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FINAL PRELIMINARY CONTAMINATION ASSESSMENT REPORT/CONTAMINATION ASSESSMENT PLAN FOR CHICORA TANK FARM CNC CHARLESTON SC

9/1/1991

KEMRON ENVIRONMENTAL SERVICES

FINAL REPORT
PRELIMINARY CONTAMINATION ASSESSMENT REPORT/
CONTAMINATION ASSESSMENT PLAN
CHICORA TANK FARM
CHARLESTON NAVAL BASE
CHARLESTON, SOUTH CAROLINA
UIC: M60169

Report to:

SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

SEPTEMBER 1991

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OF THE NAVAL SUPPLY CENTER, CHARLESTON, SOUTH CAROLINA

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PRELIMINARY CONTAMINATION ASSESSMENT REPORT/
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PRELIMINARY CONTAMINATION ASSESSMENT REPORT/ CONTAMINATION ASSESSMENT PLAN FOR CHICORA TANK FARM CHARLESTON NAVAL SHIPYARD CHARLESTON, SOUTH CAROLINA UIC: M60169

* * *

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EXECUTIVE SUMMARY

This document is a Preliminary Contamination Assessment Report (PCAR) and a Contamination Assessment Plan (CAP). As a preliminary contamination assessment report, it reports completion of preliminary delineation work at the Chicora Tank Farm (CTF), Naval Supply Center, Naval Station, Charleston, South Carolina. It also reports the findings, in summary, of prior studies. As a contamination assessment plan it discusses proposed further assessment activities necessary in order to develop a Remedial Action Plan (RAP), if one is deemed necessary. The reasons for conducting further contamination assessment are discussed as are proposed additional contamination delineation measures. In addition, limited initial abatement measures are proposed for immediate implementation.

CTF is an old facility, located approximately 1,500 feet west of the Charleston Naval Shipyard, and has been in constant use since its construction in 1943. The 23-acre facility originally consisted of six buried concrete fuel tanks, with a combined capacity of 277,000 barrels (11.634 million gallons). Due to the closure of two tanks, in 1988 and 1990, the capacity of the tank farm has been reduced to 177,000 barrels. Fuels currently stored at the site are less viscous than fuels for which the tanks were designed. Leakage through the tank walls into the attached pump rooms is substantial. This investigation was undertaken to determine whether leakage is confined to the pump rooms or is being released to the environment. Leakage to the environment in significant amounts was not found. Soils at the site contain negligible fuel concentrations with two areas along the perimeter showing low concentrations of BTEX or PAH constituents. Shallow groundwater is generally clean, with traces of benzene in one peripheral well.

A french drain system dominates groundwater movement at the site. With few exceptions, groundwaters beneath the site flow to and discharge through the french drain. The drain system discharges to the site spill containment pond. Traces of fuel were found in upstream portions of the french drain; substantial accumulations were found in the last manhole (FD-3) above the pond, a place where water levels never drop to the level of the exit pipe, as the pipe is well below the water elevation of the pond, located directly downstream. Substantial fuel contamination at the site appears to be limited to this manhole, and by implication, the pond immediately downstream. Pond waters were clean but sediments have not yet been measured.

After evaluation of the alternatives it seems clear that the low levels of soil and groundwater contamination encountered during the preliminary assessment do not justify installation of additional boreholes and monitoring wells. Instead, a monitoring schedule for the wells and the french drain system, combined with a one-time characterization of retention pond sediments is proposed. The 11 site monitoring wells and 3 french drain inlets will be sampled quarterly for a period of one year. The area of heaviest water contamination, FD-3, will be pumped to remove the existing contamination. This scheduled sampling and monitoring program should allow enough data to be collected to fully understand remediation needs of the site.

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CHAPTER 1. INTRODUCTION

This chapter provides information which places the remainder of the document in context.

1.1 PURPOSE AND SCOPE. This document is a Preliminary Contamination Assessment Report (PCAR) and Contamination Assessment Plan (CAP) for the Chicora Tank Farm (CTF), a below ground petroleum tank farm operated by the Naval Supply Center in Charleston, South Carolina. As a PCAR, this document summarizes assessment activities to date and reports the recently completed preliminary contamination assessment at CTF. As a CAP, this document reports planned follow-up assessment activities.

This document was prepared by Kemron Environmental Services, Inc., Southeastern Regional Office, at the request of the Department of the Navy, Southern Division, Naval Facilities Engineering Command (E.R. Batten, Engineer in Charge) under contract number N62467-87-D-0650.

1.2 SITE DESCRIPTION. CTF is one of two fuel and lubricant tank farms serving the Naval Shipyard. The other is the Defense Fuel Supply Point, located approximately 1/2 mile northeast of the site. CTF is located approximately 500 yards west of the Charleston Naval Shipyard, as shown in Figure 1-1. The tank farm consists of six subsurface, reinforced concrete, fuel storage tanks (five 50,000 bbl and one 27,000 bbl), located on a completely fenced site covering approximately 23 acres (Figure 1-2). The tanks are approximately 25 feet in height with 24" reinforced concrete walls, domed roofs, and attached pump rooms, measuring approximately 23'

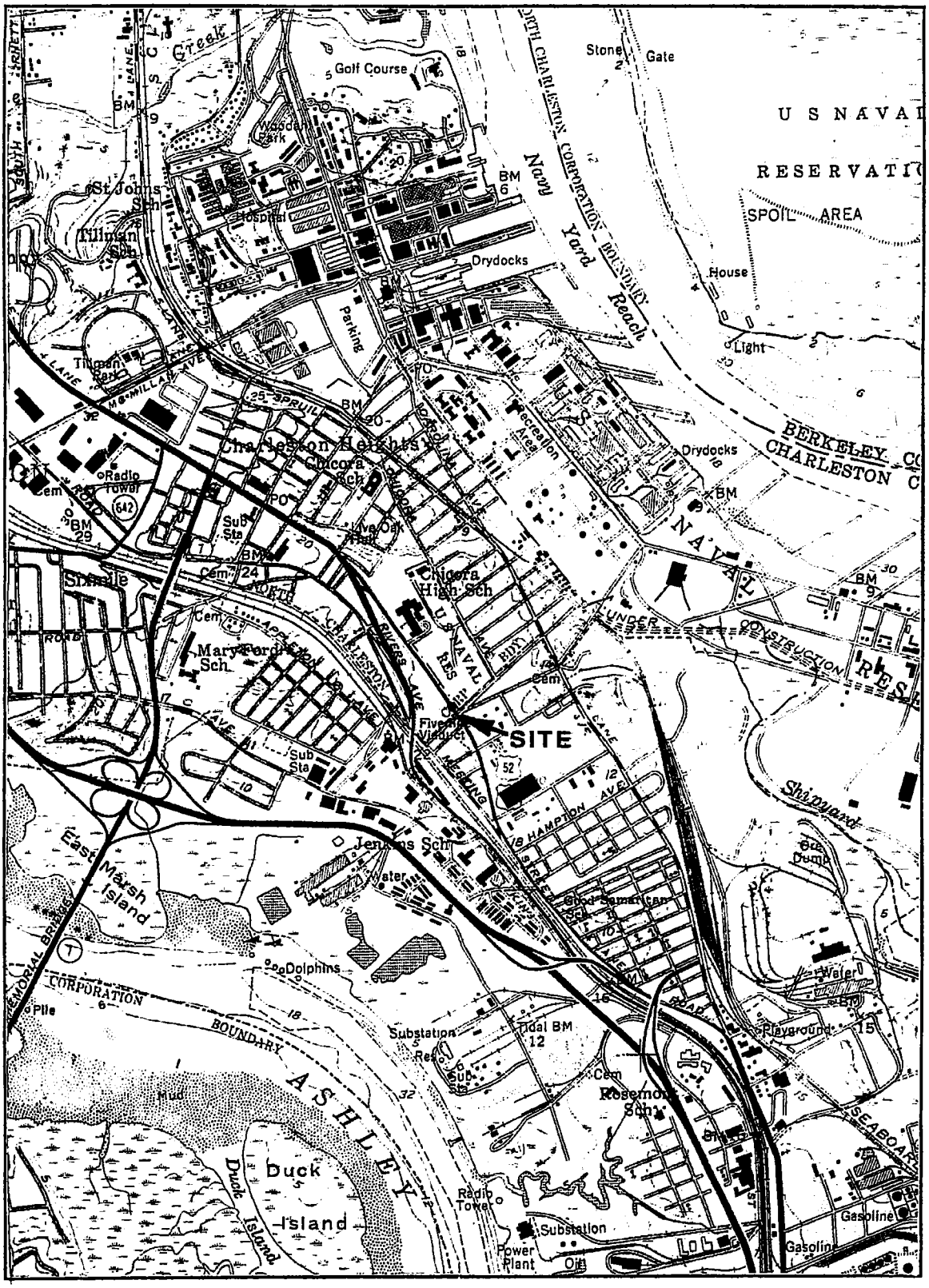

Figure 1-1. Vicinity Map Scale 1:24000
7.5 Minute USGS Charleston, SC Quadrangle.

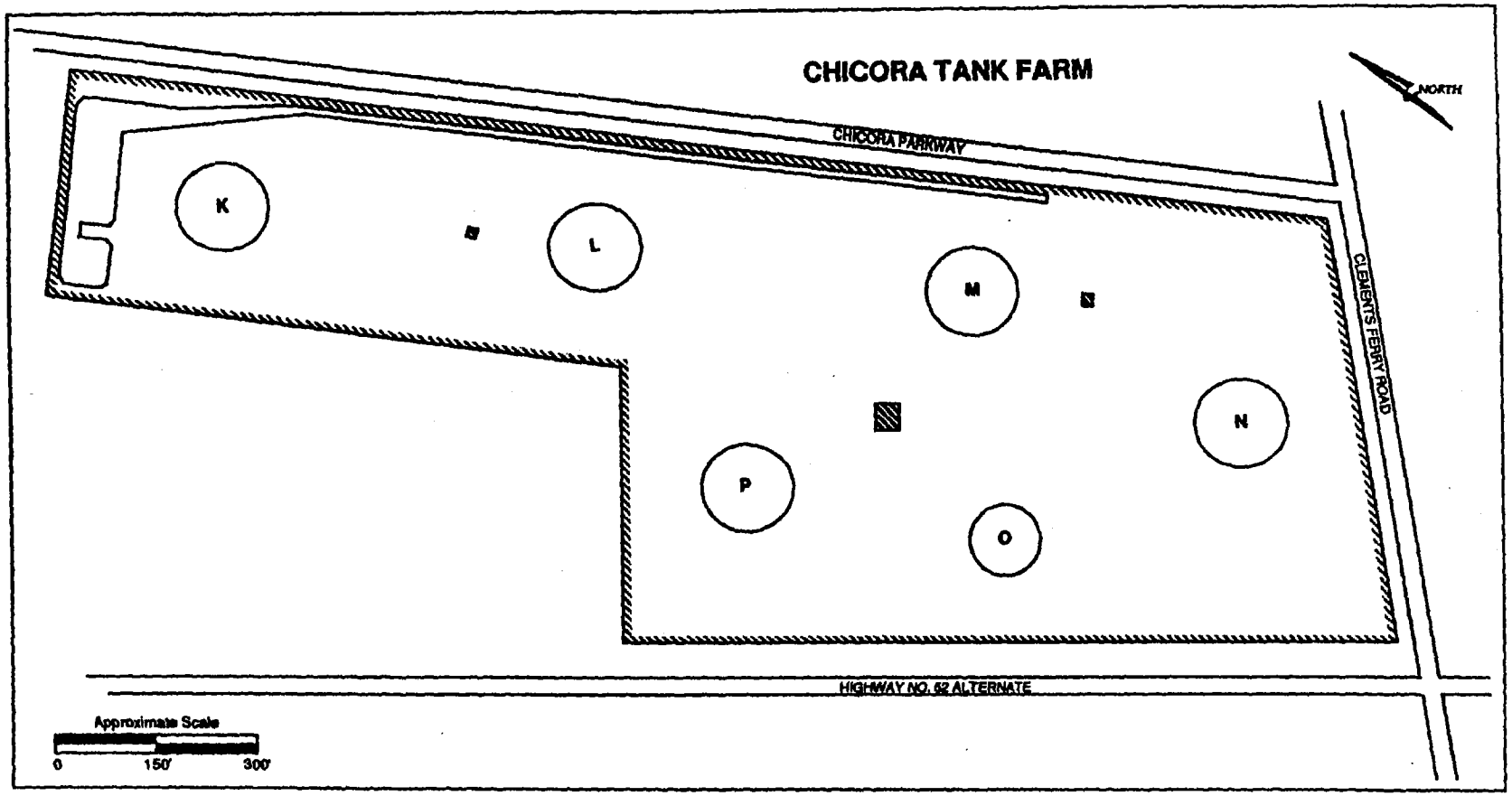

Figure 1-2. Site Map.

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X 24′ X 27′. Tanks are situated above normal grade and are covered with soil (3-5 feet thick at the apex), such that each tank appears to be a small hillock. Each tank is coated exteriorly with 3" of gunite to minimize leakage of groundwater into the tanks.

A tank sump, containing a supply pipe, a return pipe, and a wastewater drain pipe, is located adjacent to each tank pumproom. Tank and pumproom sump discharges are piped to the Base wastewater treatment plant. Underground 18" product supply and return pipelines from the tank farm extend under Chicora Parkway and follow Token and Redwood Streets to the shipyard. A french drain network is present beneath the site. The french drain network consists of a northwest to southeast oriented 18" main drainage line connected by a series of three access manholes to a series of 12" french drains which extend around or under each tank. The french drain network is illustrated on Figure 1-3. Groundwater, upon entering the french drains beneath each tank, flows into the centrally located main drainage line. Groundwater flow is then channelled through the main drainage line in a northwesterly direction into a retention pond located on the northwest portion of the property. Overflow water from the retention pond flows through a concrete discharge port into the marshy tidal slough adjacent to the northern boundary of the site.

Originally the french drain system discharged directly into the marshy tidal slough. The original purpose of the french drain system was apparently to prevent damage to the tanks from fluctuations in the shallow water table. In 1974, a spill containment system was installed consisting of a drainage ditch running along the northeast boundary of the farm and the above-mentioned retention pond located at the northwest end of the farm. Both the drainage ditch and the retention pond were lined with 30 mil polyethylene. The french drain and surface drainage

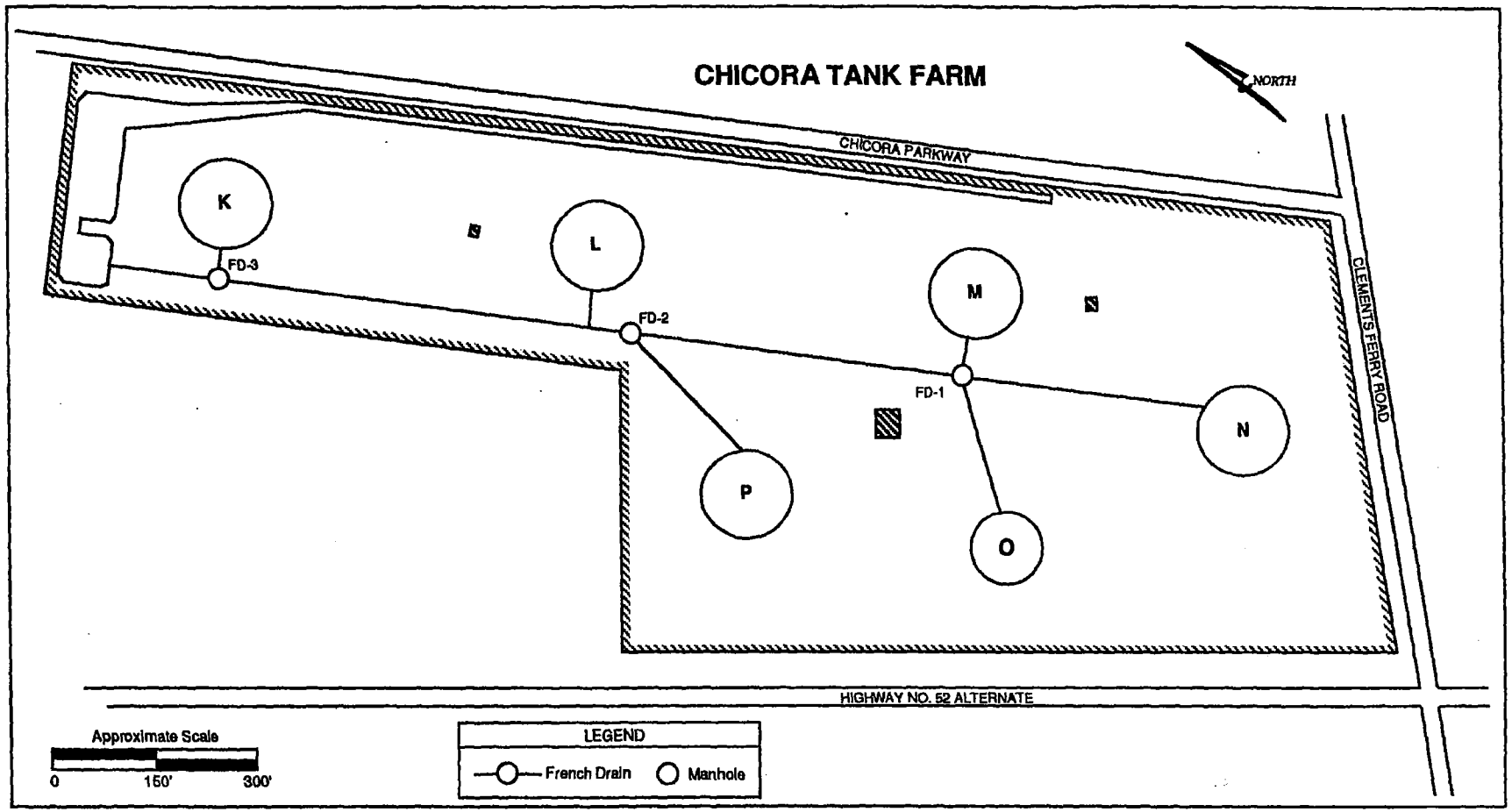

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Figure 1-3. French drain network map.

ditch were routed into the retention pond so that a constructed skimmer system could remove any free petroleum transported to the pond via the french drain or surface drainage ditch, and thereby prevent product discharges into the adjacent slough. The skimmer has not been maintained for 5-6 years and has been inoperable since at least 1986.

Three manholes provide access to the french drain system. The three access manholes are designated FD-1, FD-2, and FD-3. French drain laterals extend from beneath tanks M, N, and O and connect with the main drainage line at manhole FD-1, the southernmost and most upgradient manhole. A lateral french drain extends from tank P and connects with the main drainage line at manhole FD-2, the central manhole. Approximately 40 feet northwest of FD-2, the lateral from tank L connects with the main drainage line. No surface access is available to this location. The french drain lateral from tank K and the main drainage line connect in manhole FD-3, the northernmost manhole. Flow then continues in a northwesterly direction through FD-3 and into the retention pond.

1.3 SITE HISTORY AND REGULATORY STATUS. The fuel storage tanks at CTF were constructed in 1943 to hold heavy No. 6 fuel oil for use in the boilers of navy ships. Originally, all tanks were utilized for No. 6 storage except tank O, which was designed and utilized to hold waste oil. No. 6 fuel oil stored at CTF was replaced with Navy Special Fuel Oil (NSFO), another heavy fuel oil, in approximately 1960. NSFO stored in tanks K, L, and P was replaced in 1969 with Navy Distillate, a lighter diesel-like fuel oil. Tanks N and M continued to hold NSFO. Eventually, Navy Distillate was replaced with Diesel Fuel Marine (DFM). Tank N was taken out of service in July 1988 due to major electrical problems which continue to render the tank unusable. Tank M was taken out of service in March 1990 but remains serviceable.

Because the tanks were originally designed to hold heavy No. 6 fuel oil, which is too viscous to seep through concrete, the interior walls of the tanks were never lined to prevent seepage. Soon after the change to Navy Distillate, leakage of fuel through the tank walls into the pump rooms of tanks K, L, and P was observed. In 1986, SOUTHDIV commissioned Environmental Science and Engineering (ESE), Inc. to conduct a contamination assessment to determine whether or not the observed fuel seepage had resulted in significant soil and/or groundwater contamination around the tanks. Three soil samples were retrieved from each of nine boreholes drilled within approximately 40 feet of tanks K, L, and P at depths of 10-15 feet. Borehole locations are shown on Figure 1-4. Total petroleum hydrocarbons (TPH) and benzene, toluene, and xylenes (BTX) assays performed on these samples failed to detect any evidence of petroleum contamination. Water samples from each of the nine boreholes were examined both visually and olfactorily for signs of petroleum contamination. The water samples reportedly exhibited no petroleum odor and only the water sample from ESE borehole #3B, located northwest of tank K, had a noticeable sheen. Based on these results, ESE concluded that the tanks were not releasing fuel into the surrounding soils.

A fuel spill reportedly occurred in 1986, when tank P was filled beyond capacity. The quantity of fuel released is unknown. The fuel reportedly flowed down the eastern slope of tank P.

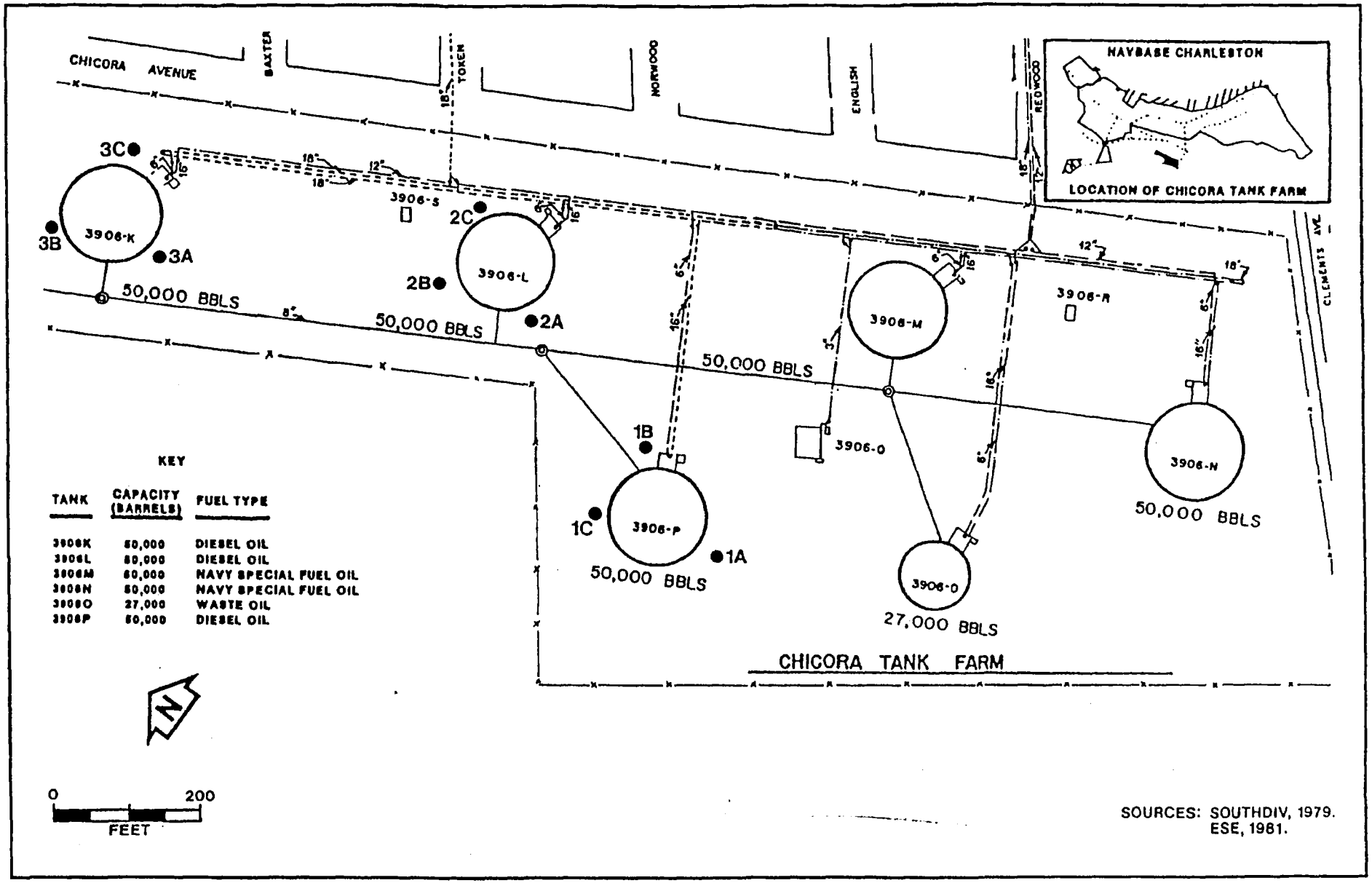

Figure 1-4. ESE borehole location map.

On 11 August 1988, NSC personnel observed free product in one of the access manholes of the french drain system at CTF. Samples were collected and laboratory analysis confirmed the presence of a combination of DFM and NSFO. Following this discovery, a site investigation was initiated by SOUTHDIV at CTF to determine the need for a more detailed contamination assessment. The investigation was limited to inspection of the site; review of existing documents and drawings; and interviews and discussions with NSC and SOUTHDIV personnel.

During site inspections on 19 and 28 September 1988, free product was observed on the water in each of the three french drain access manholes. Approximately two inches of free phase product was observed in manholes FD-2 and FD-3, while only a petroleum sheen was visible in manhole FD-1. The concrete walls of manholes FD-1 and FD-2 appeared to be coated with a dark, oily sludge below the water surface. A light sheen was visible on the surface of the retention pond during these inspections, and stressed vegetation was observed surrounding the pond. Upon completion of the investigation, SOUTHDIV recommended that a preliminary contamination assessment be conducted to gauge the extent of subsurface contamination at CTF.

1.4 REPORT ORGANIZATION. Chapter 2 of this document constitutes the PCAR, Chapter 3 the CAP, and Chapter 4 the sampling and analysis plan.

CHAPTER 2. PRELIMINARY CONTAMINATION ASSESSMENT

2.1 FIELD INVESTIGATION.

2.1.1 Tracer Survey A tracer survey and analysis was performed around the fuel storage tanks and their associated piping in February and March 1990 by Tracer Research Corp. (TRC). The survey was initiated by the addition of diflourodibromomethane (DDM) tracer to each tank at the tank farm. Enough tracer was introduced to each of the tanks to make the concentration in the tanks approximately 10 ppm, had the tanks been filled near to capacity. Actual concentrations were higher. Soil vapor sampling was initiated after a three-week waiting period, which allowed the tracer time to diffuse throughout the storage and transport system and migrate through any leaks in the concrete tanks and associated piping systems.

For the survey, steel Schedule 80 1" O.D. pipe capped with steel drive points were driven into the bermed soils at 25 foot intervals surrounding each tank. Each probe had an effective detection radius of approximately 10 to 12 feet. In order to maximize coverage and minimize testing time, sampling depths near the tanks were staggered. A soil-gas sample was retrieved at a depth of approximately six feet at every sampling location; a second sample was drawn from a depth of approximately twelve feet at every other sampling location. Steel drive points were also driven into the ground to depths ranging from one to three feet below grade in the vicinity of the fuel system piping at 25 foot intervals along the entire length of the piping system.

A vacuum pump was attached to each sample point with a hose and clasp. A vacuum was subsequently drawn on each sample point for approximately three minutes to extract gases present within the soils. Samples were extracted from each drive point stem by inserting an air-tight, pre-labeled, dedicated, hypodermic syringe through the attached hose. Trapped soil gases were collected within the syringe barrel when the syringe plunger was pulled back. Sample locations were recorded with ±1 ft accuracy. Immediately following sample collection, the contents of each syringe were injected into a gas chromatograph (GC) connected to an electron capture detector (ECD). Sample results were available approximately ten minutes after injection.

2.1.2 Soil-Gas Survey A soil-gas survey was performed over the entire area of the Chicora Tank Farm between 27 February and 9 March 1990. The survey was performed on a 100-foot grid and was designed to determine the approximate extent of organic vapors within the soils beneath the site. For the survey, a 3/4-inch stainless steel slotted sample tube and drive point were driven into the ground to a total depth of three feet (or to a shallower depth if the water table was encountered above three feet). A vacuum pump was connected to the sample tube and operated for approximately two minutes to draw organic vapors into the tube. Organic vapors in the tube were then assayed by venting the tube through a photoionization detector (PID, HNu model #161) calibrated to an isobutylene standard. The extent and concentration of organic vapors within the soils beneath the site were then determined from the soil-gas survey results. Petroleum contamination was presumed to be the source in those areas where relatively high organic vapor concentrations were detected.

2.1.3 Soil Test Borings Between 19 and 21 June, 1990, eleven soil test borings were installed by a South Carolina-certified drilling contractor in conjunction with groundwater monitor well installation at locations determined from the results of the soil-gas survey and pre-approved by DHEC. The borings were advanced by a truck-mounted drill rig using 6 1/4-inch O.D. hollow stem auger flights to a depth approximately seven feet below the existing water table. The cuttings from each borehole (and soil samples retrieved from five-foot intervals within each borehole) were monitored by the field geologist for organic vapors using a PID to assist in determining the extent of petroleum contamination beneath the site.

Soil sampling was performed in general accordance with ASTM D 1586. A standard 1.4-inch I.D., 2-inch O.D., split-barrel stainless steel sampler was used to collect soil samples. The sampler was first seated six inches into the ground to penetrate any loose cuttings, and subsequently driven an additional foot with blows from a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the final foot was recorded as a measure of soil strength and density. The soils were removed from the sampler and inspected for soil characteristics which were then recorded on borehole-specific logs. Borehole logs are included in Appendix A. All equipment coming in contact with the soil was decontaminated by steam cleaning between boreholes.

Two soil samples from each boring were selected for laboratory analysis. The sampled intervals were determined on the basis of PID results, and visual and olfactory observation. These samples were cooled to 4°C, sealed in appropriate pre-labelled containers, and shipped to the laboratory via overnight courier. Samples were assayed for Polynuclear Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), and Benzene, Toluene, Ethylbenzene, and Total

Xylenes (BTEX). EPA methods 8100, 418.1, and 8020 were used by the laboratory for PAH, TPH, and BTEX assays, respectively. Chain-of-custody was documented on all samples from the field to the laboratory.

2.1.4 Monitoring Well Construction Monitoring wells were installed in each of the soil borings described in Paragraph 2.1.3. Auger flights used to drill each borehole were left in place during well installation to prevent collapse of the boring wall. Each well was constructed by installing two-inch O.D. schedule 40 PVC screen and riser pipe into each boring. Ten feet of screen with 0.01-inch slots was placed so that screen extended approximately two to three feet above and seven to eight feet below the groundwater table at the time of drilling. Riser pipe was added to the screen on nine of the wells to set each approximately two feet above the ground surface. Riser pipe was added to the remaining two wells to set each well approximately 0.5 feet below ground surface to accommodate flush-mounted protective casings. The annular space adjacent to the screened section of each well was backfilled with a sand pack. The auger flights were pulled up as the sand was poured into the annular space; sand was allowed to accumulate to a depth approximately one foot above the screened interval. The one-foot annular space directly above the sand pack was filled with bentonite pellets to form an expansive seal. Portland cement was poured into the annular space from the bentonite seal to the ground surface to complete the well. A vertical stick-up or flush-mounted protective steel casing was placed over each well for protection. The wells were completed with a locking plastic cap placed on the riser pipe. The monitoring wells were constructed as near the South Carolina Well Standards and Regulations guidelines as the extremely high water table at the site would allow. Screen and riser lengths and intervals of grout were adjusted to compensate for this high water table. Monitoring well construction diagrams are included in Appendix B.

2.1.5 Boring and Well Locations The locations of the eleven borings/monitoring wells are shown in Figure 2-1.

2.1.6 Monitoring Well Development and Sampling Monitoring wells were developed by bailing several well volumes from each well with a decontaminated, dedicated teflon bailer. The groundwater withdrawn from the monitoring wells during development activities was containerized in a 55-gallon drum and stored at a secure on-site location prior to proper disposal in accordance with existing federal and state regulations. Groundwater samples were obtained approximately one day after installation and development of the monitoring wells. A minimum of three well volumes was purged from each well prior to sampling. Groundwater from each monitoring well was analyzed for temperature, pH, and specific conductivity in the field. Samples were retrieved from each well with dedicated bailers and poured into properly prepared containers. Sample containers were then sealed, cooled to 4°C, and shipped to the laboratory via overnight courier. Samples were assayed for TPH, PAH, and BTEX using EPA Methods 418.1, 8100, and 8020, respectively. Chain-of-custody was documented from the field to the laboratory.

2.1.7 Surface Water and French Drain Sampling Water samples were retrieved from the french drain system underlying the fuel tanks and from the retention pond on the northwestern portion of the property. The samples from the retention pond were retrieved by submerging clean, pre-labeled sample containers and then opening the container to collect a grab sample. French drain samples were retrieved by lowering a clean collection container into the drain and then transferring the collected sample to clean, pre-labeled sample containers. Following collection,

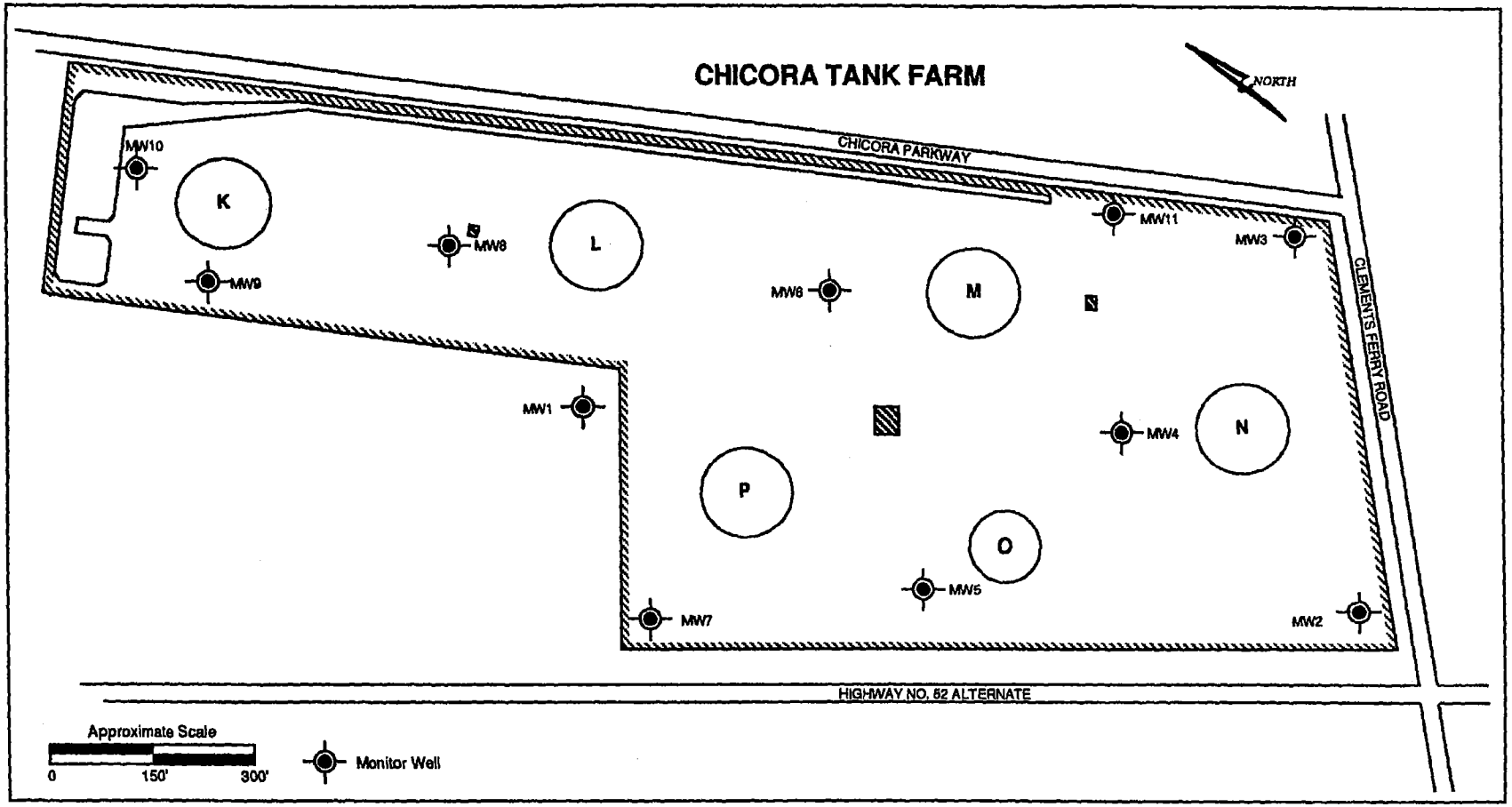

Figure 2-1. Soil boring/monitoring well location map.

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the retention pond and french drain samples were sealed, cooled to 4°C, and shipped to the laboratory via overnight courier. Chain-of-custody procedures were documented from the field to the laboratory. French drain samples were analyzed for PAH, TPH, and BTEX. Retention pond samples were analyzed for TPH and PAH. EPA methods 8100, 418.1, and 8020 were used by the laboratory for PAH, TPH, and BTEX assays, respectively.

2.1.8 Aquifer Testing Aquifer (slug in) testing was performed to estimate hydraulic conductivity and flow rates near monitoring wells MW3, MW5, and MW6. Testing was performed by raising the water level in the test well to the top of the riser pipe by adding tap water, then monitoring and recording the falling water level in the well until recovery was complete. Recovery was considered to be complete when the water level stabilized near (>90%) pre-test conditions.

Hydraulic conductivity values were calculated using the recovery rate and construction data from each well. Analyses were performed utilizing the method of Bouwer and Rice (1976). Aquifer flow rates were calculated using the following equation derived from Darcy's Law:

$$V = Ki/n$$

Where V = the aquifer flow rate in ft/sec

K = the hydraulic conductivity in ft/sec

i = the hydraulic gradient

n = the effective porosity of the aquifer

Flow rates at MW-3, MW-5, and MW-6 were calculated using measured hydraulic gradient values, well-specific hydraulic conductivity values, and estimated effective porosity values.

Hydraulic gradient values of 0.0025 for monitoring well MW-3 and 0.0143 for monitoring wells MW-5 and MW-6 were used. Effective porosity was assumed to be 0.2, a conservative estimate. This value is lower than probable effective porosity values for soils observed at the site and should result in over-estimation of groundwater flow rates. Hydraulic conductivity and flow rate calculations for MW-3, MW-5, and MW-6 are presented in Appendix C.

2.2 CHARACTERISTICS OF STUDY AREA.

2.2.1 Topography and Physiography The Charleston Naval Shipyard, CTF, and surrounding areas are located on the eastern edge of a low, narrow peninsula between the Ashley and Cooper Rivers. Area topography is typical of South Carolina's lower coastal plain, with low-relief plains drained by meandering streams and rivers flowing toward the coast past occasional marine terrace escarpments. Elevations around CTF and the Shipyard range from approximately 20 feet above mean sea level (MSL) in the inland portions of the base, to sea level along the Cooper River. Although the southern end of the base was originally tidal marsh drained by Shipyard Creek and its tributaries, over the past 70 years dredged spoil and a smaller amount of solid wastes have been used to fill the marsh. Most of the base lies within the 100-year flood zone (<10 feet MSL).

2.2.2 Climatology Charleston's close proximity to the ocean and its relatively low latitude are primarily responsible for its generally mild and temperate climate. Daily weather is controlled largely by the movement of low and high-pressure systems travelling eastward across the country and by the diurnal effects of the sea breeze generated by the differential heating and cooling of the land and the nearby sea surface. During the summer, westward movement of the

semi-permanent Bermuda high pressure system to a position off the southeastern U.S. coast prevents all but a few air mass exchanges in the Charleston area, leading to long periods dominated by warm, humid maritime-tropical (mT) air. Winter is characterized by frequent frontal passages, replacing this mT air with cool, dry, continental-polar air from the interior of the continent.

The average annual daily temperature range for Charleston is 54°F to 76°F with a prevailing wind direction of north-northeast and approximately 49 inches of precipitation per year. January is the coldest month of the year, with daily average temperatures ranging from 38°F to 61°F. July is the warmest month, having an average daily temperature range from 72°F to 89°F. On average, the temperature reaches 90°F or higher 60 days per year and drops below freezing 33 days per year. The four summer months (June through September) experience more than 50 percent of the annual precipitation, with the wettest month being July (ESE 1986). During the Atlantic hurricane season, between 1 June and 30 November, Charleston's location on the coast leaves it vulnerable to occasional tropical storms and hurricanes and their associated high winds, heavy rainfall, and storm surge.

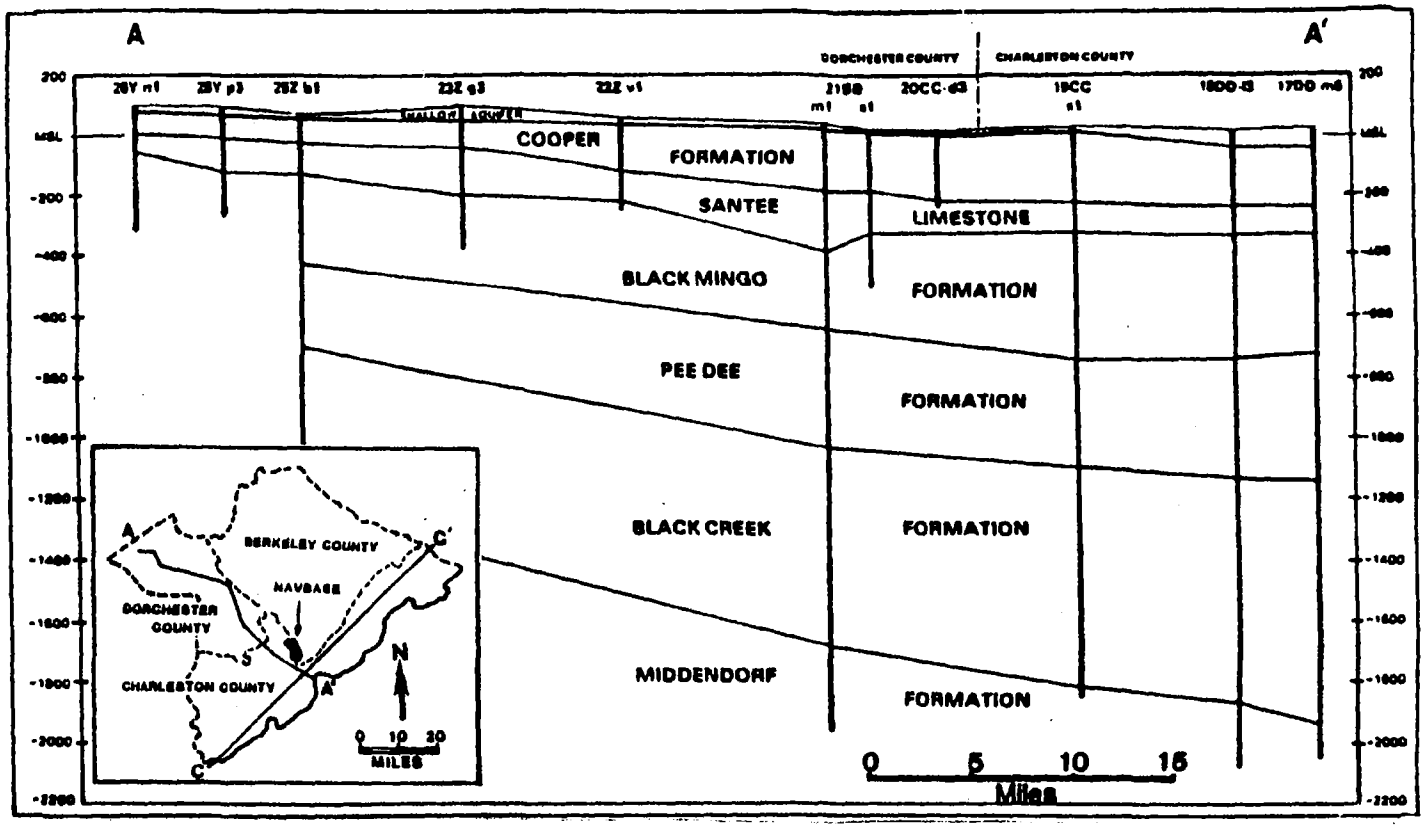
2.2.3 Surface Hydrology The southeastern portion of the shipyard is drained by Shipyard Creek while Noisette Creek drains the northern portion. Both creeks are tributaries of the Cooper River. Shipyard Creek is a small tidal tributary, approximately 1.5 miles in length, which flows in a southeasterly direction along the southwestern boundary of the base into the Cooper River. Noisette Creek is a tidal tributary, approximately 2.5 miles in length, which flows nearly due east from its headwaters in the City of North Charleston, across the northern portion of the base, and into the Cooper River. Surface drainage over the remainder of the base flows directly

into the Cooper River which flows in a southerly direction and discharges into Charleston Harbor.

Runoff from CTF flows into a shallow drainage ditch running along the northwestern edge of the site and eventually drains into a retention pond located on the far northwestern end of the property. The retention pond is connected to an adjoining marshy tidal slough that drains into the Cooper River.

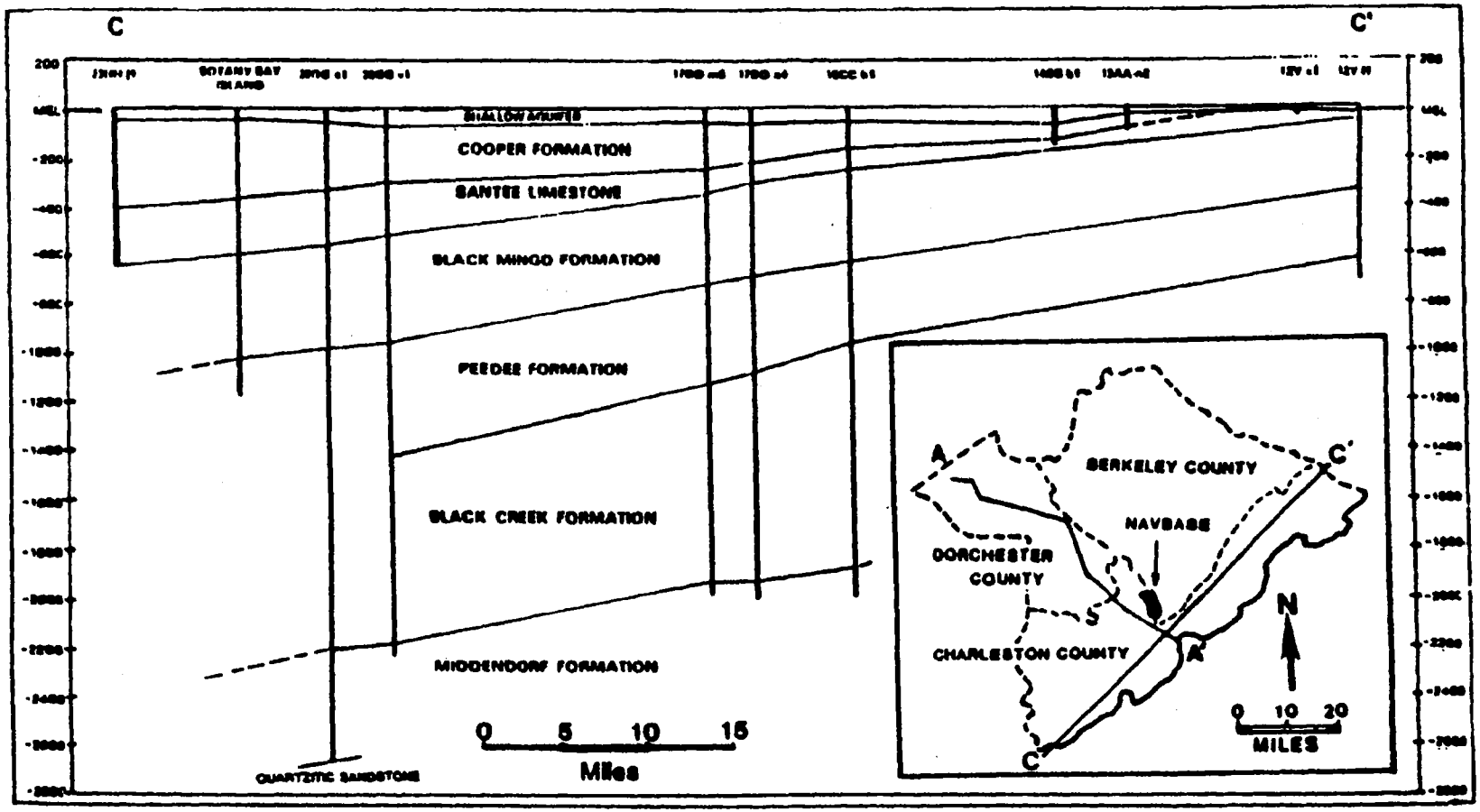
2.2.4 Regional Geology The geology of the Charleston area is typical of the southern portion of the Atlantic Coastal Plain. Cretaceous and younger sediments thicken seaward and are underlain by older igneous and metamorphic basement rock (Figure 2-2). Surface exposures at the shipyard, in those limited areas which remain undisturbed, consist of recent and/or Pleistocene-age sands, silts, and clays of high organic content. These surface soils are underlain by a clastic calcareous clay known as the Cooper Marl. The Cooper Marl is, in turn, underlain by the Santee limestone and sequentially older rock formations. A generalized southwest to northeast cross section passing through the approximate center of the base is shown in Figure 2-3.

2.2.5 Soils Surface soils at the base and the Chicora Tank Farm have been extensively disturbed. Aboriginal soils consist of the fine-grain sand, silty sand, clayey sand, sandy clay, and clay that are typical of a terrigenous tidal marsh environment. Much of the southern portion of the base and tank farm area has been filled using dredged spoil consisting primarily of an unsorted mixture of sands, silts, and clays. Fill material at the tank farm is predominantly fine



SOURCES: PARK, 1985; ESE, 1988

Figure 2-2. Regional geologic cross section (NW-SE).



SOURCES: PARK, 1985; ESE, 1988

Figure 2-3. Regional geologic cross section (SW-NE).

to medium grain clayey sand which has been graded into mounds over the fuel tanks. Soil boring logs are presented in Appendix A.

2.2.6 Hydrogeology Two distinct aquifers exist beneath the CTF and surrounding areas. A deep, confined aquifer is located in the Santee Limestone and a shallow-water aquifer is located within the near-surface sediments. Both the shallow aquifer and the Santee Limestone aquifer function as sources of potable water in other areas of the general region. The shallow aquifer is not developed either at or in the vicinity of CTF and the naval base. Deeper water from the Santee Limestone (in the vicinity of CTF and the naval base) is not suitable for potable supply due to concentrations of dissolved solids ranging from 1,000 to 1,500 ppm. The Santee is used both on base and nearby for non-potable purposes.

The Cooper Marl, in the Charleston area, is essentially impermeable and acts as an upper confining layer for the Santee Limestone aquifer. The top of the Santee Limestone aquifer has a groundwater potentiometric elevation of approximately 15 feet MSL. The hydraulic gradient in the area is generally towards the southeast. Water from the confined aquifer of the Santee Limestone formation has an upward potential through the Cooper Marl. This upward potential protects the Santee from any potential surface contamination. Groundwater in the shallow aquifer beneath areas surrounding CTF flows generally towards the east. However, beneath CTF proper, the shallow aquifer usually flows toward the centrally located french drain. Exceptions occur during low water table conditions. At such times, the influence of the french drains is less and groundwaters beneath the southwest corner of CTF may reverse direction and move off-site. Compare the potentiometric surface maps presented in Figure 2-4 generally within one to ten

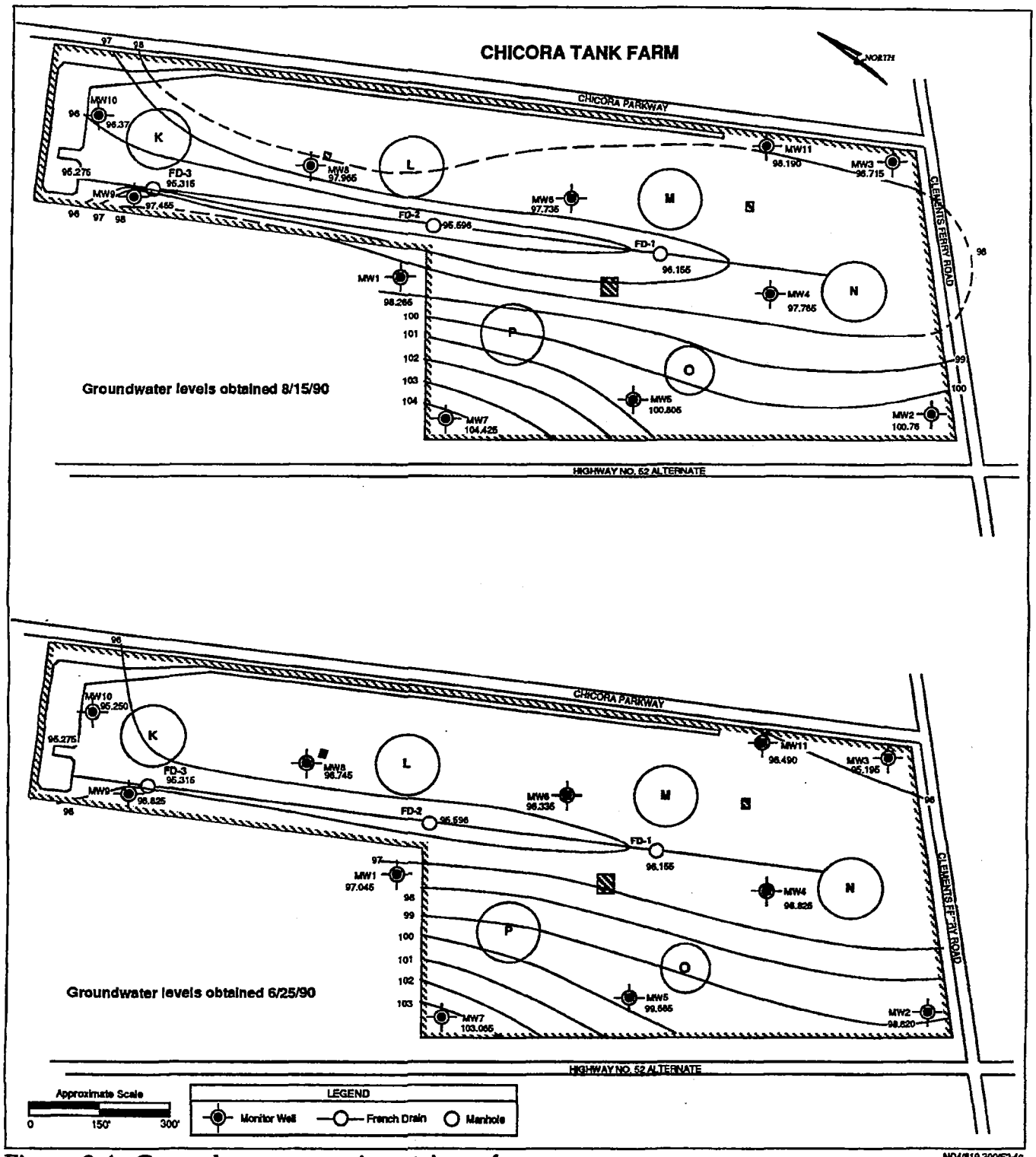


Figure 2-4. Groundwater potentiometric surface map.

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feet below land surface. Groundwater conditions recorded during the assessment are presented in Table 2-1.

Aquifer testing on monitoring well MW-3 found an average horizontal saturated hydraulic conductivity of 4.81×10^{-5} ft/s which yields a groundwater flow rate of 6.01×10^{-7} ft/s or approximately 19 ft/yr. Aquifer testing on monitoring well MW-5 found an average horizontal saturated hydraulic conductivity of 2.17×10^{-5} ft/s which yields a groundwater flow rate of 1.55×10^{-6} ft/s or approximately 49 ft/yr. Aquifer testing on monitoring well MW-6 found an average horizontal saturated hydraulic conductivity of 5.65×10^{-5} ft/s which yields a groundwater flow rate of 4.04×10^{-6} ft/s or approximately 127 ft/yr. Aquifer test worksheets are included in Appendix C.

2.2.7 Demography and Land Use The area surrounding CTF is a mature urban neighborhood long developed for commercial, public, and residential land uses. Commercial areas are located primarily along the south and southwest sides of the tank farm. Significant commercial enterprises present include a transmission shop and a trucking facility southwest of the site. A cargo container storage facility is located south of CTF, beyond Clements Ferry Road. The Norman C. Toole Middle School is located west of and adjacent to the site. Residential homes occupy properties east of the site, beyond Chicora Avenue, and north of the site, beyond the drainage slough.

2.2.8 Ecology The ecological characteristics of CTF and the adjacent area are typical of southeastern/coastal/urban relationships. Urban fauna and flora typify the area. Vegetation on the tank farm itself consists primarily of grasses and other small herbaceous, opportunistic

Table 2-1. Summary of fluid level measurements.

LOCATION	GROUNDWATER ELEVATION* 6/25/90	GROUNDWATER ELEVATION* 8/15/90
MW1	97.045	98.265
MW2	98.820	100.760
MW3	95.195	98.715
MW4	96.825	97.765
MW5	99.665	100.805
MW6	96.335	97.735
MW7	103.065	104.425
MW8	96.745	97.965
MW9	96.825	97.465
MW10	95.250	96.370
MW11	96.490	98.190

LOCATION	ELEVATION
FD-1	96.155
FD-2	95.596
FD-3	95.315
POND	95.275

*Elevations are relative to an assumed datum.

species characteristic of once cleared land that continues to be disturbed. Grazing by cattle and horses throughout the tank farm serves to prevent the reestablishment of higher canopy natural flora. Flora and fauna of the retention pond located on the northwestern end of the tank farm are typical of a freshwater pond with abundant aquatic plants, small fish and a diverse population of birds. The tidal slough adjacent to the holding pond exhibits flora and fauna characteristic of a brackish water, tidally influenced, environment.

2.3 NATURE AND EXTENT OF CONTAMINATION.

2.3.1 Composition Tanks K, L, and P are currently being used to store DFM. Seepage of fuel through the tank walls and into the pump rooms of these tanks has been observed since shortly after Navy Distillate replaced NSFO in the tanks in 1969. As discussed in paragraph 1.3, laboratory analysis of free product samples retrieved from the french drain system in 1988 found a combination of DFM and NSFO. Leakage from one or all of these three tanks was thought to be the source of fuel oil discovered in the french drain system.

2.3.2 Sources The tracer survey, soil-gas survey, and soil sampling and analysis performed during this investigation detected only weak indications of petroleum leakage from the tanks or the associated piping. No free phase petroleum or petroleum sheen was detected in the french drain manhole FD-1. A petroleum sheen was detected in french drain manhole FD-2. Free phase product was detected in french drain manhole FD-3. French drain manholes are shown in Figure 1-3. The possible sources of the contamination present within manholes FD-2 and FD-3 include previous spills, illegal dumping into the drainage system, tank leaks, leaking piping or

migration from off-site sources. The source of the petroleum sheen observed in manhole FD-2 is likely to be the fuel release on the eastern slope of tank P, noted in paragraph 1.3. The petroleum sheen in manhole FD-2 was observed to be flowing from the french drain lateral from tank P. The free phase petroleum observed in manhole FD-3 is possibly due to the above-mentioned tank P fuel release or may be due to illegal dumping into the drainage system. Speculation regarding the latter was noted during interviews with NSC personnel but appeared to be based only on the fact that fuel is observable in FD-3. The fluid level in FD-3 is well above the main french drain system outflow line from the manhole. Petroleum residues, whether resulting from the tank P spill, illegal dumping or some other source, are held above the main inflow and outflow lines within manhole FD-3 by the high water level at the discharge point downstream. Grass and debris observed in manhole FD-3 and not observed in either of the other french drain manholes suggest dumping. System hydraulics and the sheen in FD-2 suggest that FD-3 is an unplanned oil/water separator where sheens have accumulated to form a distinct layer of product.

2.3.3 Extent in Soils As discussed in paragraph 1.3, during a contamination assessment of the tank farm completed by ESE in 1986, nine soil samples were retrieved from borings installed around tanks K, L, and P. TPH and BTX assays performed on these samples failed to detect any evidence of petroleum contamination.

The tracer survey performed by TRC during the preliminary assessment (February and March, 1990), consisted of a total of 351 soil gas samples retrieved from 274 sample point locations positioned around the tanks and along approximately 2600 feet of piping (Figure 2-5). The results of the tracer survey indicate that no fuel leakage is occurring from any of the tanks or

the pipelines, although a probable vapor leak or leaks was identified in the ceiling of tank N. The TRC report is presented in Appendix D.

The soil-gas survey performed at CTF, in March, 1990, encountered few detections above 10 ppm. Levels as high as 57.7 and 69.6 ppm were encountered along the boundaries of the tank farm west of tanks L and P, adjacent to the Norman C. Toole Middle School. Soil-gas detections reaching concentrations of 64 ppm were also encountered immediately west of tank K near french drain manhole FD-3. A peak soil-gas concentration of 25.4 ppm was identified approximately two hundred feet south of tank L. Elsewhere, concentrations ranged from 0.1 to 19.6 ppm although an isolated reading of 139.6 ppm was encountered immediately adjacent to the fence along the northwest side of the site, near tank K. This reading, due to its location on the western wall of a steep drainage ditch, is assumed to be the result of hydrocarbon runoff from the nearby public road. An isopleth map of soil-gas concentrations is presented in Figure 2-6.

Soil samples retrieved from drill rig-advanced boreholes showed little evidence of contamination. Total BTEX at a concentration of 62 µg/kg (ppb) was found in borehole B-7 at a depth of 3.5 to 5.0 feet below ground surface. Total PAH of 104 µg/kg was detected in the sample retrieved from 5.0 to 6.5 feet below ground surface in borehole B-11. PAH and BTEX were not detected

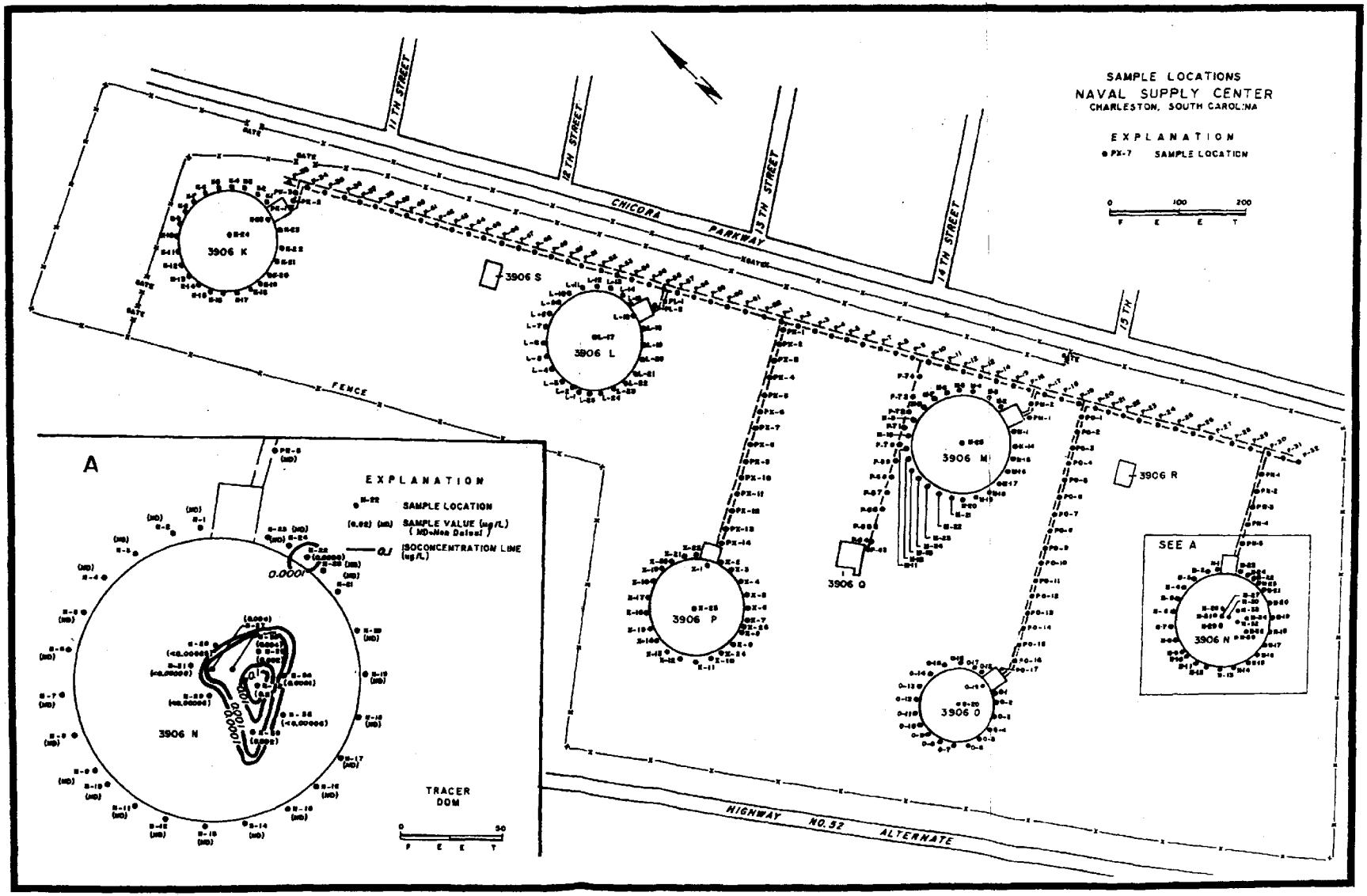

Figure 2-5. Tracer survey sample locations (from Tracer Research Corp. Report, March 1990).

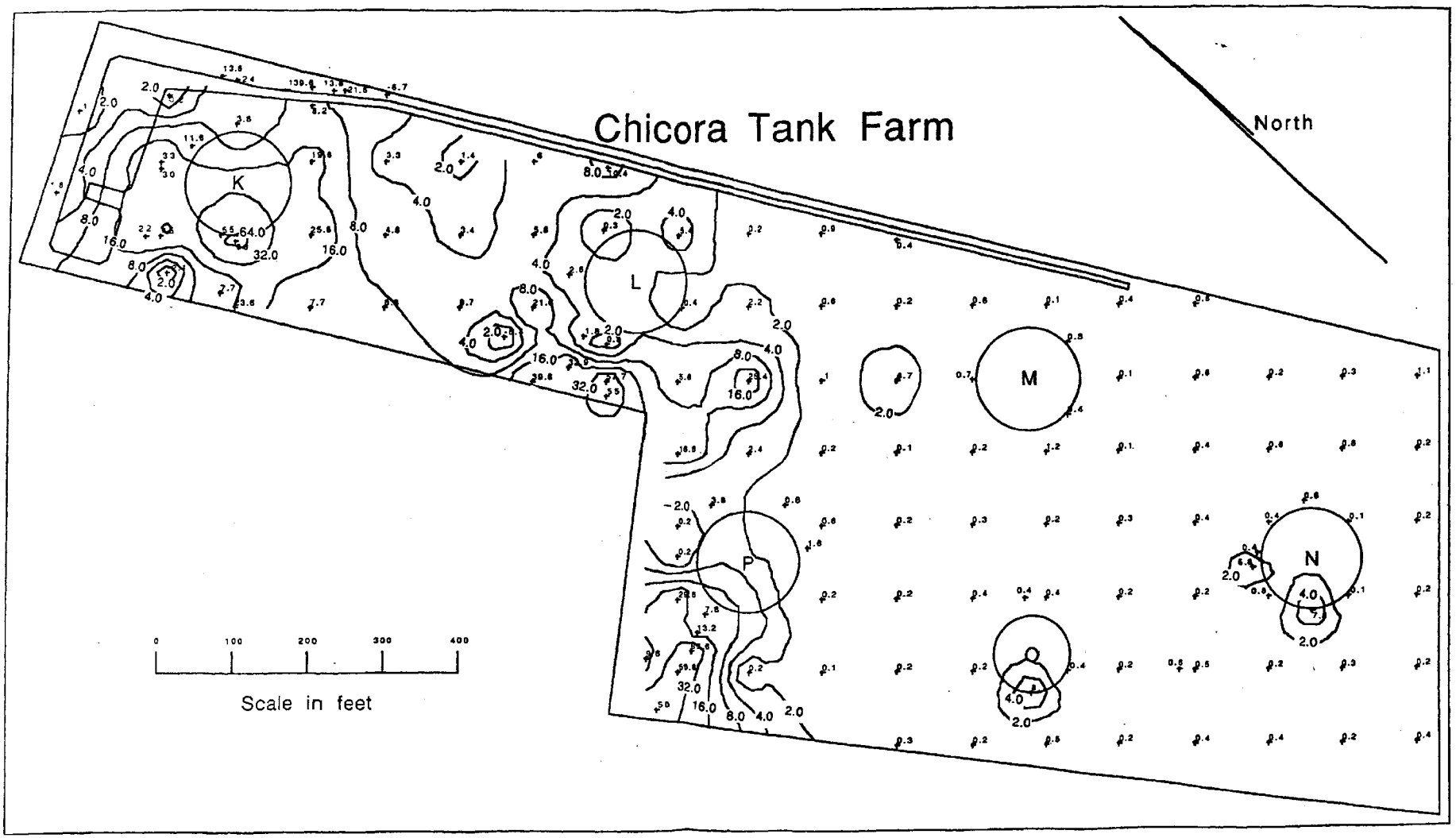

Figure 2-6. Soil-gas survey organic vapor isopleth map.

in the remaining soil samples. TPH was not detected in any soil samples. Soil sample results are presented in Table 2-2 and Appendix E.

2.3.4 Extent in Groundwater During the 1986 investigation, ESE collected groundwater samples from nine soil borings as described in paragraph 1.3. Each water sample was examined both visually and olfactorily for signs of petroleum contamination. The water sample retrieved from ESE borehole 3B, located northwest of tank K (Figure 1-4), reportedly exhibited a petroleum sheen. None of the groundwater samples were reported to have exhibited a petroleum odor.

Eleven monitoring wells were installed and sampled during the preliminary contamination assessment. The purpose of the sampling was to obtain data to determine the magnitude of groundwater contamination beneath the site. Groundwater samples from each monitoring well were assayed for PAH, TPH, and BTEX. A benzene concentration of 6 µg/l (ppb) was detected in monitoring well MW-2. BTEX was not detected in the remaining monitoring wells. TPH and PAH constituents were not detected in groundwater samples retrieved from the site monitoring wells. Groundwater laboratory results are presented in Table 2-3 and Appendix F. Prior to sampling, during monitoring well development, a slight petroleum sheen was observed in the groundwater recovered from monitoring wells MW-3 and MW-9. No petroleum odor was detected in groundwater recovered from the site monitoring wells.

2.3.5 Extent in French Drain Groundwater flowing through the french drain network present at the site was observed and sampled. Four groundwater samples were retrieved from manhole FD-1, three from manhole FD-2, and two from manhole FD-3. The samples retrieved from

Table 2-2. Summary of soil sample analyses.

Location	Depth	Constituent	Concentration (ppb)
B-7	3.5-5.0	Benzene Ethylbenzene Toluene Xylenes	7 7 21 27
B-11	5.0-6.5	Acenaphthylene Anthracene	33 71

All other samples below detection limits or below practical quantitation limits for all measured constituents.

Table 2-3. Summary of water sample analyses.

Location	BTEX Constituent	Concentration (ppb)	PAH Constituent	Concentration (ppb)	TPH (ppm)
MW-2	Benzene	6	—	BDL	BDL
FD-2	—	BDL	Acenaphthylene Fluorene Pyrene	3 6 9	2
FD2-W	—	BQL	—	BDL	2
FD3-S	—	N/A	—	N/A	240
FD3-E	—	N/A	—	N/A	470

All other samples below detection limits for all measured constituents.
BDL = Below Detection Limits
BQL = Below Practical Quantitation Limit
N/A = Not Analyzed

manhole FD-1 were designated FD-1, FD-1S, FD-1W, and FD-1E. The sample designated FD-1 was of waters leaving manhole FD-1. The samples designated FD-1S, FD-1W, and FD-1E were retrieved from the french drain laterals to tanks, N, O, and M, respectively. The samples retrieved from manhole FD-2 were designated FD-2, FD-2S, and FD-2W. The sample designated FD-2 was of waters leaving manhole FD-2. The samples designated FD-2S and FD-2W were of flows from manhole FD-1 and the lateral from tank P, respectively. The samples retrieved from manhole FD-3 were designated FD-3E and FD-3S. Samples FD-3E and FD-3S were from the tank K lateral and from the main drainage pipeline extending from manhole FD-2, respectively. French drain groundwater sample locations are shown on Figure 2-7.

All groundwater samples retrieved from the french drain system were assayed for TPH. Samples FD-2 and FD-2W were also assayed for BTEX and PAH. TPH and total PAH concentrations of 2 and 18 µg/l, respectively, were detected in sample FD-2. A TPH concentration of 2 µg/l was also detected in sample FD-2W. Extensive free phase petroleum was observed in manhole FD-3 during collection of groundwater samples. TPH concentrations of 240 and 470 µg/l were detected in samples FD-3S and FD-3E, respectively. These groundwater samples were retrieved from beneath the free-phase petroleum present in manhole FD-3 and may have become contaminated during sampling, despite precautions. TPH was not detected in the remaining french drain samples. BTEX and PAH was not detected in the remaining french drain samples assayed for these parameters. Petroleum detections in the french drain samples are shown on Table 2-3. Complete groundwater laboratory results are documented in Appendix F.

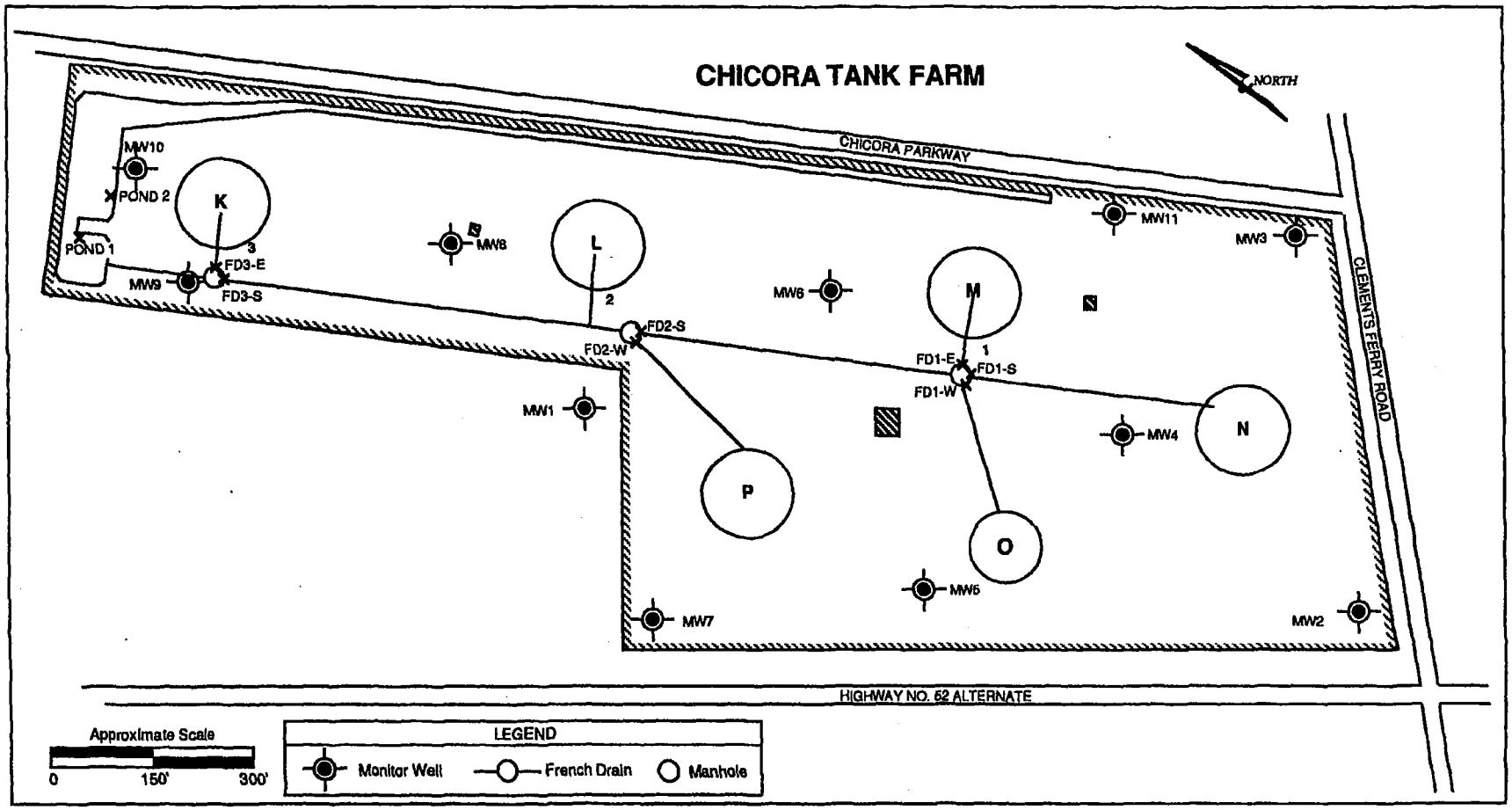

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Figure 2-7. French drain, monitoring well and retention pond water sample collection points.

2.3.6 Extent in Surface Water Two surface water samples were collected from the retention pond located on the northwestern end of the tank farm. Locations of the pond sample collection points are shown on Figure 2-7. The samples were assayed for TPH to determine the extent (if any) of petroleum contamination within the surface waters of the pond. No TPH was detected. Laboratory results from surface water assays are presented in Appendix F.

2.3.7 Contamination Summary and Conclusions The tracer survey, soil-gas survey, soil sample analyses, and groundwater sample analyses found no significant leaks from the tanks and pipelines present at the site, although traces of petroleum contamination exist at the site. The presence of 6 µg/l benzene in upgradient monitoring well MW-3 suggests that low level petroleum contamination is migrating into the area from an off-site source. Petroleum sheen observed and TPH detected in french drain water from tank P at FD-2 suggests that low-level petroleum contamination is present in the groundwater near tank P. Trace PAH detections were also found in the downstream sample retrieved from manhole FD-2. As the tracer survey detected no leaks and the soil-gas survey showed only minor organic vapor detections around tank P, (increasing in concentration to the west of tank P), the petroleum film and minor contaminant detections are likely the result of the reported fuel overtopping discussed in paragraph 1.3. Increasing soil-gas concentrations were detected west of and upgradient from tank P, as illustrated on Figure 2-6. The increasing detections upgradient from tank P suggest that the source of these detections is off-site. Laboratory results for soil and groundwater samples from MW-7 located east of tank P (Figure 2-1) found no petroleum.

Free petroleum in french drain manhole FD-3 could have come from dumping or could be an accumulation of materials transported to FD-3 via the french drain system. The absence of

petroleum contamination in monitoring well MW-9, located approximately five feet northwest of manhole FD-3 and the absence of free phase petroleum and detected petroleum contaminants downgradient in the retention pond indicates that the petroleum contamination is confined to the french drain system and most notably manhole FD-3.

The following conclusions can be drawn from data gathered to date:

- Sufficient porosity exists in the tank walls, where they are exposed in the pump rooms, to allow passage of substantial quantities of petroleum into the pump rooms. Insufficient porosity exists in the tank walls and no microscopic cracks or holes exist to allow loss of significant product quantities to site soils or groundwater. Several explanations are possible. Among these, one appears most likely to the authors of this report. Porosity within the tanks walls exists on a scale dominated by capillary and van der Waals forces; because of this, seepage occurs only where the walls have been allowed to dry out (i.e. those facing the open air of the pump room). Biodegradation in equilibrium with the seepage rate is also possible.

- Low-level petroleum and petroleum constituent contamination exists at the site due to historic releases, and probably, due to migration from one or more upgradient sources. The most significant residues remaining are in the vicinity of tank P which was overtopped in approximately 1986. Substantial contamination is limited to manhole FD-3 and (with less certainty because as yet unmeasured) downstream retention pond sediments.

- With few exceptions, potentially contaminated groundwaters at the site flow through manhole FD-3 and discharge to the pond. Gross impacts, if they exist, are limited to benthic materials.

CHAPTER 3. CONTAMINATION ASSESSMENT PLAN

3.1 PROPOSED INVESTIGATIVE ACTIVITIES. This section describes contamination assessment activities proposed for the Chicora Tank Farm. Specifically, the objectives, methods, and their rationale are addressed. Also discussed are project personnel requirements for proposed initial abatement activities.

3.1.1 Objectives Specific objectives proposed for the contamination assessment are: 1) to collect and assay sediment samples from beneath the spill containment pond located on the northwest corner of the site; 2) to remove and dispose of petroleum in french drain manhole FD-3; and 3) to institute a quarterly monitoring program of the monitoring well and french drain systems at the site for a period of one year.

3.1.2 Methods

3.1.2.1 Spill Containment Pond Sediment Sampling Sediment samples will be retrieved at eight locations beneath the pond. Proposed sample locations are shown on Figure 3-1. The samples will be retrieved by hand augering with a 2" O.D. hand auger into the submerged sediments. The retrieved sediments will be packaged in appropriate containers, cooled to 4°C, and shipped to the laboratory via overnight courier. Portions of the retrieved sediments will be separated out prior to packaging and will be placed in plastic ziploc bags and allowed to equilibrate. The samples will then be assayed with a flame ionization detector (Foxboro OVA) to determine the extent of volatile organic vapors present within the sediments. The eight

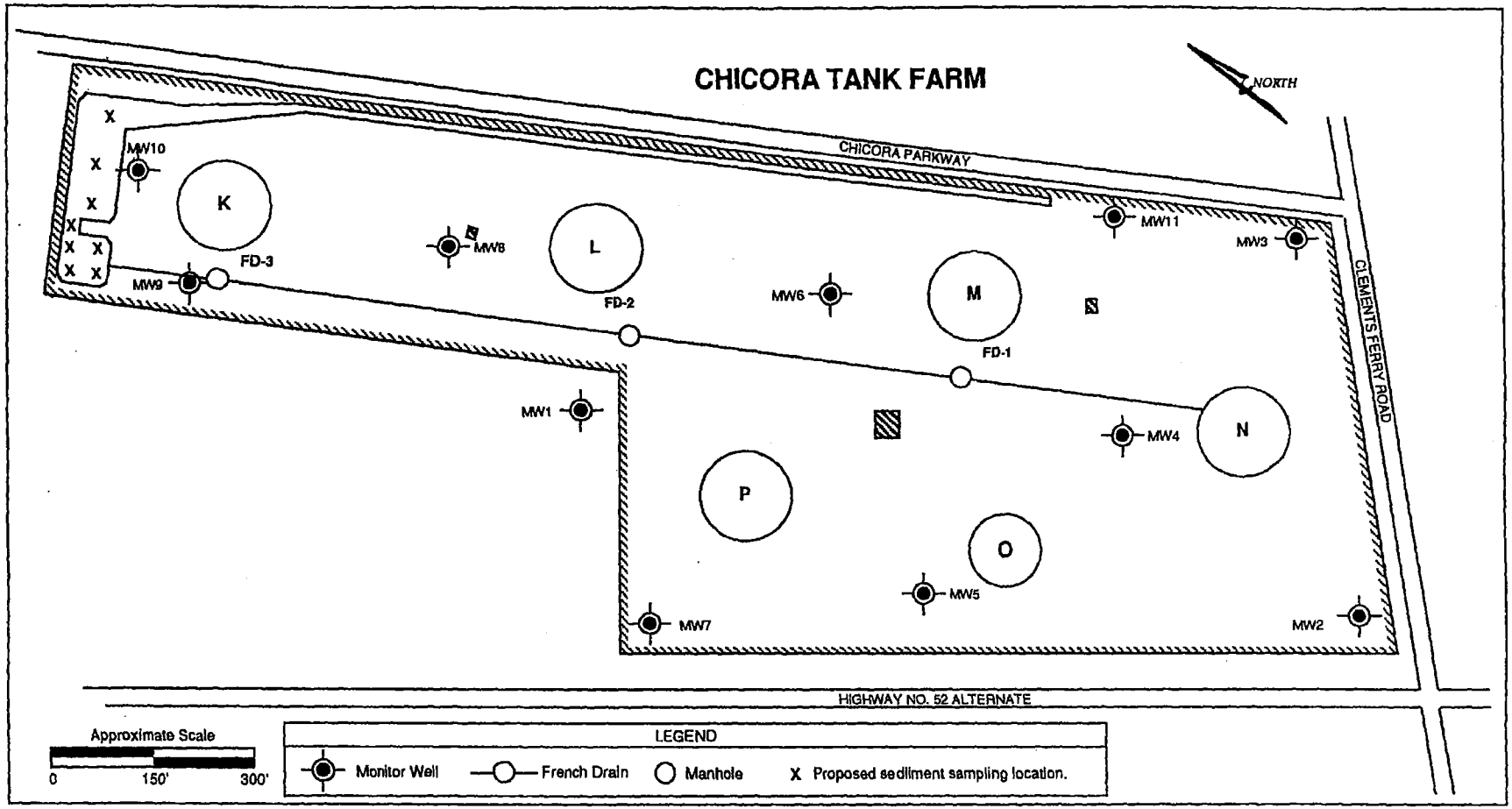

Figure 3-1. Proposed sediment sampling location map.

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sediment samples delivered to the laboratory will be assayed for TPH, BTEX, and PAH, using EPA Methods 418.1, 8020, and 8100, respectively.

3.1.2.2 Free Product Removal Free petroleum will be pumped from french drain manhole FD-3. The product will be containerized and transported to a local waste oil reclamation firm or will be transported to the liquid waste treatment facility in Pinewood, South Carolina for treatment and disposal. Disposal sampling will determine which of the above mentioned alternatives will be used. The 55-gallon drums will then be transported to a local drum reconditioning facility for cleansing.

3.1.2.3 Groundwater Monitoring The 11 site monitoring wells and three french drain manholes will be monitored quarterly for a period of one year to detect any occurrence and movement of petroleum contaminants resulting from spills or leakage from the tanks and their associated piping system. The monitoring wells will also be monitored to track any further migration of petroleum contaminants onto the CTF from off-site locations. Groundwater samples will be collected from each of the 11 monitoring wells and from each of the eight french drain lines accessible through manholes at the site. The samples will be sealed in appropriate containers, cooled to 4°C, and shipped to the laboratory via overnight courier. The samples will be assayed for TPH using EPA Method 418.1.

3.1.3 Rationale

3.1.3.1 Pond Sediment Sampling Sediment samples will be retrieved from the pond and assayed for TPH, BTEX, and PAH to determine the extent, if any, of petroleum contamination

from historical fuel spills or releases at the site. This information is necessary to estimate the magnitude of impacts in the ecosystem most likely to have been stressed by site activities.

3.1.3.2 Free Product Removal Free petroleum present in french drain manhole FD-3 will be pumped from the manhole to prevent the possibility of release to the pond, should the water level in the manhole drop to an elevation below the top of the main outflow pipe from FD-3. Removal of the free phase petroleum will also allow a determination to be made during quarterly monitoring episodes of whether the petroleum was a result of historical dumping into the system or is a result of an ongoing release from the fueling system. If free phase petroleum product re-enters the manhole, the probable source will be a fuel release at the site. If no free phase petroleum re-enters the manhole, the probable source is historical dumping into the french drain manhole. The petroleum product removed from the french drain manhole will be disposed of by a local waste oil reclamation firm or at the liquid waste treatment facility in Pinewood, South Carolina because it is a safe and ecologically sound method of disposal.

3.1.3.3 Groundwater Monitoring The 11 site monitoring wells will be sampled and assayed quarterly for one year to monitor any increasing contaminant encroachment from off-site sources and to monitor on-site fuel system leakage should it occur. The french drain pipelines exposed within the three access manholes will be sampled and assayed quarterly for a period of one year, also to monitor any fuel system leakage should it occur. Additionally, quarterly monitoring of the french drain system will help determine the source of petroleum film and dissolved petroleum contaminants in manhole FD-2, and measure the rate of free petroleum accumulation which may occur in manhole FD-3. A one year monitoring period is believed

to be a sufficient time interval to determine any increase, decrease, arrival, or disappearance of petroleum contamination beneath the site.

3.1.3.4 Laboratory Assays Assays were selected to detect constituents of petroleum contamination potentially present in certain locations in the french drain and monitoring well systems. The TPH assay (Method 418.1) was chosen to quantify petroleum hydrocarbon contamination potentially in pond sediments and groundwater beneath the site. The BTEX assay (EPA Method 8020) was chosen because benzene, toluene, ethylbenzene, and xylenes are carcinogenic petroleum constituents which require an extended period of time to break down chemically. The PAH assay (EPA Method 8100) was chosen because the 16 PAH compounds are carcinogenic or potentially carcinogenic petroleum constituents which also require an extended period of time to break down chemically.

3.2 PERSONNEL REQUIREMENTS. This section describes the number and type of personnel required for each investigative procedure.

3.2.1 Sediment Sampling Personnel Requirements The sediment sampling team will consist of a field technician and a geologist. The field technician will perform sample collection, packaging, and shipment activities. The geologist will record lithologic characteristics of the sediments and perform organic vapor assays.

3.2.2 Free Product Removal Personnel Requirements Two technicians and the site supervisor will be required for product removal and disposal. The technicians will perform product

removal, storage, transport, and disposal activities. The site supervisor will provide professional oversight.

3.2.3 Groundwater Monitoring Personnel Requirements A technician and a senior technician will be required for each quarterly sampling event. The senior technician will be the team leader and will be responsible for recording all field activities in a field log book, sample collection, packaging and shipment, and remaining in telephone contact with the project manager.

3.3 TRAINING. No special training is planned for this project. All site workers must have training, prior to arriving onsite, which meets the requirements of 29 CFR 1910.120(e). The project manager will review the training certification of each worker before allowing him or her into the work area. Each worker shall have had proper safety training and sufficient technical training to perform the tasks assigned in Section 3.2.

3.4 INFORMATIONAL PROGRAM. The project manager or the quality assurance officer will conduct a meeting prior to the initiation of site work at which time comprehensive instruction will be given to the crew regarding:

- The nature, level, and degree of exposure likely as a result of participation in the project;

- The chemical, physical, and toxicological properties of each substance known or expected to be present onsite and relevant to the duties to be performed during the project;

- The names of personnel and alternates responsible for site safety and health;
- Safety, health, and other hazards associated with each task to be performed during the project;
- Worker training assignments and project assignments;
- Personal protective equipment to be used during each task;
- Work practices which can minimize risks from hazards;
- Safe use of tools and equipment;
- The onsite medical surveillance program;
- Recognition of symptoms and signs of over exposure;
- Site control measures;
- Decontamination procedures (equipment and personnel);
- The emergency response plan;

- Confined space entry procedures, if such entry is applicable;

- The spill containment program; and

- Handling and disposal of wastes.

Each morning prior to the commencement of work, the site supervisor will conduct a meeting to review those items above which are most relevant to the day's work with particular emphasis on potential hazards that may be encountered and how to deal with them. In addition, whenever there is a change in the nature of the work being conducted, the site supervisor will review safety procedures with potentially impacted workers.

3.5 MEDICAL MONITORING. The project manager will ensure that all workers at the site have been examined by an occupational medicine physician within the past 12 months and is otherwise under medical surveillance in compliance with 29 CFR 1910.120(f).

The site supervisor will establish a buddy system for work at the site prior to the work beginning. Among other aspects of the buddy system will be a requirement that each worker report to the site supervisor any breach or failure of safety measures, physical or procedural, any resultant exposure to potentially hazardous materials, and any signs of heat stress pertaining to himself or his buddy. The site supervisor will observe the progress of the work with particular attention to compliance with safety procedures and signs of heat stress. During breaks in the work, either by the whole crew or by individuals, the site supervisor will interrogate workers regarding safety compliance and heat stress and make an appropriate examination of the same.

CHAPTER 4. SAMPLING AND ANALYSIS PLAN

The following sections describe methods to be utilized to assure collection of usable data during the site inspection. Elements of this program include project organization, sampling protocols, laboratory protocols, and quality control checks.

4.1 PROJECT ORGANIZATION AND RESPONSIBILITIES. This section describes project organization, lines of authority and responsibility of various personnel for particular tasks and quality assurance on the project.

4.1.1 Project Manager The project manager will be responsible for overall supervision and all administrative duties related to the project. Besides directing overall contamination assessment activities, he will be responsible for ensuring full compliance with this QA/QC plan and all applicable state and federal regulations. He will have final authority over and responsibility for all activities conducted during the contamination assessment.

4.1.2 Project Geologist The project geologist will be responsible for the activities of site personnel during sampling operations. He will report directly to the project manager and be responsible for assuring compliance with this QA/QC plan during the above operations. The project geologist will control submittal of selected samples to the laboratory for analyses.

4.1.3 Project Quality Assurance Officer The project quality assurance officer will be responsible for updating and reviewing compliance with program and site-specific QA/QC plans to assure that objectives of the plan are consistently met. He will review data recorded in the field log books and laboratory analytical data to validate conformity with set standards in the QA/QC plan. If changed conditions warrant, he will update this QA/QC plan to comply with DHEC and USEPA guidelines.

4.1.4 Site Supervisor The site supervisor will direct field teams under the overall direction of the project manager. As site manager, the supervisor will be responsible for assuring that all QA/QC procedures are followed by field technicians under his direction. He will report any deviations from QA/QC procedures to the project manager or quality assurance officer.

4.2 QA/QC OBJECTIVES AND PROCEDURES. This section describes the Quality Assurance/ Quality Control objectives to be attained and procedures to be followed by all laboratory and field personnel during this project.

4.2.1 QA/QC Objectives In order to provide data that present a valid characterization of each site, KEMRON has developed QA/QC procedures for the contamination assessment at the Chicora Tank Farm. Implementation and enforcement of these procedures will assure the validity of data generated during the investigation. To specify the quality and quantity of data required to achieve the established goal, the data quality objectives (DQOs) have been established and used to design sampling and analysis plans, and to determine the appropriate level of QA/QC. The elements covered in DQOs are laboratory selection, identification of the number of samples and their matrices, sampling schedules, constituents of interest, required

analytical methodologies, detection limits, holding times, deliverables, levels of QA/QC, and turnaround of analytical results.

4.2.2 Field QA/QC Procedures This section describes field Quality Assurance and Quality Control procedures. All personnel involved in this project will be required to read, understand, and comply with the procedures, methods, and protocols described in this paragraph. The project manager, QA/QC officer, and site supervisor will insure that field operations are conducted in accordance with these procedures in order to assure the validity of all data generated during field activities.

4.2.2.1 Documentation of Field Data The site supervisor will see to it that the following information is recorded in a site-specific field notebook:

- Identity of KEMRON site personnel
- Sample identification number
- Sample location and depth
- Date, time and method of sample retrieval
- Sample type (grab or composite)
- Sample description and classification (for sediments)

- Sample preservative (if any)

- Sampler (person)

- Weather conditions

- QA/QC sample designations (trip, field, or equipment blanks and duplicates)

- pH, conductivity, and temperature readings of water samples

- Organic vapor concentration readings from sediment sample headspace analyses

4.2.2.2 Decontamination Procedures This section describes procedures for decontamination of field equipment. Sampling tools such as bailers and hand augers should be decontaminated using the following procedures:

Field Cleaning Procedures for Teflon and Stainless Steel Equipment Used to Collect Samples for Organic Compounds

1. Clean with tap water and laboratory grade detergent (Alconox or equivalent) using brush if necessary to remove particulate matter and surface films.

2. Rinse thoroughly with tap water.

3. Rinse thoroughly with deionized water.

4. Rinse twice with pesticide grade and nanograde methanol or isopropanol.
5. Rinse thoroughly with analyte-free (usually organic-free or metal-free) water and allow to air dry as long as possible.

6. <u>If analyte-free water is not available, allow equipment to air dry as long as possible.</u>

7. Wrap with aluminum foil, if appropriate, to prevent contamination if equipment is to be stored or transported.

The teflon bailers used to retrieve monitoring well samples are specifically dedicated to and stored in each well and will therefore require no decontamination.

<u>4.2.2.3 Preparation of Quality Control Samples</u> An integral component of the field QA/QC program is the use of trip blanks, field blanks, equipment blanks, and sample duplicates. A trip blank consists of a VOA vial filled with analyte-free water prepared in the laboratory. The purpose of a trip blank is to detect potential contamination of samples from volatile organic compounds at any point during sample bottle shipment or storage activities. A trip blank will be placed, undisturbed, in a cooler with samples retrieved during the day. The bottle will not be listed as a trip blank on the chain-of-custody form. At least one trip blank will accompany every shipment of water or soil samples from the field to the laboratory.

A field blank is prepared in the field using analyte-free water. The purpose of a field blank is to determine if cross-contamination of samples is occurring during retrieval and storage in the field. The field blank also serves as a check on laboratory QA/QC. One field blank will be prepared for each assay method and placed into the appropriate cooler prior to retrieval of samples. The field blank frequency will be one per every ten samples or one per sampling day. Each field blank will be coded so that the lab does not know that it is a blank.

An equipment blank will be prepared periodically if non-dedicated sampling equipment is utilized. The purpose of an equipment blank is to determine the adequacy of field decontamination procedures. An equipment blank consists of rinse water collected after the final stage of equipment decontamination.

Duplicates will be prepared for both soil and groundwater samples at a ratio of about 1 for every 10 samples. The purpose of duplicate samples is to check the accuracy and precision of laboratory analytical data. In order to maintain complete objectivity and reliability, the duplicate samples will be packaged as blind duplicates, with identities not revealed on the chain-of-custody form.

4.2.3 Laboratory QA/QC Procedures KEMRON's Laboratory Quality Assurance Officer will direct analytical procedures so that they strictly follow the KEMRON QA/QC program to assure the accuracy and precision of analytical results. The QA/QC analytical procedures include:

- Appropriate sample storage
- Appropriate sample preparation methods
- Appropriate analytical methods
- Appropriate calibration and analytical procedures
- Data handling, review, and internal reporting
- Internal QA/QC oversight

All of these procedures are detailed in KEMRON's Laboratory QA/QC manual and are only briefly referred to here.

4.3 SAMPLING PROTOCOLS During the contamination assessment, sediment and groundwater samples will be collected for chemical analysis. This will be accomplished by a variety of methods described in the following paragraphs.

4.3.1 Monitoring Well Sampling Groundwater samples will be retrieved from monitoring wells previously installed at the site during the preliminary contamination assessment. Each well will be purged prior to sampling.

The pH, conductivity, and temperature of each groundwater sample will be tested and recorded in the log book. Samples will be collected using dedicated teflon bailers. Each sample will be placed into the proper pre-labeled container. A blank label is depicted in Figure 4-1. Pertinent data will be recorded in the field log as described in paragraph 4.2.2, and chain-of-custody protocols will be maintained.

4.3.2 Surface Water and French Drain Sampling Groundwater samples will be collected from the french drain system underlying the site by lowering a clean collection container into the drain. The collected samples will be transferred to appropriate pre-labeled containers. All samples will be properly packed with chain-of-custody documentation and shipped to KEMRON laboratories for analysis.

4.3.3 Retention Pond Sediment Sampling Standard hand auger borings will be drilled beneath the pond water to shallow depths at selected locations at the site by use of a previously cleaned 2-inch O.D. stainless steel hand auger. Borings will be advanced to a depth of 6-inches. Soils will be described and representative samples retained.

Samples will be collected from each boring as required with each being placed in an appropriate container and labeled accordingly. The extent of contamination also will be evaluated in the field by visual and OVA examination. A two person sampling crew will be utilized during the

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SITE: _____ SAMPLE TYPE: _____
PROJECT NO.: _____ MEDIUM: _____
SAMPLE LOCATION: _____ TIME: _____
_____
SAMPLER: _____ DATE: _____
PRESERVATIVE: _____ SAMPLE NO.: _____

Figure 4-1. Sample label.

collection of the sediment samples. All samples will be properly packed with chain-of-custody documentation and shipped to KEMRON Laboratories for analysis.

4.4 SAMPLE CUSTODY Chain-of-custody procedures will be followed and documented by all personnel. Possession and handling of samples will be recorded from the time of collection through analysis and final disposition.

Cleaned sample containers will be securely packed, sealed, and delivered to the sampling team by KEMRON Laboratories. The package will be opened by authorized personnel only, at which time a preprinted label will be affixed to each container. Chain-of-custody forms (Figure 4-2) will be filled out immediately after sample collection. Information such as sample ID number, type of sample (composite/grab), date and time of sampling, sample location, sampler, constituents to be analyzed, and special analytical requirements will be recorded at that time. The chain-of-custody form will be signed by the site supervisor upon completion of sample collection. A copy of the form will accompany the sample. Samples, packed with ice when necessary, will be shipped to the laboratory via overnight delivery.

4.5 CALIBRATION PROCEDURES This section describes the calibration methods and procedures to be used on all field and laboratory equipment during this investigation.

4.5.1 Field Equipment Equipment anticipated to be used in this assessment will be an OVA. The OVA battery, pump, and flame will be checked before each field use. The probe will be cleaned as needed.

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CHAIN OF CUSTODY RECORD

16550 Highland Road
Baton Rouge, Louisiana 70810
(504) 293-8650

PROJ. NO. | PROJECT NAME

SAMPLERS: (Signature)

STA.NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS							REMARKS

Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received for Laboratory By (Signature)	Date/Time	Remarks	

Figure 4-2. Chain-of-custody form.

4.5.2 Laboratory Equipment The laboratory calibration procedures for analytical instruments will be in accordance with KEMRON Laboratories' QA/QC Plan.

4.6 ANALYTICAL PROCEDURES. Analytical procedures for various constituents of interest are described in detail in KEMRON's QA/QC Plan. EPA Method 418.1 will be used to quantify petroleum hydrocarbon contamination in the soils and groundwater beneath the site. Method 8020 will be used on sediment samples to assay for benzene, toluene, ethylbenzene, and xylenes. Method 8100 will be used to assay for polynuclear aromatic hydrocarbons in sediment samples.

4.7 DATA REDUCTION, VALIDATION, AND REPORTING. Data transfer, reduction, validation and the interim reporting of results are primarily functions of the analytical laboratory. The project manager will assist the laboratory in data validation by checking and interpreting the results of field blanks, trip blanks, and duplicates. Laboratory procedures for data reduction, validation, and reporting are described in KEMRON Laboratories' QA/QC Plan. These procedures follow those specified in 40 CFR 136 and in Test Methods for Evaluating Solid Waste, SW-846, current edition, published by USEPA's Office of Solid Waste and Emergency Response.

Sample locations will be reported graphically on a plan view of the site, and will be tabulated in a suitable coordinate system. Raw assay results and measurements will be catalogued in an appendix.

4.8 INTERNAL QUALITY CONTROL. The intra-laboratory control program is a continuing systematic, in-house regimen intended to ensure the production of analytical data of continuing high validity. Its functions are:

- To provide a measure of the precision of analytical methods
- To maintain a continuing assessment of the accuracy and precision of analysts within the laboratory group
- To identify weak methodology and provide a continuing source of research into problems aimed at overcoming deficiencies
- To provide a permanent record of instrument performance as a basis for validating data and projecting repair or replacement needs
- To detect training needs within the analytical group
- To upgrade the overall quality of laboratory performance

The intra-laboratory control checks for analytical work are described in KEMRON Laboratories' QA/QC Plan.

4.9 PERFORMANCE AND SYSTEM AUDITS. A system audit is a qualitative evaluation of all components of the measurement systems to determine their proper selection and use. After systems (procedures) are operational and generating data, performance audits are conducted periodically to determine the accuracy of the total measurement system. The performance and system audits of analytical works are stated in KEMRON Laboratories' QA/QC Plan.

4.10 PREVENTIVE MAINTENANCE. The purpose of preventive maintenance for analytical instrumentation, field devices, and instrumentation is to assure normal operation of the equipment. The OVA used during the contamination assessment will be recharged overnight to prevent downtime. Analytical instruments will be maintained according to manufacturer's specifications. The process is referred to in KEMRON Laboratories' QA/QC Plan.

4.11 DATA ASSESSMENT PROCEDURES. Analytical performance measurements are described in KEMRON Laboratories' QA/QC Plan.

4.12 CORRECTIVE ACTION. The purpose of KEMRON'S internal corrective action protocol is to investigate and resolve any quality control problems related to field sampling procedures, sample custody, and sample analysis such as identification of contaminated field or laboratory trip blanks. In the event of a QA problem, the KEMRON quality assurance officer will review the sampling procedures utilized in the field to determine whether or not the sample integrity was compromised. The investigation will include interviews with the site supervisor and other site personnel, review of field notes, and examination of chain-of-custody documents. KEMRON'S project quality assurance officer will also coordinate with KEMRON Laboratories' quality assurance officer concerning any incident of questionable analytical results or internal

QC data. He will work with the laboratory staff to resolve any problems and implement appropriate corrective action. KEMRON will subscribe to any corrective action deemed necessary by DHEC or USEPA offices.

The internal laboratory corrective action procedures for analytical work are described in KEMRON Laboratories' QA/QC Plan.

4.13 QUALITY ASSURANCE REPORTS. The KEMRON project quality assurance officer will report to the KEMRON project manager concerning the performance of measurement systems and data quality. The final contamination assessment report will include a separate QA section summarizing all data quality information, significant quality assurance problems, if any, recommended solutions, and the outcome of any corrective actions. A copy of this report will be forwarded to the SOUTHDIV, DHEC, USEPA, and NAVBASE Charleston QA offices.

KEMRON also will compile laboratory quality assurance reports and include them in its report. The nature and content of laboratory QA reports are described in KEMRON Laboratories' QA/QC Plan.

A

APPENDIX A

SOIL BORING LOGS

BORING LOGS

Conducted by: KEMRON Environmental Services Date: 19-21 June 1990

Boring No.	Depth (ft)	Description
B-1	0 - 4	Sand (fill), fine to medium grain, red to tan, no petroleum odor.
	4 - 7	Sand (fill), fine grain, tan, no petroleum odor.
	7 - 13	Silty sand, fine grain, tan to light gray, wet, no petroleum odor.
	13 - 17	Sand, fine grain, dark gray to black, wet, no petroleum odor.
B-2	0 - 5	Clayey sand, fine grain, dark brown, no petroleum odor.
	5 - 13	Clayey sand, fine grain, gray to light tan, iron staining, wet below 9 feet, no petroleum odor.
	13 - 16	Clayey sand, fine grain, dark gray to black, shell fragments, wet, no petroleum odor.
B-3	0 - 5	Sand, fine grain, tan, no petroleum odor.
	5 - 8	Sandy clay, fine grain, light gray, iron staining, no petroleum odor.
	8 - 12	Sand, fine grain, light gray to tan, wet, no petroleum odor.
	12 - 16	Clayey sand, fine grain, dark gray, high shell content, wet, no petroleum odor.

BORING LOGS (continued)

Conducted by: KEMRON Environmental Services Date: 19-21 June 1990

Boring No.	Depth (ft)	Description
B-4	0 - 3	Sand, fine grain, brown, high shell content, no petroleum odor.
	3 - 9	Clayey sand, fine grain, light gray, wet below 7 feet, no petroleum odor.
	9 - 14	Clayey sand, fine grain, tan to red, wet, no petroleum odor.
	14 - 16	Clayey sand, fine grain, dark gray, wet, no petroleum odor.
	16 - 17	Clay, dark gray, wet, no petroleum odor.
B-5	0 - 2	Sandy clay, medium to dark brown, no petroleum odor.
	2 - 5	Sand, fine grain, light brown, no petroleum odor.
	5 - 7	Sand, fine grain, light gray, wet, no petroleum odor.
	7 - 11	Clayey sand, fine grain, gray, wet, no petroleum odor.
	11 - 16	Clayey sand, fine grain, dark gray, shell fragments, wet, no petroleum odor.
B-6	0 - 5	Sand, fine grain, tan, no petroleum odor.
	5 - 10	Sandy clay, fine grain, gray, wet, no petroleum odor.
	10 - 12	Sand, fine grain, gray, wet, no petroleum odor.
	12 - 16	Clay, gray, shell fragments, wet, no petroleum odor.

BORING LOGS (continued)

Conducted by: KEMRON Environmental Services

Date: 19-21 June 1990

Boring No.	Depth (ft)	Description
B-7	0 - 7	Sand, fine grain, tan to dark brown, no petroleum odor.
	7 - 11	Clayey sand, fine grain, medium to dark gray, wet, no petroleum odor.
	11 - 16	Clayey sand, fine grain, dark gray, high shell content, wet, no petroleum odor.
B-8	0 - 10	Sand, fine grain, tan, iron staining, no petroleum odor.
	10 - 15	Sand, fine grain, tan to black, wet, no petroleum odor.
B-9	0 - 7	Sand (fill), fine grain, tan to brown, no petroleum odor.
	7 - 12	Sand (fill), fine grain, light gray, wet, no petroleum odor.
	12 - 16	Clayey sand, fine grain, tan to red, iron staining, wet, no petroleum odor.
B-10	0 - 2	Sand (fill), fine grain, light brown, no petroleum odor.
	2 - 5	Clayey sand, fine grain, dark brown, no petroleum odor.
	5 - 8	Sand, fine grain, tan to dark brown, iron staining, no petroleum odor.
	8 - 12	Clayey sand, fine grain, light gray, iron staining, wet, no petroleum odor.
	12 - 16	Sandy clay, dark gray, wet, no petroleum odor.

BORING LOGS (continued)

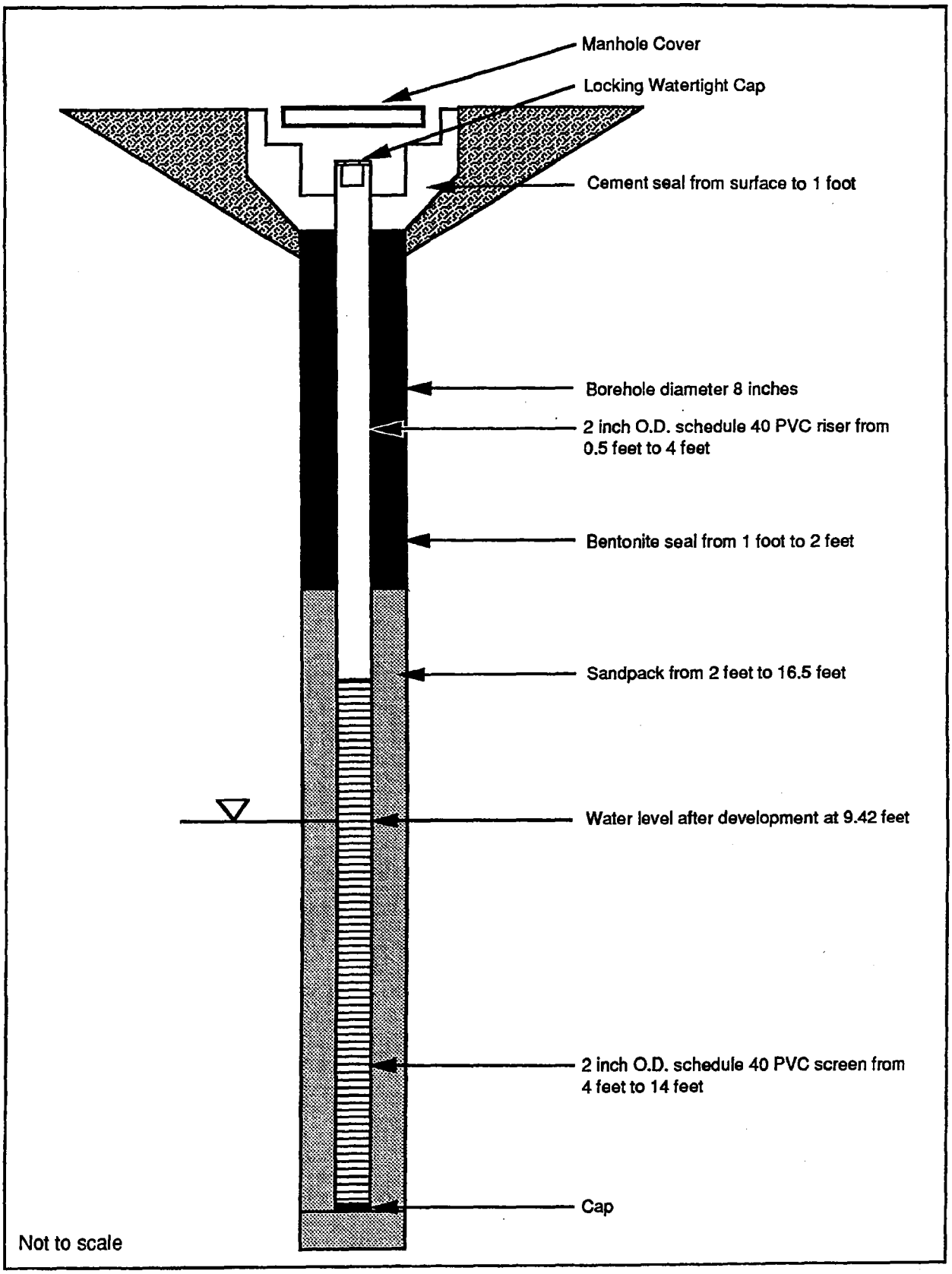
Conducted by: KEMRON Environmental Services Date: 19-21 June 1990

Boring No.	Depth (ft)	Description
B-11	0 - 6	Sand, fine grain, dark brown, no petroleum odor.
	6 - 9	Sand, fine grain, light gray, wet, no petroleum odor.
	9 - 17	Sandy clay, dark gray, wet, no petroleum odor.

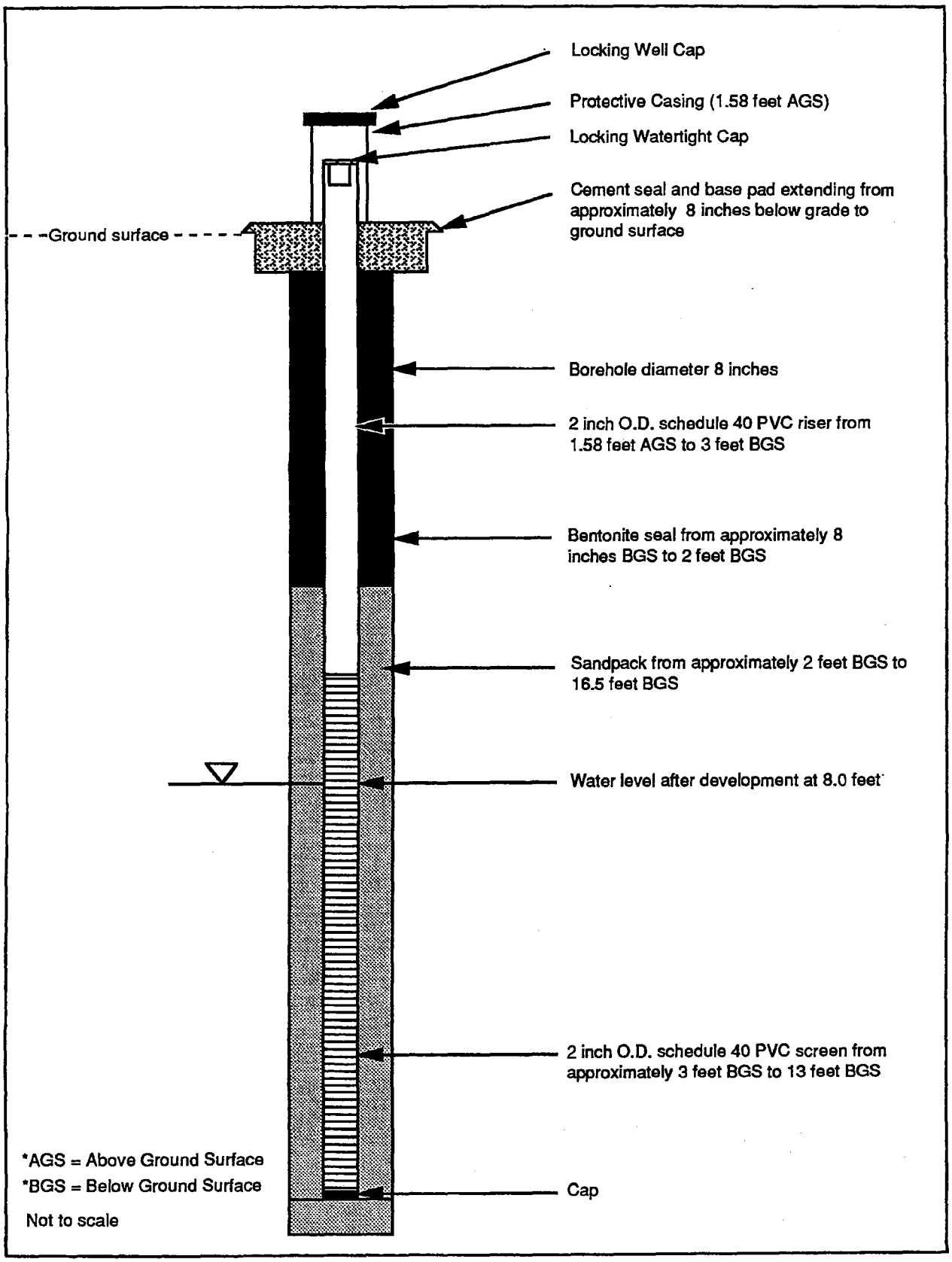
B

APPENDIX B

MONITORING WELL CONSTRUCTION DIAGRAMS



Monitor well MW-1



Monitoring well MW-2

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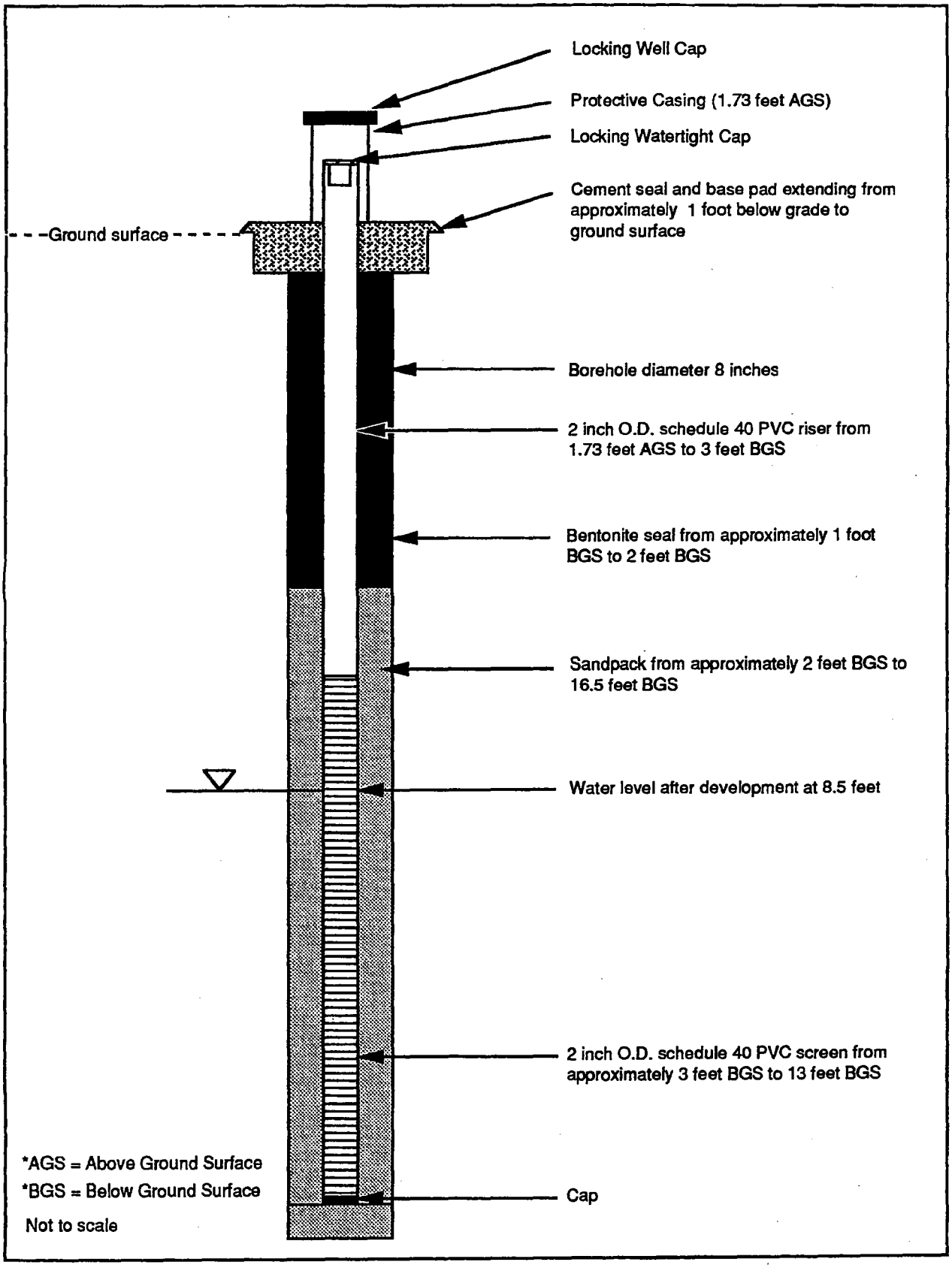

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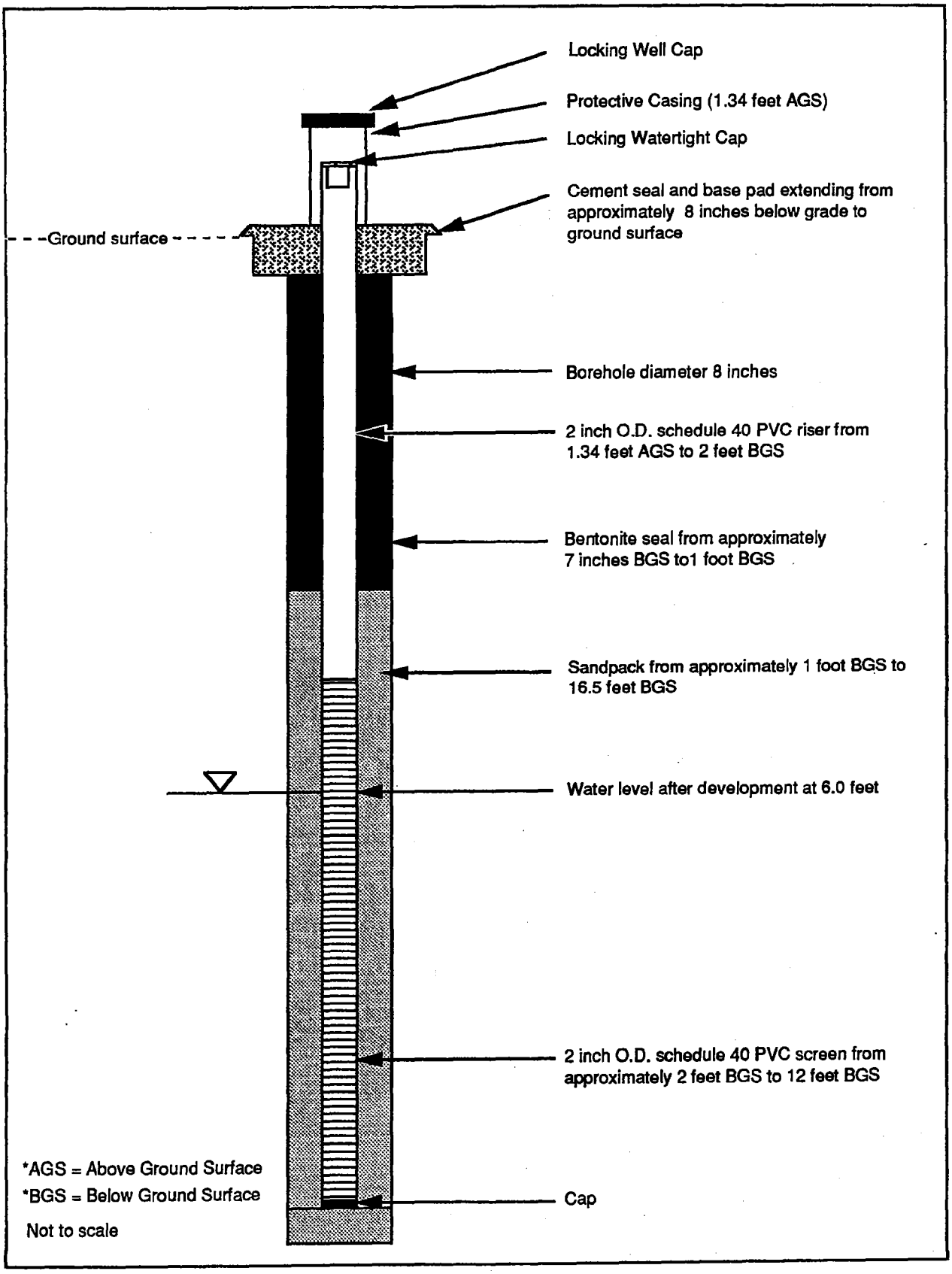

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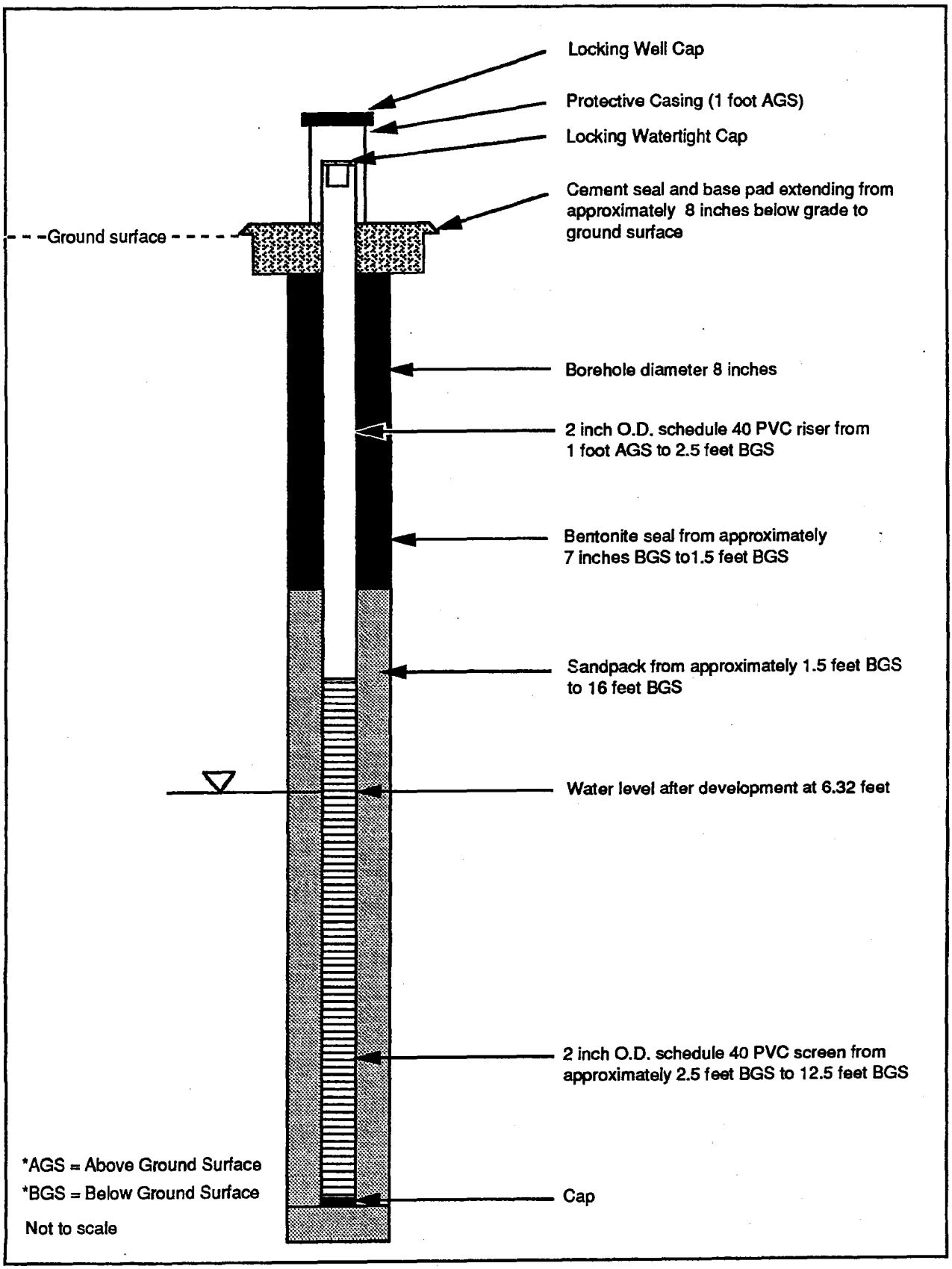

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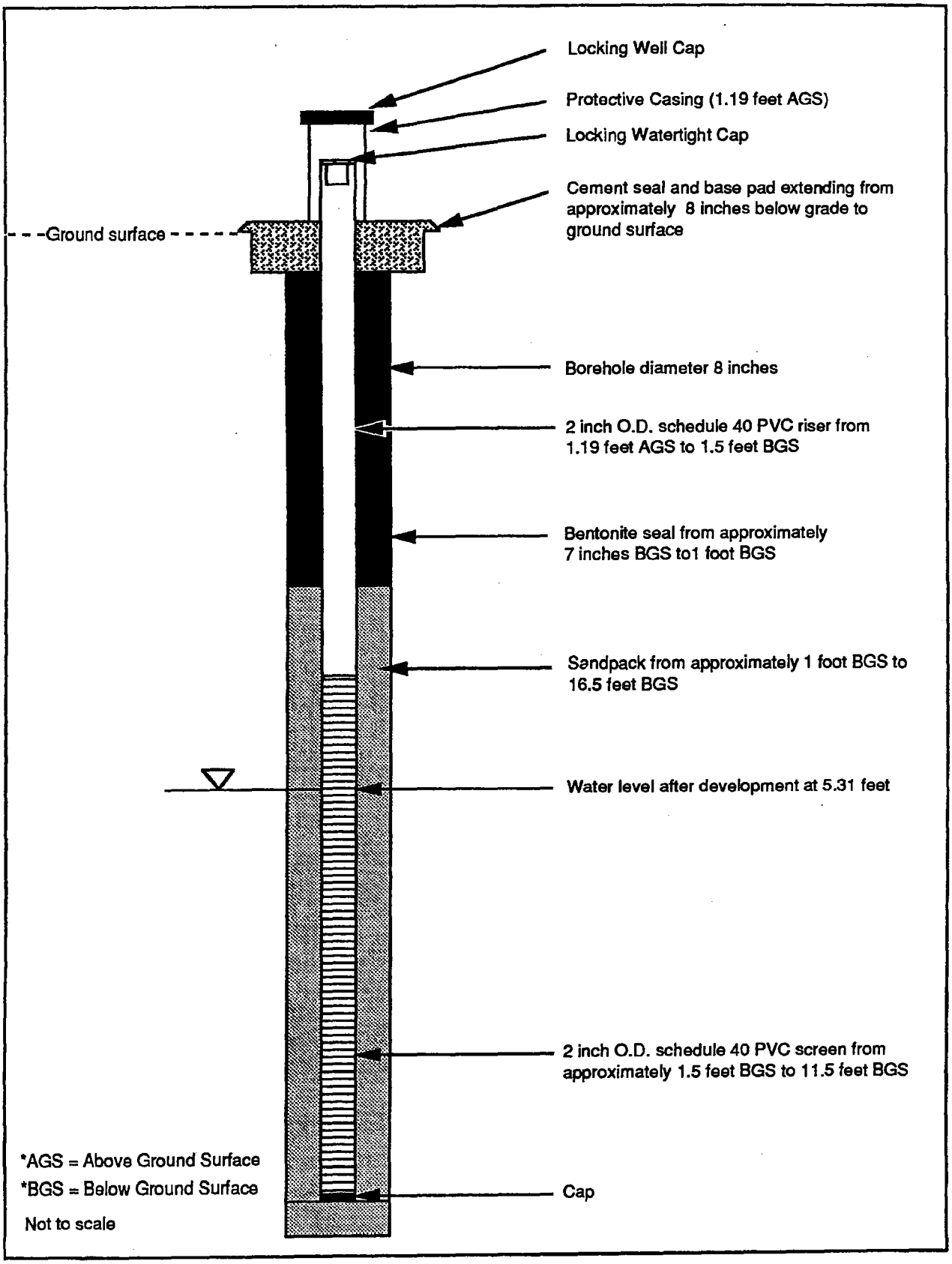

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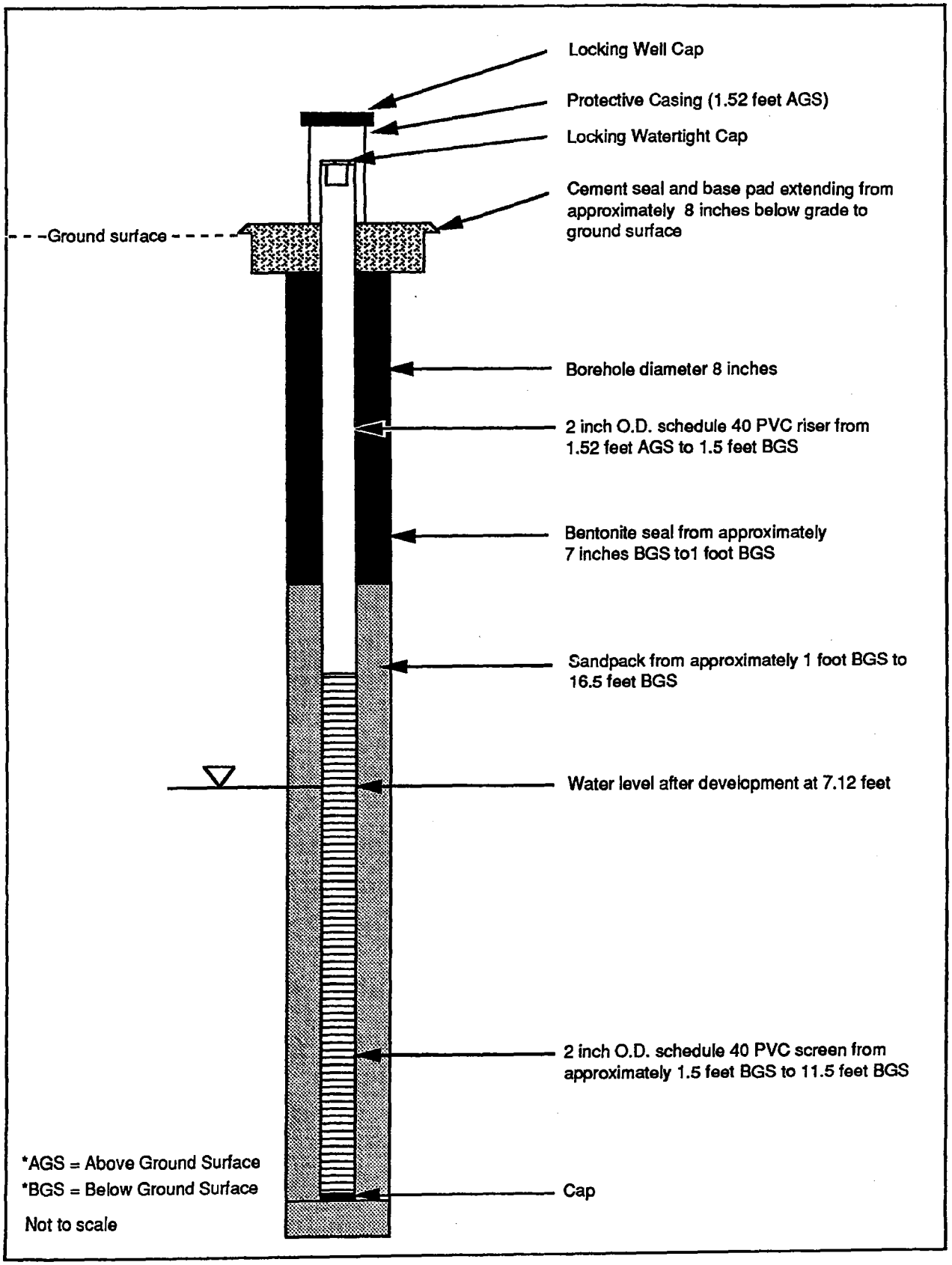

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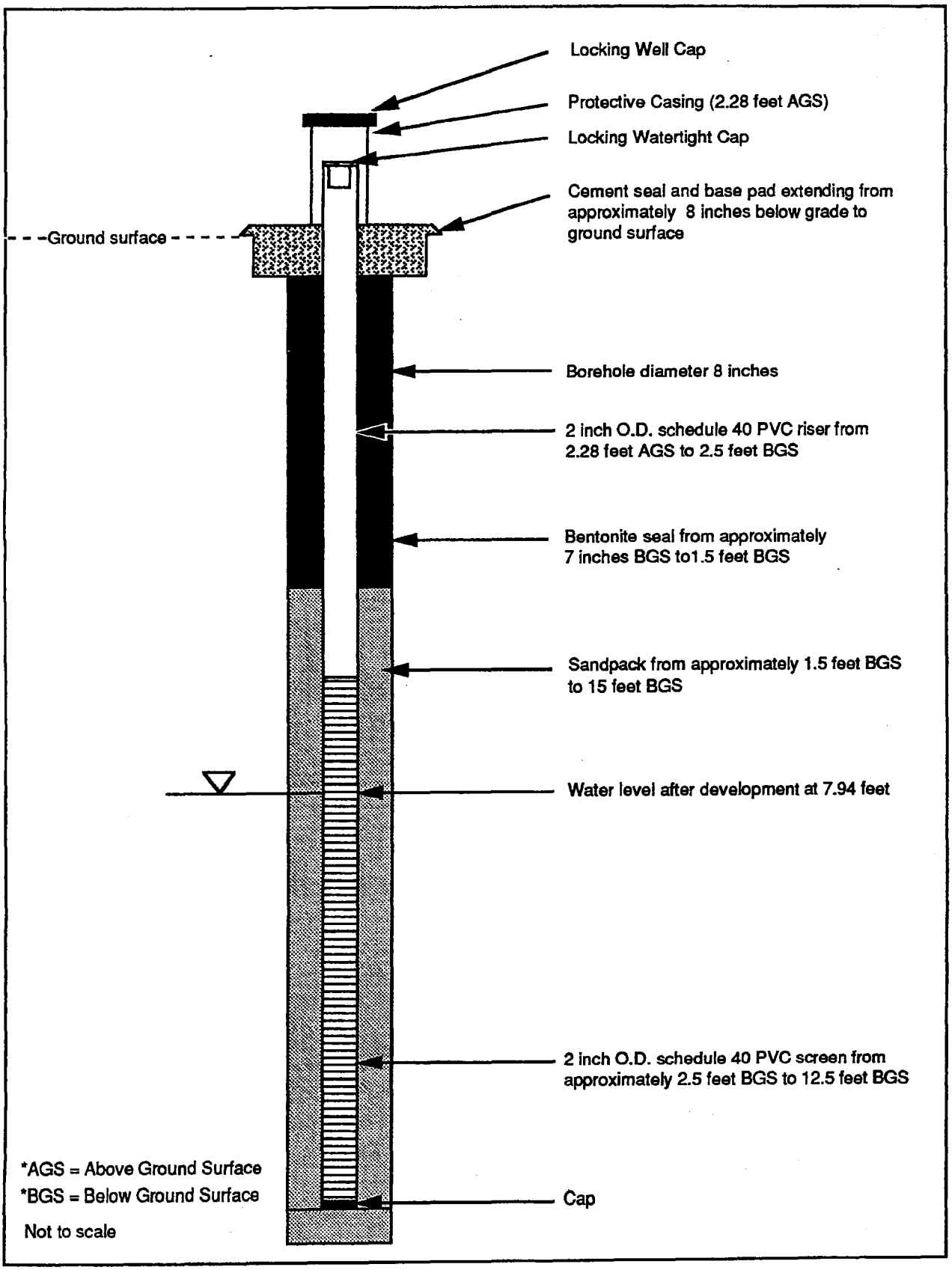

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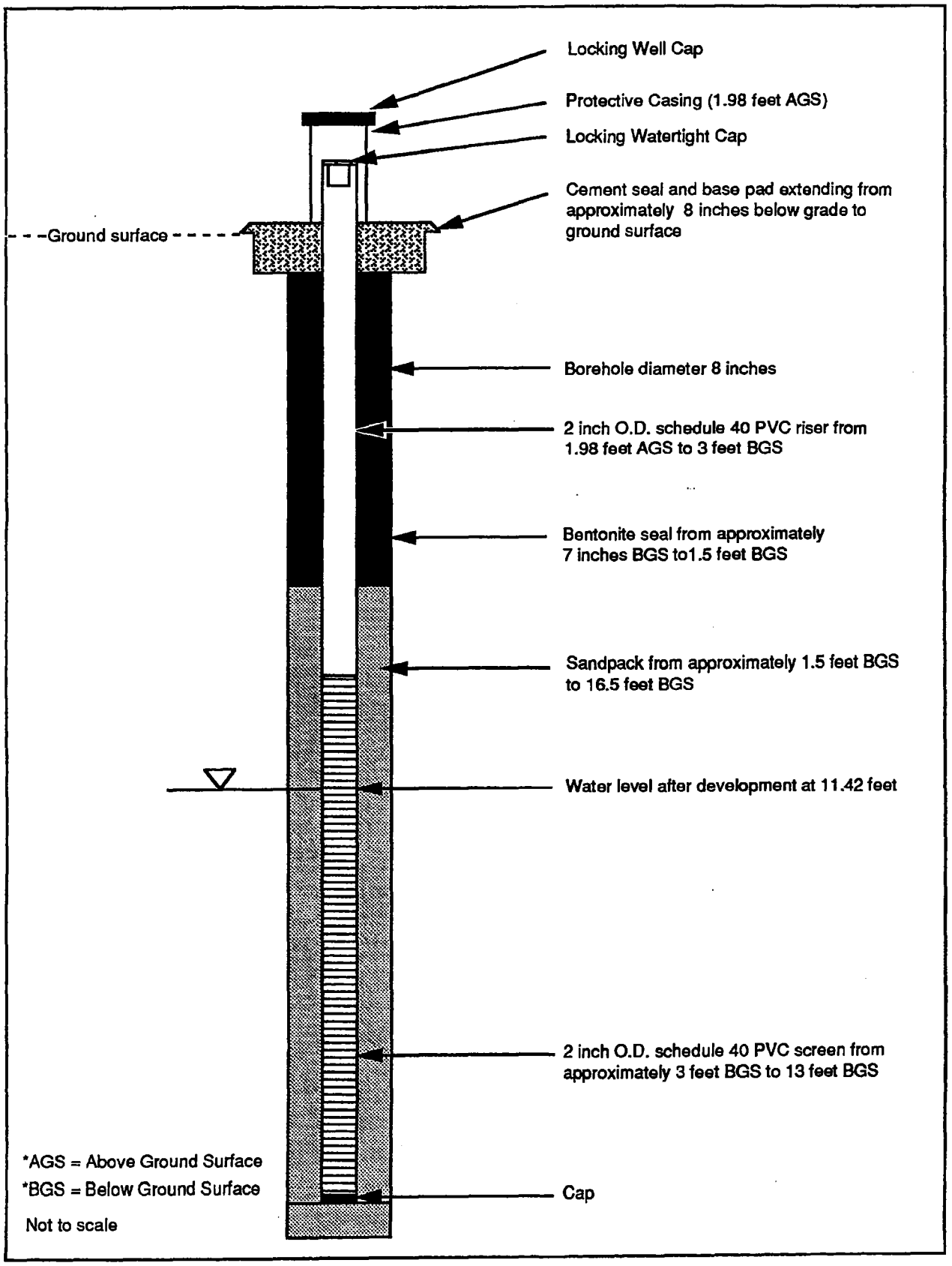
ND4/819-300/8



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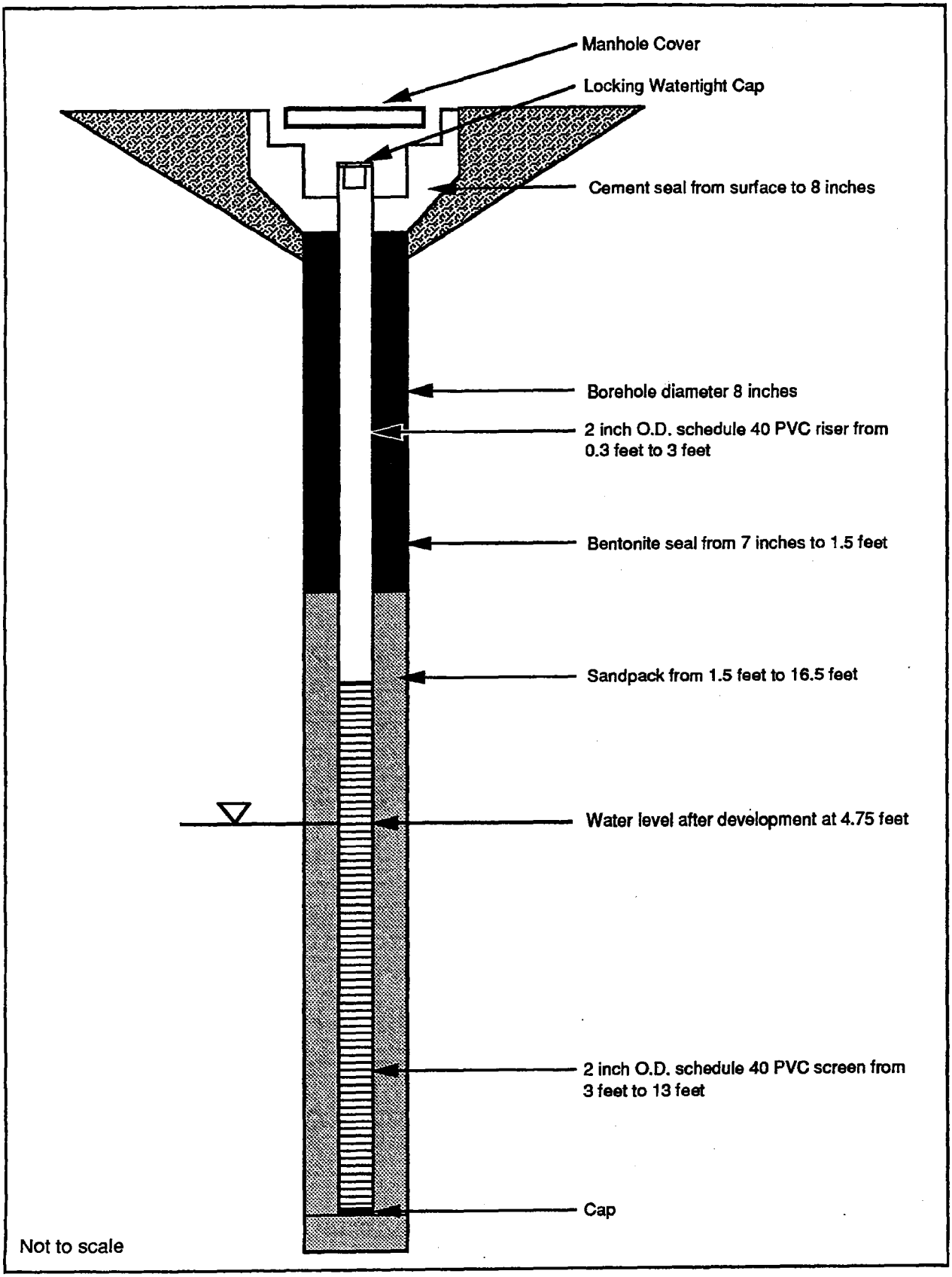

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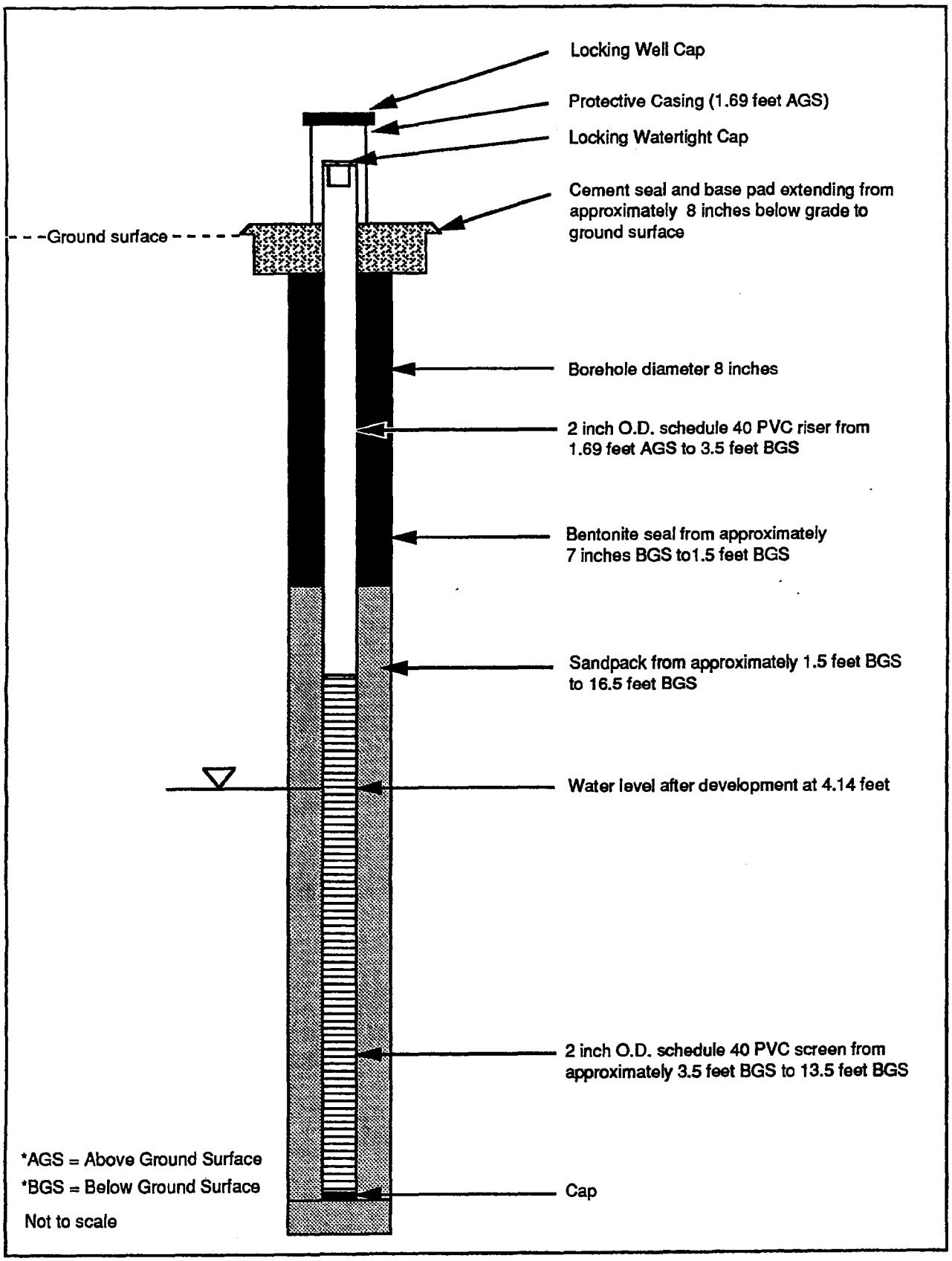


Monitoring well MW-11

ND4/819-300/11

C

APPENDIX C

HYDRAULIC CONDUCTIVITY AND FLOW RATE CALCULATIONS

Slug-in test analyses for CTF were conducted using methods presented by Bouwer and Rice (1976) to calculate Hydraulic Conductivity and Flow Rates. The following variables were used:

H_w = Height of the water column (feet)
T_l = Time lag (seconds)
R_w = Well radius (feet)
C = Coefficient of well design
K = Hydraulic conductivity (feet/second)
d = Well casing diameter (feet)
R_e = Effective radius of buildup
t = 0.37 as derived from h/H_o semilog plots
V = Flow rate (feet/second)
i = Gradient
n = Porosity*

$$\ln R_e/R_w = \left[\frac{1.1}{\ln(H_w/R_w)} + \frac{C}{L/R_w}\right]^{-1}$$

After $\ln R_e/R_w$ is derived the Hydraulic Conductivity (K) is calculated by:

$$K = \frac{d^2(\ln R_e/R_w)}{8L(t_l)}$$

The Flow Rate (V) is subsequently calculated by:

$$V = \frac{K(i)}{n}$$

* A porosity value of 0.2 was taken from the literature and utilized as a suitably conservative estimate. This value is higher than actual effective porosity values for the soil beneath the site and will result in over-estimation of groundwater flow rates.

MW-3

$H_w = (10 + 4.73) - 8.5 = 6.23'$

$R_w = 0.083'$

$C = 4.25$

$L = 10'$

$T_e = 25$ sec $\qquad i = 0.0025$

$d = 0.167' \qquad n = 0.2$

$$\ln_3 R_e/R_w = \left[\frac{1.1}{\ln\left(\frac{6.23}{0.083}\right)} + \frac{4.25}{\frac{10}{0.083}}\right]^{-1} = (0.2547 + 0.0353)^{-1} = 3.448$$

$$K_3 = \frac{(0.167)^2(3.448)}{8(10)(25)} = \frac{.0962}{2000} = 4.81 \times 10^{-5} \text{ ft/sec}$$

$$V_3 = \frac{K(i)}{n} = \frac{(4.81 \times 10^{-5})(0.0025)}{0.2} = \boxed{6.01 \times 10^{-7} \text{ ft/sec}}$$

MW-5

$H_w = (10 + 3.5) - 6.32 = 7.18'$

$R_w = 0.083'$

$C = 4.25$

$L = 10'$

$T_e = 57$ sec

$d = 0.167'$

$i = 0.0143$

$n = 0.2$

$$\ln_5 R_e/R_w = \left[\frac{1.1}{\ln\left(\frac{7.18}{0.083}\right)} + \frac{4.25}{\frac{10}{0.083}}\right]^{-1} = (0.2466 + 0.0353)^{-1} = 3.547$$

$$K_5 = \frac{(0.167)^2(3.547)}{8(10)(57)} = \frac{0.0989}{4560} = 2.17 \times 10^{-5} \text{ ft/sec}$$

$$V_5 = \frac{(2.17 \times 10^{-5})(0.0143)}{0.2} = \boxed{1.55 \times 10^{-6} \text{ ft/sec}}$$

MW-6

$H_w = (10 + 2.69) - 5.31 = 7.38'$

$R_w = 0.083'$

$C = 4.25$

$L = 10'$

$T_e = 22$ sec

$d = 0.167'$

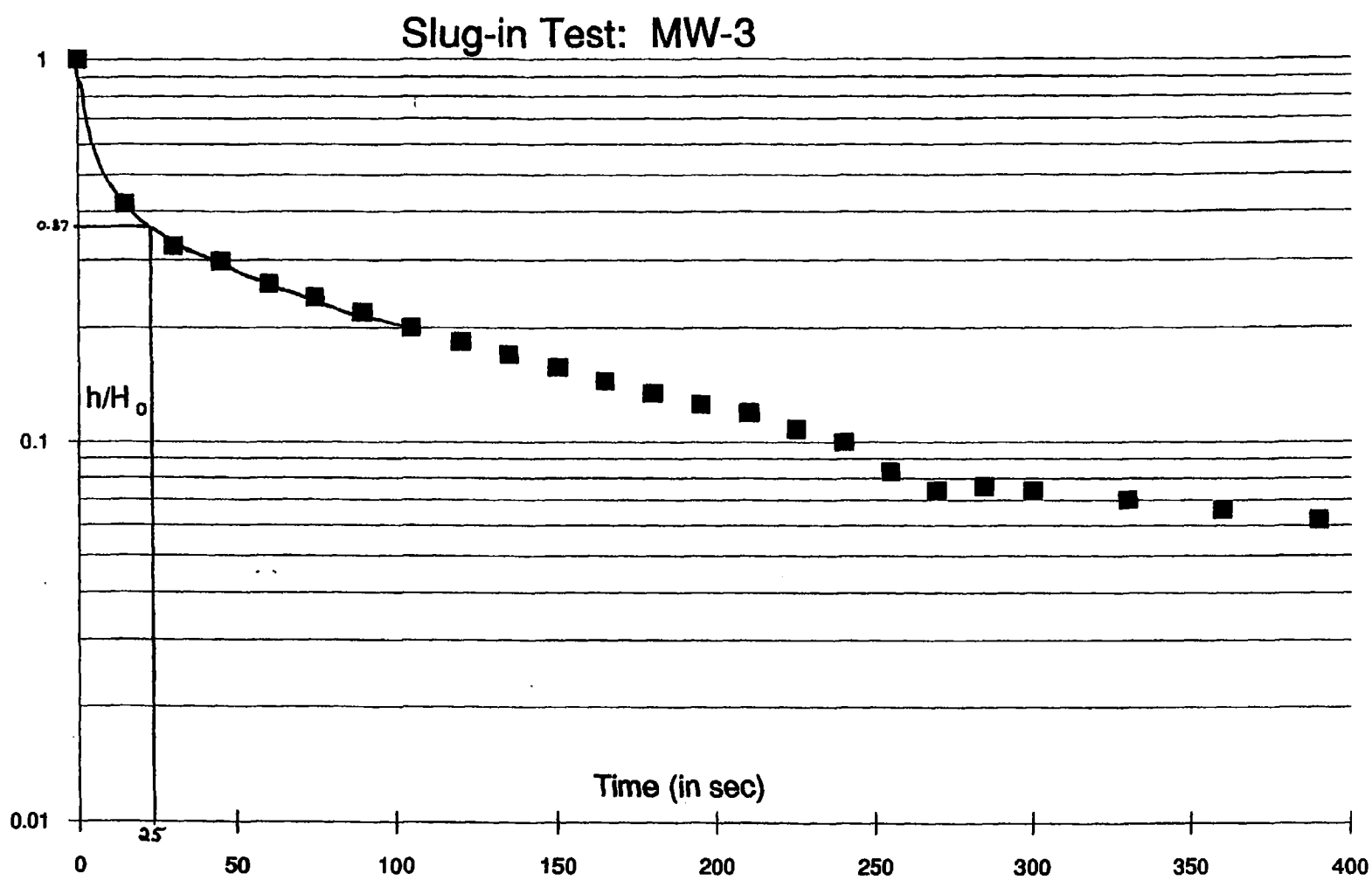
$i = 0.0143$

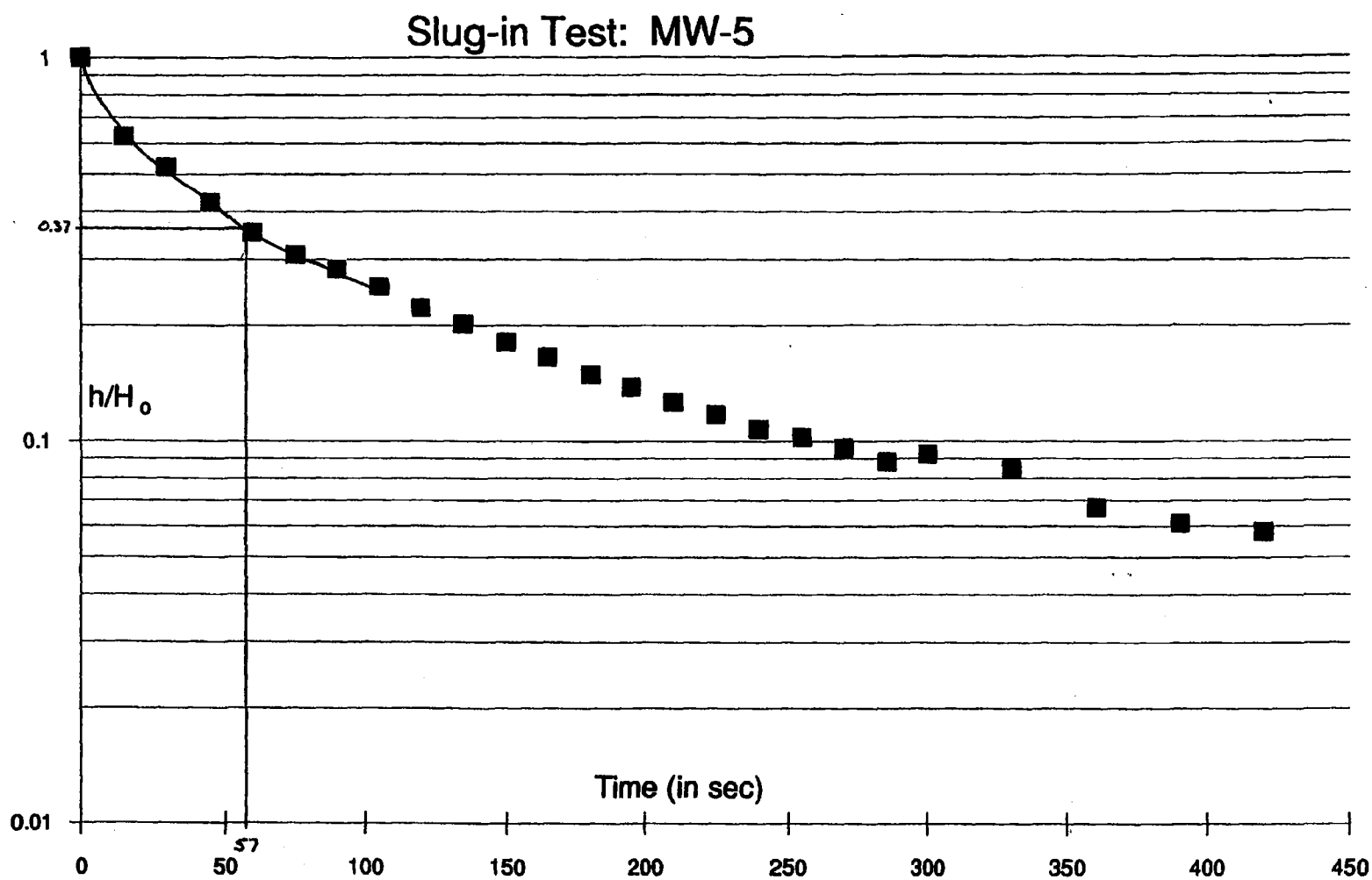
$n = 0.2$

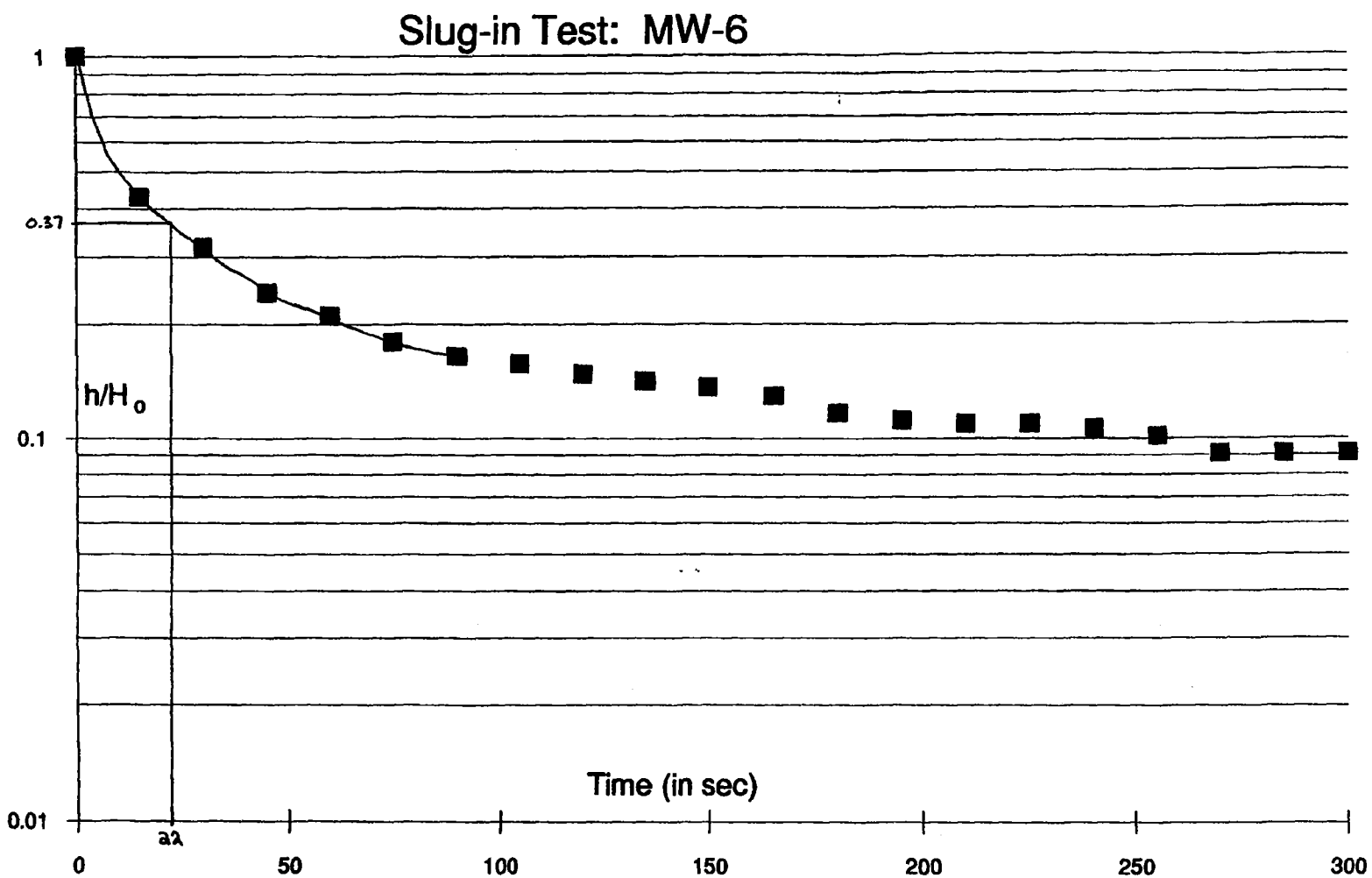
$$\ln R_e/R_w = \left[\frac{1.1}{\ln\left(\frac{7.38}{0.083}\right)} + \frac{\frac{4.25}{10}}{0.083}\right]^{-1} = (0.2451 + 0.0353)^{-1} = 3.566$$

$$K_6 = \frac{(0.167)^2(3.566)}{8(10)(22)} = \frac{0.0995}{1760} = 5.65 \times 10^{-5} \text{ ft/sec}$$

$$V_6 = \frac{(5.65 \times 10^{-5})(0.0143)}{0.2} = \boxed{4.04 \times 10^{-6} \text{ ft/sec}}$$


Slug-in Test: MW-3
1
0.87
0.1
0.01
h/H 0
Time (in sec)
25
0
50
100
150
200
250
300
350
400


Slug-in Test: MW-5
1
0.37
0.1
0.01
h/H o
Time (in sec)
0
50
57
100
150
200
250
300
350
400
450


Slug-in Test: MW-6
1
0.37
0.1
0.01
h/H o
Time (in sec)
0
50
100
150
200
250
300

SLUG TEST

WELL NUMBER MW-3

DATE 8-15-90

INITIAL CONDITIONS:

DEPTH TO BOTTOM 13.0'
DEPTH TO WATER 4.71'
WELL RADIUS 0.083'
SCREEN RADIUS 0.083'
SCREEN LENGTH 10.0'

TIME	WATER LEVEL	Δ	H/Ho	TIME	WATER LEVEL	Δ	H/Ho
0	0.0	4.71	1	630			
15	2.74	1.97	0.418	660			
30	3.18	1.53	0.325	690			
45	3.31	1.40	0.297	720			
60	3.41	1.22	0.259	750			
75	3.58	1.13	0.240	780			
90	3.68	1.03	0.219	810			
105	3.77	0.94	0.200	840			
120	3.85	0.86	0.183	870			
135	3.91	0.80	0.170	900			
150	3.97	0.74	0.157	930			
165	4.03	0.68	0.144	960			
180	4.08	0.63	0.134	990			
195	4.12	0.59	0.125	1020			
210	4.15	0.56	0.119	1050			
225	4.20	0.51	0.108	1080			
240	4.24	0.47	0.100	1110			
255	4.32	0.39	0.083	1140			
270	4.36	0.35	0.074	1170			
285	4.35	0.36	0.076	1200			
300	4.36	0.35	0.074	1230			
330	4.38	0.33	0.070	1260			
360	4.40	0.31	0.066	1290			
390	4.42	0.29	0.062	1320			
420				1350			
450				1380			
480				1410			
510				1440			
540				1470			
570							

SLUG TEST

WELL NUMBER MW-5

DATE 8-15-90

INITIAL CONDITIONS:

DEPTH TO BOTTOM 12.5'
DEPTH TO WATER 5.22'
WELL RADIUS 0.083'
SCREEN RADIUS 0.083'
SCREEN LENGTH 10.0'

TIME	WATER LEVEL	Δ	H/Ho	TIME	WATER LEVEL	Δ	H/Ho
0	0	5.22	1	630			
15	1.96	3.26	0.625	660			
30	2.50	2.72	0.521	690			
45	3.02	2.20	0.422	720			
60	3.38	1.84	0.353	750			
75	3.61	1.61	0.308	780			
90	3.75	1.47	0.282	810			
105	3.90	1.32	0.253	840			
120	4.06	1.16	0.222	870			
135	4.17	1.05	0.201	900			
150	4.28	0.94	0.180	930			
165	4.36	0.86	0.165	960			
180	4.44	0.78	0.149	990			
195	4.50	0.72	0.138	1020			
210	4.56	0.66	0.126	1050			
225	4.61	0.61	0.117	1080			
240	4.66	0.56	0.107	1110			
255	4.69	0.53	0.102	1140			
270	4.72	0.50	0.096	1170			
285	4.76	0.46	0.088	1200			
300	4.74	0.48	0.092	1230			
330	4.74	0.44	0.084	1260			
360	4.87	0.35	0.067	1290			
390	4.90	0.32	0.061	1320			
420	4.92	0.30	0.058	1350			
450				1380			
480				1410			
510				1440			
540				1470			

SLUG TEST

WELL NUMBER MW-6

DATE 8-15-90

INITIAL CONDITIONS:

DEPTH TO BOTTOM 11.5'
DEPTH TO WATER 3.96'
WELL RADIUS 0.083'
SCREEN RADIUS 0.083'
SCREEN LENGTH 10.0'

TIME	WATER LEVEL	Δ	H/Ho	TIME	WATER LEVEL	Δ	H/Ho
0	0.00	3.96	1	630			
15	2.26	1.70	0.429	660			
30	2.70	1.26	0.318	690			
45	3.00	0.96	0.242	720			
60	3.13	0.83	0.210	750			
75	3.25	0.71	0.179	780			
90	3.31	0.65	0.164	810			
105	3.34	0.62	0.157	840			
120	3.38	0.58	0.147	870			
135	3.40	0.56	0.141	900			
150	3.42	0.54	0.136	930			
165	3.45	0.51	0.129	960			
180	3.50	0.46	0.116	990			
195	3.52	0.44	0.111	1020			
210	3.53	0.43	0.109	1050			
225	3.53	0.43	0.109	1080			
240	3.54	0.42	0.106	1110			
255	3.56	0.40	0.101	1140			
270	3.60	0.36	0.091	1170			
285	3.60	0.36	0.091	1200			
300	3.60	0.36	0.091	1230			
330				1260			
360				1290			
390				1320			
420				1350			
450				1380			
480				1410			
510				1440			
540				1470			

D

APPENDIX D

TRACE SURVEY REPORT

Tracer Research Corporation

PREPARED FOR:

Kemron Environmental Services
1815 Century Boulevard, Suite 150
Atlanta, Georgia 30345
(404) 636-0928

Tracer Tight™ LEAK TEST OF SIX UNDERGROUND STORAGE TANKS

CHICORA TANK FARM
CHARLESTON, SOUTH CAROLINA

MARCH 1990

SUBMITTED BY:

TRACER RESEARCH CORPORATION

KEMRON.REP
1-90-100-T

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INTRODUCTION

Tracer Research Corporation (TRC) performed Tracer Tight™ leak testing of six underground storage tanks and approximately 2400 feet of piping at the Chicora Tank Farm in Charleston, South Carolina. Five of the tanks have 50,000 barrel capacities. The capacity of the sixth tank is 27,000 barrels. Tracer was added to the tanks on February 2, 1990 and testing was conducted from February 27 to March 8, 1990.

CONCEPT OF OPERATION AND IMPLEMENTATION

The tracer leak detection method relies upon the addition of a highly volatile liquid chemical to the fuel. If a leak occurs in the underground fuel system, fuel is released into the surrounding soil. The tracer escapes from the fuel by vaporization and disperses into the soil by molecular diffusion. Various means are used to sample the soil vapors in the immediate vicinity of the underground tanks and pipes. In this case, sampling was performed by driving probes into the ground in the vicinity of the tanks and pipes. Each probe has an effective detection radius of approximately 10 to 12 feet. This means that a given probe should detect a leak anywhere within the area described by the 10 foot radius around the probe. The tracer is placed in the tank at least two weeks prior to the probe sampling for this method to be effective. This process of leak detection by placing a liquid tracer in a liquid product followed by detection of the tracer underground in the vapor phase is protected under TRC patents.

CRITERIA FOR CLASSIFICATION OF LEAKS

The following criteria are used for the classification of leaks when tracer is detected.

LEAK STATUS

1 NO LEAKAGE - Rate less than 0.005 gallons per hour.

2 <u>VAPOR LEAK</u> - Maximum tracer concentration less than 1 ug/L in soil vapor diminishing at depths below three feet. Total volatile hydrocarbon concentrations less than 20,000 ug/L in soil vapor (if diesel is the only fuel present, substitute 100 ug/L in place of 20,000 ug/L).

3 <u>SMALL OR INTERMITTENT PRODUCT LEAK</u> **less than 0.05 gph** - Maximum tracer concentration less than 1 ug/L in soil vapor, sustaining or increasing at depths below three feet or to the top of the groundwater table. Hydrocarbon concentrations approximately equal to or greater than 20,000 ug/L in soil vapor (100 ug/L for diesel) sustaining or increasing below three feet. Distribution of elevated hydrocarbons is less than 200 square feet total area.

4 <u>SIGNIFICANT PRODUCT LEAK</u> **0.05 gph or greater** - Maximum tracer concentration greater than 1 ug/L near source, increasing or sustaining concentration below three feet or to the top of the groundwater table. Hydrocarbon concentrations greater than 20,000 ug/L in soil vapor (100 ug/L for diesel) sustaining or increasing below three feet. Distribution of elevated hydrocarbons is equal to or greater than 200 square feet total area.

TESTING RESULTS

Testing was performed on six underground storage tanks at the Naval Supply Station, Facility #3906, also known as the Chicora Tank Farm. The following table shows the tank capacity, product and product level of each tank at the time of inoculation and the completion of testing:

			Product Level(feet)	
Tank	Product	Capacity(barrels)	Feb. 2, 1990	Mar. 6, 1990
K	Diesel	50,000	19	9
L	Diesel	50,000	19	19
M	Water&Sludge	50,000	12	15
N	Oil Sludge	50,000	2	2
O	Navy Special Oil/Water	27,000	12(oil)/?(H_2O)	5(oil)/3(H_2O)
P	Diesel	50,000	14	17

Tracer was introduced to the tanks February 2, 1990. DDM tracer was added to the tanks through the vent openings in the top of the tanks. One end of a fifty foot piece of polyethylene tubing was weighted and lowered into the tanks through the vent openings. The other end of the tubing was attached to a pressurized cylinder of tracer. Two hundred pounds of tracer was released into each of the 50,000 barrel tanks. One hundred pounds of tracer was to be placed in the 27,000 barrel tank. However, the cylinder of tracer was not fully pressurized, allowing only thirty to forty pounds of tracer to release into the product in the tank. Enough tracer was added to each of the tanks so that the concentration in the tanks would be approximately 10 ppm if the tanks were filled to near capacity. Tanks M and O were never filled to capacity. Tank N was nearly empty and is unused at the present time.

The tanks are situated so that one-half of the tank is below grade. Three to five feet of backfill has been bermed over the top of the tanks. The height of the tanks is approximately twenty-five feet. The TRC field crew encountered ground water in several sampling locations as shallow as two feet below grade, indicating that the lower ten feet of the tank is below water.

Near the tanks, the sampling depths were staggered to maximize coverage and minimize testing time. All sampling locations were sampled at approximately six feet. A deeper sample, near twelve feet, was also taken at every other sampling location. The deeper sample also increased the likelihood of detecting semi-volatile hydrocarbon vapors emanating from the groundwater. If tracer labeled fuel leaks from the tank bottom, that is presumably below the water table, the fuel will migrate to the tank perimeter and up the sides of the tank to the water table surface. This results from buoyance forces acting on the fuel which is both lighter in weight and immiscible with water. Once the fuel reaches the water table surface, the tracer can evaporate out of the fuel and disperse into the soil gas where it will be detected in the perimeter sampling locations. The products stored in each of the tanks are typically semi-volatile, resulting in relatively low hydrocarbon vapor concentrations in the soil gas, even in the event of a small leak.

Appendix A includes Figure 1, which shows the map view of the tanks as well as the position of sampling locations. Samples were analyzed for DDM and total petroleum hydrocarbons, which are reported as C4-C9 aliphatic, alicyclic and aromatic compounds. Data from the sample analyses are reported in Appendix B. Sampling locations were twenty-five feet apart along the piping and twenty feet apart along the perimeter the tanks.

Tank K

A total of thirty-seven samples were collected from twenty-five vapor sampling locations placed in the vicinity of the tank and sampled at depths ranging from four to twelve feet below the bermed surface. Tracer was not detected in the samples collected near this tank, indicating that it is not leaking. The concentrations of detectable hydrocarbons in the samples ranged from 0.2 to 2 ug/L. Sampling locations near this tank have the prefix "K".

Tank L

A total of forty samples were collected from twenty-five vapor sampling locations placed in the vicinity of the tank and sampled at depths ranging from three to twenty feet below the bermed surface. Tracer was not detected in the samples collected near this tank, indicating that it is not leaking. The concentrations of detectable hydrocarbons in the samples ranged from 0.1 to 1 ug/L. Sampling locations near this tank have the prefix "L".

Tank M

A total of thirty-eight samples were collected from twenty-six vapor sampling locations placed in the vicinity of the tank and sampled at depths ranging from two to twelve feet below the bermed surface. Tracer was not detected in the samples collected near this tank, indicating that it is not leaking. The concentrations of detectable hydrocarbons in the samples ranged from 0.06 to 1 ug/L. Sampling locations near this tank have the prefix "M".

Tank N

A total of forty-seven samples were collected from thirty-six vapor sampling locations placed in the vicinity of the tank and sampled at depths ranging from two to twenty feet below the bermed surface. Tracer was detected in sampling location #22 at twelve feet below the surface. Tracer was not detected above, below or to either side of this location. The low concentration of both tracer and hydrocarbons, coupled with the isolation of the tracer, make the small amount of tracer uninterpretable and therefore insignificant. The low concentration of detectable hydrocarbons in the samples ranged from 0.1 to 4 ug/L. Sampling locations near this tank have the prefix "N".

Tracer was also detected in several sampling locations along the top of this tank. Measured tracer concentrations in these samples ranged from 0.002 to 0.2 ug/L. The low concentration of tracer and the location of the sampling locations is indicative of one or more vapor leaks in the top of the tank. The areas of leakage are concentrated along the eastern and central portions of the tank (see A of Figure 1).

Tank O

A total of thirty-two samples were collected from twenty vapor sampling locations placed in the vicinity of the tank and sampled at depths ranging from three to twenty feet below the bermed surface. Tracer was not detected in the samples collected near this tank, indicating that it is not leaking. The concentrations of detectable hydrocarbons in the samples ranged from 0.1 to 2 ug/L. Sampling locations near this tank have the prefix "O".

Tank P

A total of forty samples were collected from twenty-five vapor sampling locations placed in the vicinity of the tank and sampled at depths ranging from three to twenty feet below the bermed surface. Tracer was not detected in the samples collected near this tank, indicating that it is not leaking. The concentrations of detectable hydrocarbons in the samples ranged from 0.6 to 2 ug/L. Sampling locations near this tank have the prefix "X".

Piping

A total of one hundred seventeen samples were collected along approximately 2600 feet of piping. Samples were collected at depths ranging from one to three feet below grade in the vicinity of the piping. Tracer was not detected in any of the samples, indicating that the piping at this facility is not leaking. The detectable concentrations of hydrocarbons in these samples ranged from 0.09 to 11 ug/L. Sampling locations near the main pipeline have the prefix "P". Branch piping sampling locations are indicated by the prefix "P" and the prefix for the tank to which the piping is connected.

SUMMARY

Tracer was only detected in the sampling locations near Tank N. The levels of both tracer and hydrocarbons were very low and indicate that vapor leaks in the top portion of the tank are the source of the tracer. Hydrocarbon concentrations across the entire facility were very low, ranging from 0.06 to 11 ug/L.

One sample was placed on top of each of the tanks except Tank N, where tracer was detected. Several more sampling locations would need to be placed across the top of the tanks to give the tank complete coverage. The sides and bottom of the tank were completely covered by the testing methods used. The product level in tanks K, N and O was below the ground water level for at least a portion of the time that tracer was in the tanks. The product in tanks N was always below the water level. The low product level could keep product from flowing out of the tank.

During the course of testing, several non-tracer halocarbons were detected across the facility. These halocarbons were detected in sampling locations across the entire facility, with no concentrated plumes obviously defined.

CERTIFICATION 1-90-100-T

Location: Chicora Tank Farm
Naval Supply Center
Charleston, South Carolina

Date: March 1990

Tank	Capacity(barrels)	Product	Tracer	Leak Status
Tank K	50,000	diesel	DDM	1 *
Tank L	50,000	diesel	DDM	1 *
Tank M	50,000	motor oil	DDM	1 *
Tank N	50,000	waste oil	DDM	2 *
Tank O	27,000	fuel oil	DDM	1 *
Tank P	50,000	fuel oil	DDM	1 *

Tracer Research Corporation certifies that the tank and pipe systems listed in the above table have been tested by means of Tracer Tight™, which meets the criteria set forth in NFPA 329 for a precision leak test.

Submitted by:

Tracer Research Corporation

* Only the sides and bottoms of these tanks were completely covered in testing

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The following criteria are used for the classification of leaks when tracer is detected.

LEAK STATUS

1 NO LEAKAGE - Rate less than 0.005 gallons per hour.

2 VAPOR LEAK - Maximum tracer concentration less than 1 ug/L in soil vapor diminishing at depths below three feet. Total volatile hydrocarbon concentrations less than 20,000 ug/L in soil vapor (if diesel is the only fuel present, substitute 100 ug/L in place of 20,000 ug/L).

3 SMALL OR INTERMITTENT PRODUCT LEAK less than 0.05 gph -Maximum tracer concentration less than 1 ug/L in soil vapor, sustaining or increasing at depths below three feet or to the top of the groundwater table. Hydrocarbon concentrations approximately equal to or greater than 20,000 ug/L in soil vapor (100 ug/L for diesel) sustaining or increasing below three feet. Distribution of elevated hydrocarbons is less than 200 square feet total area.

4 SIGNIFICANT PRODUCT LEAK 0.05 gph or greater - Maximum tracer concentration greater than 1 ug/L near source, increasing or sustaining concentration below three feet or to the top of the groundwater table. Hydrocarbon concentrations greater than 20,000 ug/L in soil vapor (100 ug/L for diesel) sustaining or increasing below three feet. Distribution of elevated hydrocarbons is equal to or greater than 200 square feet total area.

APPENDIX A: ANALYTICAL DATA

KEMRON/CHICORA FUEL FARM/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
02-27-90
CONDENSED DATA

Sample	DDM (ug/l)	1148Z (ug/l)	THC (ug/l)
AIR	<0.00006	<0.00003	<0.04
P1-2'	<0.00006	<0.00003	0.9
P2-2'	<0.00006	<0.00003	0.2
P3-2'	<0.00006	<0.00003	2
P4-2'	<0.00006	<0.00003	<0.04
P5-2'	<0.00006	<0.00003	3
P6-1'	<0.00006	<0.00003	0.8
P7-1'	<0.00006	<0.00003	<0.04
P8-1'	<0.00006	<0.00003	0.4
P9-2'	<0.00006	<0.00003	<0.04
P10-2'	<0.00006	<0.00003	<0.04
P11-2'	<0.00006	<0.00003	<0.04
P12-2'	<0.00006	<0.00003	2
P13-2'	<0.00006	<0.00003	2
P14-2'	<0.00006	<0.00003	<0.04
P15-2'	<0.00006	<0.00003	<0.04
P16-2'	<0.00006	<0.00003	<0.04
P17-2'	<0.00006	<0.00003	<0.04
P18-2'	<0.00006	<0.00003	<0.04
P19-2'	<0.00006	<0.00003	300
P20-2'	<0.00006	<0.00003	<0.04
P21-2'	<0.00006	<0.00003	<0.04
P22-1.5'	<0.00006	<0.00003	<0.04
P23-1'	<0.00006	<0.00003	1
P24-2'	<0.00006	<0.00003	0.2
P25-2'	<0.00006	<0.00003	<0.04
P26-2'	<0.00006	<0.00003	0.2
P27-2'	<0.00006	<0.00003	8
P28-2'	<0.00006	<0.00003	0.9
P29-2'	<0.00006	<0.00003	0.9
P30-1'	<0.00006	<0.00003	1
P31-2'	<0.00006	<0.00003	2
P32-2'	<0.00006	<0.00003	0.09
PN1-2'	<0.00006	<0.00003	2
PN2-2'	<0.00006	<0.00003	3
PN3-2'	<0.00006	<0.00003	<0.04
PN4-2'	<0.00006	<0.00003	<0.04

Analyzed by: S. Norris
Checked by: A. Hooper
Proofed by: L. Laplander

KEMRON/CHICORA FUEL FARM/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
02-27-90
CONDENSED DATA

Sample	DDM (ug/l)	11482 (ug/l)	THC (ug/l)
AIR	<0.00003	<0.00004	<0.03
M1-6'	<0.00003	<0.00004	<0.03
M1-12'	<0.00003	<0.00004	<0.03
M2-4'	<0.00003	<0.00004	1
M2-6'	<0.00003	<0.00004	<0.06
M3-6'	<0.00003	<0.00004	<0.03
M3-12'	<0.00003	<0.00004	<0.03
M4-6'	<0.00003	<0.00004	<0.03
M5-6'	<0.00003	<0.00004	<0.03
M5-12'	<0.00003	<0.00004	0.9
M6-6'	<0.00003	<0.00004	<0.03
M7-6'	<0.00003	<0.00004	<0.03
M7-12'	<0.00003	<0.00004	<0.03
M8-6'	<0.00003	<0.00004	<0.03
M9-6'	<0.00003	<0.00004	<0.03
M9-12'	<0.00003	<0.00004	<0.03
M10-6'	<0.00003	<0.00004	<0.03
M11-6'	<0.00003	<0.00004	<0.03
M11-12'	<0.00003	<0.00004	<0.03
M12-6'	<0.00003	<0.00004	1
M13-6'	<0.00003	<0.00004	1
M13-12'	<0.00003	<0.00004	0.4
M14-6'	<0.00003	<0.00004	0.3
M15-6'	<0.00003	<0.00004	<0.03
M15-12'	<0.00003	<0.00004	<0.03
M16-6'	<0.00003	<0.00004	<0.03
M17-6'	<0.00003	<0.00004	0.2
M17-12'	<0.00003	<0.00004	0.2
M18-6'	<0.00003	<0.00004	<0.03
M19-6'	<0.00003	<0.00004	<0.03
M19-10'	<0.00003	<0.00004	<0.03
M20-6'	<0.00003	<0.00004	<0.03
M21-6'	<0.00003	<0.00004	0.06
M21-12'	<0.00003	<0.00004	<0.03

Analyzed by: S. Norris
Checked by: A. Hooper
Proofed by: L. Kaplander

Analyzed by: S. Norris
Checked by: A. Hooper
Proofed by: L. Haplander

Tracer Research Corporation

N17-6'	<0.00004	<0.00005	<0.04
N18-6'	<0.00004	<0.00005	<0.04
N18-12'	<0.00004	<0.00005	0.3
N19-6'	<0.00004	<0.00005	<0.04
N20-6'	<0.00004	<0.00005	0.2

Analyzed by: S. Norris
Checked by: A. Hooper
Proofed by: L. Haplander

Tracer Research Corporation

KEMRON/CHICORA FUEL FARM/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LO
02-28-90
CONDENSED DATA

Sample	DDM (ug/l)	114B2 (ug/l)	THC (ug/l)
N20-12'	<0.00004	<0.00005	<0.04
N21-6'	<0.00004	<0.00005	<0.04
N22-6'	<0.00004	<0.00005	<0.04
N22-12'	0.0008	<0.00005	<0.04
N23-6'	<0.00004	<0.00005	<0.04
N22-20'	<0.00004	<0.00005	3

Analyzed by: S.Norris
Checked by: R. Hooper
Proofed by: S. Stylander

Tracer Research Corporation

KEMRON/CHICORA FUEL FARM/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-01-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
AIR	<0.00006	<0.2
TANK O-HS	<0.0006	4
TANK P-HS	0.0003	<1
TANK M-HS	<0.0002	<0.7
N-24-12'	<0.00006	<0.2
N-25-12'	<0.00006	<0.2
PN-5-2'	<0.00006	1
N-26-4'	<0.00006	<0.2
TANK N-HS	0.001	14
TANKS K&L-HS	<0.0004	16
N-27-3'	0.004	0.4
AIR-K TANK	<0.00006	<0.2
K-1-6'	<0.00006	<0.2
AIR	<0.00006	<0.2
K-2-6'	<0.00006	<0.2
K-2-12'	<0.00006	<0.2
K-3-6'	<0.00006	<0.2
K-3-12'	<0.00006	<0.2
K-4-6'	<0.00006	<0.2
K-5-6'	<0.00006	0.5
K-5-12'	<0.00006	0.4
K-6-6'	<0.00006	<0.2
K-7-6'	<0.00006	<0.2
K-7-12'	<0.00006	<0.2
K-8-6'	<0.00006	<0.2
K-9-6'	<0.00006	<0.2
K-9-12'	<0.00006	<0.2

Analyzed by: K. Ptak
Checked by: A. Hooper
Proofed by: L. Kaplander

Tracer Research Corporation

KEMRON/CHICORA FUEL FARM/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-01-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
K-10-6'	<0.00006	1
K-11-6'	<0.00006	0.3
K-11-12'	<0.00006	0.2
K-12-6'	<0.00006	<0.2
K-13-6'	<0.00006	<0.2
K-13-12'	<0.00006	<0.2
K-14-6'	<0.00006	<0.2
K-15-6'	<0.00006	<0.2
K-15-12'	<0.00006	<0.2
K-16-6'	<0.00006	<0.2
K-17-6'	<0.00006	<0.2
K-17-12'	<0.00006	<0.2
K-18-6'	<0.00006	<0.2

Analyzed by: K. Ptak
Checked by: A. Hopper
Proofed by: L. Laplander

KEMRON/CHICORA FUEL FARM/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-02-90
CONDENSED DATA

SAMPLE	ODM ug/l	THC ug/l
AIR	<0.00005	<0.2
K-19-6'	<0.00005	2
K-19-12'	<0.00005	<0.2
K-20-6'	<0.00005	<0.2
K-21-6'	<0.00005	<0.2
K-21-12'	<0.00005	<0.2
K-22-6'	<0.00005	<0.2
K-23-6'	<0.00005	<0.2
K-23-12'	<0.00005	<0.2
K-24-5'	<0.00005	<0.2
K-25-4'	<0.00005	<0.2
PK-1-3'	<0.00005	<0.2
PK-2-3'	<0.00005	<0.2
PK-3-3'	<0.00005	<0.2
P-33-2'	<0.00005	<0.2
P-34-2'	<0.00005	<0.2
P-35-2'	<0.00005	<0.2
P-36-2'	<0.00005	<0.2
P-37-2'	<0.00005	5
P-38-2'	<0.00005	1
P-39-2'	<0.00005	0.6
AIR	<0.00005	<0.2
P-40-2'	<0.00005	6
P-41-2'	<0.00005	0.6
P-42-2'	<0.00005	1
P-43-2'	<0.00005	1
P-44-2'	<0.00005	0.9

Analyzed by: K. Ptak
Checked by: A. Hopper
Proofed by: A. Kaplander

Tracer Research Corporation

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-02-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
P-45-2'	<0.00005	0.2
P-46-2'	<0.00005	0.6
P-47-2'	<0.00005	0.8
P-48-2'	<0.00005	0.2
P-49-2'	<0.00005	2
P-50-2'	<0.00005	0.2
P-51-2'	<0.00005	<0.2
P-52-2'	<0.00005	<0.2
P-53-2'	<0.00005	0.3
P-54-2'	<0.00005	0.2
P-55-2'	<0.00005	<0.2
P-56-2'	<0.00005	0.2
P-57-2'	<0.00005	<0.2
P-58-2'	<0.00005	0.2
P-59-2'	<0.00005	2
P-60-2'	<0.00005	0.2
P-61-2'	<0.00005	3
P-62-2'	<0.00005	0.4
PX-1-2'	<0.00005	2
PX-2-2'	<0.00005	11
PX-3-2'	<0.00005	1

Analyzed by: K. Ptak
Checked by: A. Hooper
Proofed by: L. Kaplander

Tracer Research Corporation

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LO
03-05-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
AIR	<0.00008	<0.4
PX-4-2'	<0.00008	<0.4
PX-5-2'	<0.00008	<0.4
PX-6-2'	<0.00008	<0.4
PX-7-2'	<0.00008	<0.4
PX-8-2'	<0.00008	<0.4
PX-9-2'	<0.00008	<0.4
PX-10-2'	<0.00008	<0.2
PX-11-2'	<0.00008	<0.2
PX-12-2'	<0.00008	<0.2
PX-13-2'	<0.00008	<0.2
PX-14-2'	<0.00008	<0.2
P-63-2'	<0.00008	0.3
P-64-2'	<0.00008	0.3
P-65-2'	<0.00008	0.6
P-66-2'	<0.00008	<0.2
P-67-3'	<0.00008	0.2
P-68-3'	<0.00008	0.2
P-69-3'	<0.00008	0.4
P-70-2'	<0.00008	<0.2
P-71-3'	<0.00008	0.3
P-72-2'	<0.00008	0.2
P-73-2'	<0.00008	0.4
P-74-2'	<0.00008	<0.2

Analyzed by: K. Ptak
Checked by: R. Hogger
Proofed by: L. Kaplander

Tracer Research Corporation

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-05-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
PO-1-2'	<0.00008	<0.2
PO-2-2'	<0.00008	<0.2
PO-3-2'	<0.00008	<0.2
PO-4-2'	<0.00008	<0.2
PO-5-2'	<0.00008	<0.2
PO-6-2'	<0.00008	<0.2
PO-7-2'	<0.00008	<0.2
PO-8-2'	<0.00008	<0.2
PO-9-2'	<0.00008	<0.2
PO-10-2'	<0.00008	<0.2
PO-11-2'	<0.00008	<0.2
PO-12-2'	<0.00008	<0.2
PO-13-2'	<0.00008	<0.2
PO-14-2'	<0.00008	<0.2
PO-15-2'	<0.00008	<0.2
PO-16-2'	<0.00008	<0.2
PO-17-2'	<0.00008	<0.2
AIR	<0.00008	<0.2
N-28-4'	<0.00008	4
N-29-3'	<0.00008	0.5
N-30-3'	0.004	0.2
N-31-3'	<0.00008	0.3

Analyzed by: K. Ptak
Checked by: A. Hoomer
Proofed by: L. Kaplander

Tracer Research Corporation

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-06-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
AIR SAMPLE	<0.00007	<0.3
AIR TANK-0	<0.00007	<0.3
0-1-6'	<0.00007	<0.3
0-2-6'	<0.00007	<0.1
0-2-12'	<0.00007	<0.1
0-3-6'	<0.00007	0.4
0-4-6'	<0.00007	0.4
0-4-12'	<0.00007	0.3
0-5-6'	<0.00007	0.4
0-6-6'	<0.00007	0.2
0-6-12'	<0.00007	0.2
0-7-6'	<0.00007	<0.1
0-8-6'	<0.00007	0.6
0-8-12'	<0.00007	0.8
0-9-6'	<0.00007	2
0-10-6'	<0.00007	0.3
0-10-12'	<0.00007	0.3
0-11-6'	<0.00007	<0.1
0-12-6'	<0.00007	1
0-12-12'	<0.00007	0.8
0-13-6'	<0.00007	0.7
0-14-6'	<0.00007	<0.1
0-14-12'	<0.00007	0.1
AIR	<0.00007	<0.1
0-15-6'	<0.00007	0.9

Analyzed by: K. Ptak
Checked by: A. Hooper
Proofed by: L. Kaplander

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-06-90
CONDENSED DATA

SAMPLE	ODM ug/l	THC ug/l
O-16-6'	<0.00007	<0.1
O-16-12'	<0.00007	0.7
O-17-6'	<0.00007	<0.1
O-18-6'	<0.00007	<0.1
O-18-12'	<0.00007	<0.1
O-19-5'	<0.00007	<0.1
O-20-3'	<0.00007	<0.1
L-1-6'	<0.00007	0.7
L-2-6'	<0.00007	0.8
L-2-12'	<0.00007	0.6
L-3-6'	<0.00007	0.1
L-4-6'	<0.00007	0.1
L-4-12'	<0.00007	<0.1
L-5-6'	<0.00007	<0.1
L-6-6'	<0.00007	0.4
L-6-12'	<0.00007	0.4
L-7-6'	<0.00007	0.5
L-7-12'	<0.00007	0.7
L-8-6'	<0.00007	1
L-9-6'	<0.00007	0.1
L-9-12'	<0.00007	0.1

Analyzed by: K. Ptak
Checked by: A. Hooper
Proofed by: K. Kaplander

Tracer Research Corporation

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-07-90
CONDENSED DATA

SAMPLE	ODM ug/l	THC ug/l
AIR	<0.00006	<0.3
L-10-6'	<0.00006	<0.3
L-11-6'	<0.00006	<0.3
L-11-12'	<0.00006	0.3
L-12-6'	<0.00006	<0.3
L-13-6'	<0.00006	<0.3
L-13-12'	<0.00006	<0.3
L-14-6'	<0.00006	0.8
L-15-6'	<0.00006	0.6
L-15-12'	<0.00006	0.5
L-15-20'	<0.00006	<0.3
PL-1-2'	<0.00006	0.4
PL-2-2'	<0.00006	<0.3
L-16-4'	<0.00006	<0.6
L-17-3'	<0.00006	<0.6
L-18-6'	<0.00006	<0.6
L-19-6'	<0.00006	<0.6
L-19-12'	<0.00006	<0.6
AIR	<0.00006	<0.6
L-20-6'	<0.00006	<0.6
L-21-6'	<0.00006	0.6
L-21-12'	<0.00006	<0.6
L-22-6'	<0.00006	<0.6
L-23-6'	<0.00006	<0.6
L-23-12'	<0.00006	<0.6
L-24-6'	<0.00006	<0.6
L-25-6'	<0.00006	<0.6
L-25-12'	<0.00006	<0.6
L-25-18'	<0.00006	<0.6
L-8-20'	<0.00006	<0.6
K-23-20'	<0.00006	<0.6
K-16-20'	<0.00006	<0.6
K-9-17'	<0.00006	<0.6

Analyzed by: K. Ptak
Checked by: A. Hooper
Proofed by: L. Laplander

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-08-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
AIR	<0.00006	0.6
0-2-20'	<0.00006	<0.6
0-8-20'	<0.00006	<0.6
0-14-20'	<0.00006	<0.6
X-1-5'	<0.00006	<0.6
X-2-6'	<0.00006	<0.6
X-3-6'	<0.00006	<0.6
X-3-12'	<0.00006	<0.6
X-3-20'	<0.00006	<0.6
X-4-6'	<0.00006	1
X-5-6'	<0.00006	<0.6
X-5-12'	<0.00006	0.6
X-6-6'	<0.00006	1
X-7-6'	<0.00006	2
X-7-12'	<0.00006	2
X-8-6'	<0.00009	2
X-9-6'	<0.00006	<0.6
X-9-12'	<0.00006	0.8
X-10-6'	<0.00006	0.6
X-10-12'	<0.00006	<0.6
X-10-20'	<0.00006	<0.6
X-11-6'	<0.00006	<0.6
AIR	<0.00006	<0.6
X-12-6'	<0.00006	<0.6
X-12-12'	<0.00006	0.6
X-13-6'	<0.00006	<0.6
X-14-6'	<0.00006	<0.6
X-14-12'	<0.00006	2
X-15-6'	<0.00006	<0.6
X-16-6'	<0.00006	0.6

Analyzed by: K. Ptak
Checked by: A. Hooper
Proofed by: L. Hoplander

KEMRON/CHICORA FUEL TANKS/CHARLESTON, SOUTH CAROLINA JOB#C-944-90-LD
03-08-90
CONDENSED DATA

SAMPLE	DDM ug/l	THC ug/l
X-16-12'	<0.00006	<0.6
X-17-6'	<0.00006	<0.6
X-18-6'	<0.00006	<0.6
X-18-12'	<0.00006	<0.6
X-18-20'	<0.00006	<0.6
X-19-6'	<0.00006	<0.6
X-20-6'	<0.00006	<0.6
X-20-12'	<0.00006	<0.6
X-21-6'	<0.00006	<0.6
X-22-6'	<0.00006	<0.6
X-22-12'	<0.00006	<0.6
X-23-3'	<0.00006	<0.6
X-8-12'	<0.00006	<0.6
X-24-6'	<0.00006	<0.6
X-25-6'	<0.00006	0.6
M-1-20'	<0.00006	<0.6
M-21-20'	<0.00006	1
M-8-20'	<0.00006	<0.6
N-32-2'	0.2	<0.6
N-33-2'	0.002	0.6
N-34-3'	<0.0001	<0.6
N-35-2'	<0.00006	<0.6
N-36-2'	0.002	0.6

Analyzed by: K. Ptak
Checked by: A. Hopper
Proofed by: L. Laplander

Tracer Research Corporation

APPENDIX B: FIGURES

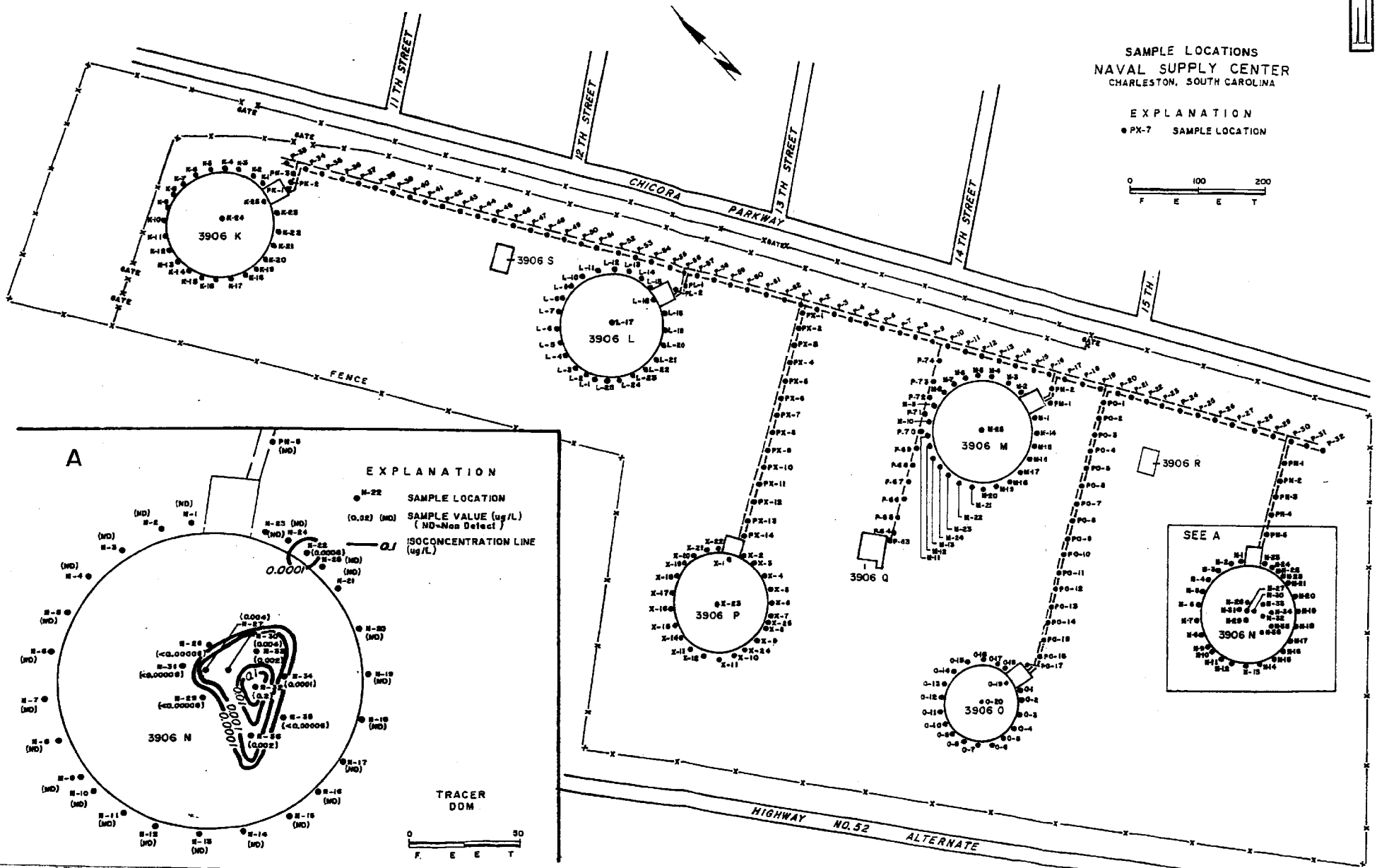
Tracer Research Corporation

SAMPLE LOCATIONS
NAVAL SUPPLY CENTER
CHARLESTON, SOUTH CAROLINA

EXPLANATION

• PX-7 SAMPLE LOCATION

0 100 200
FEET



APPENDIX E

SOIL SAMPLE LABORATORY RESULTS

E

Received: 06/23/90

KEMRON REPORT
07/11/90 16:27:23

Work Order # N0-06-338

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN John Dwyer

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750
ATTEN
PHONE (614) 373-4071

CERTIFIED BY

CONTACT G CROSS

CLIENT WAPATL 59227 SAMPLES 13
COMPANY Wapora, Inc.
FACILITY Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID 819-300/Chicora Tank Farm
TAKEN Hausner/Beck
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

01	B7/3.5-5
02	B7/10-11.5
03	B8/3.5-5
04	B8/8.5-10
05	B8/13.5-15
06	B9-5-6.5
07	B9-13.5-15
08	B10-5-6.5
09	B10-10-11.5
10	B11-5-6.5
11	B11-13.5-15
12	B12-13.5-15
13	B13-13.5-15

TEST CODES and NAMES used on this report

BETXGC	Volatile Organics (BETX)
M8100	Polyaromatic Hydrocarbons
PCT_S	Percent Solids
TPH_S	Petroleum Hydrocarbons

Kemron
ENVIRONMENTAL SERVICES

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B7/3.5-5

SAMPLE # 01 FRACTIONS: A,B,C

Date & Time Collected 06/20/90 Category SOIL

PCT_S	83 % wt.	TPH_S	<25 mg/kg

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B7/3.5-5 FRACTION 01A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 Category SOIL

ANALYST: SWC FILE #: 0702A03A
INSTRMT: HP_III INJECTED: 07/03/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	7	5.0
100-41-4	Ethylbenzene	7	5.0
108-88-3	Toluene	21	5.0
1330-20-7	Xylenes, Total	27	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B7/3.5-5 FRACTION 01B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_9
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B7/10-11.5

SAMPLE # 02 FRACTIONS: A,B,C

Date & Time Collected 06/20/90 Category SOIL

PCT_S 73 % wt.

TPH_S <25 mg/kg

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B7/10-11.5 FRACTION 02A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 Category SOIL

ANALYST: SWC FILE #: 0701A04A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B7/10-11.5 FRACTION 02B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_10
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT

Work Order # N0-06-338

Results by Sample

SAMPLE ID B8/3.5-5

SAMPLE # 03 FRACTIONS: A,B

Date & Time Collected 06/20/90 16:10:00 Category SOIL

PCT_S	82	TPH_S	<25
	% wt.		mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B8/3.5-5

FRACTION 03A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 16:10:00 Category SOIL

ANALYST: SWC FILE #: 0702A04A
INSTRMT: HP_III INJECTED: 07/03/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B8/3.5-5

FRACTION 03B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 16:10:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_11
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B8/8.5-10 FRACTION 04A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 16:15:00 Category SOIL

ANALYST: SWC FILE #: 0701A07A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B8/8.5-10

FRACTION 04A TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 16:15:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_12
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B8/13.5-15

SAMPLE # 05 FRACTIONS: A

Date & Time Collected 06/20/90 Category SOIL

PCT_S 84 % wt. TPH_S <25 mg/kg

SAMPLE ID B9-5-6.5

SAMPLE # 06 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 07:25:00 Category SOIL

PCT_S 76 % wt. TPH_S <25 mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # NO-06-338

SAMPLE ID B9-5-6.5 FRACTION 06A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 07:25:00 Category SOIL

ANALYST: SWC FILE #: 0702A06A
INSTRMT: HP_III INJECTED: 07/03/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B9-5-6.5

FRACTION 06B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 07:25:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_13
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B9-13.5-15

SAMPLE # 07 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 07:45:00 Category SOIL

PCT_S	80	TPH_S	<25
	% wt.		mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B9-13.5-15

FRACTION 07A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 07:45:00 Category SOIL

ANALYST: SWC FILE #: 0701A09A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B9-13.5-15

FRACTION 07B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 07:45:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_14
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

SAMPLE ID B10-5-6.5

SAMPLE # 08 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 09:00:00 Category SOIL

PCT_S	73 % wt.	TPH_S	<25 mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B10-5-6.5 FRACTION 08A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 09:00:00 Category SOIL

ANALYST: SWC FILE #: 0703C05A
INSTRMT: HP_III INJECTED: 07/03/90 FACTOR: *5 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	25
100-41-4	Ethylbenzene	BQL	25
108-88-3	Toluene	BQL	25
1330-20-7	Xylenes, Total	BQL	25

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED
* = ELEVATED DETECTION LIMITS DUE TO SAMPLE MATRIX

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B10-5-6.5

FRACTION 08B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 09:00:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_15
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT

Work Order # N0-06-338

Results by Sample

SAMPLE ID B10-10-11.5

SAMPLE # 09 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 09:10:00 Category SOIL

PCT_S	81	TPH_S	<25
	% wt.		mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B10-10-11.5

FRACTION 09A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 09:10:00 Category SOIL

ANALYST: SWC FILE #: 0701A11A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: *5 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	25
100-41-4	Ethylbenzene	BQL	25
108-88-3	Toluene	BQL	25
1330-20-7	Xylenes, Total	BQL	25

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED
* = ELEVATED DETECTION LIMIT DUE TO SAMPLE MATRIX

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B10-10-11.5 FRACTION 09B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 09:10:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_16
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Work Order # N0-06-338

Results by Sample

SAMPLE ID B11-5-6.5

SAMPLE # 10 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 14:55:00 Category SOIL

PCT_S	71 % wt.	TPH_S	<25 mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B11-5-6.5 FRACTION 10A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 14:55:00 Category SOIL

ANALYST: SWC FILE #: 0701A12A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B11-5-6.5 FRACTION 10B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 14:55:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_17
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	33	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	71	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # NO-06-338

SAMPLE ID B11-13.5-15

SAMPLE # 11 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 15:10:00 Category SOIL

PCT_S	62	TPH_S	<25
	% wt.		mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B11-13.5-15 FRACTION 11A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 15:10:00 Category SOIL

ANALYST: SWC FILE #: 0701A13A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B11-13.5-15 FRACTION 11B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 15:10:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_18
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B12-13.5-15

SAMPLE # 12 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 14:00:00 Category SOIL

PCT_S	81	TPH_S	<25
	% wt.		mg/kg

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B12-13.5-15

FRACTION 12A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 14:00:00 Category SOIL

ANALYST: SWC FILE #: 0701A14A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-338

SAMPLE ID B12-13.5-15 FRACTION 12B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 14:00:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_19
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B13-13.5-15

SAMPLE # 13 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category SOIL

PCT_S	61	TPH_S	<25
	% wt.		mg/kg

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B13-13.5-15

FRACTION 13A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category SOIL

ANALYST: SWC FILE #: 0701A15A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	15	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-338

SAMPLE ID B13-13.5-15 FRACTION 13B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE_20
INSTRMT: HP_II INJECTED: 07/10/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

TEST CODE **BETXGC** NAME **Volatile Organics (BETX)**

EPA Method 8020 (SW-846)

TEST CODE **M8100** NAME **Polyaromatic Hydrocarbons**

EPA Method 8100 SW-846

TEST CODE **PCT_S** NAME **Percent Solids**

EPA Method 160.3 - Gravimetric, Dryed at 103-105 Degrees C
To convert test results to "Dry Weight Basis" use this formula:

$$\text{RESULT (DRY WT.)} = \frac{\text{RESULT (REPORTED) X 100}}{\text{PERCENT SOLIDS}}$$

TEST CODE **TPH_S** NAME **Petroleum Hydrocarbons**

EPA Method 418.1

WAPORA Environmental Engineers/Scientists

№ 0884

CHAIN-OF-CUSTODY RECORD

NOTE: Laboratory will homogenize comp. samples

I will call Monday (6/25/90) to transmit prices agreed on earlier

Page 1 of 1

Project Contact: Kurt Hausner

Turn Around Requirements: Normal

Project No.: 819-300

Project Name: Chicora Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: [signature], Greg A. Beck

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	~~PHC~~ TPH	BETX	~~PAH~~ PAH		ADDITIONAL REQUIREMENTS
B7-3.5-5		✓	6/20	—	B7-3.5-5	3												✓	✓	✓		
B7-10-11.5		✓	6/20	—	B7-10-11.5	3												✓	✓	✓		
B8-3.5-5		✓	6/20	1610	B8-3.5-5	3												✓	✓	✓		* Received Broken
B8-8.5-10		✓	6/20	1615	B8-8.5-10	2													✓	✓		* Received Broken
~~B8~~ B8-13.5-15		✓	6/20	—	B8-13.5-15	1												✓				
B9-5-6.5		✓	6/21	7:25	B9-5-6.5	3												✓	✓	✓		
B9-13.5-15		✓	6/21	7:45	B9-13.5-15	3												✓	✓	✓		
B10-5-6.5		✓	6/21	9:00	B10-5-6.5	3												✓	✓	✓		
B10-10-11.5		✓	6/21	9:10	B10-10-11.5	3												✓	✓	✓		
B11-5-6.5		✓	6/21	14:55	B11-5-6.5	3												✓	✓	✓		
B11-13.5-15		✓	6/21	15:10	B11-13.5-15	3												✓	✓	✓		
B12-13.5-15		✓	6/21	14:00	B12-13.5-15	3												✓	✓	✓		
B13-13.5-15		✓	6/21	—	B13-13.5-15	3												✓	✓	✓		

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
[signature]	6/22	1700					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	6/25		

W-AD6

White - Lab Yellow - Office Pink - Field

Received: 06/25/90

KEMRON REPORT
07/16/90 12:36:44

Work Order # N0-06-343

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN Kurt Hausner

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750

L Bucino
CERTIFIED BY

ATTEN
PHONE (614) 373-4071

CONTACT G CROSS

CLIENT WAPATL 59227 SAMPLES 13
COMPANY Wapora, Inc.
FACILITY Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID #819-300/Chicora Tk. Farm
TAKEN Hausner/Beck
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

01	B2-5-6.5
02	B3-10-11.5
03	B1-15-16.5
04	B3-15-16.5
05	B5-4.5-6
06	B6-10-11.5
07	B1-5-6.5
08	B2-15-16.5
09	B4-15-16.5
10	B4-5-6.5
11	B6-5-6.5
12	B5-14.5-16
13	DFSP

TEST CODES and NAMES used on this report

BETXGC	Volatile Organics (BETX)
M8100	Polyaromatic Hydrocarbons
PCT_S	Percent Solids
TPH_S	Petroleum Hydrocarbons

Kemron
ENVIRONMENTAL SERVICES

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B2-5-6.5

SAMPLE # 01 FRACTIONS: A,B,C
Date & Time Collected 06/19/90 11:00:00 Category SOIL

PCT_S 84 % wt.

TPH_S <25 mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B2-5-6.5 FRACTION 01A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 11:00:00 Category SOIL

ANALYST: SWC FILE #: 0629C03A
INSTRMT: HP_III INJECTED: 06/29/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B2-5-6.5

FRACTION 01B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 11:00:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE11
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B3-10-11.5

SAMPLE # 02 FRACTIONS: A,B

Date & Time Collected 06/19/90 15:10:00 Category SOIL

PCT_S	72	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B3-10-11.5 FRACTION 02A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 15:10:00 Category SOIL

ANALYST: SWC FILE #: 0629C04A
INSTRMT: HP_III INJECTED: 06/29/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B3-10-11.5 FRACTION 02B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 15:10:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE22
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B1-15-16.5

SAMPLE # 03 FRACTIONS: A,B,C

Date & Time Collected 06/19/90 09:10:00 Category SOIL

PCT_S	80	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B1-15-16.5

FRACTION 03A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 09:10:00 Category SOIL

ANALYST: SWC FILE #: 0701A14A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B1-15-16.5

FRACTION 03B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 09:10:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE23
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B3-15-16.5

SAMPLE # 04 FRACTIONS: A,B,C

Date & Time Collected 06/19/90 15:15:00 Category SOIL

PCT_S	73 % wt.	TPH_S	<25 mg/kg

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B3-15-16.5 FRACTION 04A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 15:15:00 Category SOIL

ANALYST: SWC FILE #: 0629C06A
INSTRMT: HP_III INJECTED: 06/29/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B3-15-16.5

FRACTION 04B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 15:15:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE24
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B5-4.5-6

SAMPLE # 05 FRACTIONS: A,B,C

Date & Time Collected 06/20/90 07:40:00 Category SOIL

PCT_S	83	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B5-4.5-6

FRACTION 05A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 07:40:00 Category SOIL

ANALYST: SWC FILE #: 0701A15A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B5-4.5-6

FRACTION 05B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 07:40:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE25
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Work Order # N0-06-343

Results by Sample

SAMPLE ID B6-10-11.5

SAMPLE # 06 FRACTIONS: A,B,C

Date & Time Collected 06/20/90 10:40:00 Category SOLID

PCT_S	79	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

Results by Sample

SAMPLE ID B6-10-11.5 FRACTION 06A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 10:40:00 Category SOLID

ANALYST: SWC FILE #: 0702A03A
INSTRMT: HP_III INJECTED: 07/02/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B6-10-11.5

FRACTION 06B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 10:40:00 Category SOLID

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE26
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B1-5-6.5

SAMPLE # 07 FRACTIONS: A,B,C

Date & Time Collected 06/19/90 08:50:00 Category SOLID

PCT_S 86 % wt.

TPH_S <25 mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B1-5-6.5

FRACTION 07A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 08:50:00 Category SOLID

ANALYST: SWC FILE #: 0629C09A
INSTRMT: HP_III INJECTED: 06/29/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B1-5-6.5 FRACTION 07B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 08:50:00 Category SOLID

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE27
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B2-15-16.5

SAMPLE # 08 FRACTIONS: A,B,C
Date & Time Collected 06/19/90 11:15:00 Category SOLID

PCT_S 82 % wt. TPH_S <25 mg/kg

For Reports Only

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B2-15-16.5 FRACTION 08A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 11:15:00 Category SOLID

ANALYST: SWC FILE #: 0629C10A
INSTRMT: HP_III INJECTED: 06/29/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B2-15-16.5

FRACTION 08B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 11:15:00 Category SOLID

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE28
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B4-15-16.5

SAMPLE # 09 FRACTIONS: A,B,C

Date & Time Collected 06/19/90 17:00:00 Category SOIL

PCT_S 56 % wt.

TPH_S <25 mg/kg

Received: 06/25/90

Results by Sample

SAMPLE ID B4-15-16.5 FRACTION 09A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 17:00:00 Category SOIL

ANALYST: SWC FILE #: 0629C11A
INSTRMT: HP_III INJECTED: 06/29/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B4-15-16.5 FRACTION 09B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 17:00:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE29
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B4-5-6.5

SAMPLE # 10 FRACTIONS: A,B,C

Date & Time Collected 06/19/90 16:40:00 Category SOIL

PCT_S	82	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B4-5-6.5

FRACTION 10A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/19/90 16:40:00 Category SOIL

ANALYST: SWC FILE #: 0629C12A
INSTRMT: HP_III INJECTED: 06/30/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B4-5-6.5 FRACTION 10B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/19/90 16:40:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE30
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B6-5-6.5

SAMPLE # 11 FRACTIONS: A,B,C

Date & Time Collected 06/20/90 10:30:00 Category SOIL

PCT_S	79	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B6-5-6.5 FRACTION 11A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 10:30:00 Category SOIL

ANALYST: SWC FILE #: 0629C13A
INSTRMT: HP_III INJECTED: 06/30/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID B6-5-6.5

FRACTION 11B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 10:30:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE31
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Work Order # N0-06-343

Results by Sample

SAMPLE ID B5-14.5-16

SAMPLE # 12 FRACTIONS: A,B,C

Date & Time Collected 06/20/90 07:55:00 Category SOIL

PCT_S	59	TPH_S	<25
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B5-14.5-16 FRACTION 12A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/20/90 07:55:00 Category SOIL

ANALYST: SWC FILE #: 0629C15A
INSTRMT: HP_III INJECTED: 06/30/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-343

SAMPLE ID B5-14.5-16

FRACTION 12B TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/20/90 07:55:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE32
INSTRMT: HP_II INJECTED: 07/11/90 FACTOR: 33 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	30
208-96-8	Acenaphthylene	BDL	30
83-32-9	Acenaphthene	BDL	30
86-73-7	Fluorene	BDL	30
85-01-8	Phenanthrene	BDL	30
120-12-7	Anthracene	BDL	30
206-44-0	Fluoranthene	BDL	30
129-00-0	Pyrene	BDL	30
56-55-3	Benzo(a)anthracene	BDL	200
218-01-9	Chrysene	BDL	200
205-99-2	Benzo(b)fluoranthene	BDL	200
207-08-9	Benzo(k)fluoranthene	BDL	200
50-32-8	Benzo(a)pyrene	BDL	200
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	200
53-70-3	Dibenzo(a,h)anthracene	BDL	200
191-24-2	Benzo(g,h,i)perylene	BDL	200

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID DFSP

SAMPLE # 13 FRACTIONS: A

Date & Time Collected 06/18/90 14:00:00 Category SOIL

PCT_S	81	TPH_S	320
	% wt.		mg/kg

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-343

SAMPLE ID DF8P FRACTION 13A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/18/90 14:00:00 Category SOIL

ANALYST: SWC FILE #: 0701A15A
INSTRMT: HP_III INJECTED: 07/01/90 FACTOR: 1 UNITS: ug/kg VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BDL	5.0
100-41-4	Ethylbenzene	BDL	5.0
108-88-3	Toluene	BDL	5.0
1330-20-7	Xylenes, Total	BDL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANITATION LIMIT (PQL)
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Work Order # N0-06-343

Results by Sample

SAMPLE ID DFSP

FRACTION 13A TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/18/90 14:00:00 Category SOIL

ANALYST: EDG EXTRACTED: 07/05/90 FILE #: SAMPLE2
INSTRMT: HP_II INJECTED: 07/12/90 FACTOR: 3300 UNITS: ug/kg

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	3000
208-96-8	Acenaphthylene	4300	3000
83-32-9	Acenaphthene	4000	3000
86-73-7	Fluorene	4400	3000
85-01-8	Phenanthrene	BDL	3000
120-12-7	Anthracene	BDL	3000
206-44-0	Fluoranthene	BDL	3000
129-00-0	Pyrene	BDL	3000
56-55-3	Benzo(a)anthracene	BDL	20000
218-01-9	Chrysene	BDL	20000
205-99-2	Benzo(b)fluoranthene	BDL	20000
207-08-9	Benzo(k)fluoranthene	BDL	20000
50-32-8	Benzo(a)pyrene	BDL	20000
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	20000
53-70-3	Dibenzo(a,h)anthracene	BDL	20000
191-24-2	Benzo(g,h,i)perylene	BDL	20000

VERIFIED: DMD

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Test Methodology

TEST CODE **BETXGC** NAME **Volatile Organics (BETX)**

EPA Method 8020 (SW-846)

TEST CODE **M8100** NAME **Polyaromatic Hydrocarbons**

EPA Method 8100 SW-846

TEST CODE **PCT S** NAME **Percent Solids**

EPA Method 160.3 - Gravimetric, Dryed at 103-105 Degrees C
To convert test results to "Dry Weight Basis" use this formula:

$$\text{RESULT (DRY WT.)} = \frac{\text{RESULT (REPORTED) X 100}}{\text{PERCENT SOLIDS}}$$

TEST CODE **TPH S** NAME **Petroleum Hydrocarbons**

EPA Method 418.1

KEMRON
ENVIRONMENTAL SERVICES

№ 19649

CHAIN-OF-CUSTODY RECORD

I WILL CALL MONDAY (6/25/90) TO TRANSMIT PRICES AGREED ON EARLIER

Page 1 of 1

Project Contact: Kurt Hausner

Turn Around Requirements: Normal

Project No.: 819-300

Project Name: Chicora Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: Kurt Hausner, Greg A. Beck

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	TPH	BETX	PHENOLICS	PAH	ADDITIONAL REQUIREMENTS
B2 5-6.5		✓	6/19	1100	B2 5-6.5 1	3												✓	✓		✓	
B3 10-11.5		✓	6/19	1510	B3 10-11.5 2	3												✓	✓		✓	* one received broken
B1 15-16.5		✓	6/19	0910	B1 15-16.5 3	3												✓	✓		✓	
B3 15-16.5		✓	6/19	1515	B3 15-16.5 4	3												✓	✓		✓	
B5 4.5-6		✓	6/20	0740	B5 4.5-6 5	3												✓	✓		✓	
B6 10-11.5		✓	6/20	1040	B6 10-11.5 6	3												✓	✓		✓	
B1 5-6.5		✓	6/19	0850	B1 5-6.5 7	3												✓	✓		✓	
B2 15-16.5		✓	6/19	1115	B2 15-16.5 8	3												✓	✓		✓	
B4 15-16.5		✓	6/19	1700	B4 15-16.5 9	3												✓	✓		✓	
B4 5-6.5		✓	6/19	1640	B4 5-6.5 10	3												✓	✓		✓	
B6 5-6.5		✓	6/20	1030	B6 5-6.5 11	3												✓	✓		✓	
B5 14.5-16		✓	6/20	0755	B5 14.5-16 12	3												✓	✓		✓	
TRENCH		✓	6/18	1400	DFSP 13	1																

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Kurt Hausner	6/22	1700					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	6/25		

W-AD6

White - Lab Yellow - Office Pink - Field

HYDE BROS PRTG CO - MARIETTA, OHIO 45750 386-334-L4

F

APPENDIX F

WATER SAMPLE LABORATORY RESULTS

eceived: 06/23/90

KEMRON REPORT
07/11/90 13:09:36

Work Order # N0-06-335

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN John.Dwyer

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750

CERTIFIED BY

ATTEN
PHONE (614) 373-4071

CONTACT G CROSS

CLIENT WAPATL 59227 SAMPLES 3
COMPANY Wapora, Inc.
ACILITY Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID 819-300 Chicora Tank Farm
TAKEN K.Hausner/G.Beck
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

1 MW-1
2 MW-2
3 MW-12

TEST CODES and NAMES used on this report

BETXGC	Volatile Organics (BETX)
M8100	Polyaromatic Hydrocarbons
TPH	Petroleum Hydrocarbons

Kemron
ENVIRONMENTAL SERVICES

eceived: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-335

SAMPLE ID MW-1

SAMPLE # 01 FRACTIONS: A,B,C

Date & Time Collected 06/21/90

Category WATER

TPH <1 mg/l

KEMRON REPORT

Work Order # N0-06-335

ceived: 06/23/90

Results by Sample

.MPLE ID MW-1

FRACTION 01B TEST CODE BETXGC NAME Volatile Organics (BETX)

Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C03A

INSTRMT: HP_III INJECTED: 06/27/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

OTES AND DEINITIONS FOR THIS REPORT.

DET LIMIT = DETECTION LIMIT

BDL= BELOW DETECTION LIMIT

BQL= BELOW QUANITATION LIMIT

NA = NOT ANALYZED

.eceived: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-335

SAMPLE ID MW-1 FRACTION 01C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_13
INSTRMT: HP_II INJECTED: 07/07/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT
Results by Sample

Work Order # N0-06-335

SAMPLE ID MW-2

SAMPLE # 02 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH <1
mg/l

ceived: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-335

.MPLE ID MW-2

FRACTION 02B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C04A
INSTRMT: HP_III INJECTED: 06/27/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	6	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

OTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

ceived: 06/23/90

KEMRON REPORT Work Order # N0-06-335

Results by Sample

MPLE ID MW-2 FRACTION 02C TEST CODE M8100 NAME Polyaromatic Hydrocarbons

Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_14

INSTRMT: HP_II INJECTED: 07/07/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

OTES AND DEFINITIONS FOR THIS REPORT

DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

eceived: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-335

SAMPLE ID MW-12

SAMPLE # 03 FRACTIONS: A,B,C

Date & Time Collected 06/22/90

Category WATER

TPH <1 mg/l

ceived: 06/23/90

KEMRON REPORT

Work Order # N0-06-335

Results by Sample

MPLE ID MW-12

FRACTION 03B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/22/90 Category WATER

ANALYST: SWC FILE #: 0627C05A
INSTRMT: HP_III INJECTED: 06/27/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

OTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

ceived: 06/23/90

KEMRON REPORT

Work Order # N0-06-335

Results by Sample

MPLE ID MW-12

FRACTION 03C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/22/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_15
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

OTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Test Methodology

ST CODE BETXGC NAME Volatile Organics (BETX)

A Method 8020 (SW-846)

ST CODE M8100 NAME Polyaromatic Hydrocarbons

A Method 8100 SW-846

ST CODE TPH NAME Petroleum Hydrocarbons

A Method 418.1

WAPORA Environmental Engineers/Scientists

№ 0908

CHAIN-OF-CUSTODY RECORD

NOTE: Laboratory will homogenize comp. samples

Project Contact: ~~Kurt Hausner~~ will call Monday 6/25/90

Turn Around Requirements: Normal with earlier negotiated prices

Page 1 of 1

Project No.: 819-300

Project Name: Chicora Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: ~~Kurt Hausner~~

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	~~PHCs~~ TPH	BETX	PAH			ADDITIONAL REQUIREMENTS
MW 1		✓	6/21		MW1	5												✓	✓	✓			
MW 2		✓	6/22		MW2	5												✓	✓	✓			
MW 12		✓	6/22		MW 12	5												✓	✓	✓			
~~Pond~~		~~✓~~	~~6/22~~		~~Pond~~	~~1~~											~~✓~~						

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
~~Kurt Hausner~~	6/22	12:00					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	6/25		

W-AD6 White - Lab Yellow - Office Pink - Field

Received: 06/23/90

KEMRON REPORT
07/11/90 13:26:15

Work Order # N0-06-336

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN John Dwyer

CLIENT WAPATL 59227 SAMPLES 6
COMPANY Wapora, Inc.
FACILITY Atlanta
FAX # (404) 636-7162

WORK ID 819-300 Chicora Tank Farm
TAKEN Hausner/Beck
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750

ATTEN
PHONE (614) 373-4071

CERTIFIED BY

CONTACT G CROSS

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

JUL RECEIVED

SAMPLE IDENTIFICATION

01 MW-6
02 MW-7
03 MW-8
04 MW-9
05 MW-10
06 MW-11

TEST CODES and NAMES used on this report

BETXGC Volatile Organics (BETX)
M8100 Polyaromatic Hydrocarbons
TPH Petroleum Hydrocarbons

Kemron
ENVIRONMENTAL SERVICES

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-6

SAMPLE # 01 FRACTIONS: A,B,C

Date & Time Collected 06/21/90 Category WATER

TPH	<1
	mg/l

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-6

FRACTION 01B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC
INSTRMT: HP_III INJECTED: 06/27/90

FILE #: 0627C06A
FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-6

FRACTION 01C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_16
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-7

SAMPLE # 02 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH	<1 mg/l

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-7

FRACTION 02B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C07A
INSTRMT: HP_III INJECTED: 06/27/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT

Work Order # N0-06-336

Results by Sample

SAMPLE ID MW-7

FRACTION 02C TEST CODE M8100 NAME Polyaromatic Hydrocarbons

Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_17

INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT

DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-8

SAMPLE # 03 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH	<1 mg/l

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-8

FRACTION 03B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C08A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-8

FRACTION 03C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_18
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-9

SAMPLE # 04 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH	<1	mg/l

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-9

FRACTION 04B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C09A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-9

FRACTION 04C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_19
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-10

SAMPLE # 05 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH	<1 mg/l

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-10

FRACTION 05B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C10A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-38-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-10

FRACTION 05C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_20
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-11

SAMPLE # 06 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH	<1 mg/l

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-11

FRACTION 06B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0627C11A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/23/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-336

SAMPLE ID MW-11 FRACTION 06C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_21
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Test Methodology

TEST CODE **BETXGC** NAME **Volatile Organics (BETX)**

EPA Method 8020 (SW-846)

TEST CODE **M8100** NAME **Polyaromatic Hydrocarbons**

EPA Method 8100 SW-846

TEST CODE **TPH** NAME **Petroleum Hydrocarbons**

EPA Method 418.1

Environmental Engineers/Scientists

№ 0905

CHAIN-OF-CUSTODY RECORD

NOTE: Laboratory will homogenize comp. samples

Project Contact: Kurt Hausner

Turn Around Requirements: Normal

Will call Monday, 6/25 with prices negotiated earlier

Page 1 of 1

Project No.: 819-300

Project Name: Chicora Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: Kurt Hausner, Greg A. Beck

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	~~PHCs~~ TPH	BETX	PAH			ADDITIONAL REQUIREMENTS
MW-9		✓	6/21		MW-9	5												✓	✓	✓			
MW-10		✓	6/21		MW-9	5												✓	✓	✓			
MW-11		✓	6/21		MW-9	5												✓	✓	✓			

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Kurt Hausner	6/22	1200					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	6/25		

W-AD6

White - Lab Yellow - Office Pink - Field

VIRUHA Environmental Engineers/Scientists

№ 0906

CHAIN-OF-CUSTODY RECORD

NOTE: Laboratory will homogenize comp. samples

will call Monday 6/25/90 with earlier negotiated prices

Page 1 of 1

Project Contact: Kurt Hausner

Turn Around Requirements: Normal

Project No.: 619-300

Project Name: Chicora Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: [illegible], Greg A. Beck

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	~~PCBs~~ TPH	BETX	PAH		ADDITIONAL REQUIREMENTS
MW 6		✓	6/21		MW 6	5												✓	✓	✓		
MW 7		✓	6/21		MW 7	5												✓	✓	✓		
MW 8		✓	6/21		MW 8	5												✓	✓	✓		

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
[illegible]	6/22	1200					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	6/25		

W-AD6

White - Lab Yellow - Office Pink - Field

KEMRON REPORT Work Order # N0-06-342

.eceived: 06/25/90 07/11/90 11:38:02

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN Kurt Hausner

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750
ATTEN
PHONE (614) 373-4071

CERTIFIED BY

CONTACT G CROSS

CLIENT WAPATL 59227 SAMPLES 3
COMPANY Wapora, Inc.
ACILITY Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID #819-300/Chicora Tk. Farm
TAKEN Hausner/Beck
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

1 MW-3
2 MW-4
3 MW-5

TEST CODES and NAMES used on this report

BETXGC	Volatile Organics (BETX)
M8100	Polyaromatic Hydrocarbons
TPH	Petroleum Hydrocarbons

Kemron ENVIRONMENTAL SERVICES

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-342

SAMPLE ID MW-3

SAMPLE # 01 FRACTIONS: A,B,C

Date & Time Collected 06/21/90

Category WATER

TPH	<1 mg/l

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-342

SAMPLE ID MW-3 FRACTION 01B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0628B03A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED:

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEFINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANTITATION LIMIT (PQL)
NA = NOT ANALYZED

sceived: 06/25/90

KEMRON REPORT

Work Order # N0-06-342

Results by Sample

MPLE ID MW-3

FRACTION 01C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_22
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

OTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT
Results by Sample

Work Order # N0-06-342

SAMPLE ID MW-4

SAMPLE # 02 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH	<1 mg/l

ceived: 06/25/90

KEMRON REPORT

Work Order # N0-06-342

Results by Sample

MPLE ID MW-4

FRACTION 02B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0628B05A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

OTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

ceived: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-342

MPLE ID MW-4

FRACTION 02C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_23
INSTRMT: HP_II INJECTED: 07/18/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

OTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

ceived: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-342

SAMPLE ID MW-5

SAMPLE # 03 FRACTIONS: A,B,C
Date & Time Collected 06/21/90 Category WATER

TPH <1
mg/l

ceived: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-342

IPLE ID MW-5

FRACTION 03B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/21/90 Category WATER

ANALYST: SWC FILE #: 0628B06A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

TES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

eceived: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-342

AMPLE ID MW-5

FRACTION 03C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/21/90 Category WATER

ANALYST: EDG EXTRACTED: 06/28/90 FILE #: SAMPLE_24
INSTRMT: HP_II INJECTED: 07/08/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	BDL	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

OTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Test Methodology

T CODE BETXGC NAME Volatile Organics (BETX)

Method 8020 (SW-846)

T CODE M8100 NAME Polyaromatic Hydrocarbons

Method 8100 SW-846

T CODE TPH NAME Petroleum Hydrocarbons

Method 418.1

VAPORA Environmental Engineers/Scientists

№ 0907

CHAIN-OF-CUSTODY RECORD

NOTE: Laboratory will homogenize comp. samples

Will Call Monday 6/25/90 with earlier negotiated prices

Page 1 of 1

Project Contact: Kurt Hausner

Turn Around Requirements: Normal

Project No.: 814-300

Project Name: Chicura Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: Kurt Hausner, Greg A. Beck

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	~~PHCs~~ TPH	BETX	DRH		ADDITIONAL REQUIREMENTS
MW 3		✓	6/21		MW 3	5												✓	✓	✓		
MW 4		✓	"		MW 4	5												✓	✓	✓		
MW 5		✓	"		MW 5	5												✓	✓	✓		

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Kurt Hausner	6/22	1200					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	6/25		

V-AD6

White - Lab Yellow - Office Pink - Field

Received: 06/25/90

KEMRON REPORT
07/11/90 12:55:00

Work Order # N0-06-344

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN John Dwyer

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750
ATTEN
PHONE (614) 373-4071

L Burcsa
CERTIFIED BY

CONTACT G CROSS

CLIENT WAPATL 59227 SAMPLES 5
COMPANY Wapora, Inc.
FACILITY Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID #819-300/Chicora Tk Farm
TAKEN Hausner/Beck
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

01 FD-1
02 FD-2
03 MW-13
04 POND-2
05 POND-1

TEST CODES and NAMES used on this report

BETXGC Volatile Organics (BETX)
M8100 Polyaromatic Hydrocarbons
TPH Petroleum Hydrocarbons

RECEIVED

KEMRON ENVIRONMENTAL SERVICES

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-344

SAMPLE ID **FD-2**

FRACTION **02B** TEST CODE **BETXGC** NAME **Volatile Organics (BETX)**
Date & Time Collected **06/22/90 17:05:00** Category **WATER**

ANALYST: SWC FILE #: 0627C13A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	**BQL**	5.0
100-41-4	Ethylbenzene	**BQL**	5.0
108-88-3	Toluene	**BQL**	5.0
1330-20-7	Xylenes, Total	**BQL**	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT

Work Order # N0-06-344

Results by Sample

SAMPLE ID FD-2

FRACTION 02C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/22/90 17:05:00 Category WATER

ANALYST: EDG EXTRACTED: 06/29/90 FILE #: SAMPLE_9
INSTRMT: HP_II INJECTED: 07/07/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	3	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	6	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	9	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

Received: 06/25/90

KEMRON REPORT

Results by Sample

Work Order # N0-06-344

SAMPLE ID MW-13

SAMPLE # 03 FRACTIONS: A,B,C

Date & Time Collected 06/22/90

Category WATER

TPH	<1 mg/l

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-344

SAMPLE ID MW-13 FRACTION 03B TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 06/22/90 Category WATER

ANALYST: SWC FILE #: 0627C12A
INSTRMT: HP_III INJECTED: 06/28/90 FACTOR: 1 UNITS: ug/L VERIFIED

CAS#	COMPOUND	RESULT	DET LIMIT
71-43-2	Benzene	BQL	5.0
100-41-4	Ethylbenzene	BQL	5.0
108-88-3	Toluene	BQL	5.0
1330-20-7	Xylenes, Total	BQL	5.0

NOTES AND DEINITIONS FOR THIS REPORT.
DET LIMIT = DETECTION LIMIT
BDL= BELOW DETECTION LIMIT
BQL= BELOW QUANITATION LIMIT
NA = NOT ANALYZED

Received: 06/25/90

KEMRON REPORT
Results by Sample

Work Order # N0-06-344

SAMPLE ID MW-13

FRACTION 03C TEST CODE M8100 NAME Polyaromatic Hydrocarbons
Date & Time Collected 06/22/90 Category WATER

ANALYST: EDG EXTRACTED: 06/29/90 FILE #: SAMPLE_10
INSTRMT: HP_II INJECTED: 07/07/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	1
208-96-8	Acenaphthylene	BDL	1
83-32-9	Acenaphthene	BDL	1
86-73-7	Fluorene	BDL	1
85-01-8	Phenanthrene	BDL	1
120-12-7	Anthracene	BDL	1
206-44-0	Fluoranthene	BDL	1
129-00-0	Pyrene	7	1
56-55-3	Benzo(a)anthracene	BDL	5
218-01-9	Chrysene	BDL	5
205-99-2	Benzo(b)fluoranthene	BDL	5
207-08-9	Benzo(k)fluoranthene	BDL	5
50-32-8	Benzo(a)pyrene	BDL	5
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	5
53-70-3	Dibenzo(a,h)anthracene	BDL	5
191-24-2	Benzo(g,h,i)perylene	BDL	5

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT
DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

SAMPLE ID POND-2
SAMPLE # 04 FRACTIONS: A
Date & Time Collected 06/22/90 17:30:00 Category WATER

TPH <1
mg/l

SAMPLE ID POND-1
SAMPLE # 05 FRACTIONS: A
Date & Time Collected 06/22/90 Category WATER

TPH <1
mg/l

Test Methodology

TEST CODE **BETXGC** NAME **Volatile Organics (BETX)**

EPA Method 8020 (SW-846)

TEST CODE **M8100** NAME **Polyaromatic Hydrocarbons**

EPA Method 8100 SW-846

TEST CODE **TPH** NAME **Petroleum Hydrocarbons**

EPA Method 418.1

KEMRON
ENVIRONMENTAL SERVICES

№ 19647

CHAIN-OF-CUSTODY RECORD

I will call Monday (6/25/90) to transmit Prices agreed on earlier

Page 1 of 1

Project Contact: Kurt Hausner

Turn Around Requirements: Normal

Project No.: 819-300

Project Name: Chicora Tank Farm

Sampler (print): Kurt D. Hausner, Greg A. Beck

Signature: Greg A. Beck

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	TPH	BETX	PHENOLICS	PAH	ADDITIONAL REQUIREMENTS
FD-1		✓	6/22	1700	FD-1	1												✓				
FD-2		✓	6/22	1705	FD-2	5												✓	✓		✓	
MW-13		✓	6/22		MW-13	5												✓	✓		✓	
POND-2		✓	6/22	1730	POND-2	1												✓				
POND-1		✓	6/22	0910	POND-1	1												✓				

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Greg A. Beck	6/22	1900					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			DDHill	6/25/90	2020	

W-AD6 White - Lab Yellow - Office Pink - Field

HYDE BROS PRTG CO - MARIETTA, OHIO 45750 360.334-L1

eceived: 08/17/90

KEMRON REPORT
08/21/90 13:33:23

Work Order # N0-08-[illegible]8

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345

ATTEN Kurt Hausner

CLIENT WAPATL 59227 SAMPLES 4
COMPANY Wapora, Inc.
ACILITY Atlanta
FAX # (404) 636-7162

WORK ID 819-300Navy Chicora Tank Farm
TAKEN K.Hausner
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750

CERTIFIED BY

ATTEN
PHONE (614) 373-4071

CONTACT G CROSS

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

SAMPLE IDENTIFICATION

1 FD 1-S
2 FD 1-W
3 FD 1-E
4 FD 2-S

TEST CODES and NAMES used on this workorder

TPH Petroleum Hydrocarbons

KEMRON
ENVIRONMENTAL SERVICES

Received: 08/17/90

KEMRON REPORT

Work Order # N0-08-[illegible]8

Results by Sample

SAMPLE ID FD 1-S

SAMPLE # 01 FRACTIONS: A

Date & Time Collected 08/16/90 07:15:00 Category WATER

TPH <1 mg/L

SAMPLE ID FD 1-W

SAMPLE # 02 FRACTIONS: A

Date & Time Collected 08/16/90 07:30:00 Category WATER

TPH <1 mg/L

SAMPLE ID FD 1-E

SAMPLE # 03 FRACTIONS: A

Date & Time Collected 08/16/90 07:45:00 Category WATER

TPH <1 mg/L

SAMPLE ID FD 2-S

SAMPLE # 04 FRACTIONS: A

Date & Time Collected 08/16/90 08:00:00 Category WATER

TPH <1 mg/L

Received: 08/17/90

KEMRON REPORT
Test Methodology

Work Order # N0-08-198

TEST CODE TPH NAME Petroleum Hydrocarbons

EPA Method 418.1

Kemron
ENVIRONMENTAL SERVICES

№ 1

CHAIN-OF-CUSTODY RECORD

Project Contact: Kurt Hausner

Turn Around Requirements: Normal (RUSH turnaround if possible)

Page 1 of 1

Project No.: 819-300

Project Name: Navy - Chicora Tank Farm

Sampler (print): Kurt Hausner, Emil Beshara

Signature: Kurt Hausner, Emil Beshara

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	TPH	BETX	PHENOLICS	PAH	ADDITIONAL REQUIREMENTS
FD1-S		✓	8/16	0715	FD1-S	2												✓			✓	
FD1-W		✓	"	0730	FD1-W	2												✓			✓	(1)
FD1-E		✓	"	0745	FD1-E	2												✓			✓	
FD2-S		✓	"	0800	FD2-S	2												✓			✓	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Kurt Hausner	10/16/90	1700					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:
			Janet Williams	8/17		(1) Per Kurt Hausner 8-17-90 14:07 Do not run PAH's. We may dispose of samples. GNC

W-AD6

White - Lab Yellow - Office Pink - Field

HYDE BROS PRTG CO - MARIETTA, OHIO 45750 380-334-LE

Received: 08/17/90

KEMRON REPORT

08/23/90 15:54:04

Work Order # NO-[illegible]-199

REPORT TO
Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345

ATTEN Kurt Hausner

PREPARED BY
KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750

CERTIFIED BY

ATTEN

PHONE (614) 373-4071

CONTACT G CROSS

CLIENT WAPATL 59227 SAMPLES 3
COMPANY Wapora, Inc.
FACILITY Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID 819-300Navy Chicora Tank Farm
TAKEN K.Hausner
TRANS Fed Ex
TYPE
P.O. #
INVOICE under separate cover

SAMPLE IDENTIFICATION

01 FD 2-W
02 FD 3-S
03 FD 3-E

TEST CODES and NAMES used on this workorder

M8100 Polyaromatic Hydrocarbons
TPH Petroleum Hydrocarbons

Kemron
ENVIRONMENTAL SERVICES

Received: 08/17/90

KEMRON REPORT
Results by Sample

Work Order # N0-0[illegible]99

SAMPLE ID FD 2-W

SAMPLE # 01 FRACTIONS: A,B
Date & Time Collected 08/18/90 08:10:00 Category WATER

TPH	2 mg/L

Received: 08/17/90

KEMRON REPORT

Results by Sample

Work Order # N0-0[illegible]99

SAMPLE ID FD 2-W

FRACTION 01B TEST CODE M8100 NAME Polyaromatic Hydrocarbons

Date & Time Collected 08/18/90 08:10:00 Category WATER

ANALYST: EDG EXTRACTED: 08/20/90 FILE #: SAMPLE_9

INSTRMT: HP_II INJECTED: 08/23/90 FACTOR: 10 UNITS: ug/L

CAS#	COMPOUND	RESULT	DET LIMIT
91-20-3	Naphthalene	BDL	10
208-96-8	Acenaphthylene	BDL	10
83-32-9	Acenaphthene	BDL	10
86-73-7	Fluorene	BDL	10
85-01-8	Phenanthrene	BDL	10
120-12-7	Anthracene	BDL	10
206-44-0	Fluoranthene	BDL	10
129-00-0	Pyrene	BDL	10
56-55-3	Benzo(a)anthracene	BDL	50
218-01-9	Chrysene	BDL	50
205-99-2	Benzo(b)fluoranthene	BDL	50
207-08-9	Benzo(k)fluoranthene	BDL	50
50-32-8	Benzo(a)pyrene	BDL	50
193-39-5	Indeno(1,2,3-cd)pyrene	BDL	50
53-70-3	Dibenzo(a,h)anthracene	BDL	50
191-24-2	Benzo(g,h,i)perylene	BDL	50

VERIFIED: RJW

NOTES AND DEFINITIONS FOR THIS REPORT

DET LIMIT = DETECTION LIMIT
BDL = BELOW DETECTION LIMIT
NA = NOT ANALYZED
NF = NOT FOUND
DL = DILUTED OUT

KEMRON REPORT

Results by Sample

Work Order # N0-0[illegible]99

SAMPLE ID FD 3-8

SAMPLE # 02 FRACTIONS: A

Date & Time Collected 08/16/90 09:00:00 Category WATER

TPH 240 mg/L

SAMPLE ID FD 3-E

SAMPLE # 03 FRACTIONS: A

Date & Time Collected 08/16/90 09:45:00 Category WATER

TPH 470 mg/L

Received: 08/17/90

Test Methodology

TEST CODE M8100 NAME Polyaromatic Hydrocarbons

EPA Method 8100 SW-846

TEST CODE TPH NAME Petroleum Hydrocarbons

EPA Method 418.1

KEMRON
ENVIRONMENTAL SERVICES

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CHAIN-OF-CUSTODY RECORD

Project Contact: Kurt HAUSNER

Turn Around Requirements: Normal (VST if Possible)

Page 1 of 1

Project No.: 819-300

Project Name: Navy Chicora Tank Farm

Sampler (print): Kurt HAUSNER, Emil Beshara

Signature: Kurt Hausner, Emil Beshara

Sample I.D. No.	Comp	Grab	Date	Time	Sample Location	NUMBER OF SAMPLES	HOLD	% SOLIDS	VOA	ACID EXTRACT.	BASE/NEUTR. EXT.	EP TOX.-METALS	EP TOX.-ORGAN.	TOT. METALS-P.P.L.	TOT. METALS-RCRA	PCBs	PESTICIDES	TPH	BETX	PHENOLICS	PAH	ADDITIONAL REQUIREMENTS
FD2-W		✓	8/16	0810	FD2-W	2												✓			✓	
FD3-S		✓	"	0900	FD3-S	4												✓			✓	①
FD3-E		✓	"	0945	FD3-E	4												✓			✓	

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
Kurt Hausner	8/16/90	1700					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks
			Janet Williams	8/17		① per Kurt Hausner 8-17-90 14:07 Only run PAH on FD2-W. We may dispose of FD3-Sar-E PAH samples. TPH is same as above GNC

W-AD6

White - Lab Yellow - Office Pink - Field

HYDE BROS PRTG CO - MARIETTA, OHIO 45750 380.334-L1

Received: 08/21/90

KEMRON REPORT
08/27/90 11:30:35

Work Order # N0-08-245

REPORT TO: Wapora, Inc.
1815 Century Blvd.
Suite 150
Atlanta,GA 30345
ATTEN: Kurt Hausner

PREPARED BY: KEMRON ENVIRONMENTAL SERVICES
109 STARLITE PARK
MARIETTA, OHIO 45750
ATTEN
PHONE: (614) 373-4071

CERTIFIED BY

CONTACT: G CROSS

CLIENT: WAPATL 59227 SAMPLES: 1
COMPANY: Wapora, Inc.
FACILITY: Atlanta
FAX # (404) 636-7162

ANALYTICAL METHODS AND DOCUMENTATION ARE FOUND AT THE END OF THIS REPORT. ALL RESULTS ON SOILS/SLUDGES ARE REPORTED "AS RECEIVED" UNLESS OTHERWISE SPECIFIED.

WORK ID: 819-300/Chicora Tk. Farm
TAKEN: Hausner/Stovall
TRANS: Fed Ex
TYPE:
P.O. #:
INVOICE: under separate cover

SAMPLE IDENTIFICATION

01 FD2-W

TEST CODES and NAMES used on this workorder

BETXGC Volatile Organics (BETX)

KEMRON ENVIRONMENTAL SERVICES

Received: 08/21/90

KEMRON REPORT

Results by Sample

Work Order # NO-08-245

SAMPLE ID FD2-W

FRACTION 01A TEST CODE BETXGC NAME Volatile Organics (BETX)
Date & Time Collected 08/16/90 12:00:00 Category WATER

ANALYST: WSN FILE #: 3WA6670
INSTRMT: FINN_3 INJECTED: 08/23/90 FACTOR: 1 UNITS: ug/L

CAS#	COMPOUND	RESULT	PQL
71-43-2	Benzene	BQL *	5.0
100-41-4	Ethylbenzene	BQL *	5.0
108-88-3	Toluene	BQL *	5.0
1330-20-7	Xylenes, Total	BQL *	5.0

NOTES AND DEFINITIONS FOR THIS REPORT.
BQL= BELOW PRACTICAL QUANTITATION LIMIT (PQL)
NA = NOT ANALYZED
* = ANALYZED, USING METHOD 8240 BY GC/MS

QUALITY ASSURANCE SECTION

AND

ATTACHMENTS

- BFB Summary-Method 624, 8240 (VOA)
- Method 624, 8240 (VOA) Standard RIC
- Method 624, 8240 (VOA) Blank RIC
- Method 624, 8240 (VOA) Sample RIC
- Mass Spectra - Identified VOA Compounds
- Glossary
- Chain-of-Custody Record
  (if initiated by client)

Tuning Report
08/23/90 9:58:00 + 7:00
Instrument: FINN_3
Case Number:

Data: [illegible]
Cali: SCALO823 # 3
Analyst: WSN
Laboratory: KEMRON # 2

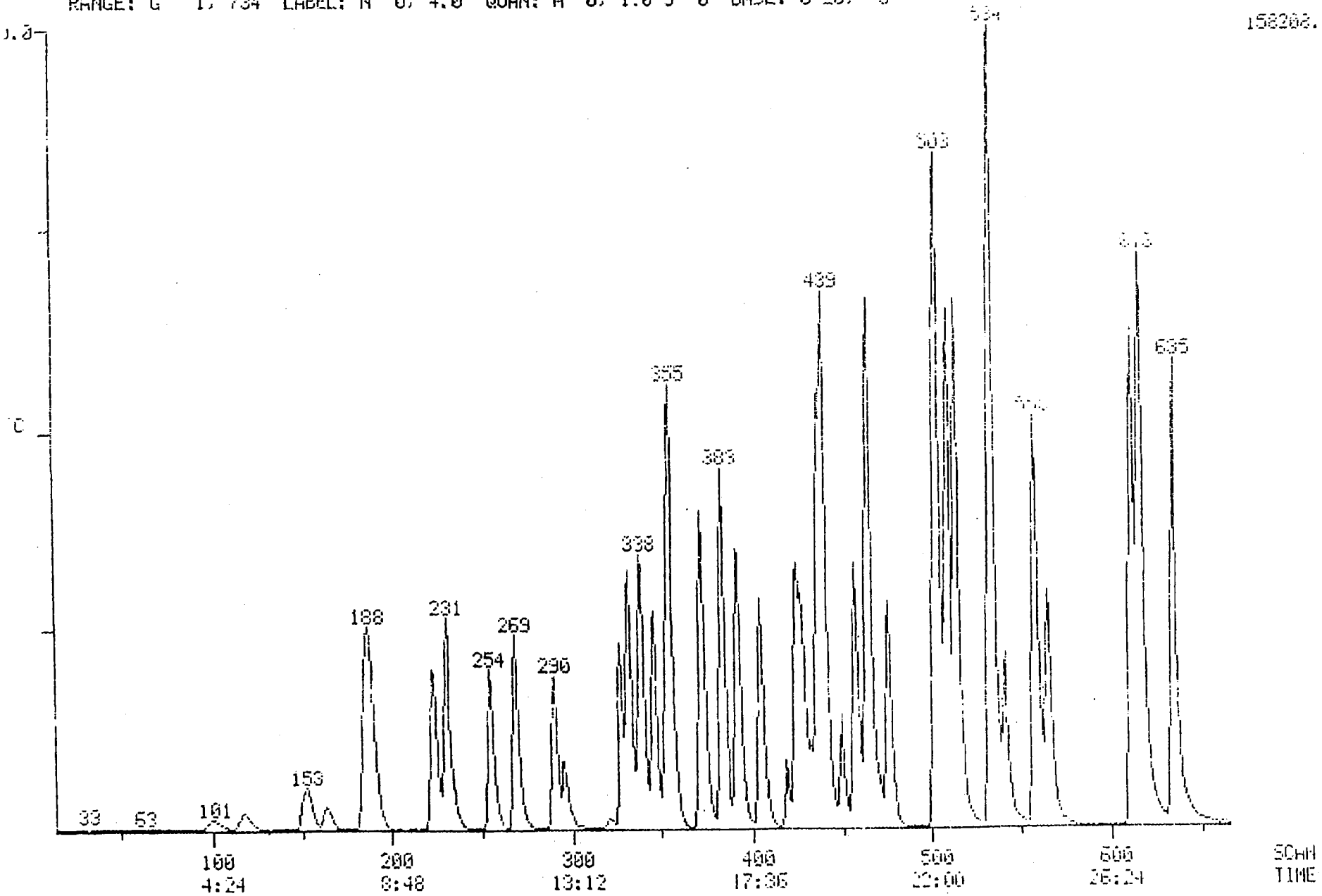
RIC: 12800.
Acct. No.:
Contract:

Ion Abundance Criteria

m/z	Intensity	% RA	Min %	Max %	Mass	Actual	Status
50	494.	16.0	15.0	40.0	95	16.0	PASS
75	1330.	43.0	30.0	60.0	95	43.0	PASS
95	3096.	100.0	100.0	---	---	100.0	PASS
96	199.	6.4	5.0	9.0	95	6.4	PASS
173	0.	0.0	---	2.0	174	0.0	PASS
174	2240.	72.4	50.0	---	95	72.4	PASS
175	178.	5.7	5.0	9.0	174	7.9	PASS
176	2256.	72.9	95.0	101.0	174	100.7	PASS
177	137.	4.4	5.0	9.0	176	6.1	PASS

RIC
08/23/90 10:19:00
SAMPLE: VSTD050 VOA STD 50 PPB +DCB CONTINUING CALIBRATION 5ML
CONDS.:
RANGE: G 1, 734 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

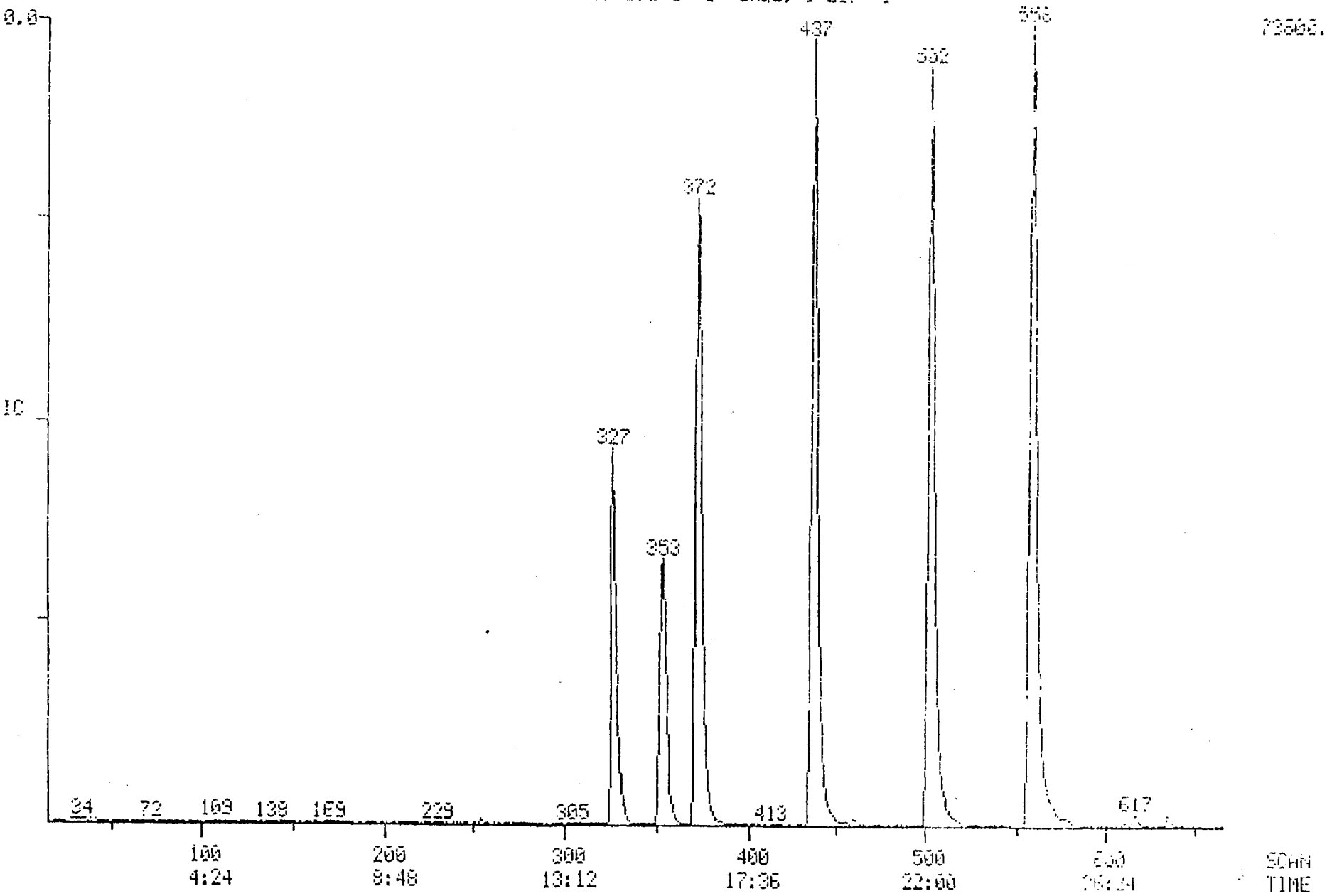
DATA: 3ST6668 #1 SCANS 15 10 665
CALI: 3ST6668 #3



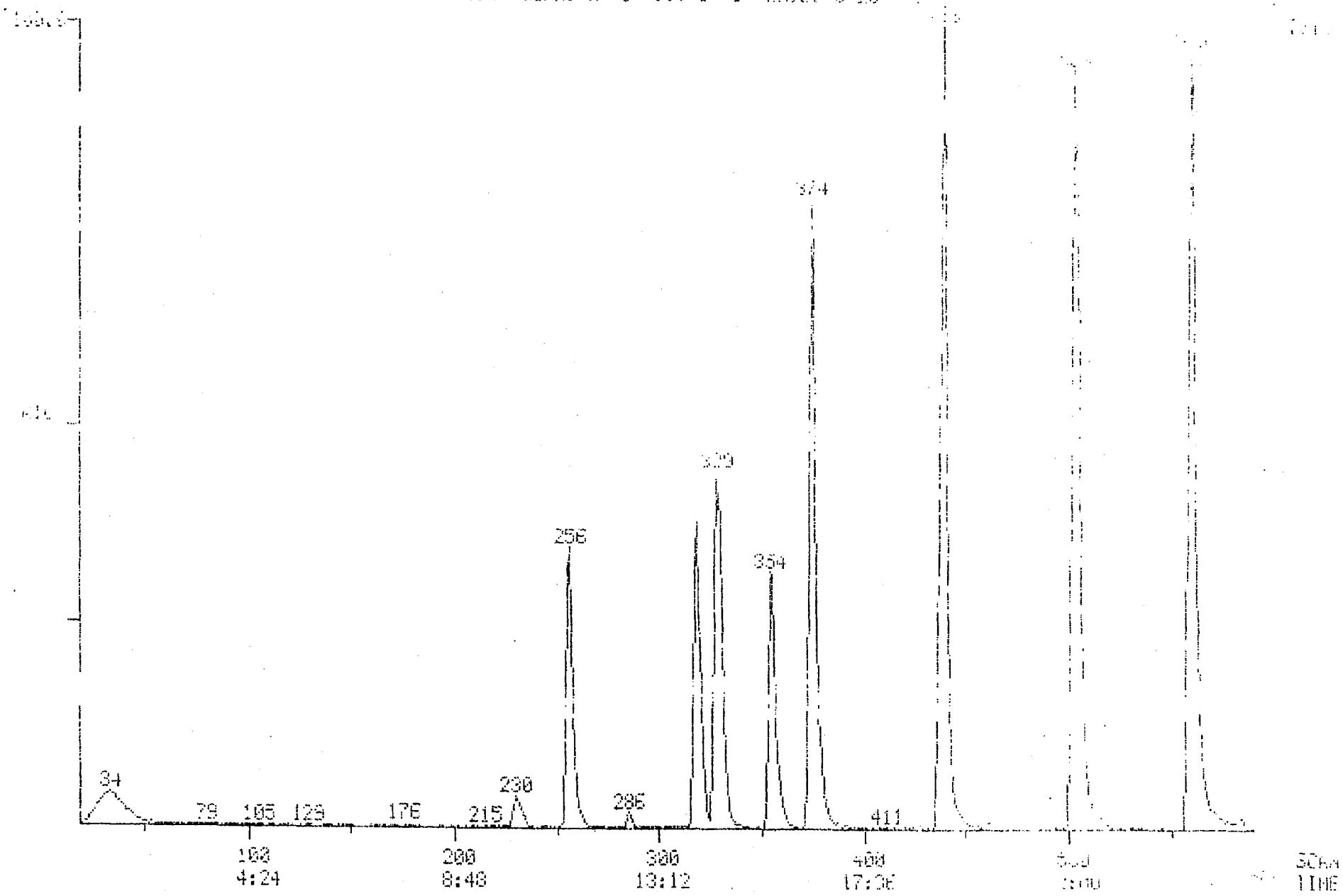
RIC
08/23/90 11:17:00
SAMPLE: VBLK0823 VOA BLANK 5ML
CONDS.:
RANGE: G 1, 734 LABEL: N 0, 4.0 QUAN: A 0, 1.0 J 0 BASE: U 20, 3

DATA: 3BK6669 #1
CALI: 3BK6669 #3

SCANS 15 TO 620



MIC
08-23-90 12:03:00
SAMPLE: WAPORA 08-24-5-01 5ML
CONCS.:
DATA: 3WA6670 #1
CHL1: 3WA6670 #3



GLOSSARY

BFB:	Bromoflurorbenzene; the compound specified in EPA Method 624/8240 for which the mass spectrometer must meet performance criteria for VOA analysis.
DFTPP:	Decafluorotriphenylphosphine; the compound specified in EPA Method 625/8270 for which the mass spectrometer must meet performance criteria for semivolatile compounds.
EPA Method 624:	GC/MS method for determining volatile organic compounds in water using the purge and trap technique.
EPA Method 625:	GC/MS method for determining semivolatile organic compounds in water using liquid/liquid extraction.
EPA Method 8240:	GC/MS Method for determining volatile organic compounds in a variety of water and waste matrices using the purge and trap technique. Reference: SW-846.
EPA Method 8270:	GC/MS Method for determining semivolatile organic compounds in a variety of water and waste matrices using liquid/liquid extraction and capillary column technique. Reference: SW-846.
IS:	Internal Standard: compound used to determine response factors (RF) for individual analytes and subsequent quantitative analysis.
RIC:	Reconstructed Ion Chromatograph; GC/MS chromatograph which plots total ion current versus scan number (time).
SS:	Surrogate Standard; quality control compounds similar to the compounds of interest which are spiked into every sample matrix. The surrogate's recovery is determined using the same internal standard procedures and the analytes.
VOA:	Volatile Organic Analysis; see EPA Method 624/8240.
SV:	Semivolatile compounds; refers to the analytes determined by liquid/liquid extraction technique Method 625/8270.

KEMRON ENVIRONMENTAL SERVICES

CHAIN OF CUSTODY RECORD

16550 Highland Road
Baton Rouge, Louisiana 70810
(504) 293-8650

PROJ. NO. 819-300

PROJECT NAME Chicora Tank Farm

SAMPLERS: (Signature) Hausner / Stovall

STA.NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NO. OF CONTAINERS	BTEX	REMARKS
FD2-W	8/16/90	1200		✓	—	3		UST. Turnaround if possible otherwise standard

Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
R. Stovall	8/20/90 1400				
Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:

Relinquished by:	Date/Time	Received for Laboratory By (Signature)	Date/Time	Remarks
		D Odell	8/21/90 1720	

Distribution: White - Accompanies Shipment; Pink - Coordinator Field Files; Yellow - Lab File