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Hazardous Waste Gr[illegible]te
Task Force

Evaluation of
Boston Industrial Prod[illegible]cts
Hohenwald, Tennesse[illegible]

United States Envir[illegible]n Agency

Tennessee Departm[illegible] Environ[illegible]

[redacted]

GROUND WATER MONITORING EVALUATION
BOSTON INDUSTRIAL PRODUCTS
HOHENWALD, TENNESSEE

UPDATE

The Hazardous Waste Ground Water Task Force evaluated the Boston Industrial Products (BIP) facility in Hohenwald, Tennessee, during the week of May 11, 1987, for compliance with the 40 CFR Part 265, Subpart F regulations. Several deficiencies pertaining to the RCRA ground water monitoring system were noted during the evaluation. S. E. Matthews, project coordinator for the evaluation, compiled a report that detailed these deficiencies and summarized the results from water quality samples collected from the RCRA monitoring wells at the facility.

This update chronicles activities at BIP following the Task Force evaluation and any actions taken by the Tennessee Department of Health and Environment (TDHE) and EPA Region IV regarding RCRA ground water monitoring at the facility.

In May 1987, TDHE requested that BIP perform accelerated sampling, with four sampling events taking place at two-month intervals. Samples collected during the Task Force evaluation would constitute the first sampling period. The second sampling episode was conducted in July. Elevated levels of lead and chromium were detected in well 5. Trichloroethylene was detected in well 3.

In July 1987, TDHE performed a RCRA Facility Assessment at BIP. The report concluded that there were fewer solid waste management units at the facility than the Task Force had determined. Comments from EPA Region IV on these findings were submitted to TDHE in November.

In September 1987, BIP consultants prepared a report for TDHE documenting permeability tests performed at the site. Hydraulic conductivities were calculated to range from 1.6×10^{-4} cm/sec to 2.1×10^{-7} cm/sec. Well construction logs for holes 5 and 5A were also included in the report.

As of November 1987, TDHE was developing an administrative order against BIP that would conclude that the present ground water monitoring system is inadequate. The order would require that additional hydrogeologic information be obtained and for additional wells to be installed. No penalty was to be assessed.

To date, EPA Region IV has taken no enforcement action against the facility.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
HAZARDOUS WASTE GROUND WATER TASK FORCE

GROUND WATER MONITORING EVALUATION

BOSTON INDUSTRIAL PRODUCTS
HOHENWALD, TENNESSEE

DECEMBER 1987

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EXECUTIVE SUMMARY

INTRODUCTION

Task Force Effort

Operations at hazardous waste treatment, storage, and disposal (TSD) facilities are regulated by the Resource Conservation and Recovery Act. Regulations promulgated pursuant to RCRA (40 CFR Parts 260 through 265, effective on November 19, 1980 and subsequently modified) address hazardous waste site operations including monitoring of ground water to ensure that hazardous waste constituents could be immediately detected if released to the environment. The regulations for TSD facilities are implemented (for EPA administered programs) through the hazardous waste permit program outlined in 40 CFR Part 270.

The Administrator of the Environmental Protection Agency (EPA) established a Hazardous Waste Ground Water Task Force to evaluate the level of compliance with ground water monitoring requirements at commercial off-site and selected on-site TSD facilities and address the cause of non-compliance. The Task Force comprises personnel from an EPA Headquarters core team, Regional Offices and the States.

There were eight Task Force evaluations conducted in Region IV during FY-86 and FY-87. Evaluations were conducted at the Region's two off-site facilities. Six evaluations were conducted at private, on-site facilities. The evaluation at Boston Industrial Products (BIP) was the sixth private on-site investigation in Region IV and was conducted the week of May 11, 1987.

Objectives of the Evaluation

The objective of the inspection at BIP was to determine compliance of the ground water monitoring system with the requirements of 40 CFR Part 265, Subpart F - Ground Water Monitoring; to determine compliance with related requirements of the Part 265 interim status regulations and the State's counterpart regulations; to evaluate the ground water monitoring system described in the RCRA Part B permit application, Part 270.14(c) and potential compliance with Part 264. Recent Amendments to RCRA require that facilities seeking a RCRA permit must also address solid waste management units at the facilities, therefore, ground water monitoring wells associated with any solid waste management units at the facility were also to be evaluated.

The BIP evaluation was coordinated by the Region IV US-EPA, Environmental Services Division and included participation by the EPA Headquarters Core Team, Region IV EPA Waste Management Division and the Tennessee Department of

Health and Environment (TDHE). In general, the evaluation involved a review of State, Federal and facility records, a facility inspection, a laboratory evaluation and ground water sampling and analysis of the monitoring wells.

BACKGROUND

Locale/Facility Operations

Boston Industrial Products, Inc. in Hohenwald, Tennessee is a part of the Dana Corporation (see Figure 1 for location). The facility produces a variety of industrial products, including fire and chemical hose. The rubber formulae are blended and mixed to meet specifications. Many variations of hoses are produced by varying the rubber content, thickness and reinforcement materials. Lead is used in the vulcanization of large rubber hoses. The lead is stripped from the hose and is reclaimed for reuse or sale. Water used to cool and set rubber hoses is discharged into a recirculation pond and recycled (Figure 2). This water contains lead which settles to the bottom of the pond and becomes part of the sediment.Sediment in the pond was found to contain 36 ppm lead by the EP Toxicity test, thus characterizing it as D008, a characteristic hazardous waste under 40 CFR 261. The State of Tennessee and US-EPA consider this pond as a hazardous waste surface impoundment.

In the past, excess water in the recirculation pond was pumped into two 30-foot by 50-foot ponds known as the east and west overflow impoundments. This practice is no longer utilized and these ponds have been abandoned. The facility did have interim status: TND004045605. In November 1985, the facility certified compliance with applicable financial assurance requirements. In December 1985, the State issued a NOV to the facility for failing to file and maintain with the State liability coverage as required under Tennessee Regulations 1200-1-11-.05(8). Later that month, TDHE and EPA inspected the facility and observed that it was continuing to store and dispose of hazardous waste in its surface impoundment. On December 31, 1985, TDHE notified the facility that interim status was terminated and its application for a final operation permit for the surface impoundment had been denied.

In January 1986, BIP informed TDHE that there was a typographical error in the financial statement that made it appear that the facility did not have enough state liability coverage. The question of loss of interim status is still under discussion.

SUMMARY OF FINDINGS AND CONCLUSIONS

COMPLIANCE WITH INTERIM STATUS REQUIREMENTS

The Task Force investigated the interim status ground water monitoring program implemented by BIP. The consensus opinion of the Task Force was that this program is not fully in compliance with 40 CFR Part 265 Subpart F and Tennessee Regulations Rule 1200-1-11-.05(6). The following is a more detailed summary of the inspection findings and conclusions.

265.90 Applicability

According to this section of the regulations, an owner/operator of a land disposal facility must implement a ground water monitoring "capable of determining the facility's impact on the quality of the ground water in the uppermost aquifer underlying the facility...". This program was to be implemented by November 1981.

At the time of the Task Force inspection, BIP had not fully defined the hydrology and geology of the site; had not documented flow directions and gradients and noted any deviations from the norm; and had not defined the vertical and lateral extent of confining units.

265.91 Ground Water Monitoring System

According to these regulations, an owner/operator must install a ground water monitoring system that is capable of yielding samples for analysis; have a sufficient number, location and depth of background monitoring wells that are not affected by the facility and yield background quality in the uppermost aquifer; and have a sufficient number, location, and depth of downgradient wells to immediately detect any statistically significant amounts of hazardous waste or hazardous waste constituents that migrate from the waste management area to the uppermost aquifer. The monitoring wells must be adequately constructed to obtain representative samples of the uppermost aquifer.

Wells GWM-1 through 4 were installed in April-October 1985. The well system is not adequate to meet the 265.91 requirements because:

- water-quality data indicate that background well GWM-1 had been impacted by the facility;
- method of well construction and well construction materials may not enable representative ground water samples to be collected from the wells;
- not enough site-specific information is available to determine if the downgradient wells are sufficient to immediately detect possible ground water contamination.

265.92 Sampling and Analysis

This section of the regulations requires an owner/operator to obtain and analyze samples from the RCRA monitoring system and to develop a sampling and analysis plan (SAP) that should include procedures and techniques for:

a. sample collection
b. sample preservation and shipment
c. analytical procedures, and
d. chain-of-custody control.

Sampling procedures were not adequate because the electric water level recorder was not sensitive enough to detect the low conductivity of the water level in the well. The nitrogen gas displacement pump used for purging and sampling aerated the samples so as to drive off volatile organics. It appears that not enough water was removed from the wells prior to purging.

It is the contention of the Task Force that the sampling and analysis plan available for review at the time of the inspection was not sufficient to satisfy the regulations. The SAP lacked information such as:

- The specific analytical procedures which are utilized for each parameter to be tested;
- Examples of chain-of-custody records or sample analysis request sheets were included in the SAP; and Quality Assurance/ Quality Control procedures.

265.93 Preparation, Evaluation and Response

BIP had not performed a student's T-test at the time of the Task Force evaluation. Only three quarters of analytical data were available for review. A ground water quality assessment plan had not been prepared for this facility.

265.94 Recordkeeping and Reporting

This section of the regulations requires an owner/operator to keep any information regarding the ground water monitoring system on-site, and to submit specific information to the proper authorities by specific dates. The Task Force found that data pertinent to the ground water monitoring system was kept on-site and was available for review. Submittals of ground water monitoring data to the State and Federal agencies appears to be within the time constraints posed by the 265.94 regulations. However, parameters that exceeded the NIPDWS were not identified in reports to TDHE or EPA.

TECHNICAL REPORT

INVESTIGATIVE METHODS

The Task Force evaluation of BIP consisted of:

- A review and evaluation of records and documents from EPA Region IV, TDHE and BIP.
- A facility on-site inspection conducted May 12-14, 1987.
- An off-site analytical laboratory evaluation.
- Sampling, analysis and evaluation of the ground water monitoring system at the surface impoundment.

Records/Documents Review and Evaluation

Records and documents from EPA Region IV and the TDHE offices, compiled by an EPA contractor (PRC), were reviewed prior to the on-site inspection. During the inspection, the Task Force met with Mr. Stan Able, Plant Engineer for BIP,and Fred Fischer and Phyllis Garman, geologic consultants for BIP.

Facility Inspection

The facility inspection included identification of waste management units, identification and assessment of waste management operations and pollution control practices and verification of location of ground water monitoring wells.

Company representatives were interviewed to identify records and documents of interest, answer questions about the documents and explain (1) facility operations (past and present), (2) site hydrogeology, (3) ground water monitoring system rationale, (4) the ground water sampling and analysis plan and (5) laboratory procedures for obtaining data on ground water quality.

Laboratory Evaluation

The off-site laboratory facility handling the ground water samples was evaluated regarding its respective responsibilities under the BIP ground water sampling and analysis plan. Analytical equipment and methods, quality assurance procedures and documentation were examined for adequacy. Laboratory records were inspected for compliance with State and Federal requirements. The ability of the laboratory to produce quality data for the required analyses was evaluated. The evaluation results are discussed in a later section of this report.

Ground Water Sampling and Handling

Sampling Locations

Water samples were collected from wells GWM-1, 2, 3, and 4. The selection of these wells for sampling was based on location to provide areal coverage both up and down gradient at the surface impoundment. The locations are identified in Figure 3.

Samples were taken by the EPA contractor Versar and sent to EPA contract laboratories for analysis. BIP requested and received split samples for all the wells. EPA Region IV and TDHE declined to split samples for independent analysis.

WASTE MANAGEMENT UNITS

Surface Impoundment and Emergency Overflow Ponds Description

According to facility reports, the surface impoundment is 100 feet by 175 feet and has a 14 foot depth at the center. The pond is clay lined and was constructed about 1966. It contains approximately 1,000,000 gallons of water and an estimated 650 cubic yards of material. The pond sediment is classified as a hazardous waste (D008) because of the lead content. The pond is susceptible to contamination from dyes and solvents from the flammable liquid room and also functions as an emergency oil containment unit.

In 1983, samples of the sediment in the pond were analyzed and determined to exceed the limits of lead according to the E.P. Toxicity procedures. Discussions were held with TDHE to determine if the pond should be classified as an impoundment. TDHE allowed the facility to perform a financial analysis to determine if closure of the pond would be recommended. It was determined that the pond was an integral part of the process and should not be closed. TDHE then required the submittal of a ground water monitoring plan. The plan was submitted and a ground water monitoring system installed April-October 1985.

The surface impoundment berm has had some seepage of the contents since the early 1980's, if not earlier. The impoundment has also had overflow problems, usually caused by heavy rainfall over a short period of time. Two smaller emergency ponds were constructed in 1982 east of the impoundment to collect any overflow. These ponds were approximately 50 feet long and 30 feet wide with an average depth of 10 feet. These ponds were abandoned in 1984 and were drained of any overflow. These ponds may be considered by EPA as regulated units because they received hazardous waste from the surface impoundment.

Water and sediment samples taken from the seepage at the surface impoundment have shown high lead values. Some of the lead may be a result from the overflow and/or a result of water leaching through hazardous sludge in the bottom of the impoundment.

Solid Waste Management Units

There are several units on site that are possible solid waste management units (See Figure 4). Descriptions are as follows:

- Non-hazardous waste landfill (closed portion): Reportedly accepted discarded wood, industrial hose and carbon black. However, at least two fires occurred here, one of which burned solvents such as toluene, according to a PA/SI performed by Tennessee's 3012 program on May 30, 1984.

- Non-hazardous waste landfill (active portion): Contains discarded wood, industrial hoses and carbon black from manufacturing processes; is permitted by TDHE. A pool of standing liquid was noted during the Task Force inspection. Gas bubbles would rise to the surface and break, leaving an oil slick on the water in this pool.

- Container storage area: Contains drums of hazardous and non-hazardous waste such as reclaimed waste lead oxide, toluene, MEK, waste oil, naptha, gasoline, fuel oil and iso-cyanate foam containing menochlorobenzene. Black oily material was noted on the ground around the drums during the Task Force inspection.

- Storage tank facilities: According to facility records, these tanks are:

No.3	underground	toluol (toluene?)
4	aboveground	alcohol
5	aboveground	MEK
6	aboveground	floor cleaner
7	aboveground	DDP
8	underground	naptha (empty)
9	aboveground	fuel oil
10	aboveground	verisol
11	underground	lubricating oil
12	aboveground	waste oil
13	aboveground	gasoline
15	aboveground	process oil
16	aboveground	lubricants
17	aboveground	lubricants/day tank
18	aboveground	hydraulic oil
19	aboveground	hydraulic oil

- Drainage ditches: There are plant drainage ditches on site, one of which drains into the Hinson Hollow tributary. Water and sediment samples have shown the presence of metals and volatile organic compounds.

- Surface impoundment overflows and berm seepage: The berm surrounding the surface impoundment has overflowed in the past and has shown leakage through the berm. Water and sediment samples have shown metals and volatile organic compounds. During the Task Force inspection, an oily black material was noted on the north bank with some dead vegetation.

- Fires: The surface impoundment has been set on fire in the past (date unknown) to burn off oil floating on the surface. The closed landfill has had at least two fires in the past (dates unknown). One fire burned for three months. Solvents were reportedly burned during one of the fires.

The facility should be required to submit information on the above-mentioned units that would allow the Agency to determine whether or not these are actually regulated units.

GEOLOGY/HYDROLOGY

At the time of the Task Force inspection, boreholes were being installed to determine the depth and thickness of a confining unit underlying the site. Work was being performed by F.T. Fischer and Associates, GEOTECH Engineering Company and Phyllis Garman of Barcon, Inc. These consultants are sub-contracted by Alley, Young and Baumgartner, Inc., consulting engineers retained by BIP in 1980-81.

The following is a summary of geologic and hydrologic information derived from USGS, TDHE and BIP consultant reports.

Geology--

The site is located on the northeastern edge of a broad plateau in an area of the Western Highland Rim that is highly dissected by steep natural drainageways and stream valleys. The facility and waste management area are on a highland ridge that forms a surface-drainage divide between East Fork Cane Creek and Indian Creek.

The RCRA impoundment is a triangular reservoir constructed at the head of a steep drainageway and is maintained with an earthen berm about 20 feet tall. Material for constructing the berm came from on site. The berm has an established grass cover but has leaked. The leaks indicate probable erosion within the berm and have caused local conduits to develop. Surface water is diverted from entering the pond on the south and east by a drainage ditch cut around the perimeter. That ditch is deeply eroded (10 to 20 feet) in its northern reaches.

Run-off water coming from the land on the western side of the impoundment has cut an erosion ditch along the northern side of a hazardous chemicals storage area. Leachate has been observed discharging from soils beneath the concrete pad and flowing into the large impoundment via the erosion ditch. Sediment analysis from this ditch showed high concentrations of lead and chromium.

Two smaller impoundments are on the hill which rises from the east side on the drainageway that contains the RCRA impoundment. These smaller ponds are rectangular-shaped and interconnected. The water they receive was pumped through a hose from the RCRA impoundment when there was a danger of overflow. Soil excavated to construct the ponds was mounded along their northern perimeter. This soil mound contributed the only significant amount of surface run-off to the overflow ponds. Drainage on the hill where they are located appears to be good, dividing toward a natural drainageway on the east and to the previously-mentioned drainage ditch on the west. Slopes are gentle on the hill-top but moderate to steep on the sides. Total relief on site is about 30 feet.

According to the Geologic Map of Kimmins Quadrangle (Marcher and Barnes, 1965), the site is underlain by the St. Louis and Warsaw Limestones. Both units are deeply weathered to a sandy clay soil with blocks and nodules of chert, some of which contain fossil coral and bryozoans. Site observation shows the Tuscaloosa Gravel to be present as well. The geologic map shows that this unit, which consists of large, rounded chert gravels in a sandy or

tripolitic clay matrix, is present on many ridges in Kimmins Quadrangle, though unmapped. The Tuscaloosa is well exposed in the eroded drainage ditch mentioned before.

About 60 feet below the St. Louis residuum is the Ft. Payne Formation - a cherty and silty limestone underlain by shale. Total thickness is about 300 feet. The Lower Mississippian-age Ft. Payne is predominately a calcareous silica-stone that weathers to a cobbly and clayey residuum. The soils consist of red to tan, brown silty clays with numerous chert nodules ranging in size from gravel to boulders. The chert locally comprises up to 50 percent of the soil matrix. Drilling at the site was often slow and difficult due to the high silica chert content. Residual soils developed from the Ft. Payne are typically thin. The Ft. Payne is unconformably overlain by the Tuscaloosa.

No structural deformities are mapped in the geologic formations of the Kimmins Quadrangle. Bedrock jointing and solution features probably have caused some minor, localized deformation in the region.

A geologic section through the RCRA monitoring wells, prepared by BIP consultants is included as Figure 5.

Hydrology--

Surface drainage from the RCRA impoundment and overflow ponds is directed northward by way of a man-made diversion ditch and a natural drainageway. These drainage waters enter a northward-trending stream valley called Hinson Hollow. The topographic quadrangle map shows the stream head for Hinson Hollow originating about 200 feet east of the BIP property line in a natural drainageway. Topography suggests that a ground water divide, as well as a drainage divide, may exist between the impoundment, overflow ponds, and stream head.

Two aquifers are recognized at the site - the upper aquifer and the production well aquifer (consultant's terminology). The upper or water-table aquifer, occurs in residuum of the Ft. Payne Formation at depths of 25 to 45 feet. Direction of groundwater flow appears to be east-northeast. Based upon field permeability tests, hydraulic conductivities range from 1.6 x 10-4 cm/s to 8.8 x 10-4 cm/s.

The production well aquifer is much deeper than the Ft. Payne Formation. The only information about this lower zone is from the facility's water supply wells. The screened zone of water supply well No. 3 is over 200 feet below land surface and water level is usually 110 feet lower than the water level in the upper aquifer.

A pump test was performed in Fall 1985. The No. 3 production well was pumped at 250 gallons gpm for 24 hours. Data collected during the pumping test indicated no interconnection between the upper aquifer and the production well aquifer. However, EPA and TDHE contend that the results are invalid because the pumping test performed was inappropriate for the site's hydrologic conditions, and not enough well construction data was available for the No. 3 well.

Adequacy of the Hydrogeologic Characterization

The major sources of hydrogeologic information pertaining to BIP are the facility RCRA Part B, the facility ground water monitoring reports, monitoring well logs for the surface impoundment and borings done in the general area, and from USGS and TDHE reports. Collectively, these sources address the hydrogeology in both a general and site-specific manner. However, it is the consensus opinion of the Task Force that at the time of the inspection, BIP had not fully characterized the hydrogeology of the site, and that the following steps should be taken to resolve the hydrogeologic issues:

1. Install additional borings for defining the vertical and lateral extent of confining units. Delineate continuity, thickness, porosity, permeability, etc.

2. Prepare a stratigraphic section across the site that would delineate the water table, hydrogeologic units, perched zones, aquitards, etc.

3. Define the hydrologic characteristics of the uppermost and underlying aquifers across the site. Determine the flow rate,interconnection, etc.

4. Delineate any recharge/discharge zones to the uppermost aquifer. Determine if any ground water divides exist across the site.

5. Determine the potentiometric surface across the site and define the presence and magnitude of vertical gradients. Note any variability in ground water flow direction.

GROUND WATER MONITORING PROGRAM DURING INTERIM STATUS

Ground water monitoring at the BIP facility has been conducted under the State interim status regulations. The following is an evaluation of the monitoring program between November 1981, when the ground water monitoring provisions of the RCRA became effective, and May 1987 when the Task Force investigation was conducted. A summary of the compliance history for this facility has been included as Appendix D of this report.

Regulatory Requirements

Ground water monitoring at this site is now regulated by the Rules Governing Hazardous Waste Management in Tennessee, which are basically the equivalent of 40 CFR Part 265, Subpart F.

The State of Tennessee received Final Authorization to administer the RCRA hazardous waste program on February 5, 1985. At that time, the State regulations became enforceable in lieu of the Federal regulations. The State interim status ground water monitoring requirements are found at Tennessee Regulations Rule 1200-1-11-.05(6).

MONITORING WELL DATA

Surface Impoundment

Alley, Young and Baumgartner, Inc. filed for a waiver from the ground water monitoring requirements in October 1983. The consultant's contention was that the clayey nature of the soils would prevent any ground water migration. In February 1984, TDHE denied the waiver on the basis that the gravelly nature of the geologic formation underlying the site could be permeable to infiltration waters. The facility was then directed to submit a ground water monitoring plan. After several NOV's, Commission Orders and discussions between TDHE, EPA Region IV and the facility, a ground water monitoring system was installed in 1985.Four ground water monitoring wells were installed in April-October 1985. GWM-1 served as the upgradient well, and GWM-2, 3, and 4 were the downgradient wells (See Figure 3 for locations).

A report on the "Well Installation and Geohydrologic Testing" was issued in November 1985 detailing the results. According to the report, four borings were converted to observation wells after drilling was completed by inserting 1.5-inch schedule 40 PVC pipe with 10 or 20-foot lengths of 0.010 inch slotted well screen at the bottom of the hole. The annular spaces were filled with sand 1 to 17 1/2 feet above the top of the screen. A 2-foot seal of bentonite was placed on top of the sand and the remainder of the annulus was backfilled to ground surface with a cement/bentonite mixture. Protective steel casings with locking caps were placed over the well casings and grouted in place. Nitrogen gas pumping systems were dedicated for each well. In March 1986, TDHE requested that these pumps be removed because the samples collected with this method might not be representative or accurate. At the time of the Task Force evaluation, these pumps were still in place. Table 1 is a summary of well construction data. Well logs are included in this report as Appendix B.

TDHE informed BIP in March 1986 that the wells were not constructed as per the approved plan of April 1985. The sand packs which should extend no more than 2 feet above the screen, were extended 1 to 17 1/2 feet higher than the top of the screen. Also nitrogen gas pumping systems agitated the water column so much as to drive off volatile organic compounds during sampling.

Ground water sampling began in November 1985. Soon after, GWM-2 went dry and eventually wells 3 and 4 also stopped yielding enough water for sampling purposes. TDHE sited BIP with a NOV in October 1986 and requested more hydrogeologic data be obtained to determine what measures were needed to correct the situation. Consultants for BIP stated that the lack of water and low yield in the wells was because of the drought conditions at that time. The consultant's contention was that the wells yielded enough water for sampling during normal environmental conditions and would yield sufficient water again as soon as precipitation began to recharge the aquifer. Because of the drought conditions, BIP did not think it appropriate to drill any additional or deeper wells. A waiver on the time limitations (four quarterly samples taken within one year) was requested on the basis that no precipitation recharge to the aquifer precluded the possibility of contaminant migration.

In December 1986, TDHE responded to the waiver request by stating that it may be justified provided the existence of an adequate confining layer could be proven by borings and permeability tests. At the time of the Task Force

inspection, borings were being drilled to determine the hydrogeologic characteristics of the 'hard pan' layer underlying the site. Drilling was difficult due to cherty nodules in the hole.

During the course of the Task Force inspection, it was discovered that all wells contained substantial amounts of water. Because of the low conductivity of the water and the small diameter of the well bore, the water level probe utilized by the BIP sampling team could not read the water-level. The sensitivity of the probe was not enough to read the low conductivity of the ground water at the site (20 to 40 umhos/cm at 25 C).

The facility has been directed to remove the nitrogen gas systems in the wells and use bailers to collect samples on an accelerated schedule.

After reviewing the monitoring well data for the surface impoundment, some deficiencies were noted. The following is a summary of the deficiencies:

1. Sand packs are not intended to extend more than 2 feet above the screen in a monitoring well. Sand packs in the BIP wells range from 1 to 17 1/2 feet above the screen. This may allow for a dilution factor that could bias the water quality sampling results.

2. PVC is not recommended when organics are a contaminant. Teflon or stainless steel might be more appropriate well construction materials.

3. The diameter of the wells (1 1/2 inch) held the water level probe tightly against the borehole. This, along with the probe's insensitivity to low conductivities gave the impression that there was little or no water in the well. It is recommended that future wells be no less than 2-inch diameter and a more sensitive water level probe be used at the site.

Because of the erroneous water-level readings, a seasonal potentiometric map has not been prepared for this site. Task Force water level measurements indicated that GWM-1 is the upgradient well. However, there is not enough information available to determine if the downgradient wells are sufficient to immediately detect possible ground water contamination. Past water quality analyses indicate that upgradient well GWM-1 may have been impacted by the facility.

Production Wells

Three water supply wells exist on the BIP property, designated No. 1, 2 and 3. BIP consultants report them all as 225 feet deep with static water levels of 160-180 feet below ground surface. Yield in No. 1 (6" diameter) was reportedly 70-100 gpm. Yields in No. 2 and No. 3 (10" diameter) are reported to be 300 gpm. Well No. 1 is not operational. All three are cased in steel. Wells 2 and 3 have stainless steel screens in the lower 30-40 feet. All are backfilled with sand and puddled clay and protected from surface water by a 6'X 6'concrete slab. These wells were installed in 1960.

Water samples were taken from well No.3 in 1981. The drinking water standards were met or exceeded for lead, mercury and selenium. TDHE sampled wells 2 and 3 in November 1983 for metals. No parameter exceeded the drinking water standards for either well.

In October-November 1985, production well 3 was utilized in a 24-hour pumping test to determine if there was interconnection between the upper and lower aquifers. Results indicated that no connection existed between the aquifers. TDHE and EPA contend that the results were invalid because the pumping test performed was inappropriate for the site's hydrogeologic conditions and that there was not enough data available on well construction for well No.3.

Ground Water Sampling

The facility began their quarterly RCRA ground water monitoring program in November 1985. Quarterly analyses were subsequently taken in February and May 1986. The facility did not sample for all of the 40 CFR Part 265.92 (b)(1)(2) and (3) parameters during those three quarters (See Table 2). The facility did not analyze for TOX - total organic halogen until May 1986 and did not take the required replicates. The facility did not sample for nitrate until May 1986. Radium was not sampled for during these three sampling episodes. During the first year of sampling, the NIPDWS for chromium and mercury were met or exceeded in one or more of the monitoring wells, including the upgradient well.

GWM-2 was dry and could not be sampled during February or May. The fourth quarter sampling of October 1986 was not conducted due to an inadequate amount of water in wells GWM-2, 3, and 4.

In October 1986, TDHE issued a Notice of Viclation pertaining to the ground water monitoring system. The major violations cited were as follows:

1. The wells were not constructed as per the approved plans.

2. Samples were not collected as per the approved sampling and analysis plan in that the wells were not properly purged and samples were aerated during sampling.

3. The system failed to provide one upgradient and three downgradient wells capable of yielding ground water samples. GWM-2 was dry since February 1986 and GWM-3 and 4 were extremely low yielding. Not enough information was available to define a continuous confining layer underlying the site.

4. Parameters that exceeded the NIPDWS were not separately identified in a report to the Commissioner.

The facility was directed by TDHE to submit an adequate ground water monitoring plan within 30 days. In late October, BIP consultants answered the NOV, stating that lack of precipitation was the reason for little or no water in the downgradient wells. The consultants did not consider drilling additional wells because of the drought conditions, and requested a waiver on the time limitations (four quarterly samples within one year). TDHE responded by saying the waiver may be justified provided the existence of an adequate confining layer could be proven by borings and permeability tests. At the time of the Task Force inspection, borings and permeability tests were being conducted to determine this information.

It appears from all available historical water quality data the contamination of the ground water has occurred at BIP. The Task Force recommends that an assessment program be instituted to determine the horizontal and vertical extent of the contaminant plume(s).

BOSTON INDUSTRIAL PRODUCTS SAMPLING AND HANDLING PROCEDURES

During the inspection, samples were collected from four wells for analysis by the EPA contract laboratory. After The Task Force sampling, the facility went through their sampling procedures at the upgradient well. The Task Force observed the sample collection and handling procedures.

Samples are collected by Alley, Young and Baumgartner, Inc. personnel which are consultants to BIP. The sampling personnel closely followed the protocol established in the "Sampling and Analytical Procedures" prepared by Alley, Young and Baumgartner, Inc. A copy is included as Appendix C in this report.

The following is a summary of the sampling protocol followed by the sampling personnel:

a. Water levels are measured using a current water level indicator with probe. All measurements are recorded.

b. Wells are to be purged 1 1/2 to 3 well volumes using the dedicated sampling device in each well.

c. Connect air hose from the portable air tank to the air line on the well. Regulate flow to produce a steady even flow of water. Measure the flow rate and calculate volume of water to be purged. Depressurize the well and measure the water level.

d. Samples will be collected as soon as the well recharges by means of the dedicated sampling device. Flow should be regulated to produce a steady, even flow to prevent aeration of the sample.

e. Collect each sample for organic analysis first.

f. Each well will have its own dedicated hose of Tygon or equal material to prevent cross contamination. Each hose will have a removable cap to prevent dirt from entering the hose. Hose shall be flushed with deionized water.

Some comments on the sampling protocol used by BIP are:

1. Gloves should be worn during sampling and should be changed at each well.

2. The water level indicator was not sensitive enough to read the low conductivity water. A more sensitive meter is recommended.

3. The nitrogen gas displacement pump is a very awkward procedure to use in the field with one person and may be a possible source of contamination. The samples were aerated so badly that all volatiles could be driven off. Teflon bailers or bladder pumps are recommended for taking samples.

4. The Task Force recommends that wells be purged from 3 to 5 well volumes or to dryness. The purging procedure now used for the BIP wells may not be sufficient to remove all standing water.

5. VOA's were collected in a plastic bottle then poured into the VOA bottle. VOA samples should be collected directly into the VOA bottle to prevent aeration.

6. Equipment was rinsed with deionized water then wiped with a paper towel. Sampling equipment was carried in the back of an open pick-up. Sampling equipment should be wrapped in aluminum foil and not left exposed in the back of the pick-up.

In summary, the procedures utilized for ground water sampling at BIP are not adequate. The RCRA ground water sampling and analysis plan (SAP) is also not adequate to meet the requirements of 40 CFR Part 265.92 (a). These requirements state that the SAP must contain procedures and techniques for:

1. Sample collection
2. Sample preservation and shipment
3. Analytical procedures, and
4. Chain-of-custody control.

The SAP does not include a specific analytical procedure for each parameter or constituent which is analyzed or measured. Merely referencing EPA 600/4-79-020, latest edition, is not sufficient. Examples of the chain-of-custody records and sample analysis request sheets should be included in the SAP. The SAP should also discuss the Laboratory Quality Assurance/Quality Control (QA/QC) program that will be used in the field and lab. There is no reference to any measurements made in the field, such as pH, specific conductivity, temperature, etc. There is no mention that field, trip or equipment blanks are taken for QA/QC purposes. The SAP should include all of this information in order to comply with all regulatory requirements.

TASK FORCE SAMPLE COLLECTION AND HANDLING PROCEDURES

This section describes the well evacuation and ground water sampling procedures followed by Task Force personnel during the May 1987 site inspection. Samples were collected by an EPA contractor (Versar) to determine if the ground water contains hazardous waste constituents or other indicators of contamination.

Water samples were collected from wells GWM-1, 2, 3, and 4 at the surface impoundment (See Tables 3 and 4). The selection of these wells was based on location to provide areal coverage both up and down gradient at the RCRA unit.

Trip blanks were poured by Versar prior the the trip to the site. Field and equipment blanks were poured at the site during sampling. A duplicate was taken from well GWM-2 for QA/QC control.

All sample bottles and preservatives were provided by an EPA contractor laboratory (I-Chem). Samples were collected by the EPA sampling contractor using the following protocol:

a. Total depth of the wells is determined by using a stainless steel tape with a weighted bottom piece. Water level is determined by using a Watermarker water level indicator.
b. Height and volume of water column is calculated.
c. Calculate three well volumes.
d. Purge three well volumes or to dryness using a pre-cleaned Teflon bailer.
e. Upon initial opening of the well, the EPA sampling contractor monitors the open well for chemical vapors using an OVA.
f. Collect sample aliquot and make field measurements.
g. Fill VOA vials first, then fill the remaining sample containers in the order shown in Table 5.
h. Immediately place samples on ice in an insulated container after filling the bottles.

The first step in the ground water well sampling procedure was to measure the depth from a reference point at the well head. At BIP, that reference is a known elevation at at the top of the well casing. The EPA sampling contractor used a Watermarker water level to measure the depth of water. The tape was rinsed with hexane applied on a Kimwipe, then rinsed with organic free HPLC water. Water level measurements were made to within 0.01 foot.

The volume of water to be purged was then calculated. The column volume of a well is the volume of standing water in the well and is calculated using the depth-to-water measurement, total well depth (determined in the field with a well sounder) and casing radius.

For purposes of the Task Force, the column volume is multiplied by three to compute the purge volume. In all cases, standard field measurements (temperature, pH, specific conductivity) were taken intermittently prior to sampling.

The wells were purged by the EPA sampling contractor using a pre-cleaned Teflon bailer that was lowered into the well with Teflon-coated stainless steel cable. The purge water was evacuated into a 5-gallon bucket. The facility then disposed of the purge water into the water treatment system.

Before sampling, chemical vapor readings were taken from the wells. All readings were noted as less than 1.0 ppm.

Samples for metals were preserved in the field. Samples were packaged and shipped to the EPA Contract Laboratory on a daily basis. All samples were

shipped according to applicable Department of Transportation regulations (40 CFR Part 171-177). All water samples from the monitoring wells were considered "environmental" for shipping purposes.

LABORATORY EVALUATION

The off-site contract laboratory facility, Specialized Assays (SA), Nashville, Tennessee, that conducts the analytical analyses for the Subpart F Ground-Water Monitoring samples for BIP, Hohenwald, Tennessee, was evaluated on November 2, 1987. The laboratory is a subcontractor for the consulting engineering firm Alley, Young & Baumgartner, Inc. (AYB), Brentwood, Tennessee. Specialized Assays contracts the fecal coliform analyses out to Middle Tennessee Laboratories, Nashville, Tennessee, and the radiological analyses out to Controls for Environmental Pollution, Inc.(CEP), Santa Fe, New Mexico. These laboratories were not visited during the inspection. The SA laboratory was evaluated for its ability to produce quality data for those parameters required by Part 265.92(b)(1),(2),(3), and by the Tennessee Department of Health and Environment. See Table 7 for the parameters evaluated during the inspection at the contract laboratory.

Analytical equipment, sample handling, holding time, preservation techniques, methods and quality assurance procedures were examined for adequacy. Laboratory records were reviewed for completeness, accuracy and compliance with State and Federal requirements.

Ground-Water Sampling and Analysis Plan

The documents reviewed during the inspection were:

1. "Generic Quality Assurance Plan," SA, June 1986.

2. "Statement of Qualifications," SA.

The sample containers prepared by SA were prelabeled for the required parameters and shipped to the AYB. Premeasured preservatives for each sample were shipped in the sampling bottles or in small vials. The sample containers and preservatives meet the EPA requirements. SA periodically checks the sample preservation, where pH adjustment is required, after the samples arrive in the laboratory.

Sample containers, preservatives, and holding times were consistent with EPA requirements, except for the fecal coliform and radiological analyses. The samples for fecal coliform analyses did not meet the 6-hour holding time requirement, and the radiological samples were preserved after arriving at CEP. See Table II-1, Test Methods for Evaluating Solid Waste - Physical/ Chemical Methods, SW-846 (3rd Edition, 1986).

Field measurements (pH and temperature) conducted by AYB personnel were not observed by the laboratory auditor. Specific conductance was conducted on a single grab sample in the laboratory. Based on the requirements for detection monitoring (Part 265.93), the owner/operator must collect a sufficient volume of ground water to allow for the analysis of four separate replicates. The laboratory method used by SA was an approved method.

However, the specific conductance meter was not calibrated daily against a standard of known value, and the cell constant at 25° C had not been determined previously.

Regulatory Requirement: The cell constant must be determined prior to measuring the sample conductance, and the specific conductance meter/electrode system must be calibrated daily against a fresh standard that is near the expected sample conductance. See Method 9050, SW-846; Method 150, Standard Methods for the Examination of Water and Wastes (Standard Methods), 16th Edition (1985); or Method 150, Methods for Chemical Analysis of Wastes and Wastewater (EPA Methods), EPA-600/4-79-020, and all current revisions.

Samples for dissolved metals were not filtered on-site by AYB, but were shipped to the laboratory for filtration.

Regulatory Requirement: Samples for dissolved metals must be filtered on-site, preserved with HNO_3 to pH <2, and stored in dark bottles if silver analysis is conducted. See Table II-1, SW-846.

Laboratory Sample Analysis

If TOC samples cannot be analyzed immediately, preservation by lowering the sample pH to less than two (<2) is required. AYB was preserving the samples to meet this requirement to retard any biological action during shipping and prior to analysis. The inorganic carbon constituents are normally removed by lowering the sample pH, followed by purging with an inert gas, prior to measuring the TOC. This technique, used for total organic carbon (TOC) samples preserved with H_2SO_4, would cause volatiles to be stripped from the sample during the sample preparation step to removed inorganic carbon (CO_2) prior to measurement of the organic carbon. The method detection limit for TOC (approximately 1 mg/L) is at least one to two orders of magnitude above the concentration of the volatile organic components of the TOC. However, these volatiles should be detected in the VOA analysis. Therefore, the emphasis on organic contamination should be placed on the VOA results instead of the TOC data.

Samples for phenol analysis were preserved with H_2SO_4 to pH <2 and were analyzed by Method 510, Standard Methods. The contract laboratory did not raise the sample aliquot pH to 4 prior to the distillation step, and the color development was conducted at pH 7.0. This practice may result in data biased low for this parameter.

Regulatory Requirement: The approved procedures, (Method 420.1, Standard Methods for the Examination of Water and Wastewater, 14th Edition (1975); Method 9065, SW-846; and Footnote 25, 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants, Federal Register, June 30, 1986) require that the sample pH be raised to approximately 4 prior to distillation and color development at pH 10.

Nitrate analyses were conducted by a non-approved specific ion electrode method. The method performance below 10 mg/L was poor and appeared to produce data that were questionable .

Regulatory Requirement: An approved method such as Method 9200, SW-846; Method 353.3, EPA Methods; or Method 418C, Standard Methods, should be used.

Samples for oil and grease were collected in glass quart jars and analyzed by Method 503A, Standard Methods. The analysis was conducted on a 500 ml aliquot which could cause a negative bias.

Regulatory Requirement: Collect a representative sample in a wide-mouth glass bottle for oil and grease determination and do not subdivide in the laboratory. See Method 503, Standards Methods, or Method 413.1, EPA Methods.

Aqueous samples for mercury analysis were not carried through the heated potassium persulfate digestion step. This could cause a negative bias if organic-mercurials were present.

Regulatory Requirement:

Aqueous samples must be digested with potassium persulfate and heated for 2 hours in a water bath at 95°C. See Method 7470, SW-846, Method 245.1, EPA Methods; or Method 303F, Standard Methods.

Organic analyses for volatile organics, base-neutral/acids and pesticides were conducted by the Contract Laboratory Protocol (CLP) or by Methods 608, 624 and 625, EPA Methods. GC/MS system performance checks were acceptable, except for the July sampling event. The GC/MS system was not calibrated every 12 hours as required in the quality assurance requirements in these methods. The deviation would not have a major impact on the July data reported, as the samples analyzed after the 12 hours were field and trip blanks and no contaminants were detected.

Quality Assurance and Data Documentation

The SA laboratory has established a formal quality assurance (QA) program that consists of a QA plan, standard operating procedures (SOP) and includes the use of duplicates, spikes, and reference standards to verify the quality of data for each parameter analyzed. Instrument calibration and maintenance records were maintained, and temperatures of regulated devices were checked and documented. All raw data, quality control records and calculations were documented and maintained on file as required. Method detection limits (MDL) were determined according to procedures in EPA's 40 CFR Part 136, Appendix B. When matrix interferences or some other problem prevents the routine reporting of MDLs, the laboratory reports a Practical Quantitation Limit (PQL), which is proper protocol as stipulated in the guidelines for EPA's Contract Laboratory Program for reporting data with sample matrix interferences.

Summary

Based on the overall findings, the contract laboratory has the capability to provide acceptable quality data for the ground-water monitoring program. Laboratory filtration of samples for dissolved metals could cause biased data for the dissolved parameters listed in Table 7. The deficiencies noted for specific conductance, phenol, nitrate, mercury, and oil and grease could cause the results to be questionable and subsequent failure of the Student's t Test. The deficiencies noted for fecal coliform holding time and radiological

preservation would cause the data to be questionable. The deficiencies noted for TOC and organics would have no major impact on data quality.

All other analytical data for parameters listed in Table 7 would be acceptable for the Subpart F, Ground-Water Monitoring.

MONITORING DATA ANALYSIS

Inorganic Elements/Compounds

The contract laboratory data indicated that fifteen elements and compounds were detected in samples collected from the monitoring wells at BIP. None of the parameters analyzed for exceeded the National Interim Primary Drinking Water Regulation limits. The Secondary Drinking Water Regulation limit of 50 ug/l was exceeded in well 1 (860 ug/l) and well 3 (600 ug/l). Lead concentrations ranged from not detected in well 4 to 26 ug/l in well 1. Analytical data for zinc and chromium is suspect or unusable because of laboratory error.

POC, POH, Chlorinated Compounds

The majority of this analytical data is considered suspect or unusable because the analytical results could not be verified, or holding times were exceeded or because of laboratory error.

Extractable Organic Compounds

The majority of the contract laboratory data was not usable because of laboratory error. Resampling and reanalysis are necessary for verification.

Purgeable Organic Compounds

Again, as with the extractable data, the majority of the purgeable data was not usable. Blank contamination was a factor. Most actual values given are estimated. Any further discussion of the results would be pointless.

REFERENCES

Civil Litigation Report: Prepared by US-EPA Region IV ORC for the Department of Justice, April 1986.

Pump Test Results: Prepared by Garmon Geologic Consulting for Boston Industrial Products, December 1985.

Well Installation and Geohydrologic Testing: Prepared by Geotek Engineering Company for Boston Industrial Products, November 1985.

Waste Stream Inspection Report for the Dana-Boston Industrial Plant; prepared by US-EPA Region IV, ESD, July 1985,

Revisions to Boston Industrial Product's Part B Application: February 1985.

Part B Application: Prepared by Alley, Young and Baumgartner, Inc. for Boston Industrial Products, September 1984.

Letter from Alley, Young and Baumgartner, Inc. to the Tennessee Division of Solid Waste Management regarding production wells at the Boston Industrial Products Plant.

Geologic Map of Kimmins Quadrangle: Marcher and Barnes, 1965.

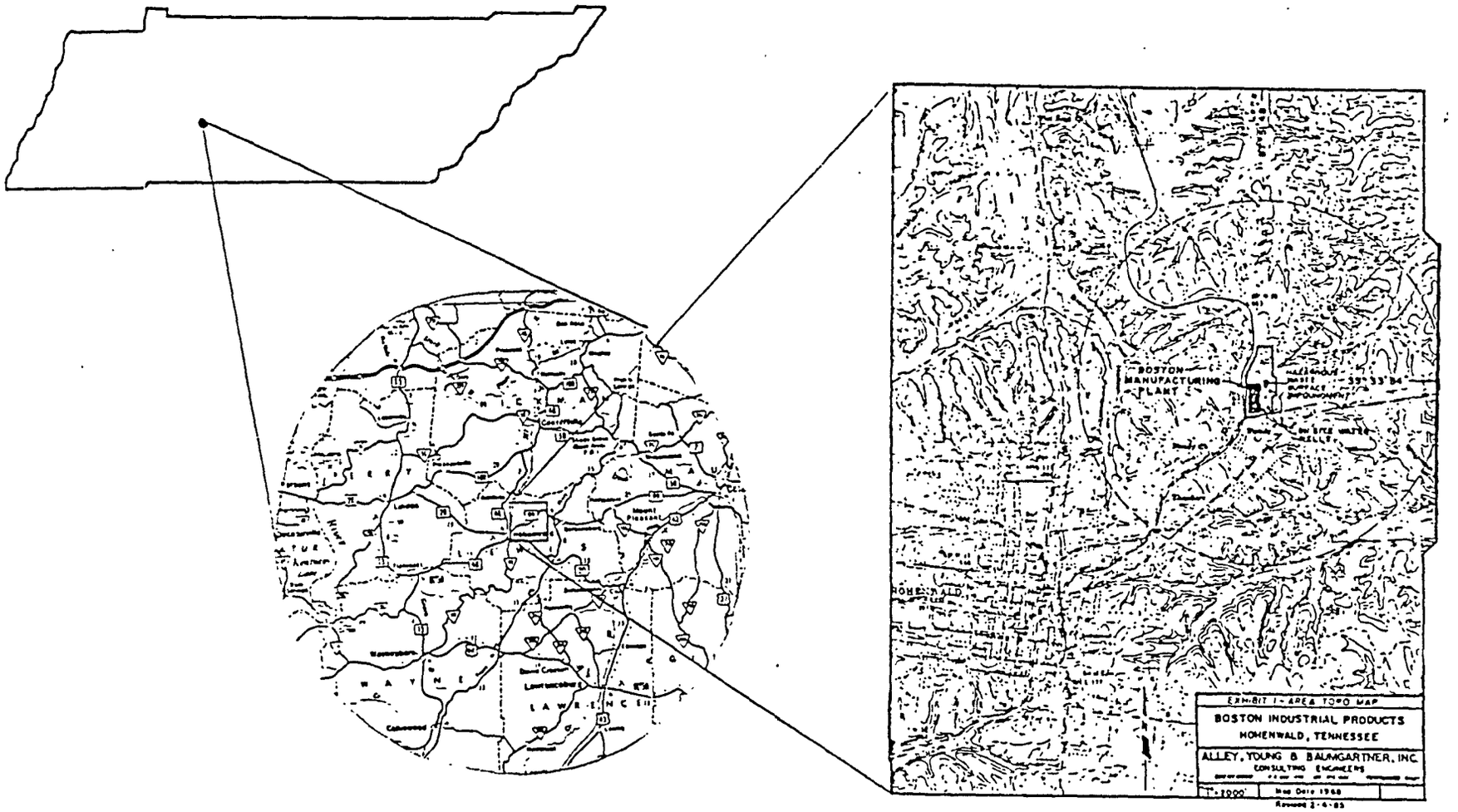
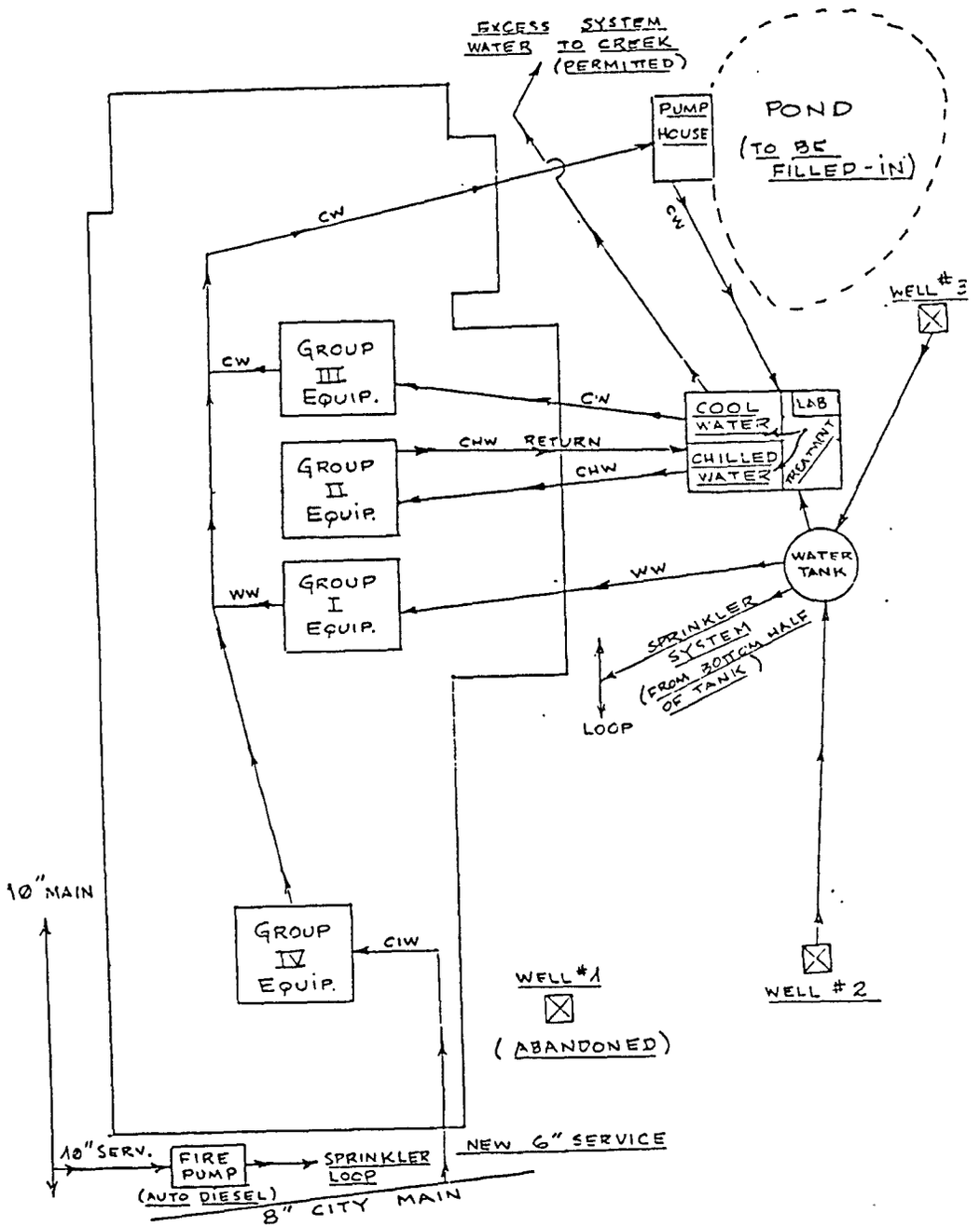


Figure 1
Facility Location Map
Boston Industrial Products
Hohenwald, Tennessee



Group I - Equipment that runs off well water - boiler, vulcanizer for food grade hose, etc.

Group II - Equipment that requires chilled water - extruder cooling troughs, mill drums, slab cooling, etc.

Group III - Equipment that uses cool water - vulcanizer wash water, heat zone temperature controllers on extruder barrels, air compressor cooling, lead press and lead extruder cooling streams, etc.

Group IV - Facilities and equipment supplied by City of Hohenwald municipal water supply - plant personnel wash basins and shower rooms, laboratory wash basins.

Figure 2
New Water System
Boston Industrial Products
Hohenwald, Tennessee

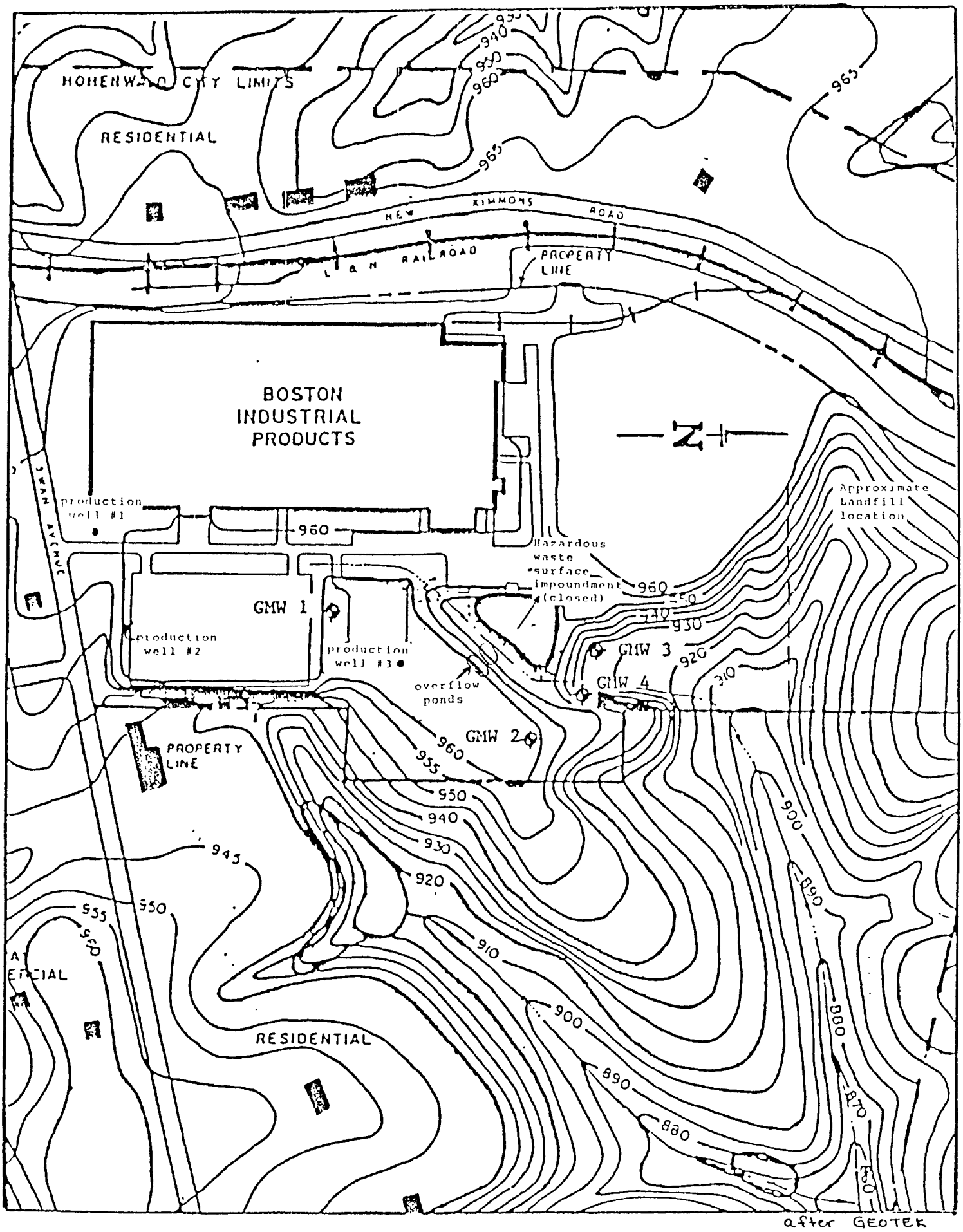
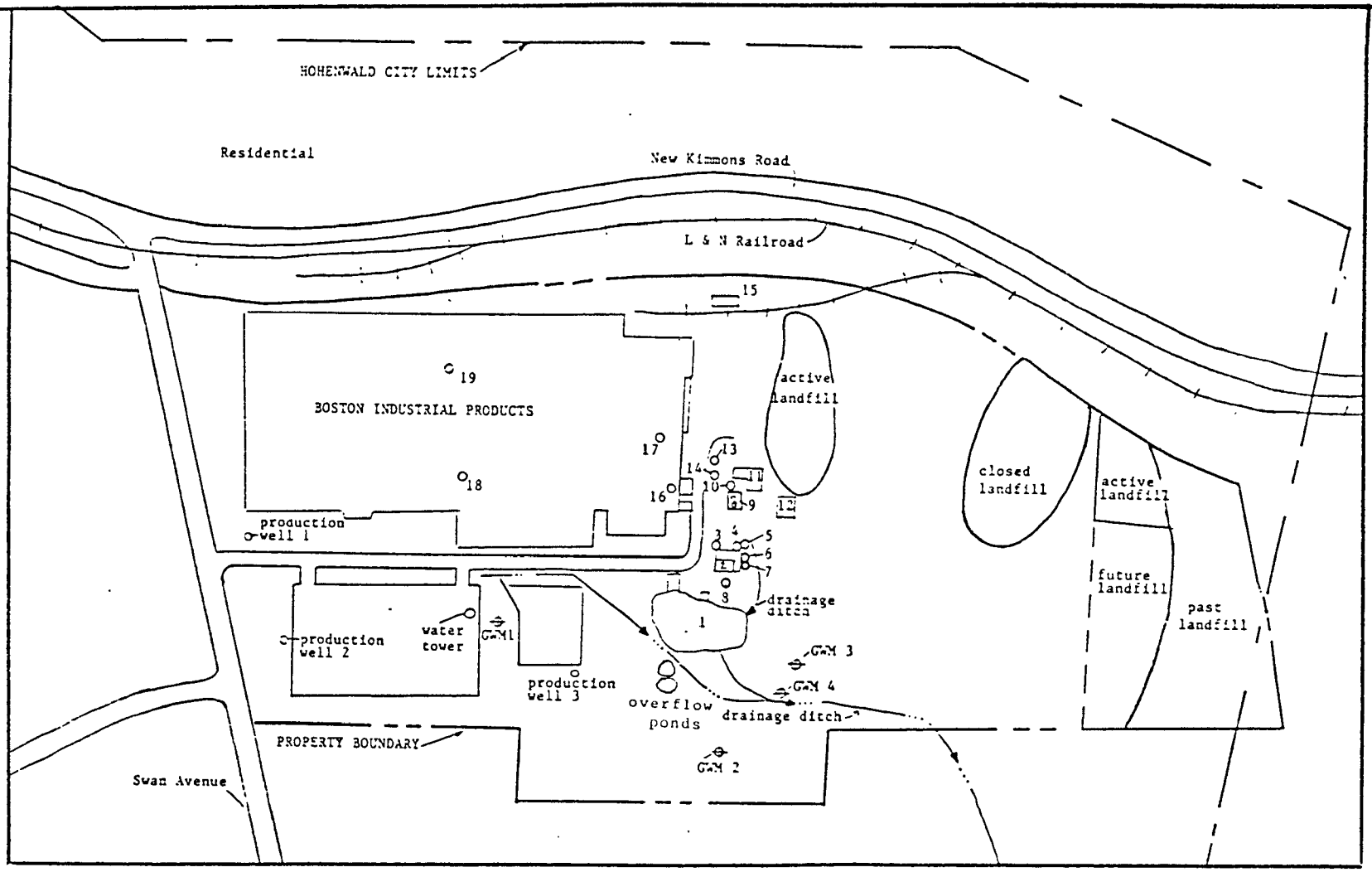


Figure 3
Facility Map with Well Locations
Boston Industrial Products
Hohenwald, Tennessee



LEGEND

1. Pond-approx.1,000,000 gal.
2. Flammable liquid mix room.
3. Toluol storage tank-4000 gal.
4. Alcohol storage tank-1500 gal.
5. MEK storage tank-500 gal.
6. Floor cleaner storage tank-2500 gal.
7. DDP storage tank-500 gal.
8. Naptha storage tank-8000 gal.
9. No.2 fuel oil storage tanks-2@30000 gal.
10. Verisol storage tank-250 gal.
11. Oil drum storage-55 gal. drums
12. Oil and Hazardous drum storage-55 gal.drums.
13. Gasoline tank-1000 gal.
14. Gasoline dispenser.
15. Process oil storage tanks-4@12000 gal. each.
16. Drum storage-55 gal. drums.
17. Process oil day tanks-4@1300 gal. total.
18. Hydraulic oil storage-500 gal.
19. Hydraulic oil storage-4000 gal.

Figure 4
Location of Potential Solid Waste Management Units
Boston Industrial Products
Hohenwald, Tennessee

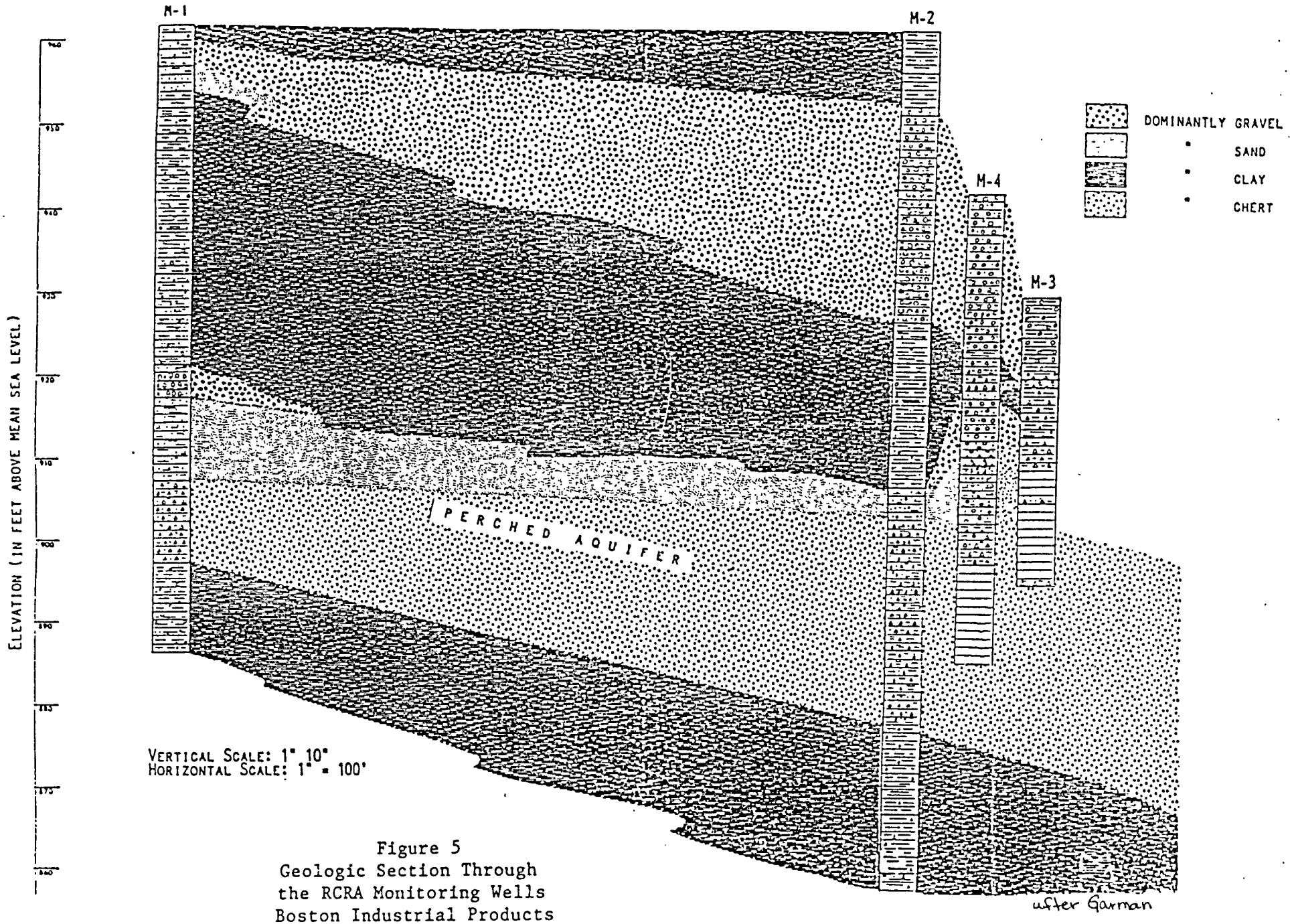


Figure 5
Geologic Section Through
the RCRA Monitoring Wells
Boston Industrial Products
Hohenwald, Tennessee

TABLE 1

MONITORING WELL CONSTRUCTION DATA

Well Number	Gradient	Date Drilled	Total Depth Drilled (ft)	Well Depth (ft)	Casing/ Screen Material	Screened Interval (ft)	Sand Pack Length	Sand Pack Amount above top of csg	Elevation relative to MSL
GWM-1	up	Apr '85	75.5	75.5	1½" PVC/ 0.010" PVC	55.3-75.3	30	10	962.96
GWM-2	down	Apr-Oct '85	103.0	85.0	"	65-85	37.5	17.5	961.50
GWM-3	down	Oct '85	35.1	35.0	"	25-35	15	5	942.45
GWM-4	down	Oct '85	57.0	54.0	"	34-54	21	1	929.60

TABLE 2
RCRA GROUND WATER MONITORING PARAMETERS

*Category 1	**Category 2	***Category 3
Arsenic	Chloride	pH
Barium	Iron	Specific Conductance
Cadmium	Manganese	TOC
Chromium	Phenols	TOX
Fluoride	Sodium	
Lead	Sulfate	
Mercury		
Nitrate (as N)		
Selenium		
Silver		
Endrin		
Lindane		
Methoxychlor		
Toxaphene		
2,4-D		
2,4,5-TP Silvex		
Radium		
Gross Alpha		
Gross Beta		
Turbidity		
Coliform Bacteria		

*EPA Interim Primary Drinking Water Standards
**Ground Water Quality Parameters
***Ground Water Contamination Indicator Parameters

All parameters listed above are to be monitored quarterly for one year to establish background concentrations for each parameter. Four replicate measurements are to be taken for Category 3 parameters for the upgradient well during each sampling event for this period. After the first year, Category 3 parameters are to be monitored semi-annually, and Category 2 parameters are to be monitored annually.

TABLE 3
SAMPLE COLLECTION DATA

Traffic No.	Sample Point	Date	Time	Parameter Sampled
MQ981	GWM-1	5-12-87	1315	VOA, POC, POX, Extractable organics, Total and Dissolved Metals
MQ982	GWM-2	5-13-87	0930	"
MQ983	GWM-2 dup.	5-13-87	0930	"
MQ984	GWM-3	5-13-87	1300	"
MQ985	GWM-4	5-13-87	1425	"
MQ986	field blank	5-13-87	1650	"
MQ987	equipment blank	5-13-87	1630	"
MQ989	trip blank	5-09-87	1030	"

TABLE 4
FIELD MEASUREMENTS

Well Number	Date Sampled	Water Level (in ft from top of csg)	Total Depth of well (in feet)	Gallons Purged	Time	pH	Temp. °C	Specific Cond. (umhos)	OVA (ppm)	Turbidity NTU	Remarks
GWM-1	5-12-87	51.71	75.63	3.0	1227 1248 1536	5.78 5.75 5.48	18.7 18.4 21.3	45.4 45.0 38.0	1.0	188	well not locked; inner casing coated with orange clay; pulled inner casing out and sampled with Teflon bailer.
GWM-2	5-13-87	57.19.	84.82	5.0	1621 0916 0932	5.71 4.98 5.04	18.5 20.0 18.0	52.0 35.4 34.6	1.0	19	purged 5-12-87; sampled 5-13-87; pulled inner casing out and sampled with Teflon bailer.
GWM-3	5-13-87	21.49	35.53	5.5	1043 1124	5.39 5.21	19.0 19.0	56.5 33.9	1.0	18	pulled inner casing out and sampled with Teflon bailer.
GWM-4	5-13-87	37.0	53.98	6.5	1335 1414	4.6 4.12	18.0 19.0	34.6 28.2	1.0	15	pulled inner casing out and sampled with Teflon bailer.

TABLE 5
ORDER OF SAMPLE COLLECTION,
BOTTLE TYPE AND PRESERVATIVE LIST

Parameter	Bottle	Preservative
Volatile Organic Analysis (VOA)	2 40-ml VOA vials	
Purgeable Organic Carbon (POC)	1 40-ml VOA vial	
Purgeable Organic Halogens (POX)	1 40-ml VOA vial	
Extractable Organics	3 1-liter amber glass	
Total Metals	1 1-liter plastic	HNO_3
Dissolved Metals	1 1-liter plastic	HNO_3

TABLE 6
HWSWTF ANALYTICAL DATA SUMMARY
BOSTON INDUSTRIAL PRODUCTS
HOHENWALD, TENNESSEE

	WELL 1	WELL 2	WELL 2 (dup.)	WELL 3	WELL 4	Field Blank	Equip. Blank	Trip Blank
	05/12/87	05/13/87	05/13/87	05/13/87	05/13/87	05/13/87	05/13/87	05/09/87
INORGANIC ELEMENT/COMPOUND	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
SILVER	--	--	--	5	5	6	--	--
BORON	NA	NA	NA	NA	NA	NA	NA	NA
BARIUM	74	--	--	34	--	--	--	--
CADMIUM	1	--	--	--	--	--	--	--
COPPER	11	--	--	--	--	--	9	--
MOLYBDENUM	NA	NA	NA	NA	NA	NA	NA	NA
NICKEL	98	--	--	--	--	--	--	--
LEAD	26	5	--	10	--	--	--	--
STRONTIUM	NA	NA	NA	NA	NA	NA	NA	NA
TELLURIUM	NA	NA	NA	NA	NA	NA	NA	NA
TITANIUM	NA	NA	NA	NA	NA	NA	NA	NA
YTTRIUM	NA	NA	NA	NA	NA	NA	NA	NA
ZINC	98	26	23	44	--	--	--	--
ZIRCONIUM	NA	NA	NA	NA	NA	NA	NA	NA
MERCURY	--	--	--	0.8JN	0.7JN	--	--	--
ALUMINUM	2100	170	130	1100	82	--	69	NA
MANGANESE	860	6	5	600	9	--	--	--
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
CALCIUM	6.4	0.85	0.86	4.4	0.77	--	--	--
MAGNESIUM	0.56	0.22	0.23	0.68	0.39	--	--	--
IRON	15J	0.77J	0.53J	6.9J	0.42J	0.05J	0.06J	--
SODIUM	3.8	5.1	5.1	6.0	5.0	0.20	0.28	--
	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
CHROMIUM,HEXAVALENT	NA	NA	NA	NA	NA	NA	NA	NA
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
POTASSIUM	0.70	--	--	0.72	--	--	--	--
GENERAL ORGANIC PARAMETERS	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
PURGEABLE ORGANIC CARBON	0.04	0.02	0.05	0.03	0.03	0.02	0.06	0.06
	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
PURGEABLE ORGANIC HALOGEN	NA	NA	NA	NA	NA	NA	11	34
SELECTED CHLORINATED COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
2,4-D	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR
2,4,5-TP	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR
2,4,5-T	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR	0.1UR
CHLOROBENZILATE	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR	1.0UR
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
DI-N-BUTYLPHTHALATE	--	--	--	2JN	--	--	--	--

TABLE 6
HWGWTF ANALYTICAL DATA SUMMARY
BOSTON INDUSTRIAL PRODUCTS
HOHENWALD, TENNESSEE

	WELL 1	WELL 2	WELL 2 (dup.)	WELL 3	WELL 4	Field Blank	Equip. Blank	Trip Blank
	05/12/87	05/13/87	05/13/87	05/13/87	05/13/87	05/13/87	05/13/87	05/09/87
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
PHENOL	--	--	--	--	--	--	6J	--
2,6-DICHLOROPHENOL	10UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR
3,3'-DIMETHYLBENZIDINE	100UR	100UR	100UR	100UR	100UR	100UR	100UR	100UR
DI-N-PROPYLNITROSAMINE	10UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR
DIBENZO(A,E)PYRENE	10UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR
DIBENZO(A,H)PYRENE	10UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR
DIBENZO(A,J)PYRENE	10UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR
METHAPYRILENE	50UR	50UR	50UR	50UR	50UR	50UR	50UR	50UR
N-NITROSODI-N-BUTYLAMINE	10UR	10UR	10UR	10UR	10UR	10UR	10UR	10UR
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
METHYL ETHYL KETONE	10UR	10UR	10UR	10UR	10UR	10UR	260J	320J
TRANS-1,2-DICHLOROETHENE	--	--	--	5	7	--	--	--
CHLOROFORM	--	--	--	--	--	1J	--	--
TRICHLOROETHENE(TRICHLOROETHYLENE)	--	--	--	7	7	--	--	--
TOLUENE	--	1JN	--	--	--	--	--	--
ACROLEIN	4JN	--	--	--	--	--	--	--
ACRYLONITRILE	8JN	--	--	--	--	--	--	--
ISOBUTYL ALCOHOL	50UR	50UR	50UR	50UR	50UR	50UR	300UR	300UR
1,4-DIOXANE	190J	5000UR	5000UR	5000UR	5000UR	5000UR	30000UR	30000UR
CROTONALDEHYDE	50UR	50UR	50UR	50UR	50UR	50UR	300UR	300UR

****

FOOTNOTES

NA - NOT ANALYZED
J - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
-- - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED
U - MATERIAL WAS ANALYZED FOR BUT NOT DETECTED. THE NUMBER IS THE MINIMUM QUANTITATION LIMIT
R - QUALITY CONTROL INDICATES THAT DATA ARE UNUSEABLE, COMPOUND MAY OR MAY NOT BE PRESENT
RESAMPLING AND REANALYSIS IS NECESSARY FOR VERIFICATION, THE VALUE IS THAT REPORTED BY THE LABORATORY

Table 7

Parameters Characterizing the Suitability of the Ground-Water as a Drinking Water Supply Appendix III

Arsenic	Endrin
Barium	Lindane
Cadmium	Methoxychlor
Chromium	Toxaphene
Fluoride	2,4-D
Lead	2,4,5-TP (Silvex)
Mercury	Gross Alpha
Nitrate (as N)	Gross Beta
Selenium	Fecal Coliforms
Silver	Gross Alpha

Parameters Establishing Ground-Water Quality

Chloride	Iron
Manganese	Sodium
Phenols	Sulfate

Nickel

Parameters Used As Indicators of Ground-Water Contamination

Specific Conductance	Total Organic Halogen
pH	Total Organic Carbon

Parameters Required by Tennessee Department of Health and Environment

Trichloroethylene	Toluene
2-Butanone	Oil & Grease

Dissolved Metals

Iron	Manganese
Sodium	Sodium
Arsenic	Barium
Cadmium	Chromium
Lead	Mercury
Selenium	Silver

Nickel

APPENDIX A

Task Force Analytical Results

Boston Industrial Products
Hohenwald, Tennessee

Due to size, the raw data is not included in this report. A copy of the data can be requested from:

EPA, Region IV
Residuals Management Branch
Waste Compliance Section
345 Courtland Street, N.E.
Atlanta, Georgia 30365

(404) 347-7603

8321 OAK RIDGE HIGHWAY • KNOXVILLE, TN 37931 • 615/690-0128
GEOTEK
ENGINEERING COMPANY

OBSERVATION WELL INSTALLATION DATA

Date: 5-1-85 Installed by: Ronald Ray

Observation Well No: 1 Inspected by: Others

Drilling Method: Air Rotary

Drilling Fluid: Water

Observation Well Screen: 1.5-in. Schedule 40 PVC, 0.010-in. slotted.

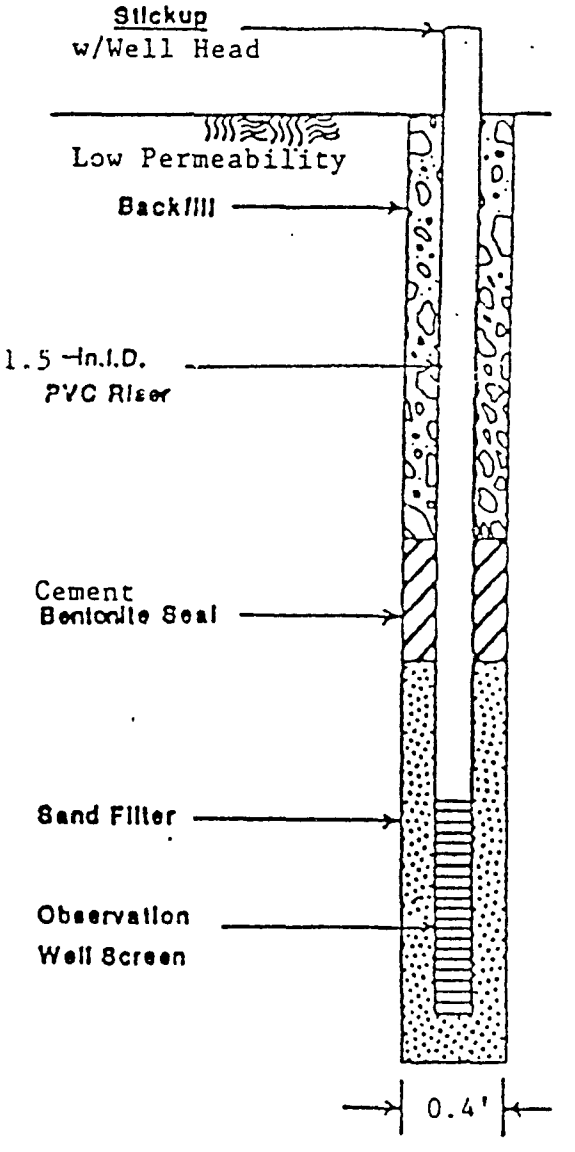
Method of Development: Surged with formation water, approximately one hour.

STRATIGRAPHY

Soil Type	Depth
Clay, Sandy	0.0'-4.0'
Sand, Clayey	4.0'-8.0'
Clay, Sandy	8.0'-42.0'
Gravel	42.0'-45.0'
Sand & Chert	45.0'-65.0'
Clay, Sandy	65.0'-75.5'

WATER LEVEL READINGS

Date	Depth Below Well Head	Elevation*
10-22-85	56.2'	
10-23-85	55.1'	
10-24-85	55.3'	
10-29-85	55.5'	
10-30-85	55.4'	
10-31-85	55.4'	



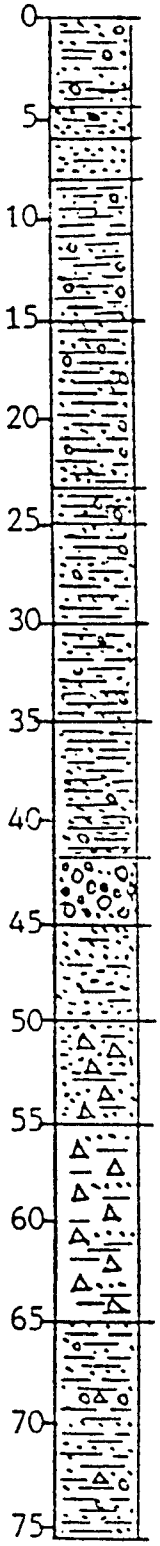
Elev.*	Depth
	(1.2')
	0.0'
	43.3'
	45.3'
	55.3'
	75.3'
	75.3'

Comments:

*Elevations are not presently available.

DOCKET NO. B-32-26

Monitoring Well #1 - Boston Industrial Products, Hohenwald, TN



Interval(feet)	Description
0 - 4	Clay, sandy, medium to coarse to very coarse grained quartz sand, subangular to subrounded, with scattered larger subrounded chert grains and rounded pebbles of chert & quartz; poorly sorted; slightly moist to dry; brown to more reddish-brown at 3 feet.
4 - 6	Sand, clayey; coarse-grained, subangular, with sub-rounded pebbles of chert & quartz; poorly sorted; slightly moist to dry; reddish-brown.
6 - 8	Sand, clayey; coarse-grained to very coarse grained, subangular to subrounded, poorly sorted; slightly moist to dry; yellowish-brown to brownish-red.
8 - 15	Clay, sandy; medium- to coarse-grained quartz sand, sub-rounded, with few subangular, scattered chert pebbles; poorly sorted; slightly moist; yellowish-brown to reddish-brown.
15 - 23	Same, with scattered subrounded chert & quartz pebbles, poorly sorted; slightly moist; reddish-brown.
23 - 25	Same, but yellowish-brown.
25 - 30	Clay, sandy; medium-grained quartz & chert sand, sub-angular to subrounded, with scattered larger subrounded chert & quartz pebbles; poorly sorted; moist; brown.
30 - 35	Same, more clayey at 33-35 feet.
35 - 42	Same. but brown to yellowish-brown.
42 - 45	Gravel, chert & quartz, subangular to subrounded, with matrix of medium- to coarse-grained quartz sand; poorly sorted; wet; yellowish-brown; WATER at 45 feet.
45 - 50	Sand, clayey, very fine grained, subrounded, with some scattered coarser grains of chert & quartz, subrounded, medium-sorted, wet; yellowish-brown.
50 - 55	Sand, very clayey; and bedded chert; sand, medium-grained, subangular, medium-sorted; yellowish-brown; wet. Very tough to drill; auger coupling broke.
55 - 65	Chert, bedded, with mixed sandy clay, sand fine- to medium-grained, subrounded, medium-sorted; yellowish-brown; very wet. Very little return; tough to drill.
65 - 75.5	Clay, sandy, fine- to medium-grained, subrounded, medium-sorted; with angular chert cobbles; yellowish-brown; wet; Clay somewhat plastic.

Total depth = 75.5 feet

Water level after drilling complete & day after = 29.9 feet.

DOCKET NO. B-32-14

8321 OAK RIDGE HIGHWAY • KNOXVILLE, TN 37931 • 615/690-0128
GEOTEK
ENGINEERING COMPANY

OBSERVATION WELL INSTALLATION DATA

Date: 9-25-85 Installed by: Tom Huffaker

Observation Well No: 2 Inspected by: Others

Drilling Method: Air Rotary

Drilling Fluid: Water

Observation Well Screen: 1.5-in. Schedule 40 PVC, 0.010-in. slotted.

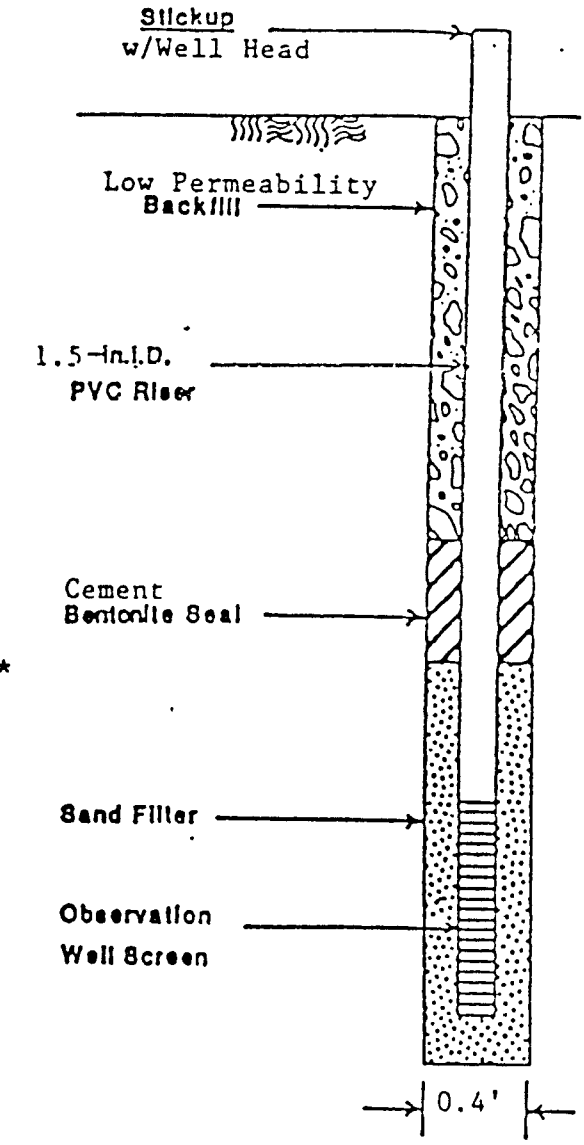
Method of Development: Surged with formation water, approximately one hour.

STRATIGRAPHY

Soil Type	Depth
Clay with Silt & Chert	0.0'-85.0'

WATER LEVEL READINGS

Date	Depth Below Well Head	Elevation*
10-22-85	64.8'	
10-23-85	62.1'	
10-24-85	62.6'	
10-29-85	62.4'	
10-30-85	62.3'	
10-31-85	62.5'	



Elev.*	Depth
	(1.2')
	0.0'
	45.5'
	47.5'
	65.0'
	85.0'
	85.0'

Comments:

*Elevations are not presently available.

DOCKET NO. B-32-27

Monitoring Well #2 - Boston Industrial Products, Hohenwald, TN

Interval(feet)	Description
0 - 9	Clay, sandy, (fill) medium- to coarse-grained quartz, with scattered subrounded quartz pebbles, poorly sorted; yellowish-brown with some iron staining. (Using water to drill)
9 - 20	Gravel, clayey; quartz & chert, subrounded to subangular, poorly sorted, white to yellow, and brown to reddish-brown.
20 - 35	Gravel, clayey; chert, from very coarse grains to pebbles, subrounded to subangular; poorly sorted; pebbles white to brown in yellowish-brown matrix. (Set 34 feet of 6" ID PVC casing to stabilize side walls of drill hole).
35 - 55	Clay, sandy, with ¼" to 1" diameter chert & quartz gravel, well-rounded; poorly sorted; very friable; sand, fine- to medium-grained; yellowish-brown; gravel, very light gray, reddish-brown, & light bluish gray.
55 - 59	Sand, clayey, fine- to coarse-grained quartz & chert; yellowish-brown; with coarse chert gravel, angular, poorly sorted; reddish-brown to light bluish gray. (Ran in-situ permeability test on 35- to 59-foot interval. results = 2.1 X 10^{-7}cm/sec).
59 - 69.5	Chert, silty, sandy, mixed with tight clay; medium- to coarse-grained to very coarse grained with scattered pebbles; angular; poorly sorted; gray, bright red, & bright yellow. (Using air rotary; very little return & very difficult to drill). WATER at approx. 1.5 gpm.
69.5- 74	Same, with some iron cementation. Water decreased at 73-74 feet. (Drilling fluids did not "mix" in pond water & appeared to be denser (sank to bottom)).
74 - 79	Same, but not as cherty; less water.
79 - 83.5	Same, with higher percentage of clay and silt. Hard to drill (chert) at 81 and 83 feet. Water at approx.0.5gpm.
83.5- 95	Clay, cherty; with quartz & chert gravel, well rounded, partially devitrified, some with iron streaks; light- to medium-gray, brown, & yellowish-brown. Water circulating at approx. 4.5gpm.
95 - 103	Same, with smaller pieces returned. Water circulation poor.

DOCKET NO. B-32-19

8321 OAK RIDGE HIGHWAY • KNOXVILLE, TN 37931 • 615/690-0128
GEOTEK
ENGINEERING COMPANY

OBSERVATION WELL INSTALLATION DATA

Date: 10-7-85 Installed by: Tom Huffaker

Observation Well No: 3 Inspected by: Others

Drilling Method: Air Rotary

Drilling Fluid: None

Observation Well Screen: 1.5-in. Schedule 40 PVC, 0.010-in. slotted.

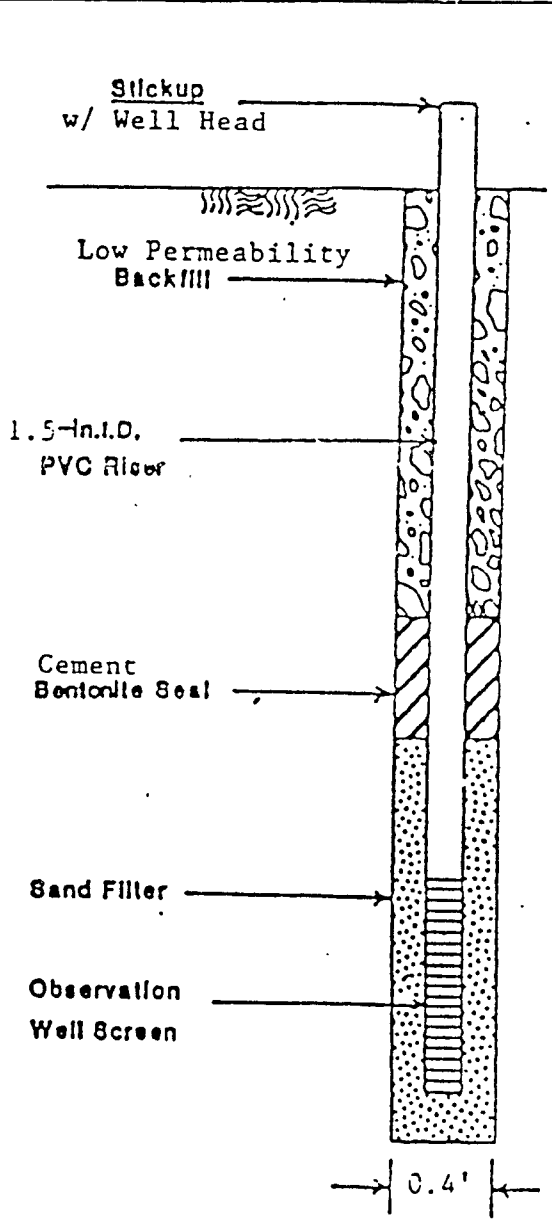
Method of Development: Surged with formation water, approximately one hour.

STRATIGRAPHY

Soil Type	Depth
Clay w/Chert & Silt	0.0'-9.5'
Clay and Chert	9.5'-15.0'
Clay w/Chert & Silt	15.0'-20.0'
Clay w/Chert	20.0'-35.0'

WATER LEVEL READINGS

Date	Depth Below Well Head	Elevation*
10-22-85	28.2'	
10-23-85	28.1'	
10-24-85	25.9'	
10-29-85	26.1'	
10-30-85	26.2'	
10-31-85	26.4'	



Elev.*	Depth
	(1.4')
	0.0'
	18.0'
	20.0'
	25.0'
	35.0'
	35.0'

Comments:

*Elevations are not presently available.

PROJECT NO. B-32-29

2720 NOLENSVILLE ROAD • NASHVILLE, TENNESSEE 37211 • (615) 256-6891
GEOTEK
ENGINEERING COMPANY

Log Of Boring

Job No. 84-1569

Client Alley, Young and Baumgartner
Project Boston Industrial Products

Boring No 3 Date 10-7-85 Sheet 2 of
Type of Boring Roller/Air Rig B-53
Casing used ____ Size 6" Drilling mud used
Boring begun ____ Boring completed
Ground Elevation ____ referred to
Dat
Field Party: Huffaker, Jr. & Lewis

Location of Boring	
Water Level	20.3'
Time	
Date	10-7-85

Rock Data						Soil Data					
Length cored Ft	Recovery Ft	% Recovery	Drilling Time, min.	% Drill Water Return	R Q D %	Sample Type	Sample No	Blows per 6" Drive	N-Value	DEPTH IN FEET	GRAPH	Description of soil or rock & notes on drilling operation
						N	320.0	50/3"		20		Tan silty clay w/chert (wet) Spoon refusal @ 20.3
						B	325.0	50/1"		25		Tan silty clay (moist) spoon refusal @ 25.1" Bag sample
						N	335.0	12 50/4"		35		Sandy silty chert spoon refusal @ 35.10', end of boring

DOCKET NO. B-32-21

2720 NOLENSVILLE ROAD • NASHVILLE, TENNESSEE 37211 • (615) 256-6891
GEOTEK
ENGINEERING COMPANY

Log Of Boring

Job No. 84-1569

Client Alley, Young and Baumgartner
Project Boston Industrial Products

Boring No. 3 Date 10-7-85 Sheet 1 of
Type of Boring 6" roller bit Rig Mobile B-53
Casing used Size Drilling mud used
Boring begun Boring completed
Ground Elevation referred to Da
Field Party: Huffaker, Jr. & Lewis

Location of Boring	
Water Level	16'
Time	
Date	10-7-85

Rock Data						Soil Data					
Length cored Ft	Recovery Ft	% Recovery	Drilling Time, min.	% Drill Water Return	R Q D %	Sample Type	Sample No	Blows per 6" Drive	N-Value	DEPTH IN FEET	GRAPH	Description of soil or rock & notes on drilling operation
						S	300.0			0		Red & tan silty clay w/chert
										1		
										2		
										3		Dark brown & black clay w/chert & silt
										4		
										5		
						S	305.0			6		
										7		
										8		
										9		
										10		
						N	310.0	50/3"		11		Hard clay mostly chert, shelby refused changed to standard spoon, refusal @ 10.3' Red silty clay & chert
										12		
										13		
										14		
										15		
						N	315.0	8		16		
								12				
								17	29			Red & tan clay w/silt and chert
										17		Wet
										18		
										19		DOCKET NO. B-32-20
										20		

8321 OAK RIDGE HIGHWAY • KNOXVILLE, TN 37931 • 615/690-0128
GEOTEK
ENGINEERING COMPANY

OBSERVATION WELL INSTALLATION DATA

Date: 10-9-85 Installed by: Tom Huffaker

Observation Well No: 4 Inspected by: Others

Drilling Method: Air Rotary

Drilling Fluid: None

Observation Well Screen: 1.5-in. Schedule 40 PVC, 0.010-in. slotted.

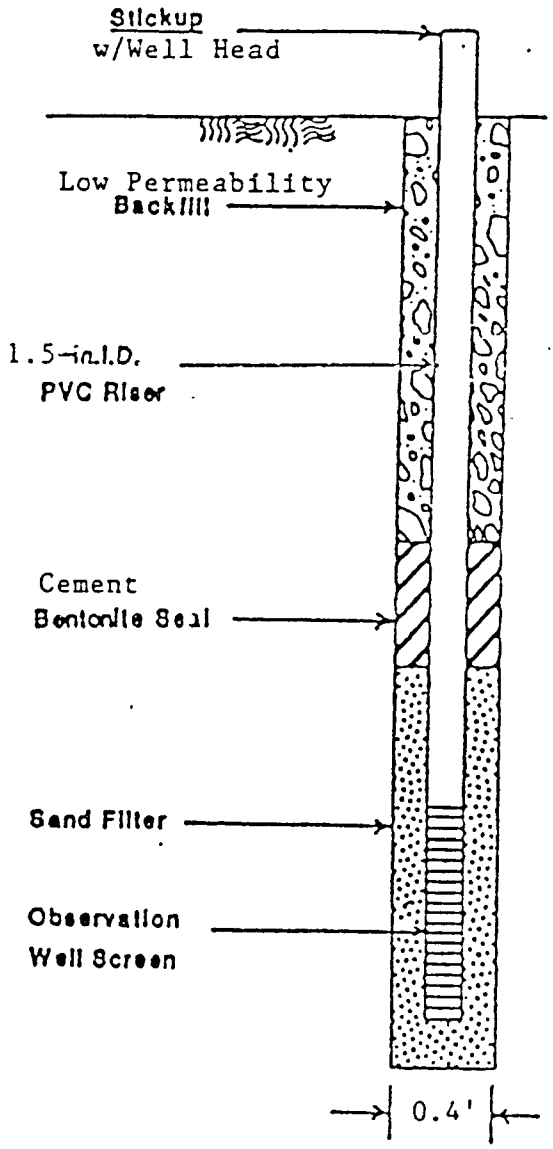
Method of Development: Surged with formation water, approximately one hour.

STRATIGRAPHY

Soil Type	Depth
Clay w/Silt & Chert	0.0'-1.5'
Chert w/Silty Sand	1.5'-23.0'
Sandstone with Conglomerate	23.0'-29.5'
Clay w/Chert	29.5'-54.0'

WATER LEVEL READINGS

Date	Depth Below Well Head	Elevation*
10-29-85	42.7'	
10-30-85	42.8'	
10-31-85	42.9'	



Elev.*	Depth
	(1.2')
	0.0'
	31.0'
	33.0'
	34.0'
	54.0'
	54.0'

Comments:

*Elevations are not presently available.

2720 NOLENSVILLE ROAD • NASHVILLE, TENNESSEE 37211 • (615) 256-6891
GEOTEK
ENGINEERING COMPANY

Log Of Boring

Job No. 84-1569

Client Alley, Young and Baumgartner
Project Boston Industrial Products

Location of Boring	
Water Level	
Time	
Date	

Boring No 4 Date 10-9-85 Sheet 1 of 1
Type of Boring Roller/Air Rig B-53
Casing used ____ Size 6" Drilling mud used ____
Boring begun ____ Boring completed ____
Ground Elevation ____ referred to ____ Datu
Field Party Huffaker, Jr. & Lewis

Rock Data						Soil Data					
Length cored Ft	Recovery Ft	% Recovery	Drilling Time, min	% Drill Water Return	R Q D %	Sample Type	Sample No	Blows per 6" Drive	N-Value	DEPTH IN FEET	GRAPH	Description of soil or rock & notes on drilling operation
						N	400.0	11		0		Red & brown clay w/silt and chert
								38		1		
								50/4"				Spoon refusal @ 1.4"
										2		
										3		
										4		
										5		
						N	405.0	38				
								50/3"		6		
										7		
										8		
										9		
										10		
						N	410.0	27				
								29		11		
								50/1"				
										12		
										13		
										14		
										15		
						N	415.0	25				
								50/2"				Chert w/tan sand & silt
										16		
										17		
										18		
										19		
										20		

DOCKET NO. B-32-22

2720 NOLENSVILLE ROAD • NASHVILLE, TENNESSEE 37211 • (615) 256-6891
GEOTEK
ENGINEERING COMPANY

Log Of Boring

Job No. 84-1569

Client Alley, Young and Baumgartner
Project Boston Industrial Products

Location of Boring.	
Water Level	
Time	
Date	

Boring No 4 Date 10-9-85 Sheet 2 of 3
Type of Boring Roller/Air Rig B-53
Casing used ____ Size 6" Drilling mud used ____
Boring begun ____ Boring completed ____
Ground Elevation ____ referred to ____ Datum
Field Party: Huffaker, Jr. & Lewis

Rock Data						Soil Data					
Length cored Ft	Recovery Ft	% Recovery	Drilling Time, min	% Drill Water Return	R O D %	Sample Type	Sample No	Blows per 6" Drive	N-Value	DEPTH IN FEET	GRAPH	Description of soil or rock & notes on drilling operation
						N	420.0			20		No recovery on sample due to fall in
										21		
										22		22' to 22.9' layer of chert
										23		Maroon sandstone w/chert & chert-stone conglamorate
										24		Chert w/tan sand & silt
						N	425.0			25		No recovery on sample due to fall in
										26		
										27		
										28		
										29		
										30		Red & tan clay w/chert & silt
						N	430.0	50/5"		31		
										32		
										33		
										34		
										35		
										36		
										37		
										38		
										39		

DOCKET NO. B-32-23

2720 NOLENSVILLE ROAD • NASHVILLE, TENNESSEE 37211 • (615) 256-6891
GEOTEK
ENGINEERING COMPANY

Log Of Boring

Job No 84-1569

Client Alley, Young and Baumgartner

Project Boston Industrial Products

Location of Boring.

Water Level	
Time	
Date	

Boring No 4 Date 10-9-85 Sheet 3 of _
Type of Boring Roller/Air Rig B-53
Casing used _____ Size 6" Drilling mud used _____
Boring begun _____ Boring completed _____
Ground Elevation _____ referred to _____ Dat
Field Party Huffaker, Jr. & Lewis

Rock Data						Soil Data					
Length cored Ft	Recovery Ft	% Recovery	Drilling Time, min	% Drill Water Return	R Q D %	Sample Type	Sample No	Blows per 6" Drive	N-Value	DEPTH IN FEET	GRAPH	Description of soil or rock & notes on drilling operation
						N	440.0	18		40		Red & tan clay w/silt and chert
								50/3"		41		
										42		
										43		
										44		
							445.0			45		Bag sample
										46		
										47		
										48		
										49		
										50		
										51		
										52		
										53		
										54		Hole fell in to 54'
							455.0			55		Bag sample
										56		
										57		End of boring @ 57'
										58		
										59		
										60		

DOCKET NO. B-32-24

SAMPLING & ANALYTICAL PROCEDURE

Wellhead is protected with an outer steel casing, 12-inch diameter, that extends a minimum of 10 inches into the cement grout apron. The number of each well will be permanently painted on the side of the well casing.

Each well has a 1/12 inch CPVC interior water discharge pipe.

The PVC casing is threaded and installed with teflon sealing tape at each joint.

The top of the casing has been constructed in such a manner that it can be kept locked at all times except during sampling. The keys to the locks and the sealing device are kept by a designated employee of Boston Industrial Products.

Well designations shall be clearly marked on the casing for easy identification.

All drilling equipment was washed with water from on-site hydrants between drill holes.

All wellhead elevations were surveyed to determine elevations to MSL.

BEGIN →

C. Sampling Procedures

Under 1200-1-11-.05(6) of the Tennessee Solid Waste Regulations, the minimum of four (4) wells will be sampled according to EPA 530/SW-611. All samples will be collected by Boston Industrial Products personnel or their agents.

AYB, Inc.

The samples will be preserved as described in "Methods for Chemical Analysis of Water and Wastes", EPA-6900/4-79-020, and delivered to a qualified laboratory for analysis. It is recommended that the collection, delivery, and analysis of the samples be performed by a qualified engineering firm to clarify the chain of custody of the samples. If the samples are to be collected by Boston Industrial Products, the procedures described herein will be followed:

1. The water levels shall be measured and recorded and the base elevations determined. An instrument type current meter water level indicator shall be used by lowering the probe down the 1/2 inch water discharge pipe. (Meters are available from various suppliers such as Branard Hellman of Atlanta, GA) Water levels will be recorded immediately.
2. It shall be required to evacuate one and one-half to three times the volume of water in the well to obtain fresh groundwater. The well volume will equal 0.367 gallons of water per foot) x (the depth of the well-the depth of the water level in feet). Evacuation will be accomplished using the dedicated sampling device in each well.
   a. Connect air hose from the portable air tank to

the air line on the well. Regulate the flow to produce a steady, even flow of water from the discharge.

b. Measure the flow rate and evacuate the well 1-1/2 to 3 times the volume of water in the well.

c. Depressurize the well and measure the water level.

3. Samples shall be collected as soon as the well is sufficiently recharged.

a. Water sampling shall be accomplished in the same manner as water evacuation. Regulate the flow to produce a steady, even flow of water. The water flow rate shall be slow enough to prevent any aeration from occurring.

b. Samples for organic analysis shall be collected first.

c. Each well will have its own dedicated hose of Tygon or equal material to insure no cross contamination occurs. Each hose will have a removable cap to minimize the entrance of dirt into the hose between sampling occasions. Before each sampling, the portion of the hose projecting above the well cap shall be flushed with

deionized water.

The physical, chemical and bacteriological integrity of the sample must be maintained from the time of sampling to the time of testing in order to keep any changes at a minimum. The time between sampling and testing will be kept at the absolute minimum.

D. Analysis and Handling of Samples

The following general methods are to be employed:

Metals - Glass container, NMO_3 to pH <2, cool to 4°C

Nitrate - Glass - Cool to 4°C

Coliforms - Sterile Glass - Cool, $NA_2S_2O_3$

Radiological - Glass or Plastic - HNO_3 to pH <2

Organics - Glass, Teflon Cap, Cool, no air gap

pH - on-site, cool and check in lab

Phenols - Glass - tinted, cool to 4°C, N_2SO_4 to pH <2

T.O.C. - Glass - Cool to 4°C, $H_2|SO_4$ to pH <2

Specific Conductance - Glass - Cool to 4°C

Fluoride - Glass, cool to 4°C

Sulfate - Glass, cool to 4°C

All samples are to be in the laboratory within 24 hours of collection. The samples are shipped using courier service companies directly.

Sample labels are necessary to prevent mididentifica-

tion of samples. Gummed paper labels or tags are adequate. The label must include at least the following information:

Name of Collector

Date and Time of Collection

Place of Collection

Collector's Sample Number, which uniquely identifies the sample

Sample seals are used to preserve the integrity of the sample from the time it is collected until it is opened in the laboratory. Gummed paper seals can be used as official sample seals. The paper seal must carry information such as:

Collector's name

Date and Time of Sampling

Collector's sample number (This number must be identical with the number of the sample label.)

The seal must be attached in such a way that it is necessary to break it in order to open the sample container.

To establish the documentation necessary to trace sample possession from the time of collection, a chain of custody record will he filled out and accompany every sample.

The sample will be delivered to the laboratory for analysis as soon as practical - usually the same day as the

sampling. The sample will be accompanied by the chain of custody record. The sample will be delivered to the person in the laboratory authorized to receive samples.

When the sample is shipped to the laboratory, it will be packaged in a proper shipping container to avoid leakage and/or breakage. A cardboard box that will provide at least 10 cm (4 in.) of tight packing around the sample container will be used. Acceptable packing materials include sawdust, crumpled newspaper, vermiculite, polyurethane chips, etc. Samples that require refrigeration will be packed with reusable plastic packs or can of frozen freezing gels in molded polyurethane boxes with sturdy fiberboard protective case. The boxes will be taped closed with masking tape or fiber plastic tape.

All packages will be accompanied by a sample analysis sheet and chain of custody record. Complete address of the sender and the receiving laboratory must legibly appear on each package. When sent by mail, register the package with return receipt requested. When sent by common carrier, obtain a copy of the bill of lading. Post office receipts and bill of lading copies may be used as part of the chain of custody documentation.

Samples will be refrigerated and preserved as required

by SW 846.

E. Sampling Program

1. Interim First Year Sampling - Background

The parameters to be analyzed for during the first year are shown in Exhibit No. 4. The analysis procedures are to follow EPA 600/4-79-020, latest edition.

2. Second Year and Continuing Monitoring Samples

The following parameters have been selected for monitoring.

Parameter	Analytical Method	Detectability	Number/Year
Chloride	325.3	1 mg	1
Iron	236.2	0.001 mg/l	1
Manganese	243.2	0.0002 mg/l	1
Phenols	420.1	0.005 mg/l	1
Sodium	273.1	0.015 mg/l	1
Sulfate	375.4	1.0 mg/l	1
pH	150.1	—	2
Specific Conductance	1230.1	—	2
Total Organic Carbon	415.	1 mg/l	2
Lead	239.1	0.1 mg/l	2
Total Organic Halogen			

*From EPA 600/4-79-020 (latest edition) (SW 846)

a. At the end of the first 6 month monitoring fol-

lowing the first year background monitoring, and after each applicable 6 month monitoring period thereafter, Boston Industrial Products will compare the results from the initial background data to each 6 month data according to F, Procedure for Statistically Evaluating Groundwater Monitoring Data.

3. Procedures for Establishing Background Quality

Background

Background quality will be established by sampling all upgradient wells according to the interim first year procedure. Once the data on the sampling has been collected, background data comparison will be prepared as per Rule 1200-1-11-.05(6)(c)3.

4. Proposed Compliance Point

The point of compliance is proposed to be the toe of the levee of the surface impoundment. This point must comply with 1200-1-11-06 (8)F.

F. Procedure for Statistically Evaluating Groundwater Monitoring Data

1. Procedure

Step One - From the background data obtained for each well (as per Rule 1200-1-11-.05(6)(c)3), for each

parameter to be compared, calculate the background arithmetic mean (X_B) and variance (V_B) as follows:

$$X_B = \frac{\sum_{i=1}^{N_B} X_i}{N_B} \quad \text{and} \quad V_B = \frac{\sum_{i=1}^{N_B} (X_i - X_B)^2}{N_B - 1}$$

where x_i is an individual measurement in a set containing N_b measurements. For at least the parameters pH, specific conductance, and total organic carbon; the number of measurements N_B will equal or exceed 16 since at least 4 replicate measurements of each of at least 4 samples (quarterly) must be obtained for establishing background. For other indicator parameters, N_B will equal or exceed 4 based on the minimum four quarterly measurements.

Step Two - For each parameter for each well, calculate t using the equation

$$t = \frac{X - X_B}{\sqrt{\left[\frac{(N-1)V + (N_B - 1)V_B}{N + N_B - 2}\right]\left[\frac{N + N_B}{(N)(N_B)}\right]}}$$

where X, V, and N are identified as follows:

a. For the parameters pH, specific conductance, and total organic carbon, the subsequent periodic monitoring required by Rule 1200-1-11-.05(6)(c)4 will result in at least 4 measurements of the parameter. For these parameters and any others for which a number of measurements (N) are obtained, the arithmetic mean (X) and variance (V) shall be calculated as per Step One above.

b. For those indicator parameters for which only a single measurement (X) is obtained in subsequent periodic sampling and analysis, X = X, V = 0, and N = 1.

NOTE: If X is equal to or (except for pH) less than X_B, then no deterioration of groundwater quality with regard to that parameter can have occurred and no further statistical analysis of that

parameter is necessary.

Step Three - Compare the calculated t - statistic from Step Two above to the appropriate t - statistic value from Table 1. For pH the value from the "Two-tailed t" column of Table 1 shall be used since both increases and decreases of that parameter are of concern. For the other parameters, the values from the "One-tailed t" column shall be used since only increases of those parameters are of concern. If the calculated value of t exceeds the value of t found in the table, a statistically significant difference in the parameter for that well has occurred.

2. Interpretation of Results

The occurrence of a statistically significant increase in a parameter value (or pH decrease) for a well indicates a possible problem which needs further evaluation. In particular, the results for that well need to be correlated with similar results from the other wells in the monitoring system. The spatial and depth distribution of the wells must be considered in relationship to the indicated groundwater zone(s) of contamination, groundwater flow rates and flow directions, and the locations of possible sources of

contamination (including, of course, the facility).

The entire groundwater monitoring system must be considered before a determination can be made that a facility is contaminating groundwater.

G. Procedure for Annual Determination of Uppermost Aquifer Flow Rate and Direction

Annually Boston Industrial Products will determine the direction and velocity of the groundwater. The following procedures will be used.

(a) The groundwater elevation from each well will be determined.

(b) Using the elevations from (a), the gradient will be calculated.

(c) Once the gradient is determined, Darcy's calculation for velocity (V_D + KI) will be used, where K = hydraulic conductivity and I is the gradient. It is understood V_D is approximately one-half of the intervoid velocity.

H. Procedure to be Implemented if a Significant Increase in Any Parameter is Identified at Monitoring Well

If the statistical analyses of data from a detection well sampling event shows a significant increase (or pH decrease) in a downgradient well, Boston Industrial Products will immediately resample those downgradient wells where a

significant difference was detected, split the sample into two portions and obtain analyses of all additional samples to determine whether the significant difference was a laboratory error.

If the analyses confirm the significant increase (or pH decrease) Boston Industrial Products will provide written notice to the Commissioner of the Tennessee Department of Health and Environment within seven days of the date of such confirmation, that the facility may be affecting the groundwater quality.

Within 15 days after notifying the Commissioner of the affected groundwater quality, Boston Industrial Products will develop and submit to the Commissioner a specific groundwater assessment plan, an outline of which is contained in Appendix A.

I. Groundwater Reporting Procedures

If the groundwater is being monitored using the original indicator evaluation program, Boston Industrial Products will evaluate the data on the elevations obtained when sampling each well and at least annually, determine whether the requirements to have at least one (1) upgradient well and three (3) downgradient wells are being satisfied. If the evaluation shows that the location requirement is no

longer satisfied, Boston Industrial Products will immediately modify, with the approval of a Department Staff geologist, the number, location, or depth of the monitoring wells to bring the groundwater monitoring system into compliance with this requirement.

1. The following records will be kept:

   Analyses required quarterly during the first year (primary drinking water standards, parameters establishing groundwater quality, and parameters used as indicators of groundwater contamination);

   Analyses required after the first year, as follows:

   Annually: record the results of the parameters establishing groundwater quality; and

   Every six months: record the results of the parameters used as indicators of groundwater contamination.

   Record the elevation of the groundwater surface at each well each time a sample is obtained.

2. The following groundwater information will be reported:

   During the first year, when initial background concentrations are being established for the facility

for each groundwater monitoring well, the results will be submitted to the commissioner within 15 days after completing each quarterly analysis. Each well will be identified for any parameters listed in the primary drinking standards.

3. An annual report for each well will be submitted providing the following information:
   - The results of analyses for the parameters establishing groundwater quality;
   - The results of the parameters used as indicators of groundwater contamination;
   - The elevation of the groundwater surface each time a sample is obtained; and an evaluation of well placement as per ;05(6)(d)(6).
   - The results for each time the "Procedure for Statistically Evaluating Groundwater Monitoring Data" is used to determine if any well exhibits groundwater contamination;

   Any significant differences from initial background found in the upgradient wells will be noted.
4. The commission will be notified within 15 days of any parameter exceeding the primary drinking water standards.

Compliance History

RCRA ground water monitoring at the site is regulated by the Tennessee equivalent regulations to 40 CFR Part 265, Subpart F. The compliance history for BIP regarding ground water monitoring has been extensive. The following is a summary, in chronological order, of the correspondence, reports, etc. that were available for review for the Task Force's use. This should not be interpreted as a complete record.

11-07-80: BIP files the Part A for the facility.

12-07-81: BIP consultants submit the landfill operation manual and closure drawings for review.

01-04-82: BIP responds to a non-notifer letter.

01-18-82: BIP notifies TDHE that they are a generator/storage facility.

09-14-82: TDHE conducts a hazardous waste generator inspection.

09-15-82: TDHE issues a "Notice of Violation" (NOV) to correct deficiencies noted during the 9-14-82 inspection.

10-25-82: BIP notifies TDHE that all 30-day violations are corrected.

11-03-82: TDHE and BIP hold a compliance review meeting to discuss the E P Toxicity results from the surface impoundment.

11-05-82: TDHE issues a permit to operate the industrial solid waste landfill- BIP must post a performance bond.

11-05-82: TDHE requests a ground water monitoring program within 120 days.

11-30-82: TDHE performs a follow-up inspection - all generator standard violations are corrected, but no ground water monitoring system is in place.

12-08-82: BIP notifies TDHE of an overflow at the surface impoundment.

12-08-82: BIP is advised that all violations noted during the 9-14-82 inspection are corrected.

12-16-82: Part A is revised.

12-21-82: Results from the overflow samples show oil, grease and lead concentrations.

01-07-83: BIP is informed that the surface impoundment can be used because of the revised Part A.

04-05-83: BIP consultants prepare a report to determine the feasibility of closing the surface impoundment.

08-19-83: TDHE conducts a TSDF inspection at BIP - several violations are noted, including the lack of a ground water monitoring system.

08-26-83: TDHE issues a "Notice of Non-Compliance". BIP is given 30 days to correct violations noted during the 8-19-83 inspection.

09-02-83: BIP consultants prepare a status report regarding ground water monitoring.

10-20-83: TDHE "Major Facilities Status Sheet".

10-24-83: BIP consultants prepare a "Request for Waiver for Ground Water Monitoring Requirements".

11-10-83: TDHE conducts a follow-up inspection - some violations have been corrected but no ground water monitoring system is in place.

11-17-83: TDHE informs BIP that all 8-19-83 violations have been corrected and that the waiver from ground water monitoring requirements is under review.

11-83: BIP consultants prepare a Waste Analysis Plan.

11-30-83: TDHE collects water and sediment samples from the surface impoundment.

12-09-83: TDHE study plan for sampling at BIP.

12-21-83: TDHE cannot approve the waiver because of insufficient information.

01-12-84: BIP consultants respond to the 12-21-83 letter.

01-17-84: TDHE requests a meeting to discuss the waiver.

01-24-84: The TDHE sampling results indicate that the impoundment's water and sediment are hazardous.

02-08-84: TDHE issues a NOV to BIP for ground water monitoring deficiencies and denies the waiver. TDHE believes that contamination already exists at the site. A ground water monitoring plan is due 3-30-84.

03-07-84: TDHE conducts a TSDF inspection - generator/storage violations noted.

03-08-84: TDHE issues a "Notice of Non-Compliance" for violations noted during the 3-7-84 inspection.

03-30-84: BIP submits a ground water monitoring plan to TDHE for review.

04-11-84: TDHE requests the Part B.
04-12-84: TDHE reviews the ground water monitoring plan and finds it inadequate.

04-13-84: EPA requests the Part B.

04-30-84: BIP submits a revised ground water monitoring plan for review.

05-01-84: TDHE issues a "Notice of Non-Compliance" for an inadequate ground water monitoring plan.

05-10-84: TDHE performs a site investigation at BIP.

05-17-84: TDHE requests a show-cause meeting.

05-19-84: TDHE conducts a follow-up inspection.

05-21-84: TDHE inspection report notes all violations have been corrected.

05-25-84: BIP wants to analyze for lead instead of TOX.

06-06-84: TDHE collects water and sediment samples from the impoundment.

06-13-84: A show-cause meeting is held to discuss the ground water monitoring system.

06-26-84: Sampling results from the overflow ponds do not exhibit the characteristics of a hazardous waste.

07-03-84: EPA responds to questions from BIP on how to complete the Part B.

07-03-84: TDHE informs BIP that enforcement will continue.

07-17-84: EPA informs BIP the Part B is due by 10-13-84.

07-20-84: BIP updates their hazardous waste notification.

08-06-84: TDHE requests ground water monitoring action be added to the Commissioner's Order against BIP.

08-09-84: TDHE conducts an inspection and notes the dam is leaking.

08-14-84: TDHE issues a "Notice of Non-Compliance" for violations noted during the 8-9-84 inspection.

08-31-84: TDHE requests enforcement action against BIP.

09-12-84: TDHE informs BIP that the ground water monitoring plan is adequate if certain conditions are met.

09-14-84: EPA Waste Engineering Section requests enforcement action against BIP for ground water monitoring violations.

09-20-84: Results from the TDHE 6-6-84 sampling indicate the impoundment exceeds the limit for E P Toxicity.

09-28-84: TDHE issues a "Notice of Deficiency" (NOD) for their financial assurance.

10-84: BIP submits the Part B to TDHE and EPA for review.

10-84: BIP submits a revised ground water monitoring plan.

10-02-84: TDHE conducts a follow-up inspection.

10-03-84: BIP consultants respond to the TDHE 9-12-84 letter requesting a ground water monitoring plan.

10-04-84: TDHE informs BIP that the dam was still leaking during the 10-2-84 inspection.

10-19-84: TDHE informs BIP that the financial assurance appears to meet the requirements.

10-30-84: TDHE approves the BIP ground water monitoring plan if certain conditions are met.

10-30-84: TDHE denies the request to substitute lead for TOX.

11-19-84: TDHE conducts sampling for the E P Toxicity test.

11-28-84: TDHE issues comments on the Part B deficiencies.

12-18-84: EPA WES requests EPA ESD sample at BIP.

12-19-84: BIP advises EPA that as of 12-31-84 they will merge into the parent DANA Corporation.

12-20-84: EPA issues comments on the Part B deficiencies.

12-21-84: EPA requests BIP to answer the 3004(u) questionnaire.

01-03-85: TDHE issues a NOD to BIP for Part B deficiencies.

01-10-85: Dingle ground water survey.

01-18-85: BIP requests an extension for the Part B revisions due date.

01-21-85: EPA ESD prepares study plan for a RCRA waste sampling investigation at BIP.

01-28-85: TDHE denies the request for Part B extension.

02-85: BIP submits the Part B revisions.

02-01-85: EPA denies the request for Part B extension.

02-21-85: EPA informs BIP of the Hazardous and Solid Waste Amendments of 1984.

02-27-85: BIP wants to delay well drilling until 4-85; TDHE concurs. BIP will try to clean-close the impoundment.

03-11-85: TDHE conducts a hazardous waste inspection at BIP.

03-12-85: EPA advises BIP that the Agency had not received a response to the 3004(u) questionnaire.

03-20-85: TDHE issues a NOV for violations noted during the 3-11-85 inspection.

04-01-85: TDHE visits BIP to monitor well installations. It is noted that the cooling pond has no freeboard and is being siphoned to the overflow ponds.

04-02-85: TDHE returns to BIP and notes the cooling pond has freeboard.

04-11-85: TDHE denies approval of using glued joints in the monitoring wells - threaded joints must be used.

04-16-85: EPA summarizes the 1984 HSWA and how they will affect BIP.

04-16-85: EPA ESD collects samples from the effluent to the pond and the liquid leaking through the berm - samples contained chlorobenzene and toluene.

05-15-85: EPA prepares an updated Dingle ground water survey questionnaire.

05-26-85: BIP consultants request a meeting with TDHE to clarify requirements for implementing the groundwater monitoring program.

06-20-85: TDHE and EPA meet with BIP to discuss the ground water monitoring program.

06-21-85: EPA prepares a "Complaint and Compliance Order" for ground water monitoring violations at BIP.

06-24-85: TDHE issues a "Commissioner's Order and Assessment of Civil Penalty and Damages" to BIP for ground water monitoring violations. The penalty was $7724.00 and damages were $5941.12.

06-25-85: EPA advises TDHE on current methodology recommended for ground water monitoring.

07-26-85: EPA ESD issues report on the waste stream inspection conducted 4-85.

07-31-85: TDHE issues a "Tentative Decision to Deny a Permit" to BIP.

09-23-85: EPA updates the Dingle ground water survey.

10-03-85: TDHE notifies EPA of the tentative decision to deny the permit for BIP.

10-21-85: TDHE summarizes the information available for the BIP landfill.

10-31-85: BIP consultants prepare a status report on the ground water monitoring program at the site.

11-85: BIP consultants submit the "Well Installation and Geohydrologic Testing" report.

11-08-85: BIP certifies compliance with all applicable state ground water monitoring and financial responsibility requirements.

11-12-85: TDHE notifies EPA of the tentative decision to deny the permit for BIP.

11-13-85: TDHE responds to BIP's questions on ground water monitoring requirements.

12-06-85: TDHE issues a NOV to BIP for failure to comply with the State Financial requirements.

12-10-85: TDHE and EPA perform a LOIS inspection at BIP. The inspections shows that the surface impoundment is still in use.

12-11-85: BIP consultants submit the pump-test results. The data indicates no interconnection between aquifers.

12-31-85: TDHE issues the notification to terminate interim status and denial of a permit for BIP.

01-86: The EPA Region IV Office of Regional Counsel prepares a Litigation Report for enforcement of BIP's loss of interim status.

01-07-86: BIP submits revised financial responsibility and liability coverage to TDHE to correct the financial requirement violation.

01-20-86: BIP submits ground water monitoring data to TDHE for review. It is noted that there is a high concentration of oil and grease in wells 3 and 4.

01-23-86: TDHE conducts an inspection at BIP to determine surface and ground water sources that might be affected by the facility.

01-29-86: BIP responds to TDHE's intent to terminate interim status.

02-20-86: TDHE responds to BIP's 1-29-86 letter.

02-20-86: EPA submits their comments on the BIP Part B to TDHE.

03-04-86: EPA discusses the ground water monitoring system with BIP consultants.

03-05-86: TDHE advises BIP that the groundwater monitoring system in place is not adequate for monitoring purposes.

03-31-86: BIP submits closure/post-closure cost estimates and the Annual Report.

04-04-86: EPA submits the civil litigation report to the Department of Justice for review.

04-17-86: EPA submits the BIP Facility Management Plan to TDHE for review.

04-25-86: BIP attorneys request a meeting with EPA and DOJ.

06-06-86: TDHE and BIP meet to discuss the ground water monitoring system.

06-10-86: EPA requests that the Task Force perform an evaluation at BIP.

06-25-86: TDHE requests more information on the ground water monitoring system at BIP.

07-15-86: BIP consultants respond to the TDHE 6-25-86 letter.

07-25-86: TDHE performs a comprehensive ground water monitoring inspection and notes violations.

10-01-86: TDHE issues a NOV for violations noted during the 7-25-86 inspection.

10-06-86: BIP responds to the NOV.

10-16-86: BIP consultants submit water level data indicating little or no water in the RCRA monitoring wells.

10-20-86: BIP consultants respond to the 10-1-86 NOV.

10-29-86: TDHE and EPA advise BIP on methodology for a pump test

10-31-86: BIP responds to the 10-86 NOV.

11-04-86: TDHE conducts a follow-up inspection at BIP.

12-01-86: TDHE issues a second NOV for violations not corrected from the 10-86 NOV.

01-09-87: BIP responds to the second NOV.

03-27-87: TDHE directs BIP to determine the depth and thickness of the confining layer underlying the site.

03-30-87: BIP informs TDHE that a boring program is underway.

04-06-87: EPA informs BIP that the Task Force inspection will be the week of 5-11-87.