down the hole hammer bit. Drilling will be continued to approximately 15 feet below the water table and Monitoring Well MW-16 will be completed with an open borehole. This is consistent with construction of the other monitoring wells installed by Geraghty & Miller. Similarly, Geraghty & Miller has proposed Monitoring Well MW-17 to be installed in the front (east) of Four Winds Plaza to evaluate ground-water quality in the bedrock unit further downgradient of the Western Auto USTs.

SAMPLING AND ANALYSIS

One soil sample should be collected from the interval with the highest HNU reading from the boring for Monitoring Well MW-16. Analysis will include Target Compound List (TCL) VOCs, TCL Base Neutral/Acid extractable (BNA) compounds, Target Analyte List (TAL) Metals, Cyanide, and TPH as specified in the Tutu Service Station Investigation Work Plan (Geraghty & Miller, Inc. 1992). The TCL BNA parameter list includes PAHs as well as other semi-volatile compounds. At least two rounds of water level measurements will be collected from the piezometers and monitoring well after well development. Ground-water samples will be collected from Piezometers P-1 and P-2 and Monitoring Wells MW-16 and MW-17 during the second sampling round of the monitoring well system installed for the Tutu Service Station Investigation.

If you have any questions, or if we can provide you with any additional information, please call.

Sincerely,

GERAGHTY & MILLER, INC.

Thomas V. Danahy
Senior Scientist/Project Manager

Robert Mozer
Project Director/Project Officer

c: Caroline Kwan, USEPA
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Jose Agrelot, Soil Tech

PR01301-WP4/6293.LTR/df

Table 1. Summary of Detected Compounds for Soil, Ground Water, and Sand-Backfill Samples Collected by Caribbean Hydro-Tech, Inc., November 28 through December 11, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Sample	Date Collected	Matrix/Description	Detected Compounds	Analyte Concentration	
UST No. 1	11/25/92	Sand-Backfill	PHC	14,000	ug/kg
			Oil & grease	15,000	ug/kg
TW-1	11/25/92	Soil	PHC	32,000	ug/kg
			Oil & grease	40,000	ug/kg
TW-2	11/25/92	Liquid	Benzene	2.8	ug/L
			Ethylbenzene	11	ug/L
			Toluene	3.6	ug/L
			Xylenes (total)	17	ug/L
			PHC	430,000	ug/kg
			Oil & grease	450,000	ug/kg
UST No. 2	12/8/92	Liquid	1,1,1-Trichloroethane	700	ug/L
			Benzene	26	ug/L
			Ethylbenzene	13	ug/L
			Naphthalene	190	ug/L
			Pyrene	350	ug/L
			1-Methylnapthalene	200	ug/L
			Oil & grease	690,000	ug/L
			PHC	690,000	ug/L
TW-4	12/2/92	Soil	2-Methylnaphthalene	570	ug/kg
			PHC	56,000	ug/kg
			Oil & grease	240,000	ug/kg
TW-5	12/2/92	Liquid	Ethylbenzene	7.8	ug/L
			Toluene	1.1	ug/L
			Xylenes (total)	24	ug/L
			Fluorene	760	ug/L
			Naphthalene	730	ug/L
			2-Methylnapthalene	1,100	ug/L
			PHC	90,000	ug/L
			Oil & grease	110,000	ug/L
UST No. 3 (Ramp Tank)	12/2/92	Sand-Backfill	Chrysene and Benzo(a)anthracene	1,600	ug/kg
			Fluoranthene	340	ug/kg
			Phenanthrene and Anthracene	400	ug/kg
TW-6	12/9/92	Soil	1,1,1-Trichloroethane	100	ug/kg
			PHC	100,000	ug/kg
			Oil & grease	330,000	ug/kg

ug/L Micrograms per liter.
ug/kg Micrograms per kilogram.
PHC Petroleum hydrocarbons.
UST Underground storage tank.
No samples were collected at Borings TW-3, TW-7, and TW-8 for laboratory analysis.
PR01301-T1/6293A.XLS/df

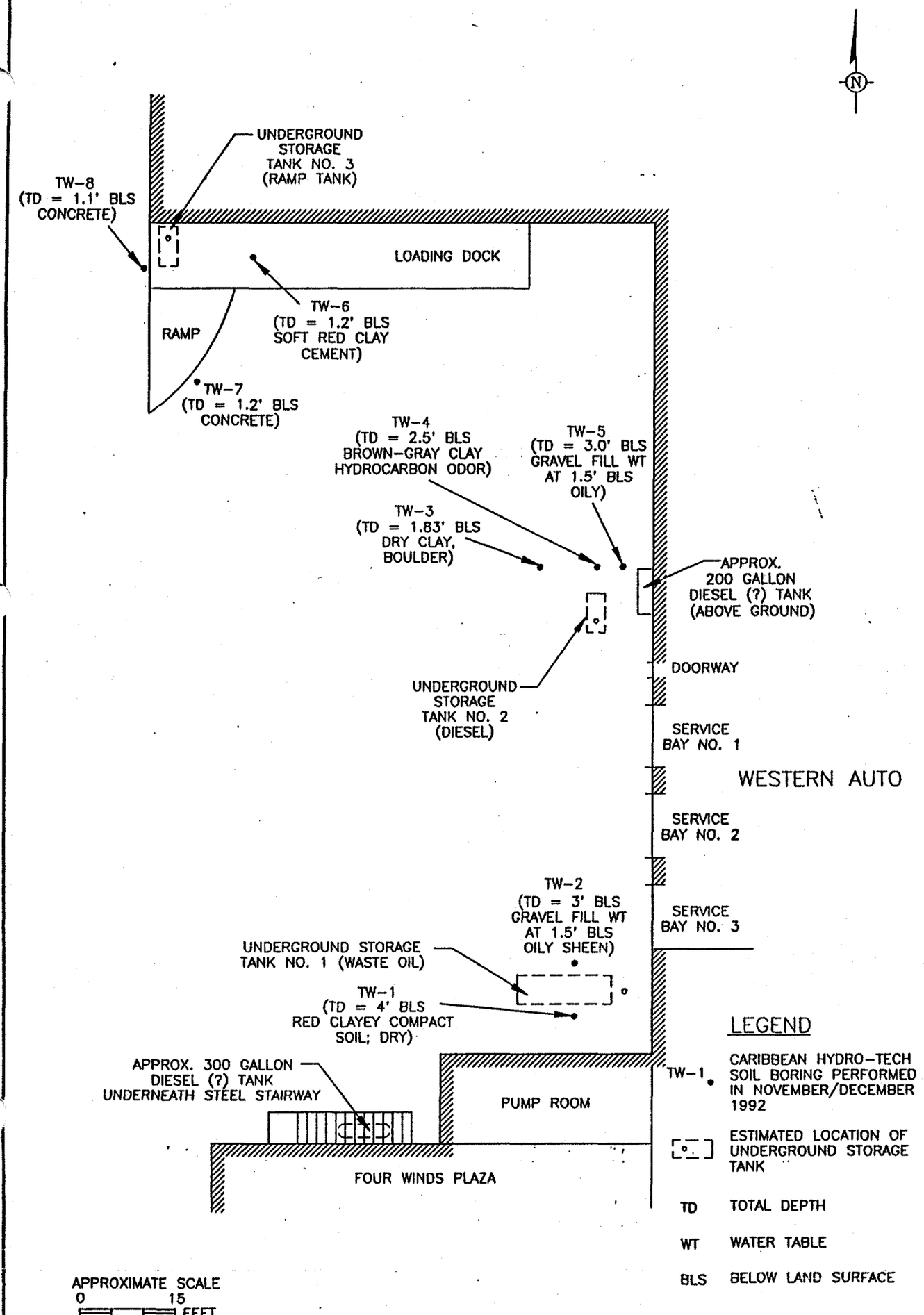
Table 2. Estimated Volume of Materials Historically Stored in Underground Storage Tanks and Materials Presently Stored in Above Ground Tanks, Western Auto Garage Area, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Tank	Dimensions (estimated in feet) (2)	Volume (approximate)	Material(s) Reportedly Contained (1)
UST No. 1	4' x 15' to 5' x 20'	Estimated 1,175 gallons to 2,447 gallons	Waste oil (presently filled with sand)
UST No. 2	3' x 5' to 3' x 6'	Estimated 220 gallons to 264 gallons	Diesel Fuel
UST No. 3 (Ramp Tank)	5' x 15' to 5' x 20'	Estimated 1,836 gallons to 2,447 gallons	Unknown (presently filled with sand)
Above ground Tank No. 1	Will be measured in the field	Estimated 200 gallons	Diesel Fuel
Above ground Tank No. 2	Will be measured in the field	Estimated 300 gallons	Diesel Fuel

UST Underground storage tank.
(1) Materials historically and currently contained in Western Auto tanks as reported by Caribbean Hydro-Tech, Inc. 1992.
(2) Estimated dimensions of underground storage tanks were reported by Caribbean Hydro-Tech, Inc. 1992.

PR01301-T1/6293.XLS/df

DWG DATE: 3JUNE93	PRJCT NO.: PR01301	FILE: TU-226	DRAWING: TU-226	CHECKED: J. BURDICK	APPROVED: T. DANAHY	DRAFTER: K. MC CANN



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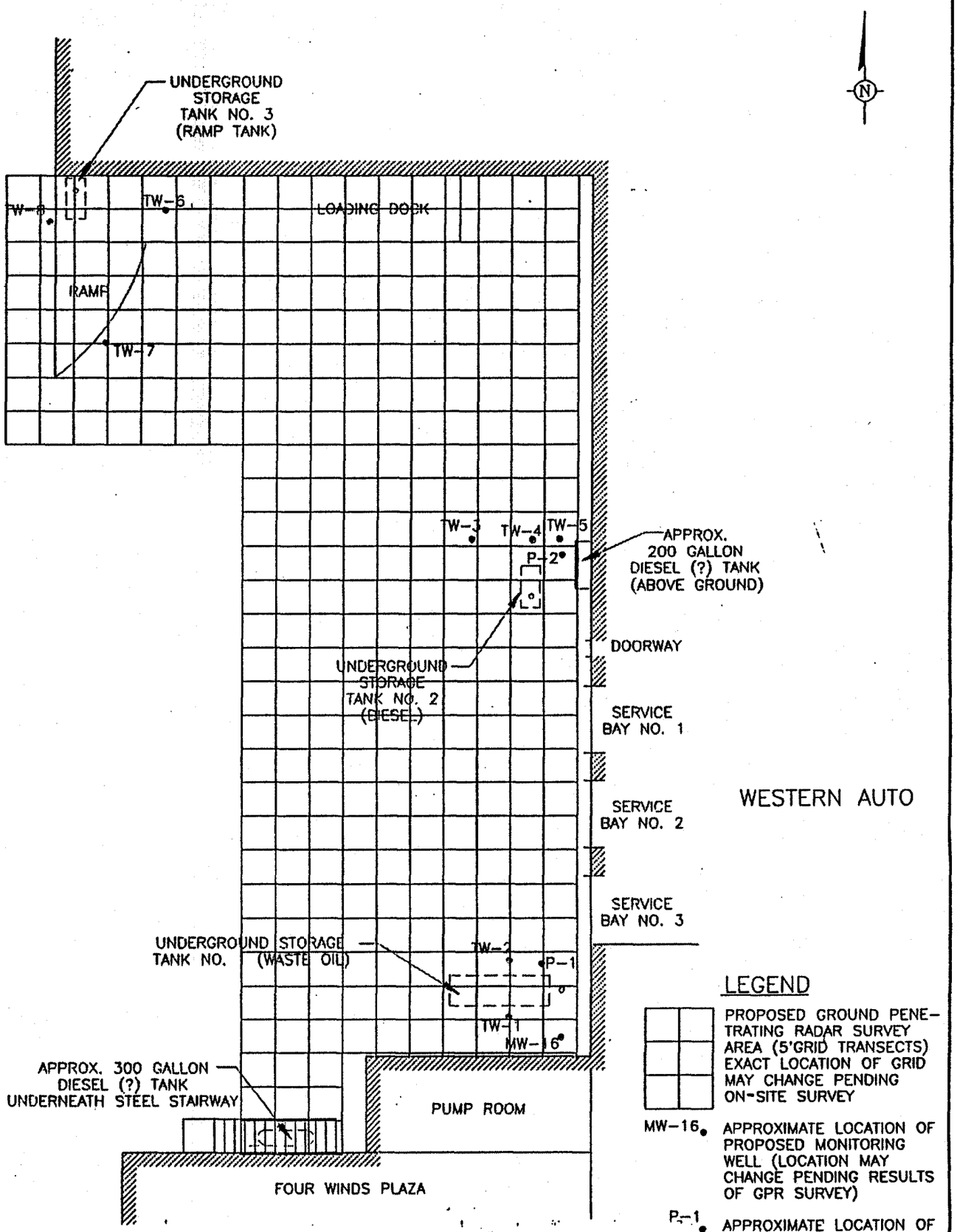
WESTERN AUTO GARAGE AREA SITE PLAN

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE 1

DWG DATE: 2JUNE93	PRJCT NO.: PR01301	FILE: TU-227	DRAWING: TU-227	CHECKED: J. BURDICK	APPROVED: T. DANAHY	DRAFTER: K. MC CANN



LEGEND

- PROPOSED GROUND PENETRATING RADAR SURVEY AREA (5'GRID TRANSECTS) EXACT LOCATION OF GRID MAY CHANGE PENDING ON-SITE SURVEY
- MW-16 • APPROXIMATE LOCATION OF PROPOSED MONITORING WELL (LOCATION MAY CHANGE PENDING RESULTS OF GPR SURVEY)
- P-1 • APPROXIMATE LOCATION OF PROPOSED PIEZOMETER (LOCATION MAY CHANGE PENDING RESULTS OF GPR SURVEY)
- TW-1 • CARIBBEAN HYDRO-TECH SOIL BORING PERFORMED IN NOVEMBER/DECEMBER 1992
- ESTIMATED LOCATION OF UNDERGROUND STORAGE TANK

APPROXIMATE SCALE
0 15
FEET

GERAGHTY & MILLER, INC.
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WESTERN AUTO GARAGE AREA
PROPOSED WORK

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
2