EPA WORK ASSIGNMENT NUMBER: 041-2Z00
EPA CONTRACT NUMBER: 68-W8-0110
EBASCO SERVICES INCORPORATED

ARCS II PROGRAM

FINAL DRAFT
SCREENING SITE INSPECTION REPORT
TENNECO CHEMICAL COMPANY
AKA KALAMA CHEMICAL, INC. FACILITY
GARFIELD, BERGEN COUNTY, NEW JERSEY

CERCLIS NUMBER: NJD002005148

FEBRUARY 1992

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SUBMITTED BY:

Judith Cusick
Task Leader
Ebasco Services Incorporated

APPROVED BY:

Ming Kuo, PhD., PE
ARCS II Technical Support Manager
Ebasco Services Incorporated

REVIEWED BY:

Edgar Aguado
SSI Site Manager
Ebasco Services Incorporated

SITE SUMMARY AND RECOMMENDATION

The Tenneco Chemical site (aka Kalama Chemical, Inc. Facility) is located on 290 River Drive in Garfield, Bergen County, New Jersey (Cerclis ID Number NJD002005148). The property, now owned by Kalama, is designated as Block 50.01 Lot 1 and Block 50.02 Lot 1 on the assessment map for the city of Garfield. Block 50.01 Lot 1 is approximately 500 feet by 560 feet (6.4 acres) and is occupied by the manufacturing facilities. The area of manufacturing (i.e., Block 50.01 Lot 1) is referred to as the site, facility or plant in this document. The second lot, Block 50.02 Lot 1, is approximately 40 feet by 560 feet (0.5 acres) and is the location of the river-water pump house and employee parking. River Drive, which runs north-south, divides the two lots. The facility is active and has always been used for the purpose of manufacturing chemicals. The Passaic River flows along the western boundary of Block 50.02 Lot 1. The site which is located in a residential area is completely fenced in. Figure 1 depicts the facility on a USGS topographical map. Figure 2 is a site sketch map depicting the site layout and various features on and around the site. The site topography is relatively flat with some sloping toward the Passaic River.

The site is approximately 40 to 50 percent active, with approximately one half of the 39 existing buildings at the site still in full or partial use. The site is approximately 25% paved and 50% building occupied. Several of these buildings are subdivided into separately numbered structures. The other buildings are either vacant, idle, or are used for storage, shops, or offices. Seven buildings have been removed (buildings 2, 3, 37, 38, and three unnumbered buildings). Table 1 presents a summary of the dates of construction, current usage, and historic use of each separately identified structure.

The plant was originally constructed in 1891 by Fritzche Brothers. The plant has operated continuously since that time except for a period during World War I. Fritzche Brothers sold the plant to Von Heyden Chemical Fabrische around the turn of the century. The company name was changed to Von Heyden Chemicals, then changed to Heyden Chemicals, then to Heyden-Newport Corporation. Heyden-Newport Corporation was purchased in 1965 by the Tennessee Gas Transmission Co. which later became Tenneco Inc.. Kalama Chemical of Seattle, Washington purchased the property in December 1982.

Chemicals that were produced at the Tenneco facility are used in pharmaceuticals, cosmetics, food packaging are preservatives, synthetic flavorings, printing inks, dyestuffs and other products. The plant has historically been the site of salicylic acid production since the turn of the century, and of salicylate salts from the 1930s to present. Parasepts (also known as Parabens, a registered trademark for certain methyl, ethyl, propyl and butyl esters of para-hydroxy benzoic acid) and methylene disalicylic acid (MDA) have been produced at the plant since the 1940s. During the 1930s until 1982, formaldehyde was produced at the plant. Benzoic acid, benzaldehyde and sodium benzoate were produced in facility buildings and on a diked pad in the southeastern section of the facility from about 1960 to February 1984.

During World War II, the United States Government installed equipment at the plant for the manufacture of Pentaerythritol, a glycerine substitute. Pentaerythritol production continued until 1962. Resorcinol, Jet Lube, Sodium, Potassium, and Methyl Salicylate, Fumaric Acid, Pentamids, DDSA, Nuosperse HOH, Nuvis HS, B-Oxynapththoic Acid and Naphthalene distillation were products and processes historically performed at the Tenneco plant.

Toluene was used at the site as a raw material for the production of benzoic acid and benzaldehyde in the air oxidation process. Phenol and sodium hydroxide are currently used as raw material for the production of salicylic acid in the carboxylation process. Methyl salicylate is manufactured by the

esterification of salicylic acid and methanol, with sulfuric acid used as a catalyst. Formaldehyde was formerly produced by the catalytic oxidation of methanol. Benzene was formerly used in the manufacture of Resorcinol.

The site has undergone various changes throughout its existence. Buildings have been demolished, replaced and modified over the years, as have underground pipes such as chemical and sanitary sewage lines, and such structures as catch basins and sumps. The plant is served by railroad sidings from the Erie Lackawanna Railroad, in the central and northern section of the facility. The site had formerly had 27 underground storage tanks (USTs) onsite used for the storage of fuel oil, methanol, toluene, and other chemicals. These tanks were removed by the current owner and Tenneco from 1987 to 1990.

Two staged soil piles were located on the Monroe (facility north) Street side of the facility. These piles were the result of various on-site activities which are not specifically known. A raw material quarantine area, which is fenced in completely, is located near a product drum storage area on the Hudson Street side of the facility. A scrap area exists along the south side of the facility.

There are and formerly existed a variety of other above-ground structures at the facility. The former benzoic acid/benzaldehyde production facility in the southeastern section of the plant is of particular significance because of reported presence of contaminants. This structure was built in 1960 by Heyden-Newport and abandoned by the current owner in 1984.

The site has been the location of some releases and spills which date back to the 1970's. Some of the compounds that have reportedly been released or spilled include toluene, benzoic acid (liquid and powder), methanol, and sulfuric acid. In addition, other chemical process wastes have reportedly been disposed of at this site. The components of this waste reportedly included acid solutions (pH<3), organics, and miscellaneous waste materials. The areas of concern include the location of the former and current salicylic acid production facilities in the northeastern section of the plant, the location of the former benzoic acid/benzaldehyde production facility in the southeastern section of the facility and the former Resorcinol production facility (destroyed by explosion in 1951) located in the southeastern section of the facility. It is not known whether there are any Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), National Priority List (NPL), Resource Conservation and Recovery Act (RCRA) sites, industrial facilities or any potential sources of contamination within 1 mile of the site. It is unknown whether any RCRA permits exist for the facility. The facility holds a State Pollutant Discharge Elimination System Permit (SPDES No. NJ0000124) to discharge on site runoff to the Passaic River.

Historically air emissions have occurred at the facility. Air releases include visible smoke reported being emitted into the outdoor air by the facility, approximately 1,000 pounds of toluene were released into the atmosphere (March 17, 1981), an emission of benzoic acid dust (April 6, 1981), source odors from the facility from sodium benzoate reactors (May 14, 1981), another emission of benzoic acid dust into the atmosphere (June 11, 1981), and 30 pounds of salicylic acid powder were emitted to the atmosphere (June 29, 1984). In the past, the facility has held up to 93 air pollution certificates to operate control apparatus equipment under plant ID No. 00053. As of June 1988, approximately two-thirds of the company's 93 stacks were still operating. Four stacks had certificates renewed until 1993.

On several occasions, area residents have complained of smog and vapor releases as well as odors emitting from the plant. Several letters to the City of Garfield Board of Health also targeted the various chemical plants in Garfield stating "There are many pungent and noxious odors hovering throughout Garfield due to these plants." (October 11, 1978 letter to Mr. Paul Arbesman).

The Tenneco Inc. site is currently under an Administrative Consent Order (ACO) with the NJDEP. The ACO was executed between the current owner and the New Jersey Department of Environmental Protection (NJDEP) in December 1988. The site has been the subject of various sampling programs and investigations performed for purposes such as evaluating the environmental conditions of the facility in support of the requirements under New Jersey's Environmental Cleanup Responsibility Act (ECRA).

In 1986, a Preliminary Investigation of Soil Quality Condition was conducted at the site. The investigation included the drilling of five soil borings and collection of soil samples. Samples for laboratory chemical analysis were collected from each soil boring. The borings ranged in depth from 8 feet to 12 feet below ground surface. In addition, a water sample from soil boring B-4 was collected for laboratory analysis. The sampling and analysis program consisted of five soil samples analyzed for the following contaminants: volatile organic compounds, base neutral compounds, acid extractable compounds, total phenolics, total petroleum hydrocarbons (TPHCs), benzoic acid, benzaldehyde, formaldehyde, and alcohols. An aqueous sample form boring B-4 was also analyzed for volatile organic compounds.

Between 1987 and 1988, an ECRA Sampling Plan was implemented at the Tenneco site. Thirteen soil borings, which ranged in depth from 3.5 feet to 22 feet below ground surface, were drilled and nine monitoring wells were installed in December 1987. Also, soil and groundwater sampling and water level measurements were conducted. During this investigation, Tenneco and the current owner jointly initiated the removal of the underground storage tanks (USTs) at the facility. Eleven of the 27 USTs were removed during the ECRA sampling plan investigation. (The additional 16 USTs were removed in April and May 1988, September and October 1988, January 1989, and February 1990.) Also during that time, the current owner removed a light, non-aqueous phase liquid (LNAPL) from Monitoring Wells MW-5 and MW-7. The 1987-1988 ECRA Sampling Plan Investigation soil sampling and analysis program consisted of 13 soil borings ranging in depth form 3.5 feet to 22 feet below ground surface analyzed for the following parameters: volatile organic compounds, base neutral compounds, acid extractable compounds, including tentatively identified compounds (TICs), total phenolics, total petroleum hydrocarbons (TPHCs), benzoic acid, and benzaldehyde. The groundwater investigation of 1987-1988 included the sampling of nine monitoring wells. These samples were analyzed for the following parameters: volatile organic compounds, base neutral compounds, acid extractable compounds including tentatively identified compounds, total phenolics, total petroleum hydrocarbons (TPHCs), benzoic acid, benzaldehyde, and methanol.

In 1991, a revised ECRA sampling plan was implemented at the site. The sampling plan included the drilling and sampling of 46 soil borings, 0.5 feet deep to 12 feet deep. Twelve additional monitoring wells, ranging in depth from 12.5 feet to 36 feet, were also installed. Ground water samples were collected and analyzed from the monitoring wells (including those wells installed during previous investigations). The 1991 soil sampling consisted of 46 soil borings ranging from 0.5 feet to 12 feet below ground surface. These samples were analyzed for the following parameters: volatile organic compounds, base neutral compounds, acid extractable compounds including tentatively identified compounds, total phenolics, total petroleum hydrocarbons (TPHCs), arsenic, beryllium, cadmium, vanadium, polychlorinated biphenols, toluene, methanol, hexene and pH. One round of groundwater sampling was performed in April 1991. Groundwater samples from monitoring wells, including these wells installed during the previous investigations, were analyzed for the following parameters: volatile organic compounds, base neutral compounds, acid extractable compounds including tentatively identified compounds, total phenolics, total petroleum hydrocarbons (TPHCs), benzaldehyde, chloride and fecal coliform.

The site is located in the Piedmont Lowland Physiographic Province. Bedrock within this Province consists of sedimentary and igneous formations of the Triassic and Jurassic Periods. Unconsolidated glacial and fluvial deposits of the Pleistocene and Recent Epochs cover the bedrock in most area of the Province. Beneath the facility is a complex sequence of unconsolidated deposits, which consist primarily of sand with discontinuous layers of silt and clay, and fill. The fill is present immediately beneath the facility. The fill is typically a mixture of sand, gravel, crushed stone, and brick fragments. The thickness of fill material is approximately 3 to 8 feet. At some locations, groundwater occurs in the fill. The fill is underlain by natural deposits consisting of sand with discontinuous silt and clay layers. The unconsolidated deposits are approximately 25 to 35 feet in thickness. Regionally, there are two aquifers: the overburden aquifer in the unconsolidated deposits and the bedrock aquifer in the Brunswick Formation. Groundwater in the overburden aquifer flows to local and regional discharge points such as the Passaic River. Groundwater in the bedrock aquifer occurs in fracture such as bedding planes, and flows through the fractures to local and regional points of discharge. The depth of the water table increases towards the Passaic River. The silt and clay layers make up a vast amount of the deposits underlying the facility. The consolidated deposits where saturated, contain one water bearing zone. The ground surface elevation at the site is flat and its elevation ranges from approximately 16 feet mean sea level (msl) to 19 feet msl. Ground water occurs under most of the facility from 7 to 10 feet below ground surface and flows in a westerly/southwesterly direction.

There are no public supply wells that supply drinking water within four miles of the site. There is a backup well located 3.4 miles from the site. This well is only used during peak periods in the summer time but according to the Hackensack Water Company, the well has been inactive for the last five years. The population served by this well was approximately 3,000 people. Reservoirs supply (such as the Oradell Reservoir) sources of drinking water for the area. The lowest point of waste disposal/contamination has been estimated at 9 to 11 feet. This depth is the lowest point at which significant contamination was found on the site. Therefore, the waste disposal/contamination is estimated to be lower than the recorded groundwater levels, and the distance between the lowest point of waste disposal/storage to the highest seasonal level of water is a negative distance.

The Passaic River is located to the west of the facility. The distance between the facility and the Passaic River is 94 feet (straight line). The Passaic River is tidal and flows by the facility in a north to south direction. There is not a well defined runoff pathway to the river. Stormwater collected on-site is discharged to the Passaic River (SPDES permit NJ0000124). The facility has a permit to discharge its storm water runoff, along with cooling water, to the Passaic River. The process wastewater and sanitary sewage are disposed through sewers to the Passaic Valley Sewage Authority. The site has no on-site water bodies, dry wells, or detention ponds. The City of Garfield is located in an area with a reported flood elevation of approximately 20 feet. This area is listed as a flood hazard area. The site area is located within the 100 year floodplain. There are no known intakes within 15 miles downstream of the probable point of entry (PPE). The waters within 15 miles downstream of the site are brackish, and are not used for drinking water purposes. The sale or consumption of all fish from the tidal Passaic River is prohibited. Because of this prohibition, there is no recreational or commercial fishery at this time. The facility is located across from an open water body (the Passaic River) therefore, the open water is considered to be a sensitive environment. No freshwater or coastal wetlands are within 1 or 2 miles of the site, respectively. There are no habitats of Federally endangered species within 1 mile of the site.

The facility is surrounded by residences (all approximately 100 feet away from the facility) on three sides of the facility (north, south and east). The total number of houses is 26. An estimated 64 people occupy these residences. The facility presently employs approximately 85 employees. The Garfield School #6 is located on Hudson and Cambridge Street. This school has an enrollment of

approximately 300. Approximately 36,942 people live within one mile of the site. There are no day care centers within 200 feet of the site property. The Passaic River (located west of the facility) is an open water body, therefore is considered to be a sensitive environment.

The facility is surrounded by residences on three sides. Approximately 387,970 individuals populate within four miles of the site. Again, the Passaic River is considered to be an open water body, therefore it is a sensitive environment.

The Preliminary Investigation of the 1986 sampling and analytical results displayed total petroleum hydrocarbons at a maximum of 1070 parts per million (ppm) which exceeds the NJDEP Interim Soil Action Level (ISAL) of 100 ppm. Toluene was detected in the soil from the 1986 soil investigation at a maximum concentration 2,470 ppm which exceeds the 1 ppm ISAL established. The maximum concentration of phenol was detected to be 19.8 ppm. Acid extractable compounds have ISALs established on a case-by-case basis, therefore no grounds for comparison could be made. The ISALs for Base Neutrals which is 10 ppm was not exceeded by any samples from the 1986 sampling event. A water sample collected from soil boring B-4 during the Preliminary Investigation contained 5,400,000 ppb of toluene, 68,000 ppb of benzene, and 12,000 ppb of methylene chloride. No New Jersey maximum contaminant level (MCL) or Safe Drinking Water Act (SDWA) has been established for toluene, therefore there is no basis for comparison at this time. No background levels were reported to have been recorded for this investigation.

The 1987-1988 activities performed at the site for soil had maximum concentrations as follows, for chlorobenzene, 6 ppm; toluene, 5,280 ppm, and xylenes, 4.5 ppm. Total volatiles were reported at 5,292.2 ppm. The ISAL for volatile organic compounds is established at 1 ppm. The ISAL for base neutrals is 10 ppm. The sampling activities for the base/neutral acid extractable compounds reported maximum concentrations as follows: napthalene 2.8 parts ppm; acenapthylene 0.39 ppm; phenanthrene 3.4 ppm; anthracene 0.85 ppm; fluoranthene 4.1 ppm; pyrene 6.19 ppm; Bis(2-ethylhexyl)phthalate 2.7 ppm; chrysene 4.0 ppm; benzo(a)anthracene 3.0 pp; benzo(b)fluoranthene 5.69 ppm; and benzo(a)pyrene 2,4 ppm. The reported concentration of total petroleum hydrocarbons (TPHC) was recorded as 4,660 ppm which exceeds the 100 ppm ISAL established for soils. The concentration of phenol was reported to be 200 ppm which exceeds the volatile ISAL of 1 ppm. No background levels were reported to have been recorded for this investigation.

The 1987-1988 analytical results from the sampling activities for groundwater sampling are as follows: benzene 3.4 ppm; toluene 6.37 ppm; trichlorofluoromethane 1.4 ppm; and total volatiles 100.1 ppm. These concentration values for benzene exceed the NJ MCL and the SWDA MCL at 0.001 ppm and 0.005 ppm respectively. Total phenol was recorded to be elevated levels (2,570 ppm). Phenol is not listed on the NJ MCL or the SDWA MCL therefore, there is no basis for comparison.

Tentatively identified volatile organic compounds (VOCs) were detected in samples from all monitoring wells during the ECRA Sampling Plan Investigation at concentrations from 48 ppb to 17,324 ppb.

The 1991 series of investigations results for the soil boring sampling and analysis program indicated that constituents such as toluene, benzene, PAHs, and TPHCs exceeded the NJDEP-ECRA guidance level of amounts at several locations. Toluene, benzene, total PAHs, and total PHCs were detected in the soil at concentrations up to 20,000 mg/kg, 80 mg/kg, 71 mg/kg and 4,670 mg/kg, respectively. The concentration levels from the samples for toluene and benzene exceed the NJ ISALs for volatile organics of 1 ppm. The maximum reported concentration of PAHs (71 ppm) exceeded the ISALs for base neutrals (10 ppm). The maximum concentration for TPHCs (4,670 ppm) did exceed the ISALs

approximately 300. Approximately 11,551 people live within one mile of the site. There are no day care centers within 200 feet of the site property. The Passaic River (located west of the facility) is an open water body, therefore is considered to be a sensitive environment.

The facility is surrounded by residences on three sides. Approximately 133,222 individuals populate within four miles of the site. Again, the Passaic River is considered to be an open water body, therefore it is a sensitive environment.

The Preliminary Investigation of the 1986 sampling and analytical results displayed total petroleum hydrocarbons at a maximum of 1070 parts per million (ppm) which exceeds the NJDEP Interim Soil Action Level (ISAL) of 100 ppm. Toluene was detected in the soil from the 1986 soil investigation at a maximum concentration 2,470 ppm which exceeds the 1 ppm ISAL established. The maximum concentration of phenol was detected to be 19.8 ppm. Acid extractable compounds have ISALs established on a case-by-case basis, therefore no grounds for comparison could be made. The ISALs for Base Neutrals which is 10 ppm was not exceeded by any samples from the 1986 sampling event. A water sample collected from soil boring B-4 during the Preliminary Investigation contained 5,400,000 ppb of toluene, 68,000 ppb of benzene, and 12,000 ppb of methylene chloride. No New Jersey maximum contaminant level (MCL) or Safe Drinking Water Act (SDWA) has been established for toluene, therefore there is no basis for comparison at this time. No background levels were reported to have been recorded for this investigation.

The 1987-1988 activities performed at the site for soil had maximum concentrations as follows, for chlorobenzene, 6 ppm; toluene, 5,280 ppm, and xylenes, 4.5 ppm. Total volatiles were reported at 5,292.2 ppm. The ISAL for volatile organic compounds is established at 1 ppm. The ISAL for base neutrals is 10 ppm. The sampling activities for the base/neutral acid extractable compounds reported maximum concentrations as follows: napthalene 2.8 parts ppm; acenapthylene 0.39 ppm; phenanthrene 3.4 ppm; anthracene 0.85 ppm; fluoranthene 4.1 ppm; pyrene 6.19 ppm; Bis(2-ethylhexyl)phthalate 2.7 ppm; chrysene 4.0 ppm; benzo(a)anthracene 3.0 pp; benzo(b)fluoranthene 5.69 ppm; and benzo(a)pyrene 2,4 ppm. The reported concentration of total petroleum hydrocarbons (TPHC) was recorded as 4,660 ppm which exceeds the 100 ppm ISAL established for soils. The concentration of phenol was reported to be 200 ppm which exceeds the volatile ISAL of 1 ppm. No background levels were reported to have been recorded for this investigation.

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Tentatively identified volatile organic compounds (VOCs) were detected in samples from all monitoring wells during the ECRA Sampling Plan Investigation at concentrations from 48 ppb to 17,324 ppb.

The 1991 series of investigations results for the soil boring sampling and analysis program indicated that constituents such as toluene, benzene, PAHs, and TPHCs exceeded the NJDEP-ECRA guidance level of amounts at several locations. Toluene, benzene, total PAHs, and total PHCs were detected in the soil at concentrations up to 20,000 mg/kg, 80 mg/kg, 71 mg/kg and 4,670 mg/kg, respectively. The concentration levels from the samples for toluene and benzene exceed the NJ ISALs for volatile organics of 1 ppm. The maximum reported concentration of PAHs (71 ppm) exceeded the ISALs for base neutrals (10 ppm). The maximum concentration for TPHCs (4,670 ppm) did exceed the ISALs

for TPHCs (100 ppm). The southeastern section of the facility where the former toluene USTs had been located and where production facilities which used toluene and benzene existed is an area of concern because of high concentration of toluene, benzene, and PAHs. Total PHCs were detected at high concentrations throughout the facility and are considered to be a constituent of concern in the soil. No background levels were reported to have been recorded for this investigation.

The results of the ECRA-related ground water sampling during 1991 indicated that the primary constituents of concern are toluene, phenol, and benzene. Toluene concentration was highest in the sample from Monitoring Well MW-11. Samples from Monitoring Wells MW-4 and MW-17 contained 100,000 ppb of toluene. Concentrations of toluene at 64,000 ppb 18,000 ppb, 15,000 ppb, 12,000 ppb and 5,640 ppb were detected in samples form Monitoring Wells MW-14, MW-6, MW-5, MW-10 and MW-3, respectively. Toluene was present in ground water throughout the facility. Toluene with concentrations up to 110,000 ppb were detected in ground water. The toluene area of concern for soil appears to be one of the source areas for toluene in groundwater. There is no NJ MCL or NJ SDWA MCL for toluene listed; therefore a comparison cannot be made.

Phenol was also present in the groundwater throughout the facility. Phenol concentrations up to 120,000 ppb were located in the southern half of the facility. Benzene was present in the groundwater from the southern half of the facility at a maximum concentration of 3,500 ppb. The area of benzene contamination in groundwater extends to, and possibly across the southern and western facility boundaries. Trichloroethylene (TCE) and other organic compounds were present in groundwater at various locations across the facility. TCE had been detected on-site in the groundwater at concentrations up to 2,700 ppb. This level of contamination exceeds the NJ MCL established at 1 ppb.

The highest reported concentration of benzene is 3,500 ppb which was detected in Monitoring Well MW-4. This level exceeds the NJ MCL of 1 ppb.

Trans-1,2-Dichloroethene (DCE) was detected at a maximum from Monitoring Well MW-18 at 49 ppb. This level exceeds the NJ MCL established of 10 ppb.

Vinyl Chloride was detected at a maximum in the sample from Monitoring Well MW-18 (24 ppb). This level exceeds the NJ MCL of 2 ppm. Tetrachloroethene which was detected at a maximum in the sample from Monitoring Well MW-5D (26 ppb) had levels that surpass the NJ MCL of 1 ppb.

1,1,1-Trichloroethane (TCA) was detected in samples from two monitoring wells MW-5D and MW-16, at concentrations of 80 ppb and 17 ppb, respectively. The sample from MW-5D exceeds the NJ MCL of 26 ppm. Chloroform was detected in samples from Monitoring Wells MW-8 at a concentration of 1 ppb and from MW-16 at a concentration of 5 ppb. 1,1-Dichloroethene was detected in MW-16 at a concentration of 1 ppb, which does not exceed the NJ MCL established for 1,1-Dichloroethene of 2 ppb.

Samples from MW-1 indicated a concentration of ethylbenzene at 15 ppb and of total xylenes at 26 ppb; while samples from MW-9 indicated a concentration of ethylbenzene at 32 ppb and of total xylenes at 44 ppb. Chlorobenzene was detected at a maximum in the sample from MW-18 (35 ppb) which surpasses the NJ MCL of 4 ppm.

Chloride was detected in the sample from MW-5 at a concentration of 130 mg/L. A sample from MW-3 indicated major ions such as sulfate (36,000 mg/L), sodium (4,130 mg/L), iron (2,280 mg/L) and chloride (763 mg/L). Total dissolved solids in MW-3 were detected at a concentration of 37,400 mg/L.

Tentatively identified volatile organics were detected in all but one monitoring well during the Geraghty & Miller Revised ECRA Sampling Plan Investigation at concentrations that ranged from 53 ppb to 599,785 ppb .

Ebasco did not perform any site sampling because the existing analytical data are adequate. A site reconnaissance was performed by Ebasco on Wednesday, November 20, 1991. The purpose of the site reconnaissance was to document existing site conditions, note the locations and conditions of buildings and observe the locations of all potential source areas of contamination. Photographs of the site reconnaissance which were taken to document site conditions are included as Attachment A.

Toluene, phenol, benzene, polycyclic aromatic hydrocarbons (PAHs), petroleum hydrocarbons (PHCs), trichloroethylene (TCE) and other chlorinated organic compounds such as vinyl chloride have been identified on the site from sampling activities. As a result of plant operation, these compounds were repeatedly spilled onto the ground resulting in substantial soil contamination at the site. Several areas of concern have been identified at the site. The location of the former and current salicylic acid production facilities in the northeastern section of the plant, the location of the former benzoic acid/benzaldehyde production facility in the southeastern section of the plan, and the former Resorcinol production facility (destroyed by explosion in 1951) located in the southeastern section of the plant are all identified areas of concern. Contamination was found in the soil and groundwater by various investigations. There have also been several documented releases of contaminants to the atmosphere. Pungent and noxious odors, smog and vapor have been the subject of complaint from neighbors of the facility. Several investigations by the New Jersey Department of Environmental Protection, Division of Environmental Quality, have been staged. There have also been various documented releases of toluene (1,000 lbs. on 3/17/81), benzoic acid dust (4/13/81 and 6/11/81) and salicylic acid (6/27/84). It is unknown if air releases have reoccurred.

There are no surface water intakes within 15 miles downstream of the site. The population served by wells within 4 miles of the site is zero, however, the Hackensack Water Company has a well which was at one time used for supply during the summertime at peak conditions. This well has not been active for the last 5 years. The Passaic River has been identified as a sensitive environment within 200 feet of the site property. There are approximately 64 people occupying residences within 200 feet of the property. There are approximately 300 students attending school within 200 feet of the site property. There are no daycare centers within 200 feet of the site property. Approximately 85 employees work at the site. Approximately 36,9420 individuals reside within 1 mile of the site and 387,970 individuals reside within 4 miles of the site.

Based on the existing conditions of the site, a **HIGH PRIORITY** recommendation is given for the site. Although soil, the groundwater soil and surface water pathways do not posed an apparent risk to human health and the environment, documented releses of contaminats to the air pose a risk to nearby residents.

SITE ASSESSMENT REPORT: SITE INSPECTION

PART I: SITE INFORMATION

1. Site Name/Alias: Tenneco Chemical Company (aka Kalama Chemical Company)

   Street 290 River Drive

   City Garfield State New Jersey Zip 07026

2. County Bergen County Code 003 Cong. Dist. 12

3. EPA ID No. NJD002005148

4. Block No. 50.01, 50.02 Lot No. 1,2

5. Latitude 40 52' 05 " Longitude 74 06' 38'

   USGS Quad Hackensack, Orange, Paterson, and Weehawken

6. Owner Kalama Chemical Inc. Tel. No. (206)682-7890

   Street Bank of California, Suite 10

   City Seattle State Washington Zip 98164

7. Operator: Kalama Chemical Inc. Tel. No. (201) 779-8880

   Street 290 River Drive

   City Garfield State New Jersey Zip 07026

8. Type of Ownership

   X Private O Federal O State

   O County O Municipal O Unknown O Other

9. Owner/Operator Notification on File

   O RCRA 3001 Date:_____ O CERCLA 103C Date:_____

   O None X Unknown

10. Permit Information

Permit	Permit No.	Date Issued	Expiration Date	Comments
NJDPES	NJ0000124	Unknown	Unknown	Issued for discharges to surface water and one to a sanitary waste water transport system.

The Kalama facility filed their NJDPES application on time, but has not yet received notification of approval.

Ref. No. 11.

Permit	Permit No.	Date Issued	Expiration Date	Comments
POTW	NJ0000124	5/27/91	5/27/96	Industrial waste water from facility to the Passaic Valley Sewage Commission's Domestic Treatment Works (adjusted for pH) POTW

Air Pollution Certificates:

Permit	Permit No.	Date Issued	Expiration Date	Comments
Stack No. 87	042186	4/7/89	4/7/94	Soda Ash Solution Tank T3
Stack No. 88	042187	4/7/89	4/7/94	Neutralizer T-8, Meth Sal Bldg
Stack No. 89	042188	4/7/89	4/7/94	Hydrolizer T-9, Meth Sal Bldg
Stack No. 92	042191	5/27/84	5/27/89-Renewed	Drum Dump Hopper B-2
Stack No. 13	040430	9/16/89	9/16/94	2-Salicyclic Acid Packing Station
Stack No. 12	002030	1/15/86	1/15/91-Renewed	Raymond No. 10 Imp Mill
Stack No. 29	018328	5/13/91	5/13/96	Truck Loading Scrubber
Stack No. 28	004414	9/7/86	9/7/91-Cancelled	Benzaldehyde Still No. 2
Stack No. 63	079275	7/30/87	7/30/92-To Be Cancelled	Catwalk Tank CW 6
Stack No. 62	079274	7/30/87	7/30/92-To Be Cancelled	Catwalk Tank CW 7

Air Pollution Certificates (continued)

Permit	Permit No.	Date Issued	Expiration Date	Comments
Stack No. 38	031602	11/2/87	11/2/92-To Be Cancelled	Storage Tank Vent No. 10
Stack No. 39	031603	11/2/87	11/2/92-To Be Cancelled	Storage Tank Vent No. 11
Stack No. 30	031594	1/5/88	1/5/93	Propanol Tank
Stack No. 48	035391	3/30/88	3/30/93-To Be Cancelled	Methanol Tank No. 32-1
Stack No. 49	035395	3/30/88	3/30/93-To Be Cancelled	Methanol Tank No. 32-2
Stack No. 50	035397	3/30/88	3/30/93-To Be Cancelled	Methanol Tank No. 32-3
Stack No. 41	032883	4/16/88	4/16/93	MOA Mill Hopper
Stack No. 37	087910	12/21/88	12/21/93	Storage Tank
Stack No. 01	042677	4/7/89	4/7/94	Sulfuric Acid Catch Tank
Stack No. 85	042184	6/16/89	6/16/94	Methanol Recv. T-5
Stack No. 90	042189	4/7/89	4/7/94	Vacuum Pump P-8, Meth Sal Bldg
Stack No. 91	042190	4/7/89	4/7/94	Filter Receiver Item M2 Methyl Sal Bldg
Stack No. 25	060937	7/2/90	7/2/95	Vent Condenser Stack

Ref. No. 11

11. Site Status

X Active O Inactive O Unknown

12. Years of Operation: 1903 to present

13. Identify the types of waste sources (eg., landfill, surface impoundment, piles, stained soil, above or below-ground tanks or containers, land treatment, etc.) on site. Initiate as many waste unit numbers as needed to identify all waste sources on site.

(a) Waste Sources

Waste Unit No.	Waste Source Type	Facility Name for Unit
1	Pile	Large Soil pile staged on north side of plant
2	Pile	Small Soil pile staged on north side of plant
3	Scrap Area	Scrap Area Hudson Street Side
4	Pile	Debris near building No. 4, south side of plant
5	Area of Concern	Southeastern section of facility

(b) Other Areas of Concern

Identify any miscellaneous spills, dumping, etc. on site; describe the materials and identify their locations on site.

Historically, several minor spills did occur at the Tenneco (aka Kalama Chemical Company) facility. Spills and or releases have occurred at various times on site, however, no documentation of spills prior to 1981 were located. Since 1981, documented records indicate spills or releases of toluene, liquid benzoic acid, salicylic acid, benzoic acid powder, sulfuric acid, and methanol. Records do not indicate that the site was used for dumping purposes, however there are staging and storage areas before materials are to be disposed of off-site.

Ref. No. 1 pp. 2,3; Ref. No. 19

14. Information available from

Contact Juan Davila Agency USEPA Region II Tel.No. (212)264-6669

Preparer Judith A. Cusick Agency Ebasco Environmental Date February 5, 1992

PART II: WASTE SOURCE INFORMATION

Waste Unit 1 consisted of soil was generated from various activities on site. The dimensions of this large pile are approximately 60' x 15' x 20'. The soil was staged near the fence at the Monroe Street side of the facility. The soil was analyzed for disposal and the results indicated that the soil was non-hazardous.

Ref. No. 4; Ref. No. 19.

Waste Unit 2 also consisted of soil generated from various onsite activities. The dimensions of this pile located on the Monroe Street side of the facility are approximately 20' x 15' x 4'. This pile was also analyzed for disposal purposes and the results indicated that the soil was non-hazardous.

Ref. No. 4, Ref. No. 19.

Waste Unit 3 consisted of a large area located on the south side of the facility used for scrap and machinery disposal. This scrap area contained former on-site machinery and other materials stored for disposal. This scrap area was scattered along the Hudson Street side of the facility. The scrap items and machinery were rusted.

Ref. No. 4, Ref. No. 19.

Waste Unit 4 consisted of a small pile of debris generated from demolition activities performed on building No. 4. This pile which was located near building No. 4, was the result of the demolition activities from the removal of the inactive piping which had formerly existed on the side of building No. 4.

Ref. No. 4, Ref. No. 19.

Waste Unit 5 is the southeastern section of the facility. This area has been established as an area of concern because of the high concentrations of toluene, benzene and poly aromatic hydrocarbons (PAHs) in the soil, and the high concentrations of trichloroethene (TCE), benzene, phenol, and toluene in the groundwater. This section of the facility includes the locations of the former toluene underground storage tanks (USTs) and production facilities for benzoic acid/benzaldehyde which used benzene and toluene. Sources other than the USTs (i.e., leaks and spills) probably contributed to the toluene contamination on the soil.

Ref. No. 2 pp. 15, 17, 20

See Figure 2 for the location of each Waste Unit.

PART III: SAMPLING RESULTS

EXISTING ANALYTICAL DATA

Geraghty & Miller (G&M) conducted various investigations at the Tenneco site. In 1986, a Preliminary Investigation of Soil Quality Conditions was prepared. A sampling plan was prepared as part of the Environmental Cleanup Responsibility Act (ECRA)-required Site Evaluation Submission. The plan titled, "Sampling Plan for Site Evaluation, Kalama Chemical, Inc. Facility, Garfield, New Jersey" was submitted to the New Jersey Department of Environmental Protection (NJDEP) in August 1987. The field work was conducted from September 1988 through March 1988. Based on the results of the ECRA Sampling Plan Investigation, an addendum was proposed to the NJDEP in October 1988 with an additional sampling plan addendum letter to address certain uncertainties regarding the nature and extent of contamination. The NJDEP required Kalama to submit an expanded sampling plan addendum in March 1989. The work detailed in the G&M Revised Sampling Plan Addendum began in January 1991 and was completed in September 1991 with the completion of the G&M report, "Sampling Plan Addendum No. 2."

Ref. No. 2 pp. 8-10

The following is a brief description of each investigation performed at the site to date.

Preliminary Investigation (June 1986)

The Preliminary Investigation included the drilling of five soil borings and the subsequent collection of samples. The locations which are depicted on Figure 3 were designated as B-1 through B-5. These soil borings ranged in depth from 8 feet to 12 feet below ground surface (bgs). In addition, a water sample was collected from soil boring B-4 for laboratory analysis. The sampling locations included a shipping/transfer area for chemicals, the area of the fuel oil and methanol underground storage tanks, the railcar loading and unloading area, the benzaldehyde production area, and the chemical transfer area near Building 32. The soil samples were analyzed for the following parameters: Volatile, base/neutral and acid extractable organic compounds; total petroleum hydrocarbons; total phenolics; benzoic acid; benzaldehyde; formaldehyde and alcohols. Results revealed the concentration of toluene to be 2,470 ppm in an area adjacent to the benzaldehyde storage tanks. Phenol was detected at 19.8 ppm outside of Building No. 32, which was used for shipping chemicals by truck. Reported depths for these soil samples ranged from 0 to 2 feet and 2 to 4 feet (Table 2).

The results of the analysis of the soil and fluid samples indicate the presence of a variety of base/neutral extractable organic compounds at the location B-2. Toluene was detected in all soil samples and the fluid sample from boring B-4. The soil and fluid samples from boring B-4 had toluene concentration of approximately 0.2 percent and 0.5 percent, respectively. Phenol was detected in the soil sample from boring B-5 at a concentration of 19.8 ppm. Tables 2 and 3 summarize the results of the analysis of the soil and fluid samples. The NJDEP Interim Soil Action Levels (ISAL's) from February 1990 for base neutrals and volatile organics are 10 ppm and 1 ppm, respectively. These levels of toluene and phenol exceeded the 1990 ISAL standards.

The highest reported concentration of benzene is 3,500 ppb which was detected in Monitoring Well MW-4. Benzene was also detected in the sample form Monitoring Well MW-14 at a concentration of 1,700 ppb and in the samples form Monitoring Wells MW-1, MW-9 and MW-10 at concentrations of 1,000 ppb, 490 ppb and 140 ppb, respectively. Benzene was detected in the samples from Monitoring Wells MW-7 and MW-8 at concentration of 29 ppb and 10 ppb, respectively. These levels exceed the 1 ppb NJ MCL.

TCE was detected at a maximum concentration of 2,700 ppb in the sample from Monitoring Well MW-5D. TCE was detected at concentrations of 1,400 ppb, 900 ppb, 550 ppb, and 260 ppb in samples from Monitoring Wells MW-5, MW-9, MW-18, and MW-16, respectively and in the sample from MW-15 at a concentration of 18 ppb. The NJ maximum contaminant level for TCE which was exceeded in these samples is 1 ppm.

Trans-1,2-Dichloroethene (DCE) was detected in samples from Monitoring Wells MW-3D at a concentration of 24 ppb, MW-6D at 44 ppb, MW-9 at 32 ppb, MW-12 at 18 ppb, MW-15 at 19 ppb and MW-18 at 49 ppb. Monitoring Well MW-16 had a concentration of 2 ppb. The NJ MCL for DCE (10 ppb) was exceeded in each of these samples.

Vinyl Chloride (NJ MCL of 2 ppb) was detected in samples from Monitoring Wells MW-3D (12 ppb), MW-9 (20 ppb), MW-12 (5 ppb), and MW-18 (24 ppb). These levels exceed the NJ MCL for vinyl chloride. Tetrachloroethene was detected in samples from Monitoring Wells MW-5D (26 ppb), MW-9 (11 ppb), MW-12 (9 ppb), and MW-16 (5 ppb). These levels exceed the 1 ppm NJ MCL for tetrachloroethene.

1,1,1-Trichloroethane (TCA) was detected in samples from two monitoring wells MW-5D and MW-16, at concentrations of 80 ppb and 17 ppb, respectively. The sample from MW-5D exceeds the NJ MCL of 26 ppm for TCA. Chloroform was detected in samples from Monitoring Wells MW-8 at a concentration of 1 ppb and from MW-16 at a concentration of 5 ppb. 1,1-Dichloroethene was detected in MW-16 at a concentration of 1 ppb.

Samples from MW-1 indicated a concentration of ethylbenzene at 15 ppb and of total xylenes at 26 ppb; while samples from MW-9 indicated a concentration of ethylbenzene at 32 ppb and of total xylenes at 44 ppb. The NJ MCL for xylenes (44 ppb) was not exceeded. Chlorobenzene was detected in samples from MW-2 (29 ppb), MW-9 (19 ppb), MW-12 (10 ppb) and MW-18 (35 ppb). These levels exceed the NJ MCL of 4 ppb for chlorobenzene.

Chloride was detected in the sample from MW-5 at a concentration of 130 mg/L. A sample from MW-3 indicated major ions such as sulfate (36,000 mg/L), sodium (4,130 mg/L), iron (2,280 mg/L) and chloride (763 mg/L). Total dissolved solids in MW-3 were detected at a concentration of 37,400 mg/L. Table 8 summarizes the concentrations of inorganic constituents found in the sample from MW-3.

Tentatively identified compounds were detected in all but one monitoring well during the Geraghty & Miller Revised ECRA Sampling Plan Investigation at concentrations that ranged from 53 ppb to 599,785 ppb .

At this time, additional investigations which were proposed by Geraghty & Miller Inc, in their "Sampling Plan Addendum No. 2" are being performed in order to further define the presence, concentration, distribution and source of constituents of concern both onsite and offsite.

Ref. No. 2 pp. 12-21; Ref. No. 3 pp. 10-14.

Site Inspection Results

No site sampling was required since the existing analytical data are adequate to evaluate the actual environmental conditions of the site. A site reconnaissance was performed by Ebasco on Wednesday, November 20, 1991. The purpose of the site reconnaissance was to document existing site conditions, note the locations and conditions of buildings and observe the locations of all potential source areas of contamination. Photographs of the site reconnaissance which were taken to document site conditions are included as Attachment A. An HNu (model AR725319) was utilized to monitor ambient air during the site reconnaissance. Background reading was recorded to be 2 parts per million (ppm).

The facility is an active chemical manufacturing company with tank trucks, tractor trailers, and rail cars entering the site regularly. The site which is approximately 40 to 50 % in operation is approximately 25% paved and 50 % building occupied. There are several above ground storage tanks (active) for such materials as methanol, liquid nitrogen, n-propynol, formaldehyde, fuel oil and water. There are some 55 gallon drums and drum storage areas on-site. The storage areas were mainly for the containment of raw material used and finished product generated at the facility.

While touring the site, there was no evidence of any superficial soil contamination nor were there any irregular discolorations on the asphalt. Since the site is primarily buildings and asphalt, the vegetation which was present mainly along the edges of the facility boundary in small amounts, consisted mainly of weeds and some grass. Repaving occurred in areas where the former underground storage tanks were once located. The site topography is flat. Runoff is discharged by the on-site storm drain system to the Passaic River. Several storm drains were observed during the site reconnaissance. Runoff from the process buildings is discharged to the local Publicly Owned Treatment Works (POTW) facility. The conditions of existing on and off site monitoring wells were noted throughout the reconnaissance.

The facility which is located in a residential area is fenced on all four sides. Twenty-six houses surround the facility on the north, south, and east side. The site is located 94 feet from the Passaic River (across River Drive west of the facility).

Two staged soil piles were located on the Monroe (facility north) Street side of the facility. These piles were the result of various on-site activities which are not specifically known. A raw material quarantine area is located near a product drum storage area on the Hudson Street side of the facility. This quarantine area was completely fenced in and contained approximately 10 55-gallon drums of a material called Iso Par C. Also in the vicinity of this drum storage area along the south side of the facility was a scrap area which consisted of former on-site machinery and other miscellaneous materials. The materials which were located in several piles along the fence area were not covered and were rusted. Towards the southwest corner of the site, a pair of borings were found. These borings were drilled through some large sheets of plywood material into the ground. One borehole had registered an HNu reading of 5-8 ppm at the borehole opening.

A water sample collected from soil boring B-4 during the Preliminary Investigation contained 5,400,000 ppb of toluene, 68,000 ppb of benzene, and 12,000 ppb of methylene chloride. The light non-aqueous phase liquid (LNAPL) collected from Monitoring Well MW-7 contained 541,000,000 ppb (54 percent) of toluene and 408,900,000 ppb (41 percent) of PHCs. The reported concentration of methylene chloride exceeds the New Jersey Maximum Contaminant Level (NJ MCL) of 2 ppb.

Ref. No. 2 pp. 6, 8-10; Ref. No. 1; Ref. No. 3 p. 6, 7-9; Ref. No. 5.

ECRA Sampling Plan Investigation (1987-1988)

The ECRA Sampling Plan Investigation included the drilling of soil borings, installation of ground water monitoring wells, sampling of soil and groundwater and measuring water levels. During this investigation, remedial activities occurred in that the current owner and Tenneco jointly initiated the removal of USTs at the facility. The whereabouts of these inactive, removed USTs is not known. Also during this time, the current owner removed a light, non-aqueous phase liquid (LNAPL) from Monitoring Wells MW-5 and MW-7.

The soil sampling included the drilling of thirteen soil borings, designated as S-1 through S-13 locations shown in Figure 3. Samples were obtained by using split-spoon sampling techniques (one sample was collected using a hand auger in December 1987). The borings ranged in depth from 3.5 feet to 22 feet below ground surface. These soil samples were analyzed for the following parameters: Volatile and base/neutral extractable organic compounds including tentatively identified compounds; total petroleum hydrocarbons; total phenolics; benzoic acid; and benzaldehyde. The groundwater sampling program included the installation of nine monitoring wells (three of which were installed in converted soil borings). The monitoring wells were designated as MW-1, MW-2, MW-3, MW-3D, MW-4, MW-5, MW-6, MW-6D, and MW-7. These monitoring wells are depicted on Figure 3. Samples from the monitoring wells were analyzed for the following parameters: Volatile and base/neutral extractable organic compounds including tentatively identified compounds; total petroleum hydrocarbons; total phenolics; benzoic acid; benzaldehyde; and methanol. One round of ground water sampling was conducted in January 1988. In addition to the listed parameters, MW-3 was analyzed for selected inorganic constituents (i.e., major ions). Ground water from MW-7 was not sampled; instead a sample of the LNAPL present in the monitoring well was collected for analysis. Along with the soil and groundwater sampling program, three rounds of groundwater level measurements were conducted in January, February and March 1990. As previously mentioned, the LNAPL present in monitoring well MW-7 was removed by pumping on seven occasions during the period of May through November 1988. A LNAPL was also removed from monitoring well MW-5.

The soil quality investigation performed during 1987-1988 included the collection of soil samples during the tank excavation program and the exploratory soil boring program. Soil samples that were collected around tanks that held fuel oil or gasoline were analyzed for total petroleum hydrocarbons, while samples collected around tanks that held toluene or methanol were analyzed for those specific target compounds. The analytical results for UST soil samples (Table 4) indicate that soil quality was impacted by some degree by the products stored in the tanks. The analytical results for the soil samples collected during the soil boring program are summarized in Table 5. Toluene was the volatile detected in highest concentrations, and was especially high in soil samples collected from the southeastern portion of the facility. Benzene was also detected in high concentrations in soil samples S-7 and S-8. The ISAL for volatile organics is 1 ppm. The maximum reported concentrations of toluene and benzene are 5280 ppm and 6 ppm, respectively, which exceed the ISAL volatile level. Several base/neutral extractable compounds were detected in soil samples collected from the southern

half of the facility. The ISAL for base neutral compounds is 10 ppm; the reported soil concentrations did not exceed this limit. Detectable levels of total petroleum hydrocarbons (TPHC) were found in soil samples S-1, S-2, S-3, S-7, S-8 and S-12. The maximum concentration reported was 4.66 ppm, which does not exceed the ISAL for TPHC at 100 ppm. Total phenols were detected in samples S-1 and S-2 at concentration of 8.7 and 200 ppm, respectively. These levels of contaminants exceed the ISALs for base neutrals of 10 ppm.

The groundwater investigation indicated benzene and toluene to be the principal volatile organic compounds detected in the monitoring well samples. Tables 6 and 7 present summaries of the groundwater analyses performed. Between September 1987 and March 1988, there were nine monitoring wells installed on-site (in unconsolidated deposits) and sampled. A sample of a product layer floating on the water table from MW-7 revealed high concentrations of toluene (541,000 ppm) and petroleum hydrocarbons (408,900 ppm). This monitoring well was located to the west of building 32, in the approximate area of the former underground storage tank farm (4 tanks) to the north of building 18, and the 5 USTs located between buildings 18 and 32. Several base/neutral compounds were detected in relatively low concentration in all monitoring well samples. Benzaldehyde was detected in the sample from MW-5 at a concentration of 570 ppb. Tentatively identified volatile organic compounds (VOCs) were detected in samples from all monitoring wells during the ECRA Sampling Plan Investigation at concentrations from 48 ppb to 17,324 ppb.

Ref. No. 6 pp 8-10 ; Ref. No. 3 pp. 7-9; Ref. No. 2 p. 8-10.

Revised ECRA Sampling Plan Investigation (1991)

The Revised ECRA Sampling Plan Investigation was conducted in 1991. This Investigation included 8 main tasks which included an Aerial Photograph History, additional soil sampling, the installation of additional monitoring wells, water-level measurements, monitoring well sampling, pumping tests, underground storage tank removal, and soil venting.

The soil sampling included forty-six borings designated as B-1 through B-46. These samples were collected in January 1991 using the split-spoon sampling techniques and hand-augering drilling techniques (for five of the soil boring locations). The soil boring locations are depicted on Figure 3. The soil borings ranged in depth from 0.5 feet to 12 feet below ground surface. The soil samples were analyzed for the following list of parameters: Volatile, and base/neutral acid extractable organic compounds including tentatively identified compounds; total petroleum hydrocarbons; total phenolics; arsenic, beryllium, cadmium, and vanadium; polychlorinated biphenyls; toluene; methanol; hexene; and pH.

Twelve additional monitoring wells were installed at the site (Figure 3). These wells were designated as MW-8 through MW-18 and MW-5D. The monitoring wells installed in January 1991 and April 1991 ranged from 12.5 to 35 feet in depth. One round of groundwater sampling was conducted in April 1991. Ground water samples from all monitoring wells (previous investigations included) were sampled for the following parameters: Volatile, and base/neutral and acid-extractable compounds including tentatively identified compounds (TICs); total petroleum hydrocarbons; total phenolics; benzaldehyde; chloride; and fecal coliform.

Other activities performed included the pumping tests conducted in May 1991; the removal of all USTs at the facility (including post-excavation soil sampling program); and soil venting performed in order to determine the feasibility and potential of soil vapor extraction for removing contaminants from the unsaturated (vadoze) zone. A well search within a 0.5 mile radius of the site was also

performed.

The results of the soil boring sampling and analysis program indicated that constituents such as toluene, benzene, PAHs, and TPHCs exceeded the NJDEP-ECRA guidance level of amounts at several locations. Toluene, benzene, total PAHs, and total PHCs were detected in the soil at concentrations up to 20,000 ppm, 80 ppm, 71 ppm and 4,670 ppm, respectively. The southeastern section of the facility where the former toluene USTs had been located and where production facilities which used toluene and benzene existed is an area of concern because of high concentration of toluene, benzene, and PAHs. Total PHCs were detected at high concentrations throughout the facility and are considered to be a constituent of concern in the soil. Tables 19 (Geraghty & Miller) through 23, 27 through 29, summarize the Revised ECRA Sampling Plan Investigation for soil and groundwater samples.

Toluene was found at elevated concentration in the samples from soil borings B-20 (230 ppm), B-18 (890 ppm), B-6 (360 ppm), B-8 (360 ppm), B-7 (17 ppm), B-9 (2.4 ppm), B-26 (20,000 ppm), B-13 (3,400 ppm), B-14 (620 ppm), B-16 (12 ppm), B-4 (17,000 ppm), and B-3 (2.4 ppm). Each of these detected concentrations of toluene exceeds the NJ MCL for volatile organics of 1 ppm.

Total petroleum hydrocarbons (TPHCs) were detected in the samples from B-18 (206 ppm), B-6 (547 ppm), B-8 (576 ppm), B-9 (153 ppm), B-26 4,430 ppm), A-26-C (1,250 ppm), B-13 (1,630 ppm), B-14 (1,410 ppm), C-3-A (424 ppm), B-42 (207 ppm), B-44 (737 ppm), B-46 (400 ppm), B-2 (148 ppm), B-4 (4,670 ppm), B-10 (193 ppm), B-40 (4,040 ppm) B-43 (320 ppm), B-33 (1,820 ppm), B-34 (1,770 ppm), B-35 (1,550 ppm), and B-39 (672 ppm). These concentration exceed the NJ ISALs of 100 ppm for TPHCs.

Total PAHs were detected in the samples from soil borings B-6 (12.5 ppm), B-26 (71.3 ppm), B-42 (19.6 ppm) B-33 (15.3 ppm), and B-44 (11.1 ppm). The NJ ISALs for total PAHs is 10 ppm. Benzene was detected in the sample from B-26 (20,000 ppm) which exceeds the NJ MCL of 10 ppm for base neutrals. Other contaminants identified include PCB-1260, which was found in samples from soil borings B-44 (0.47 ppm) and the field duplicate sample (2.2 ppm). Significant levels of tentatively identified compounds (TICs) did occur in the soil. Additional sampling is proposed by a contractor for the current owner in order to further address soil remediation strategies.

The results of the ECRA-related ground water sampling during 1991 indicated that the primary constituents of concern are toluene, phenol, and benzene. Toluene concentration was highest in the sample from Monitoring Well MW-11. Samples from Monitoring Wells MW-4 and MW-17 contained 100,000 ppb of toluene. Concentrations of toluene at 64,000 ppb 18,000 ppb, 15,000 ppb, 12,000 ppb and 5,640 ppb were detected in samples form Monitoring Wells MW-14, MW-6, MW-5, MW-10 and MW-3, respectively. Toluene was present in ground water throughout the facility. Toluene with concentrations up to 110,000 ppb were detected in ground water. The toluene area of concern for soil appears to be one of the source areas for toluene in groundwater. There is no NJ MCL or NJ SDWA for toluene for basis of comparison.

Phenol was also present in the groundwater throughout the facility. Phenol concentrations up to 120,000 ppb were located in the southern half of the facility. Benzene was present in the groundwater from the southern half of the facility at a maximum concentration of 3,500 ppb. This exceeds the NJ MCL of 1ppb. The area of benzene contamination in groundwater extends to, and possibly across the southern and western facility boundaries. Trichloroethene (TCE) and other organic compounds were present in groundwater at various locations across the facility. TCE had been detected on-site in the groundwater at concentrations up to 2,700 ppb.

PART IV: HAZARDOUS WASTE ASSESSMENT

GROUNDWATER PATHWAY

1. Describe the likelihood of the release of contaminant(s) to the groundwater as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provided rationale for attributing them to the site. For observed release,define supporting analytical evidence.

Analytical data from previous investigations (1987-1988, 1991) indicate that an observed release of contaminants (i.e., toluene, phenol, benzene and TCE) has occurred. Toluene is present in groundwater throughout the facility. Toluene concentrations up to 110,000 ppb were detected in groundwater samples from the southern half of the facility. Phenol is also present in groundwater throughout the facility. The areas of toluene and phenol contamination in groundwater extend to, and probably a cross the northern, southern and western boundaries of the facility. Other contaminants detected in the groundwater are: trans-1,2-Dichloroethene (DCE), vinyl chloride, tetrachloroethene, 1,1,1-Trichloroethane (TCA), chlorobenzene, chloroform, 1,1-Dichloroethene, ethylbenzene, total xylenes, methylene chloride, fecal coliforms and various major ions.

Ref. No. 3 pp. 41-57.

2. Describe the aquifer of concern; include information such as depth, thickness, geologic composition, areas of karst terrain, permeability, overlying strata, confining layers, interconnections, discontinuities, depth to water table, groundwater flow direction.

The facility is located in the Piedmont Lowland Physiographic Province. Bedrock within this Province consists of sedimentary and igneous formations of the Triassic and Jurassic Periods. Unconsolidated glacial and fluvial deposits of the Pleistocene and Recent Epochs cover the bedrock in most areas of the Province, especially in lowland areas. The bedrock which underlies the Tenneco facility belongs to the sedimentary Brunswick Formation. This formation if comprised primarily of reddish-brown sandstones and shale beds that dip generally 10 degrees to 15 degrees to the northwest.

Two aquifers which exist regionally are the overburden aquifer in the unconsolidated deposits and the bedrock aquifer in the Brunswick Formation which is the aquifer of concern. The bedrock under the facility consists of sedimentary and igneous formations of the Triassic and Jurassic Periods. The Passaic River, which is located 94 feet of the facility, acts as a discharge point for groundwater in the overburden aquifer. Beneath the Tenneco facility is a complex sequence of unconsolidated deposits, primarily sand layers with discontinuous layers of silt, slay and fill. Fill material which is present immediately underneath the facility, is approximately 3 to 8 feet in depth. The fill is typically a mixture of sand, gravel, crushed stone, and brick fragments, with some locations that have groundwater occurring in it. The fill is underlain by natural deposits consisting of sand with discontinuous silt and clay layers. The unconsolidated deposits are approximately 25 to 35 feet in thickness. Groundwater in the unconsolidated deposits occurs about 7 to 10 feet below ground surface. The depth to the water table increases towards the Passaic River.

The unconsolidated deposits consist of mainly silt and clay layers. The unconsolidated deposits underlying the facility, including the fill material, contain one water-bearing zone, where saturated. The water-bearing zone is non-homogeneous because of the variations in lithology of the unconsolidated depths. As a result, the hydraulic characteristics will vary significantly both horizontally and vertically across the site.

The groundwater flow for the site is generally a westerly/southwesterly direction towards the Passaic River. The soil hydraulic conductivity based on G & M slug test data ranged from 0.3 ft/day to 13 ft/day. These hydraulic conductivities are consistent with the grain size and density of the unconsolidated materials which underlies the facility. The overall groundwater flow gradient across the site is approximately 0.01.

Ref. No. 3 pp. 24-30. Ref. No. 1 p.3.

3. Is a designated well head protection area within 4 miles of the site?

There is no formal well head protection area established within 4 miles of the site.

Ref. No. 12.

4. What is the depth from the lowest point of waste disposal/storage to the highest seasonal level of the saturated zone of the aquifer of concern?

Generally, the groundwater in the unconsolidated deposits occurs at 7-10 ft bgs. (Again, two aquifers which exist regionally are the overburden aquifer in the unconsolidated deposits and the bedrock aquifer in the Brunswick Formation which is the aquifer of concern.) However, at the area in the vicinity of MW-4, the groundwater has been recorded to be 3-4 feet higher. G & M referred to this condition as an apparent water-table mound. In June 1991, G & M installed a piezometer cluster. The preliminary measurements indicated that the water level in the shallow piezometer was approximately 4 feet higher than that in the deeper piezometer. Based on the preliminary water-level measurements, G & M stated that the apparent water-table mound in the vicinity of Monitoring Well MW-4 could be a water body that is locally perched by the underlying clay layer. The lowest point of waste disposal has been estimated at 9 to 11 feet. This depth is the lowest point where contamination was found (soil boring with depth of 9 to 11 feet). Therefore, the waste disposal is estimated to be lower than the recorded groundwater levels, and the distance between the lowest point of waste disposal/storage to the highest seasonal level of water is a negative distance (approximately negative 5 feet).

Ref. No. 3; pp. 24-29; Ref. No. 3 Table 16.

5. What is the permeability value of the least permeable intervening stratum between the ground surface and the aquifer of concern?

There is no continuous intervening stratum at the site; however, hydraulic conductivities based on G & M slug test data ranged from 0.3 ft/day to 13 ft/day.

Ref. No. 3 p. 28-29; Ref. No. 1 pp. 3-4.

6. What is the net precipitation for the area?

The net precipitation for 1990 was 52.3 inches.

Ref. No. 7.

7. What is the distance to and depth of the nearest well that is currently used for drinking purposes.

The nearest public supply well is the Hackensack Water Company well located in Rochelle Park. This well is used for potable water which is directed to the distribution systems. The well has not been used in 5 years; its main function is to serve as a backup well only during peak periods (summertime). The Hackensack Water Company is supplied with surface water from the Oradell Reservoir (on the Hackensack River). The Hackensack Water Company is considering sealing the well. It is located 3.4 miles away from the site and has a depth of 473 feet. The City of Garfield is supplied water by the Passaic Valley Reservoir and has a wellfield in Elmwood Park. Garfield and its neighboring towns are supplied water by reservoir and for the most part by means other than wells (Oradell Reservoir).

Ref. No. 13; Ref. No. 12; Ref. No. 14; Ref. No. 15; Ref. No. 16; Ref. No. 9; Ref. No. 18; Ref. No. 28.

8. If a release to groundwater is observed or suspected, determine the number of people that obtain drinking water from wells that are documented or suspected to be located within the contaminated boundary of release.

There are no wells supplying groundwater for drinking purposes within the contaminated boundary of release. The City of Garfield and its neighboring towns are supplied water by northern (upstream of the flow of the Passaic River) sources. The water is supplied by a reservoir source (Oradell Reservoir).

Ref. No. 13.

9. Identify the population served by wells located within 4 miles of the site that draw from the aquifer of concern.

Distance	Population
0-1/4 mi	0
>1/4-1/2mi	0
>1/2-1mi	0
>1-2mi	0
>2-3mi	0
>3-4mi	0

Currently, no one is served by wells located within 4 miles of the site. It was reported that the city of Garfield at one time did have 11 public supply wells located north of the Tenneco site, which served approximately 10,000 people. The Wallington Borough was reported to have had 4 wells located south of the site, which served an estimated 2,000 people. The Lodi Borough was reported to have had 11 wells northeast of the site, which served approximately 28,000-30,000 people. The Hackensack Water Company is reported to have one well located 3.4 miles northeast of the site and it is only used during peak periods (i.e., summertime; it has been inactive for the last five years). The population served by this well was 3,000 people.

Ref. No. 13; Ref. No. 31; Ref. No. 32; Ref. No. 33.

10. Identify uses of groundwater within 4 miles of the site (i.e. private drinking source, municipal source, commercial, irrigation, unusable.

The following wells are located within four miles of the site:

Well	Type	Distance from site	Depth (feet)	Comments Active/Inactive	Formation (Aquifer)
Garfield Water Department	Public	0.4	276	Inactive	GTRB
Garfield Water Department	Public	0.5	400	Inactive	GTRB
Garfield Water Department	Public	0.8	475	Inactive	GTRB
Garfield Water Department	Public	0.8	405	Inactive	GTRB
Lodi Borough	Public	1.0	607	Inactive	GTRB
Lodi Borough	Public	1.1	459	Inactive	GTRB
Wallington Borough	Public	1.2	400	Inactive	GTRB
Wallington Borough	Public	1.3	400	Inactive	GTRB
Miles Laboratories	Industrial	1.3	408	Unknown	GTRB
Lodi Borough	Public	1.4	400	Inactive	GTRB
Miles Laboratories	Industrial	1.4	300	Unknown	GTRB
Farmland Dairies Inc.	Industrial	1.5	300	Unknown	GTRB
Farmland Dairies Inc.	Industrial	1.5	300	Unknown	GTRB
Wallington Borough	Public	1.5	503	Inactive	GTRB
Wallington Borough	Public	1.5	506	Inactive	GTRB
Lodi Borough	Public	1.6	307	Inactive	GTRB
Lodi Borough	Public	1.6	300	Inactive	GTRB
Lodi Borough	Public	1.6	332	Inactive	GTRB
D.A.K. Manufacturing Corp.	Industrial	1.6	250	Unknown	GTRB
Fritzche Dodge & Olcott	Industrial	1.7	600	Unknown	GTRB
D.A.K. Manufacturing Corp.	Industrial	1.8	NA	Unknown	GTRB
D.A.K. Manufacturing Corp.	Industrial	1.8	NA	Unknown	GTRB
D.A.K. Manufacturing Corp.	Industrial	1.8	NA	Unknown	GTRB
Park 80-Kiddie Associates	Industrial	1.9	400	Unknown	GTRB
Orval Kent Food Company	Industrial	2.0	580	Unknown	GTRB
Park 80-Kiddie Associates	Industrial	2.0	400	Unknown	GTRB
Park 80-Kiddie Associates	Industrial	2.0	300	Unknown	GTRB
Lodi Borough	Public	2.0	470	Inactive	GTRB
Park 80-Kiddie Associates	Industrial	2.1	300	Unknown	GTRB
Orval Kent Food Company	Industrial	2.2	470	Unknown	GTRB
Marcal Paper Mills	Industrial	2.2	308	Unknown	GTRB
Marcal Paper Mills	Industrial	2.2	330	Unknown	GTRB
Marcal Paper Mills	Industrial	2.2	325	Unknown	GTRB
Marcal Paper Mills	Industrial	2.2	282	Unknown	GTRB
Marcal Paper Mills	Industrial	2.2	NA	Unknown	GTRB
Marcal Paper Mills	Industrial	2.2	NA	Unknown	GTRB
Lodi Borough	Public	2.2	373	Inactive	GTRB
Lodi Borough	Public	2.4	373	Inactive	GTRB
Ganes Chemical, Inc.	Industrial	2.5	490	Unknown	GTRB
Ganes Chemical, Inc.	Industrial	2.5	526	Unknown	GTRB
Ganes Chemical, Inc.	Industrial	2.5	430	Unknown	GTRB
Fair Lawn Borough	Public	2.8	400	Unknown	GTRB

Well	Type	Distance from site	Depth (feet)	Comments Active/Inactive	Formation (Aquifer)
Spinnerin Yarn Co., Inc.	Industrial	3.3	404	Unknown	GTRB
Spinnerin Yarn Co., Inc.	Industrial	3.3	435	Unknown	GTRB
Spinnerin Yarn Co., Inc.	Industrial	3.3	400	Unknown	GTRB
Spinnerin Yarn Co., Inc.	Industrial	3.3	400	Unknown	GTRB
Givaudan Corporation	Industrial	3.3	250	Unknown	GTRB
Henkel Process Chemicals	Industrial	3.3	170	Unknown	GQSD
Givaudan Corporation	Industrial	3.4	297	Unknown	GTRB
Hoffman-LaRoche	Industrial	3.4	140	Unknown	Unknown
Hoffman-LaRoche	Industrial	3.4	650	Unknown	GTRB
Hackensack Water Company	Public	3.4	473	Unknown	GTRB
Carlstat-E. Rutherford B.O.E.	High Capacity	3.5	225	Unknown	GTRB
Hoffman-LaRoche	Industrial	3.5	NA	Unknown	GTRB
Hoffman-LaRoche	Industrial	3.5	720	Unknown	GTRB
Hoffman-LaRoche	Industrial	3.6	402	Unknown	GTRB
Upper Montclair Country Club	Industrial	3.6	490	Unknown	GTRB
ITT Avionics Division	Industrial	3.7	500	Unknown	GTRB
ITT Avionics Division	Industrial	3.7	450	Unknown	GTRB
ITT Avionics Division	Industrial	3.7	500	Unknown	GTRB
Upper Montclair Country Club	Industrial	3.7	335	Unknown	GTRB
Arcola Country Club	Industrial	3.8	200	Unknown	GTRB
Upper Montclair Country Club	Industrial	3.8	300	Unknown	GTRB
Upper Montclair Country Club	Industrial	3.8	12	Unknown	GTRB
Fisher Scientific Division	Industrial	3.8	335	Unknown	GTRB
ITT Avionics Division	Industrial	3.9	500	Unknown	GTRB
Fair Lawn Bureau	Public	3.9	413	Unknown	GTRB
Arcola Country Club	Industrial	3.9	500	Unknown	GTRB
Arcola Country Club	Industrial	3.9	208	Unknown	GTRB
Fair Lawn Bureau	Public	3.9	413	Unknown	GTRB

GTRB = Brunswick Formation
GQSD = Stratified Dirt

Ref. No. 9; Ref. No. 10; Ref. No. 13; Ref. No. 14; Ref. No. 15; Ref. No. 16.

SURFACE WATER PATHWAY

11. Describe the likelihood of a release of contaminant(s) to surface water as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provide a rationale for attributing them to the site. For observed release, define the supporting analytical evidence.

It is not likely that a release of contaminants to the surface water has occurred. Stormwater which is collected on-site is discharged to the Passaic River (SPDES permit NJ0000124). It is possible that the stormwater which is discharged to the Passaic River could come in contact with on site contaminated soils; however, there are no unpaved areas with existing analytical data to support the evidence of contamination. The occurrence of release to the surface water has not been supported by any known investigations. No surface water sampling investigations have been reported.

Ref. No. 4; Ref. No. 3 pp. 29-34; Ref. No. 1 pp. 4, 9, 10.

12. Identify the nearest downslope surface water if possible, include a description of possible surface drainage patterns from the site.

The Passaic River is the nearest downslope surface water. The Passaic River is tidal in the vicinity of the site. Stormwater is discharged to the Passaic River. No other migration pathways to downstream surface water are known to exist.

Ref. No. 3 p.15; Ref. No. 1 p 4.

13. What is the distance to the nearest downslope surface water? Measure the distance along a course that runoff can be expected to follow.

The distance to the nearest downslope surface water is 94 feet. This distance is from the River Drive side of the facility, across the street (River Drive) to the Passaic River.

Ref. No. 3 Figure 5.

14. Define the floodplain that the site is located within.

The City of Garfield is located in an area with a reported flood elevation of 20 feet. This area is listed as a flood hazard area. The area is located within the 100 year floodplain.

Ref. No. 24

15. What is the 2-year 24-hour rainfall

The 2-year 24 hour rainfall is 3.25 inches.

Ref. No. 8.

16. Identify drinking water intakes in surface waters within 15 miles downstream of the site. For each intake identify: the distance from the point of surface water entry, population served, and stream flow at the intake location

Intake	Distance	Population Served	Flow (cfs)
None			Unknown

There are no intakes within 15 miles downstream of the probable point of entry (PPE). The waters within 15 miles downstream of the site are brackish, and are not used for drinking water purposes.

Ref. No. 12.

17. Identify fisheries that exist within 15 miles downstream of the point of surface water entry. For each sensitive environment specify the following:

Fishery	Water Body Type	Flow (cfs)
None	Passaic River	Unknown

The sale or consumption of all fish from the tidal Passaic River is prohibited. Because of this prohibition, there is no recreational or commercial fishery at this time within 15 miles downstream of the PPE.

Ref. No. 25; Ref. No. 29.

18. Identify sensitive environments that exist within 15 miles of the point of surface water entry. For each sensitive environment specify the following:

Environment	Water Body Type	Flow (cfs)
Passaic River	River	Unknown

No environmentally sensitive areas have been identified by the Bureau of Marine Fisheries within the lower Passaic, however, according to their department, the current legislation considers "open water" to be environmentally sensitive. Since the Passaic River is an open water body, it could be considered to be a sensitive environment.

Ref. No. 25; Ref. No. 29.

19. If release to surface water is observed or suspected, identify any intakes, fisheries, and sensitive environments from question Nos. 16-18 that are or may be located within the contamination boundary of the release.

Intake	Fishery	Environment
None	None	Passaic River

No intakes and no commercial fisheries exist, however, according to the NJDEPE Division of Marine Fisheries, the current legislation considers all open water (ie, the Passaic River) to be a sensitive environment. There are no other sensitive environments within 15 miles downstream of the PPE.

Ref. No. 25; Ref. No. 29.

SOIL EXPOSURE PATHWAY

20. Determine the number of people that occupy residence or attend school or day care on or within 200 feet of the site property.

The Tenneco facility is surrounded by residences on three sides (north, south and east). All of these residences are approximately 100 feet from the site property. To the north of the facility are 10 houses (which appear to be a mix of one and two family homes). There are 6 houses (5 of which appear to be 2 family) on Cambridge Street and on the next block heading south on Cambridge, past the intersection of Commerce Street and Cambridge are 3 houses. The southern side of the facility (Hudson Avenue) has 2 two family houses located to the east of Bloomingdale Avenue, and 5 two family houses located west of the intersection of Bloomingdale Ave. and Hudson Street. An estimated 64 people occupy these residences. Garfield School #6, located on Palisade Avenue, is located within 200 feet of the site property. This school has an enrollment of approximately 300. There are no day care centers within 200 feet of the site property. The total number of people residing within 200 feet of the property is 64.

Ref. No. 11; Ref. No. 19; Ref. No. 20; Ref. No. 26.

21. Determine the number of people that work on or within 200 feet of the site property.

Approximately 85 employees work at the Tenneco site.

Ref. No. 11.

22. Identify terrestrially sensitive environments on or within 200 feet of the site property.

The Passaic River is located on the west side of the facility approximately 100 feet away. Since the Passaic River is an open water body, it is classified as a sensitive environment according to the New Jersey Department of Environmental Protection, Office of Administrative Fisheries.

Ref. No. 4; Ref. No. 25.

AIR PATHWAY

23. Described the likelihood of release of contaminants to air as follows: observed release, suspected release, or none. Identify contaminants detected or suspected and provided a rationale for attributing them to the site. For observed release define the supporting analytical evidence.

There are documented reports of releases of contaminants to the air. In March of 1981, approximately 1000 pounds of toluene were released to the atmosphere when a cooling water pump failed. In June 1981, a gasket failure caused the discharge of benzoic acid dust. In June 1984, an estimated 30 pounds of salicylic acid were emitted to the atmosphere due to a plugged spray nozzle. In the past, the Tenneco facility has held up to 93 air pollution certificates to operate control apparatus equipment under plant ID No. 00053. As of June 1988, approximately two-thirds of the company's 93 stacks were still operating. Four stacks had certificates renewed until 1993. On several occasions, area residents have complained of smog and vapor releases as well as odors emitting from the plant. Many of these emissions were a result of equipment failure.

Ref. No. 4 pp 2,4,5; Ref. No. 21; Ref. No. 19.

24. Determine populations that reside within 4 miles of the site

Distance	Population
0-1/4 mi	2,913
>1/4-1/2 mi	8,819
>1/2 - 1 mi	25,210
>1-2 mi	94,770
>2-3 mi	123,036
>3-4 mi	133,222

Ref. No. 22; Ref. No. 23.

25. Identify sensitive environments and wetlands acreage within 1/2 mile of the site.

It is not documented whether there are any wetlands acreage within 1/2 mile of the site. However, recent legislation has established open bodies of water to be classified as sensitive environment. Since the Passaic River is located west of the facility, a sensitive environment is located approximately 94 feet to the west of the site.

Sensitive Environment Type	Distance
Passaic River	94 feet west of facility

Ref. No. 1 p. 4; Ref. No. 25.

26. If a release to air is observed or suspected, determine the number of people that reside or are suspected to reside within the area of the air contamination from the release.

The number of people that reside within 0 to 1/4 of a mile of the site and could be possibly within the area of air contamination in the event of a potential release is approximately 2,193.

Ref. No. 22; Ref. No 23.

27. If a release to air is observed or suspected, identify any sensitive environments, listed in question No. 25, that are or may be located within the area of air contamination from the release.

The Passaic River is considered to be a sensitive environment. This environment may be located within the area of air contamination from the release.

Ref. No. 4 p. 4; Ref. No. 25.

Table 1. Historic and Current Use of Facility Buildings, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
1	1900	Boiler house, originally coal, changed to No. 6 Fuel Oil in 1940s.
2	1900	Originally offices, later cafeteria, demolished in 1990.
3	1900	Methyl Salicylate production (1950–1969), waste acid neutralization (1970–1988), demolished in 1988.
4	1903	Methyl Salicylate drumming and storage.
7	1900	Copper/Sheet Metal Shop (maintenance).
8	1900	Formaldehyde distillation (1900–1982), vacant since 1982.
9	1945	Scale house, locker room, lunchroom.
10A (39A)	1922 (1977)	Building 10A demolished in 1977, replaced by Building 39A. Salicylic and Parahydroxybenzoic Acid production (1922–1965), vacant (1965–1977), Methyl Salicylate distillation and Methanol storage (1977–1991).
10B, C, D	1922	Salicylic and Parahydroxybenzoic Acid production (1922–1965), storage of Sodium Salicylate and Salicylic Acid (1965–1991).
10E	1915	Sodium and Potassium Salicylate production (1915–1965), Methylene Disalicylic Acid production on second floor (1965–1991), storage of filters and drums on first floor (1965–1991).
10F	1915	Benzyl, Benzoin and Propyl Gallate production (1968), Methylene Disalicylic Acid and Parasepts production (1965–1991).

The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long–time employees.

Table 1. Historic and Current Use of Facility Buildings, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
10G	1907	Kettle room, Parahydroxybenzoic Acid storage and production (1965–1991).
10H	1907	Boiler room (1907–1965), vacant (1965–1991).
10M	1921; 1968	Salicylic Acid production (1921–1965), destroyed by explosion in 1965, rebuilt in 1968, Parasepts production (1968–1991), pharmaceutical grade Benzoic Acid production (1968–1991).
10N (39)	1922 (1977)	Building 10N demolished in 1977, replaced by Building 39, B–Oxynaphthoic Acid production (1950–1965), Methyl Salicylate and drum packaging (1977–1991).
10O	1915	Storage of Parasepts and other drums (1960–1991).
10P1, P2, P3, P4	1924	Raw material storage including Potassium Hydroxide, Sodium Salicylate, Caustic Soda and Phenol. Building 10P3 houses a freon chiller (1924–1991).
10P5	1942	Research laboratory (1942–1963), Benzoic Acid production control center (1963–1982), vacant (1982–1989), instrument shop (1989–1991).
10Q1	1929	Raw material storage, kettle room for Salicylic Acid (1929–1991).
10Q2	1924	Kettle room for Salicylic Acid (1924–1991).
10R	1929	Lockers and Salicylic Acid storage (1924–1991).
10S	1929	Kettle room for Salicylic Acid, and Soda Ash storage (1929–1991).

The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long-time employees.

Table 1. Historic and Current Use of Facility Buildings, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
10T	1942	Resorcinol production (1942–1951), Sodium Benzoate, Benzoic Acid and Benzaldehyde production (1960–1984), vacant (1984–1991).
11	pre–1940	Naphthalene distillation (1950–1965), vacant (1965–1991).
12	1922	Para–formaldehyde production (1930s–1982), vacant (1982–1990), drum storage and electrical shop (1990–1991).
16	1916	Warehouse (1916–1987), partially rented (1987–1990), warehouse (1990–1991).
17	1928	Laboratory (1928–1991), pilot plant (1940s–1969), partially rented.
18	1942	Maintenance shop.
20, 20A	1917	Research laboratory (1917–1967), maintenance office (1967–1991).
21	unknown	Meterhouse.
22A, 22B	1941	Garages (1941–1960s), product storage (1960s–1991).
23	1944	Garage, drum storage (1944–1991).
25	1916	Carpentry shop.
29	pre–1940	Laboratory.

The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long-time employees.

Table 1. Historic and Current Use of Facility Buildings, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
30	1929	Spare parts stock room and maintenance shop (1929–1991).
31	1929	Formaldehyde production (1929–1982), vacant (1983–1991).
32	1941	Formaldehyde production (1941–1982), vacant (1983–1991).
32A	1941	Formaldehyde production (1941–1982), vacant (1982–1991).
32B	1941	Parasepts production (1941–1991) Nuosperse HOH, Nuvis HS, Pentamids, Jet Lube, DDSA production (1941–1970s).
33, 33A, 33B	1941	Pentaerythritol production (1941–1960), Fumaric Acid production (1961–1983), warehouse and shipping (1984–1991).
34	1941	Offices and document storage (1941–1991).
35	unknown	Pumphouse (river water).
36	1945	Pentaerythritol production (1945–1960), Formic Acid production (1945–1968), Salicylic Acid, Sodium, Potassium and Magnesium Salicylate production (1969–1991).
36A	1968	Salicylic Acid sublimer and warehouse (1968–1991).
37	1970's	Benzaldehyde drumming (1970s–1984), demolished in 1990.
38	unknown	Battery charging, demolished in 1988.
39A, 39	1977	Replaced Buildings 10A and 10N. Methyl Salicylate production and storage (1977–1991). See descriptions for Buildings 10A and 10N.

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The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long-time employees.

Table 2 - Compounds Detected in the Soil 1986

PARAMETER	B-1	B-2	B-3	B-4 *	B-5 *	Depth (ft)
Miscellaneous Parameters						
Total Petroleum Hydrocarbons	<47.9	<40.9	1070	236	100	0 - 2
Benzoic Acid				<100		0 - 2
Benzaldehyde			<200	<200		0 - 2
Formaldehyde			<100		<100	0 - 2
Total Phenolics		<100			<100	0 - 2
Volatile Organic Compounds						
Benzene	ND	ND	ND	15	0.066	2- 4
Toluene	0.0097	0.011	0.116	2470	0.73	2- 4
Ethylbenzene	ND	ND	ND	ND	0.0042	2- 4
Methylene Chloride	ND	ND	ND	15	ND	2- 4
1,1,1-Trichloroethane	0.0036	0.017	0.02	ND	ND	2- 4
Dibromochloromethane	0.011	ND	ND	ND	ND	2- 4
Bromoform	0.035	ND	ND	ND	ND	2- 4
1,1,2,2-Tetrachloroethane	ND	ND	ND	4.4	ND	2- 4
Acid Extractable Organic Compounds						
Phenol		0.0941	0.232	0.341	19.8	0 - 2
Base/Neutral Extractable Organic Compounds						
Anthracene		0.0979	ND	ND	ND	0 - 2
Benzo (a) anthracene		0.743	ND	BMDL	ND	0 - 2
Benzo (a) pyrene		0.459	ND	BMDL		0 - 2
Benzo (b) fluoroanthene		0.836	ND	0.129		0 - 2
Benzo (ghi) perylene		0.322	ND	ND		0 - 2

Note: Blank = not analyzed
* Composite Sample
All concentrations in ppm.
BMDL- Below method detection limit
ND- Not Detected

Table 2 - Compounds Detected in the Soil 1986 (Continued)

PARAMETER	B-1	B-2	B-3	B-4 *	B-5 *	Depth (ft)
Base/Neutral Extractable Organic Compounds (Continued)						
Benzo (k) fluranthene		ND	ND	0.422		0 - 2
bis (2-Ethylhexyl) phthalate		0.654	ND	ND		0 - 2
Butyl benzyl phthalate		ND	ND	BMDL		0 - 2
Chrysene		0.377	ND	0.299		0 - 2
Di-n-butyl phthalate		BMDL	BMDL	0.408		0 - 2
Fluoranthene		1.16	BMDL	1.9		0 - 2
Fluorene		ND	ND	0.6		0 - 2
Indeno (1,2,3-c,d) pyrene		0.195	ND	ND		0 - 2
Napthalene		ND	ND	0.0706	ND	0 - 2
Phenanthrene		0.582	BMDL	2.35	ND	0 - 2
Pyrene		1.11	ND	1.28	0.118	0 - 2

Note: Blank = not analyzed
* Composite Sample
All concentrations in ppm.
BMDL- Below method detection limit
ND- Not Detected

Table 3

Concentrations of Volatile Organic Compounds in Water Sample from Boring B-4

Volatile Organic Compound	
Methylene Chloride	12
Benzene	68
Toluene	5400

Note: Concentrations reported in ppm

Table 4
Soil Samples Collected Around Underground Storage Tanks
Detected Concentrations (1988)

Tank	Sample ID	Parameter	Concentration
A-25	A-25 (4)	TPHC	10.2
C-3	C-3 (A)	TPHC	424
	C-3 (C)	TPHC	75
	C-3 (D)	TPHC	23
	C-3 (E)	TPHC	89
	C-3 (F)	TPHC	24
	C-3 (FILL)	TPHC	369
	C-3 (EXCV)	TPHC	18
A-26	A-26 (A)	TPHC	419
	A-26 (B)	TPHC	58
	A-26 (C)	TPHC	1250
	A-26 (D)	TPHC	489
A-27	A-27(B)	Methanol	15.8
A-4	A-4 (A)	TPHC	3410
	A-4 (B)	TPHC	72
	A-4 (C)	TPHC	291
	A-4 (E)	TPHC	87
	A-4 (EXCV)	TPHC	96
A-9	A-9 (A)	Toluene	0.064
	A-9 (B)	Toluene	0.039
	A-9 (C)	Toluene	805
	A-9 (D)	Toluene	130
	A-9 (COMP)	Toluene	26.8
A-10	A-10 (A)	Toluene	299
	A-10 (B)	Toluene	342
	A-10 (C)	Toluene	261
A-11	A-11 (A)	Toluene	110
	A-11 (B)	Toluene	72.6
	A-11 (C)	Toluene	130

Notes: All concentrations in ppm.
EXCV - Excavated material
COMP - Composite sample
TPHC- Total Petroleum Hydrocarbons

Table 4 (continued)

Tank	Sample ID	Parameter	Concentration
A-12	A-12 (A)	Toluene	3.33
	A-12 (B)	Toluene	594
	A-12 (C)	Toluene	34.6
	A-12 (D)	Toluene	64.6
C-2	C-2 (A)	TPHC	9160
	C-2 (B)	TPHC	3230
	C-2 (C)	TPHC	7520
	C-2 (D)	TPHC	2160
	C-2 (E)	TPHC	<37
	C-2 (F)	TPHC	2470
E-1	E-1 (A)	TPHC	1750
	E-1 (B)	TPHC	18500
	E-1 (C)	TPHC	5150
	E-1 (D)	TPHC	3390
	E-1 (E)	TPHC	6820

Notes: All concentrations in ppm.
EXCV - Excavated material
COMP - Composite sample
TPHC- Total Petroleum Hydrocarbons

Table 5
Soil Samples from Exploratory Soil Borings

Parameter	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	MW-5	Field Blank
Volatile Organic Compounds														
Benzene							6000	5600						
Chlorobenzene									10J				NA	
Ethyl benzene							1700J						NA	
Methylene chloride			7.8JB	8.8JB	7.41JB	8.3JB			8.9JB	9.6JB			NA	13.8
Tetrachloroethene					8.0J							16J	NA	
Toluene	36600	16800000		19J		49	5280000	1120000		14J	13J	72	NA	
Trichlorofluoromethane	510J												NA	
Xylenes (total)	1100J						4500J	1200J				26	NA	
Total Volatiles	38210	16800000	7.8	27.8	15.4	57.3	5292200	1126800	18.9	23.6	13	114	NA	13.8
Base/Neutral Extractable Organic Compounds														
Naphthalene		2800	20J				770	200J						
Acenaphthylene			150J	200J					390					NA
Acenaphthene			10J						30J					NA
Fluorene	90J									160J				NA
Phenanthrene	100J	3400	150J	220J	40J		1000	62J	630	99J	8J	80J		NA
Anthracene		850	54J	60J			100J		200J	20J				NA
Dibutyl phthalate	50J			70JB		46JB		30JB		87JB	20JB			NA
Fluoranthene	40J	4100	320J	510	70J		510	40J	1400	170J	20J	330		NA
Pyrene	70J	6910	455	650	70J		300J	38J	1600	130J	20J	340		NA
Bis(2-ethylhexyl)phthalate	630	2700	280J	100J	200J	65J	610	48J	100J	64J	91J			NA
Chrysene		4000	390	590	601		200J	20J	1300	97J	20J	420		NA
Benzo (a) anthracene		3000	320J	480	50J		200J	20J	1100	70J	20J	330		NA
Benzo (b) fluoranthene		5690	765	810	50J		280J	30J	1900	130J	40J	1000		NA
Benzo (a) pyrene		2400	370	610	50J		80J	10J	1300	68J	20J	560		NA
Indeno (1,2,3-c,d) pyrene		950	170J	310J			80J	7J	640	38J		270J		NA
Dibenzo (ghi) perylene			60J	70J					200J			40J		NA
Total Base/Neutral Extractable Organic Compounds	980	37760	3674	4980	590	111	4100	505	11460	1163	259	3610	0	NA
Total Petroleum Hydrocarbons (mg/kg)	1070	4660	63				600	180				300		NA
Total Phenol (mg/kg)	8.7	200												
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes: All concentrations in ug/kg unless otherwise specified
J - Estimated
B- Detected in laboratory reagent blank
Samples collected in 1987

Table 6
Ground Water Sample Results

Parameter	MW-1	MW-8W*	MW-2	MW-3	MW-3D	MW-4	MW-5	MW-6	MW-6D	Field Blank	Trip Blank
Volatile Organic Compounds											
Benzene	676	960	1.5J			3400J					
Chlorobenzene	4.7J	5.6J	2.9J								
trans-1,2-Dichloroethene					23						
Ethyl benzene	15	15									
Tetrachloroethene			1.5J							1.0J	
Toluene	22	24	1.1J	5640	5.1	6370			2.5J	1.8J	1.5J
Trichlorofluoromethane					4.0J		1400		1.8J		
Xylenes (total)	17	16						3.0J			3.4J
Total Volatiles	734.7	1020.6	7	5640	32.1	100100	7770	3	4.3	2.8	4.9
Base/Neutral Extractable Organic Compounds											
1,3-Dichlorobenzene			4.0J							NA	NA
1,4-Dichlorobenzene			7.9J							NA	NA
1,2-Dichlorobenzene			5.5J							NA	NA
1,2,4-Trichlorobenzene			0.5J							NA	NA
Naphthalene	1.8J	1.9J	37	2J	1.0J	60.6	0.6J			NA	NA
Acenaphthene			4.3J			0.4J				NA	NA
Fluorene	0.7J	0.7J	9.3J			6.1J	0.4J			NA	NA
N-Nitrosodiphenylamine						0.3J				NA	NA
Phenanthrene		0.1J	1.2J			16.6J	0.2J			NA	NA
Anthracene			0.9J			3.4J				NA	NA
Fluoranthene			0.2J			9.3J	0.1J			NA	NA
Pyrene			0.3J			6.9J				NA	NA
Bis(2-ethylhexyl)phthalate			1.2J		1.0J	6.3J			2.5J	NA	NA
Chrysene						3.0J				NA	NA
Benzo (a) anthracene						3.0J				NA	NA
Di-n-octyl phthalate						24.7					
Benzo (b) fluoranthene										NA	NA
Benzo (a) pyrene						2.4J				NA	NA
Indeno (1,2,3-c,d) pyrene						1.0J				NA	NA
Benzo (ghi) perylene						1.0J				NA	NA
Total Base/Neutral Extractable Organic Compounds	2.5	2.7	72.3	2	2	145	1.3	0.4	2.5	NA	
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	570		NA	NA	NA	NA
										NA	NA
Other Parameters											
Total Phenol (mg/L)	0.2	0.15		2570	122	4.65			NA	NA	
Total Petroleum Hydrocarbons (mg/L)			2.6			8			NA	NA	
Formaldehyde (mg/L)		NA	NA	NA	NA	NA	NA	NA	NA	NA	
Methanol (mg/L)	5.9	NA	<2.0	120	NA	NA	NA	NA	NA	NA	

Notes: Concentrations reported in ug/L, unless otherwise noted.
NA- Not Analyzed
J- Compound detected below method detection limit
Samples collected in January 1988.

Table 7
Monitoring Well MW-7
Constituent Concentrations of
Product Sample Collected

Parameter	Concentration
Volatile Organic Compounds	
Benzene	
Chlorobenzene	
trans-1,2-Dichloroethene	
Ethyl benzene	
Tetrachloroethene	
Toluene	541000
Trichlorofluoromethane	
Xylenes (total)	
Total Volatiles	
Base/Neutral Extractable Organic Compounds	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	
1,2-Dichlorobenzene	
1,2,4-Trichlorobenzene	
Naphthalene	580
Acenaphthene	150J
Fluorene	340
N-Nitrosodiphenylamine	
Phenanthrene	760
Anthracene	60J
Fluoranthene	170J
Pyrene	160J
Bis(2-ethylhexyl)phthalate	
Chrysene	80J
Benzo (a) anthracene	70J
Di-n-octyl phthalate	
Benzo (b) fluoranthene	40J
Benzo (a) pyrene	60J
Indeno (1,2,3-c,d) pyrene	20J
Benzo (ghi) perylene	
Total Base/Neutral Extractable Organic Compounds	
Benzoic Acid	NA
Benzaldehyde	NA
Other Parameters	
Total Phenol (mg/kg)	
Total Petroleum Hydrocarbons (mg/kg)	408900
Formaldehyde	
Methanol	

Notes: Concentrations reported in ppm, unless otherwise noted.
NA- Not Analyzed
J- Compound detected below method detection limit

Table 8
Monitoring Well MW-3
Concentrations of Inorganic
Constituents in Sample

Parameter	Concentration (mg/L)
Chlorides	763
Bicarbonated as $CaCO_3$	160
Nitrate and Nitrite as N	0.18
Total Dissolved Solids (@ 180 degree celsius)	37400
Sulfates	36000
Calcium	4.5
Iron	2280
Magnesium	72
Manganese	5.98
Potassium	36.9
Sodium	4130

Table 19. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-2 (2-2.7')	B-3 (2.3-2.9')	B4-01 (4-6')	B4-02 (8-9')	B5-01 (4-5')	B6-01 (4-5')	B6-01 (4-5') Duplicate	B-07-01 (.8-1.4)	B-07-02 (6-7.9')	B-08-01 (4-6')	B-09-01 (6-8')	B-13-01 (6-7')	B-14 01 (4-4.8')
	Date	17-Jan-91	18-Jan-91	18 Jan 91	18 Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	22-Jan-91	22-Jan-91
Methylene chloride		.015 JB	NA	.019 JB	NA	NA	.66 B	NA	NA	NA	NA	NA	NA	NA
Toluene		.024 J	2.4	.11	17000	.012 J	62	360	17	.085	360	2.4	3400	.47
Benzene		NA	NA	NA	NA	NA	NA	NA	.21 J	.24	NA	.28	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	.018 J	NA	.33	NA	NA
Ethylbenzene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	.16	NA	NA
Carbon tetrachloride		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL VOCS:		.039	2.4	.129	17000	.012	62.66	360	17.21	.343	360	3.17	3400	.47

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 19. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-14-02 (6-7.4')	B-15-01 (3-3.5')	B-16-01 (3.2-3.8')	B-18-01 (3-3.5')	B-19-01 (2-2.6')	B-20-01 (.5-2')	B-20-02 (2-2.8')	B-22-01 (.9-1.7')	B-26-01 (1.5-2')	B-27-01 (1-1.8')	B-43B (2.3-2.8')	FB-01-22 [mg/L]	FB-01-24 [mg/L]
	Date	22-Jan-91	22-Jan-91	22-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	24-Jan-91	24-Jan-91	30-Jan-91	22-Jan-91	24-Jan-91
Methylene chloride		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		620	.091	12	890	.83	.067	230	.094	20000	160	.0064 J	.0027 J	.0033 J
Benzene		NA	NA	.13 J	NA	NA	NA	NA	NA	80	NA	NA	NA	NA
Xylenes (total)		NA	NA	.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride		NA	NA	.43 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane		NA	NA	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL VOCS:		620	.091	14.8	890	.83	.067	230	.094	20080	160	.0064	.0027	.0033

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 20. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B6-01 (4-5')	B6-01 (4-5') Duplicate	B-07-01 (.8-1.4)	B 07-02 (6-7.9')	B-08-01 (4-6')	B-09-01 (6-8')	B-26-01 (1.5-2')	B-29-01 (6-7.4')	B-32-01 (.6-1.1')	B-33-01 (4-4.3')	B-34-01 (4-4.9')	B-35-01 (4-4.4')	B-40-01 (4-6')
	Date	18-Jan-91	18-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	24-Jan-91	24-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91	28-Jan-91
Naphthalene		.75 J	.3 J	NA	NA	.28 J	1.5 J	11 J	NA	NA	8.6	5.7	1.3 J	NA
Fluorene		4.1	1.7 J	.19 J	NA	.32 J	3.2 J	10 J	NA	NA	.65 J	.39 J	NA	NA
Phenathrene		1.9 J	.96 J	.047 J	.067 J	.25 J	1.1 J	18 J	NA	.22 J	1.4 J	.89 J	.6 J	.15 J
Anthracene		.35 J	.13 J	NA	NA	.026 J	.42 J	NA	NA	.05 J	.14 J	.091 J	.097 J	NA
Fluoranthene		1.1 J	.23 J	.042 J	.11 J	.15 J	.64 J	12 J	NA	.33	.45 J	.5 J	.51 J	.22 J
Pyrene		.89 J	.15 J	.03 J	.1 J	.12 J	.5 J	10 J	.0055 J	.27 J	.78 J	.61 J	.58 J	.26 J
Chrysene		.74 J	.091 J	NA	.085 J	.11 J	.25 J	4.9 J	NA	.18 J	.42 J	.42 J	.42 J	.22 J
benzo(a)anthracene		.55 J	NA	NA	.066 J	.068 J	NA	5.4 J	NA	.17 J	.31 J	.27 J	.3 J	.15 J
Benzo(b)fluoranthene		1.2 J	.11 J	NA	.14 J	.12 J	.4 J	NA	NA	.28 J	.42 J	.42 J	.58 J	.37 J
Benzo(a)pyrene		.58 J	NA	NA	.099 J	.054 J	NA	NA	NA	.15 J	.26 J	.26 J	.29 J	.2 J
Indeno(1,2,3-c,d)pyrene		.21 J	NA	NA	.044 J	NA	NA	NA	NA	.082 J	.15 J	.16 J	.19 J	NA
Benzo(ghi)perylene		.15 J	NA	NA	.037 J	NA	NA	NA	NA	.071 J	.29 J	.21 J	.24 J	NA
bis(2-ethylhexyl) phthalate		NA	NA	.24 J	.34	NA	NA	NA	NA	.038 J	NA	NA	NA	NA
Acenaphthene		NA	NA	NA	.016 J	NA	NA	NA	NA	.019 J	1.4 J	1.2 J	.53 J	NA
dibutyl phthalate		NA	NA	NA	NA	NA	NA	NA	.041 JB	.044 JB	NA	NA	NA	NA
Acenaphthylene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL BNA:		12.52	3.671	.549	1.104	1.498	8.01	71.3	.0465	1.904	15.27	11.121	5.637	1.57

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 20. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-42-01 (.2-.6')	B-43A (.8-1.3')	B-45A (.6-1.1')	FB-01-21 [mg/L]
	Date	30-Jan-91	30-Jan-91	30-Jan-91	21-Jan-91
Naphthalene		NA	NA	NA	NA
Fluorene		NA	NA	NA	NA
Phenathrene		3.4 J	.018 J	.077 J	NA
Anthracene		NA	NA	NA	NA
Fluoranthene		4 J	NA	.22 J	NA
Pyrene		3.7 J	NA	.19 J	NA
Chrysene		2.2 J	NA	.31 J	NA
benzo(a)anthracene		2.3 J	NA	.29 J	NA
Benzo(b)fluoranthene		4 J	NA	.63	NA
Benzo(a)pyrene		NA	NA	.47	NA
Indeno(1,2,3-c,d)pyrene		NA	NA	.25 J	NA
Benzo(ghi)perylene		NA	NA	.26 J	NA
bis(2-ethylhexyl) phthalate		NA	NA	NA	.0055 J
Acenaphthene		NA	NA	NA	NA
dibutyl phthalate		NA	NA	NA	NA
Acenaphthylene		NA	NA	.06 J	NA
Dibenzo(a,h)anthracene		NA	NA	.071 J	NA
TOTAL BNA:		19.6	.018	2.828	.0055

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 21. Summary for Detected Concentrations of Metals in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-32-01 (.6-1.1')	B-33-01 (4-4.3')	B-34-01 (4-4.9')	B-35-01 (4-4.4')
	Date	25-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91
Arsenic		1.5	4.8	4.4	6
Vanadium		18	32	34	36

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

Ref. No. 3

Table 22. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-2 (2-2.7')	B4-01 (4-6')	B4-02 (8-9')	B5-01 (4-5')	B5-02 (8-9.7')	B6-01 (4-5')	B6-01 (4-5') Duplicate	B-07-01 (.8-1.4)	B-07-02 (6-7.9')	B-08-01 (4-6')	B-09-01 (6-8')	B-10-01 (4-4.5')	B-13-01 (6-7')
	Date	17-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	22-Jan-91
Petroleum hydrocarbons		148	2860	4670	88	55	547	347	51	NA	576	153	193	1630
Total Phenolics		NA	NA	NA	NA	NA	NA	NA	NA	5.6	40	7.4	NA	NA
PCB-1260		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Ref. No. 3

Table 22. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-14-01 (4-4.8')	B-14-02 (6-7.4')	B-15-01 (3-3.5')	B-18-01 (3-3.5')	B-19-01 (2-2.6')	B-20-01 (.5-2')	B-20-02 (2-2.8')	B-22-01 (.9-1.7')	B-26-01 (1.5-2')	B-27-01 (1-1.8')	B-28-01 (6-7.8')	B-30-01 (8-9.2')	B-31-01 (6-7')
	Date	22-Jan-91	22-Jan-91	22-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	24-Jan-91	24-Jan-91	24-Jan-91	25-Jan-91	25-Jan-91
Petroleum hydrocarbons		1410	160	40	206	48	60	89	99	4430	69	32	31	52
Total Phenolics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1260		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Ref. No. 3

Table 22. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-32-01 (.6-1.1')	B-33-01 (4-4.3')	B-34-01 (4-4.9')	B-35-01 (4-4.4')	B-39-01 (6-8')	B-40-01 (4-6')	B-41-01 (1.5-2')	B-42-01 (.2-.6')	B-43A (.8-1.3')	B-44-01 (.3-8')	B-44-02 (.3-8')	B-46-01 (1-1.5')
	Date	25-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91	28-Jan-91	28-Jan-91	28-Jan-91	30-Jan-91	30-Jan-91	30-Jan-91	30-Jan-91	30-Jan-91
Petroleum hydrocarbons		59	1820	1770	1550	672	4040	27	207	320	737	370	400
Total Phenolics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1260		NA	NA	NA	NA	NA	NA	NA	NA	NA	.47	2.2	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Ref. No. 3

Table 23. Summary for Detected Concentrations of Methanol in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-36-01 (6-6.9')	B-37-01 (6-6.5')	B-38-01 (4-5')	B 38-02 (4-5')	B 39-01 (6-8')
	Date	28-Jan-91	28-Jan-91	28-Jan 91	28 Jan-91	28-Jan-91
Methanol		3.5	.22	2.6	1.9	2.2

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

Ref. No. 3

Table 27. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID / Date	MW-1 (6-21') 20-Apr-91	MW-1 (6-21') Duplicate 20-Apr-91	MW-2 (5.5-15.5') 22-Apr-91	MW-2 (5.5-15.5') 22-Apr-91	MW-3S (5-15') 22-Apr-91	MW-3D (35-40') 22-Apr-91	MW-4 (1-16') 22-Apr-91	MW-5 (4-19') 22-Apr-91	MW-5D (25-35') 23-Apr-91	MW-6S (6-21') 20-Apr-91	MW-6D (27-32') 21-Apr-91	MW-7 (6-21') 21-Apr-91	MW-8 (5-25') 23-Apr-91
Benzene		860	1000	NA	NA	NA	NA	3500 J	NA	NA	NA	4.7 J	29	10
Ethylbenzene		14 J	15 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		110	87	NA	NA	1200	6.3	100000	15000	NA	18000	8.3	NA	1.4 J
Xylenes (total)		26	13 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8
Chlorobenzene		NA	NA	27	29	NA	1.9 J	NA	NA	NA	NA	1.1 J	NA	4.5 J
trans-1,2-Dichloroethene		NA	NA	NA	NA	NA	24	NA	NA	NA	NA	44	NA	NA
Trichloroethene		NA	NA	NA	NA	NA	2.1 J	NA	540	2700	NA	3.4 J	NA	NA
Vinyl chloride		NA	NA	NA	NA	NA	12	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene		NA	NA	NA	NA	NA	NA	NA	NA	26 J	NA	NA	NA	NA
1,1,1-Trichloroethane		NA	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	NA	NA
Chloroform		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 J
1,1-Dichloroethene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL VOCS:		1010	1115	27	29	1200	46.3	103500	15540	2806	18000	61.5	29	22.8

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 27. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-9 (6-26')	MW-10 (3-23')	MW-11 (5-25')	MW-12 (5-25')	MW-13 (2.5-12.5')	MW-14 (3-18')	MW-15 (5-25')	MW-16 (10-30')	MW-17 (2-22')	MW-18 (4-24')
	Date	22-Apr-91	21-Apr-91	21-Apr 91	22-Apr-91	22-Apr-91	20-Apr-91	23-Apr-91	23-Apr-91	23-Apr-91	23-Apr-91
Benzene		490	140 J	NA	23	NA	1700 J	NA	NA	NA	NA
Ethylbenzene		32 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		43 J	12000	110000	4 J	24	64000	NA	NA	100000	NA
Xylenes (total)		44 J	NA	NA	1 1 J	NA	NA	NA	NA	NA	NA
Chlorobenzene		19 J	NA	NA	10	NA	NA	NA	NA	NA	35 J
trans-1,2-Dichloroethene		32 J	NA	NA	18	NA	NA	19	1.6 J	NA	49 J
Trichloroethene		900	NA	NA	5.6	NA	NA	18	260	NA	550
Vinyl chloride		20 J	NA	NA	5.4 J	NA	NA	NA	NA	NA	24 J
Tetrachloroethene		11 J	NA	NA	8.6	NA	NA	NA	4.9 J	NA	NA
1,1,1-Trichloroethane		NA	NA	NA	NA	NA	NA	NA	17	NA	NA
Chloroform		NA	NA	NA	NA	NA	NA	NA	4.9 J	NA	NA
1,1-Dichloroethene		NA	NA	NA	NA	NA	NA	NA	1.4 J	NA	NA
TOTAL VOCS:		1591	12140	110000	77.7	24	65700	37	289.8	100000	658

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 28. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-1 (6-21')	MW-2 (5.5-15.5')	MW-3S (5-15')	MW-3D (35 40')	MW-4 (1-16')	MW-5 (4-19')	MW-5D (25-35')	MW-6S (6-21')	MW-6D (27-32')	MW-7 (6-21')	MW-9 (6-26')	MW-10 (3-23')	MW-11 (5-25')
	Date	20-Apr-91	22-Apr-91	22-Apr 91	22-Apr-91	22-Apr-91	22-Apr-91	23-Apr-91	20-Apr-91	21-Apr-91	21-Apr-91	22-Apr-91	21-Apr-91	21-Apr-91
Naphthalene		2.4 J	1.6 J	NA	3.5 J	49 J	NA	NA	1 J	NA	NA	NA	NA	NA
Phenol		72	26	240000	930000	1200	10 J	58	120000	15000	3.4 J	14 J	520	54000
1,3-Dichlorobenzene		NA	7.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene		NA	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene		NA	3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene		NA	3.5 J	NA	NA	NA	NA	NA	NA	NA	1.9 J	NA	NA	NA
Fluorene		NA	.97 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenathrene		NA	NA	NA	NA	13 J	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde		NA	NA	NA	NA	32 J	NA	NA	NA	NA	NA	NA	NA	50 J
2-Nitrophenol		NA	NA	NA	NA	16 J	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene		NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 J	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3 J	NA	NA	NA
bis(2-ethylhexyl) phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	9.6 J	NA	NA	NA
4-Nitrophenol		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL BNA:		74.4	60.27	240000	930003.5	1310	10	58	120001	15000	17.3	14	520	54050

Analyte concentrations in micrograms per liter [parts per billion (ppb)]
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

Table 28. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-12 (5-25')	MW-13 (2.5-12.5')	MW-14 (3-18')	MW-17 (7-22')	MW-18 (4-24')
	Date	22-Apr-91	22-Apr-91	20-Apr-91	23-Apr-91	23-Apr-91
Naphthalene		NA	NA	15	13 J	NA
Phenol		8900	5100	950	1900	NA
1,3-Dichlorobenzene		NA	NA	NA	NA	NA
1,4-Dichlorobenzene		NA	NA	NA	NA	4.6 J
1,2-Dichlorobenzene		NA	NA	NA	NA	36
Acenaphthene		NA	NA	NA	NA	NA
Fluorene		NA	NA	NA	NA	NA
Phenathrene		NA	NA	NA	NA	NA
Benzaldehyde		NA	NA	NA	NA	NA
2-Nitrophenol		NA	NA	35	NA	NA
Fluoranthene		NA	NA	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate		NA	NA	NA	NA	NA
4-Nitrophenol		NA	NA	20 J	NA	NA
TOTAL BNA:		8900	5100	1020	1913	40.6

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Ref. No. 3

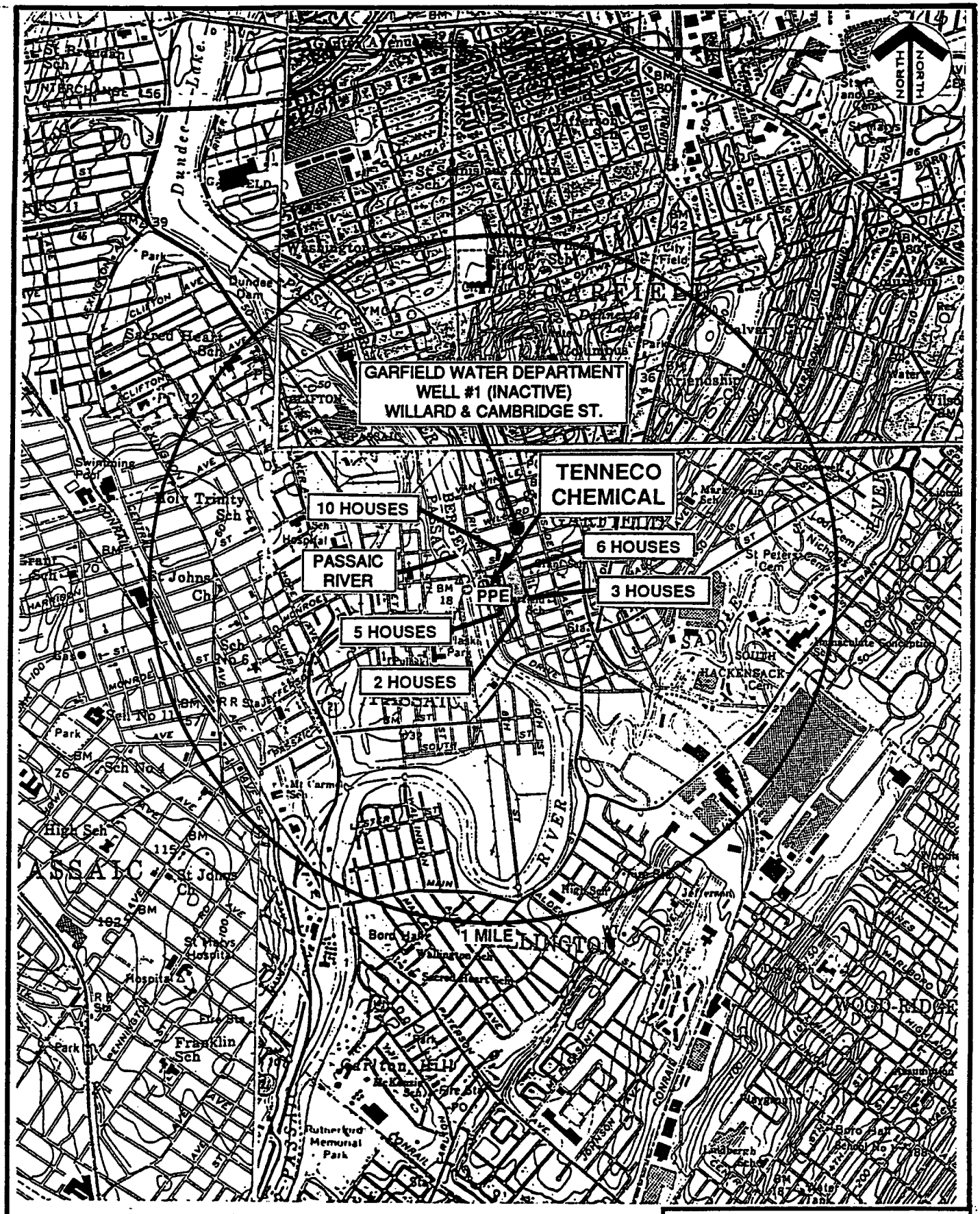
Table 29. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-7 (6-21')	MW-9 (6-26')	MW-14 (3-18')	FB-001
	Date	22-Apr-91	22-Apr-91	22-Apr-91	21-Apr-91	22-Apr-91	20-Apr-91	20-Apr-91
Total Phenolics		241000	878000	172	NA	351	763	NA
Petroleum hydrocarbons		NA	NA	NA	4100	NA	NA	NA
Phenols		NA	NA	NA	NA	NA	NA	1300

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Ref. No. 3



SOURCE: HACKENSACK, ORANGE, PATERSON, WEEHAWKEN USGS

SCALE

0 3000 FEET

FIGURE 1

TENNECO CHEMICAL
USGS SITE MAP

EBASCO ENVIRONMENTAL

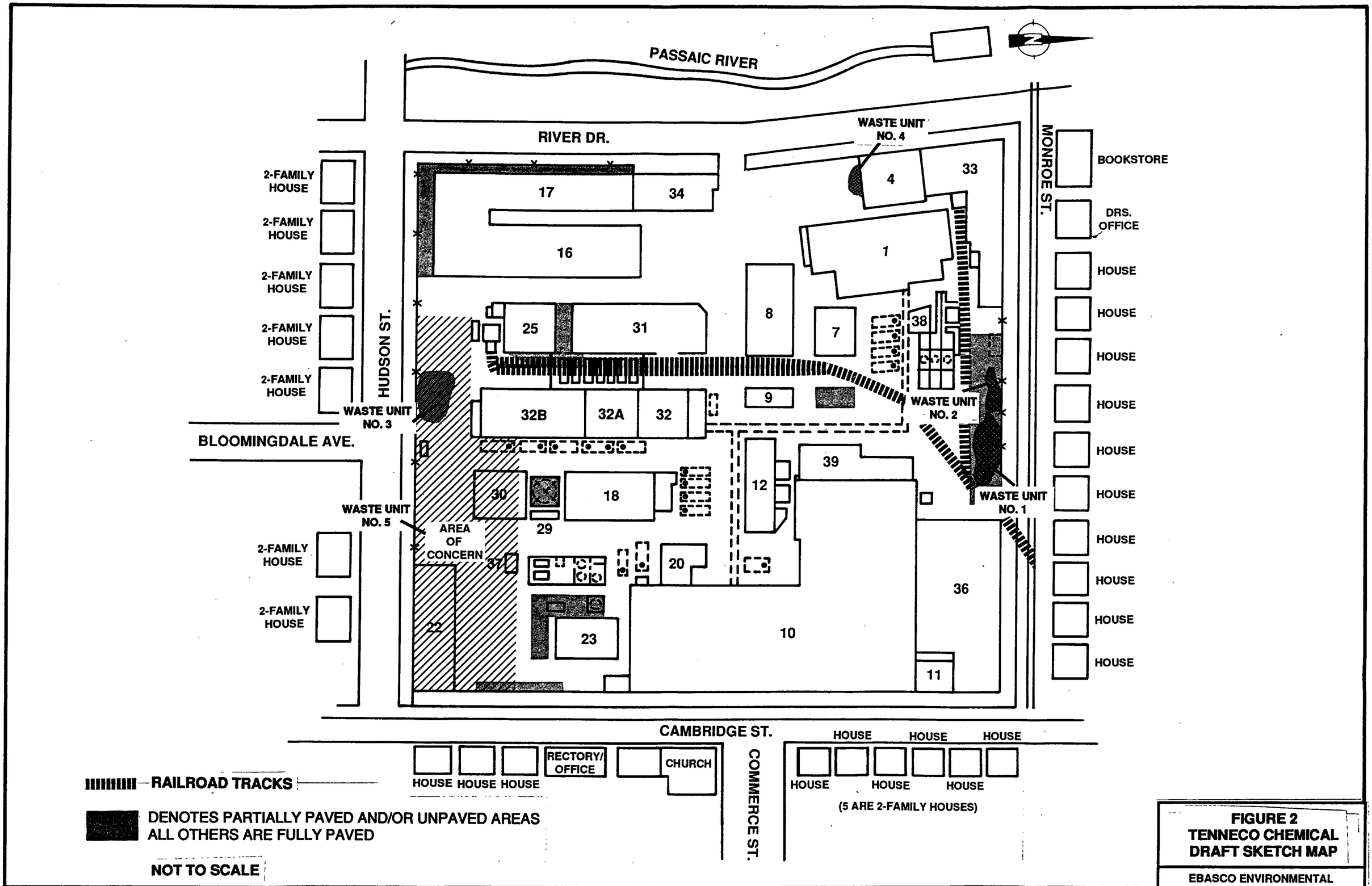


FIGURE 2
TENNECO CHEMICAL
DRAFT SKETCH MAP

EBASCO ENVIRONMENTAL

Reference List

REFERENCES

1. EPA Preliminary Assessment, February 28, 1989

2. Sampling Addendum No. 2 (Geraghty & Miller), September 1991

3. Revised ECRA Sampling Plan Investigation Report Vol. 1 & 2 (Geraghty & Miller), September 1991

4. Field Logbook - Site Reconnaissance, November 1991

5. Preliminary Invest. of Soil Quality at the Kalama Chemical Inc., Facility (Geraghty & Miller), December 1986

6. ECRA Soil and Groundwater Investigation, June 1988 (Geraghty & Miller)

7. Local Climatological Data (NOAA), January 1990 - December 1991

8. Technical Paper No. 40; Rainfall Frequency Atlas of the United States, March 1980

9. Preliminary Survey of Water Withdrawal Points, September 1988

10. Telecon: Bart Cerami, Water Technical Programs - Bureau of Water Allocation with Judith Cusick, Ebasco Environmental, December 16, 1991

11. Telecon: Hari Goel, Technical Superintendent - Kalama Chemical Inc., Facility with Judith Cusick, Ebasco Environmental, December 16, 1991

12. Telecon: Bob Kecskes, NJDEP Water Supply Planning with Judith Cusick, Ebasco Environmental, December 10, 1991

13. Telecon: Mike Sfuerruzzo, Garfield Water Department with Judith Cusick, Ebasco Environmental, December 6, 1991

14. Telecon: Sam Cannizzo, Lodi Borough Water Department with Judith Cusick, Ebasco Environmental, December 16, 1991

15. Telecon: Mike Sfuerruzzo,Garfield Water Department with Judith Cusick, Ebasco Environmental, December 16, 1991

16. Telecon: Ray Milne, Wallington Water Department with Judith Cusick, Ebasco Environmental, December 16, 1991

17. Telecon: Bruce Halgren, NJDEP Administrative Marine Fisheries with Judith Cusick, Ebasco Environmental, December 10, 1991

18. Telecon: Don Hoven, Hackensack Water Company with Judith Cusick, Ebasco Environmental, December 16, 1991

19. Letters of Concerning the Site

20. Telecon: Garfield School Office of Superintendent of Schools with Judith Cusick, Ebasco Environmental, December 10, 1991

21. Letter of June 11, 1981

22. Telecon: Drew Pavlica, City Clerk, Garfield, NJ with Judith Cusick, Ebasco Environmental, December 16, 1991

23. Calculation for Population within 1/4 mile of the site, Judith Cusick, December 16, 1991

24. Fema Floodway maps (November 1, 1984) and Telecon: Clark Gilman, Division of Coastal Resources with Judith Cusick, Ebasco Environmental, December 20, 1991

25. Telecon: Bruce Halgren, NJDEP Administrative Marine Fisheries with Judith Cusick, Ebasco Environmental, January 8, 1992

26. Telecon: Noreen Best, Senior Planner Bergen County Department of Planning and Economic Development, Garfield, New Jersey with Judith Cusick, Ebasco Environmental, January 24, 1992

27. Telecon: Mike Sfuerruzzo,Garfield Water Department with Judith Cusick, Ebasco Environmental, January 28, 1992

28. Telecon: Don Hoven, Hackensack Water Company with Judith Cusick, Ebasco Environmental, January 27, 1992

29. Letter from Bill Andrews (NJDEPE Division of Marine Fisheries) to Judith Cusick, January 28, 1992

30. Letters/Communications involving spills/releases at the site

31. Telecon: Bill Mastroberte, Wallington Water Department with Judith Cusick, Ebasco Environmental, February 6, 1992

32. Telecon: Mike Sfuerruzzo, Garfield Water Department with Judith Cusick, Ebasco Environmental, February 7, 1992

33. Telecon: Sal Capizzi, Lodi Borough Water Department with Judith Cusick, Ebasco Environmental, February 7, 1992

ATTACHMENT A

PHOTOGRAPHS FROM
SITE RECONNAISSANCE
NOVEMBER 20, 1991

Photographs from Site Reconnaissance

1. On the Bank of the Passaic River, across from facility
2. Scrap Material located in vicinity of Raw Material/Quarantine Area
3. Parking lot and paved area between buildings No. 4 & 1, pile of material on ground near building
4. View of some scrap material, property fence
5. Discarded scrap material
6. Finished product storage area
7. Discarded scrap material near raw material storage area
8. Active tracks from the Erie Lackawanna Railroad
9. Unpaved area
10. Pile of staged soils
11. MW-13 located near large pile of stage soils (picture 10)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

II. PAST RESPONSE ACTIVITIES N/A

01 ☐ A. WATER SUPPLY CLOSED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ B. TEMPORARY WATER SUPPLY PROVIDED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ C. PERMANENT WATER SUPPLY PROVIDED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ D. SPILLED MATERIAL REMOVED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ E. CONTAMINATED SOIL REMOVED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ F. WASTE REPACKAGED — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ G. WASTE DISPOSED ELSEWHERE — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ H. ON SITE BURIAL — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ I. IN SITU CHEMICAL TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ J. IN SITU BIOLOGICAL TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ K. IN SITU PHYSICAL TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ L. ENCAPSULATION — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ M. EMERGENCY WASTE TREATMENT — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ N. CUTOFF WALLS — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ O. EMERGENCY DIKING/SURFACE WATER DIVERSION — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ P. CUTOFF TRENCHES/SUMP — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

01 ☐ Q. SUBSURFACE CUTOFF WALL — 02 DATE _____ 03 AGENCY _____
04 DESCRIPTION

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 10 - PAST RESPONSE ACTIVITIES

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

II PAST RESPONSE ACTIVITIES (Continued) N/A

01 ☐ R. BARRIER WALLS CONSTRUCTED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ S. CAPPING/COVERING
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ T. BULK TANKAGE REPAIRED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ U. GROUT CURTAIN CONSTRUCTED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ V. BOTTOM SEALED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ W. GAS CONTROL
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ X. FIRE CONTROL
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ Y. LEACHATE TREATMENT
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ Z. AREA EVACUATED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

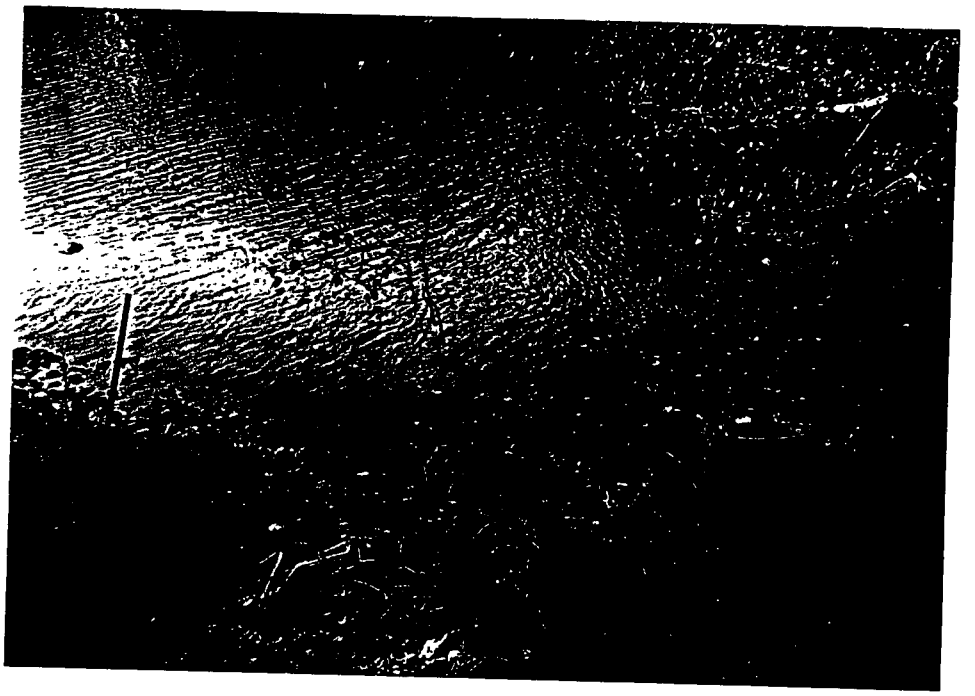
01 ☐ 1. ACCESS TO SITE RESTRICTED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ 2. POPULATION RELOCATED
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

01 ☐ 3. OTHER REMEDIAL ACTIVITIES
04 DESCRIPTION
02 DATE _____ 03 AGENCY _____

III. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Tenneco (aka Kalama Chemical Inc., Facility)



11/20/91

11:40 AM

On the bank of the Passaic River (across from Kalama facility) ~ across River Drive.

photo by: J. Cusick

Tenneco (AKA Kalama Chemical Inc., Facility)

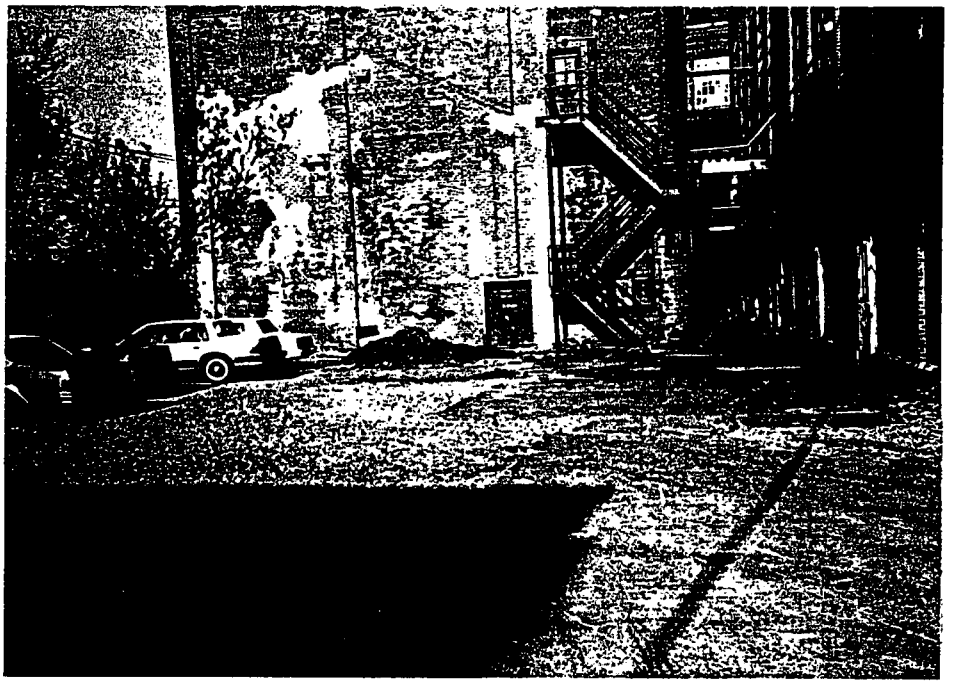
11/20/91

11:25 AM

Scrap Material located in vicinity of Raw Material / Quarantine Area

Hudson St. side

photo by: J. Cusick



11/20/91
11:35 AM

Parking lot & paved area between buildings No. 4 & No. 1

Pile of material on ground near building is from work performed during removal of pipes from building.

photo by: J. Cusick

TENNECO (AKA KALAMA CHEMICAL INC., FACILITY)

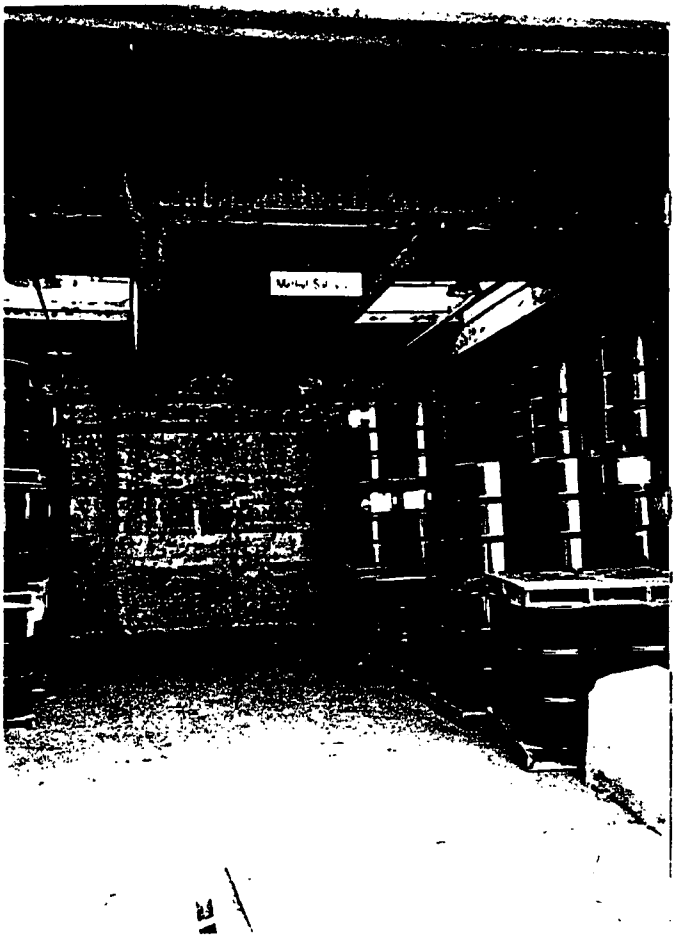
11/20/91
11:25Am

View of some scrap material; property fence; and Quarantine Area.
photo by: J. Cusick

11/20/91
11:25AM

Discarded scrap material - Cambridge St. (back) side of facility
photo by: J. Cusick

TENNECO (AKA KALAMA CHEMICAL Inc, Facility)

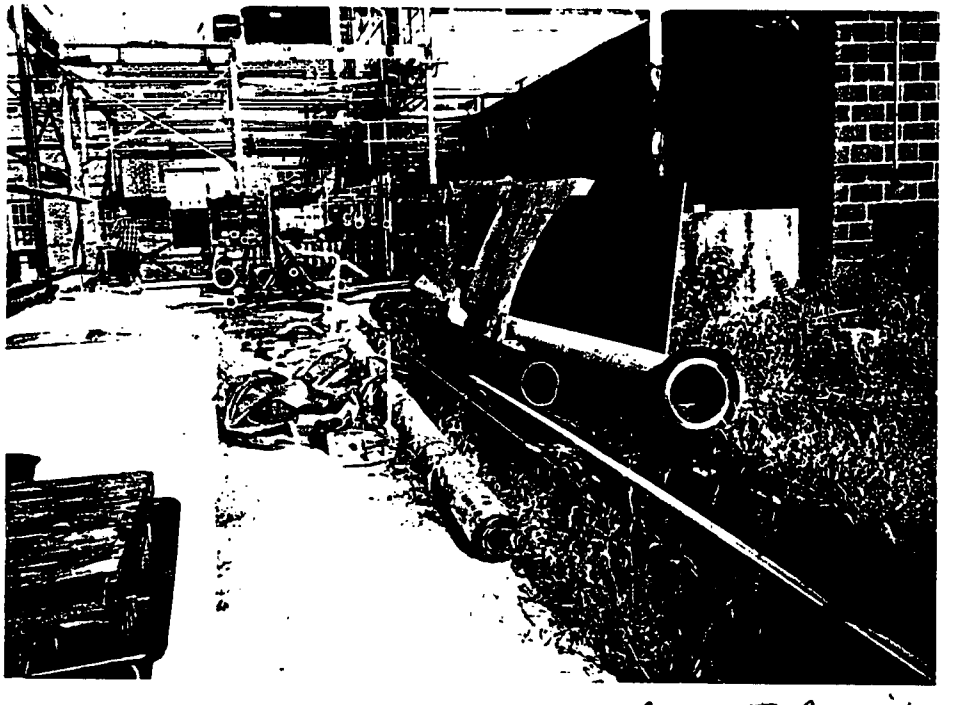


Finished product storage area for Methyl Salicylate

11/20/91

11:25 AM

photo by J. Cusick



Discarded scrap material located near raw material storage area

11/20/91
11:25AM

photo by: J. Cusick

Tenneco (AKA Kalama Chemical Inc. Facility)

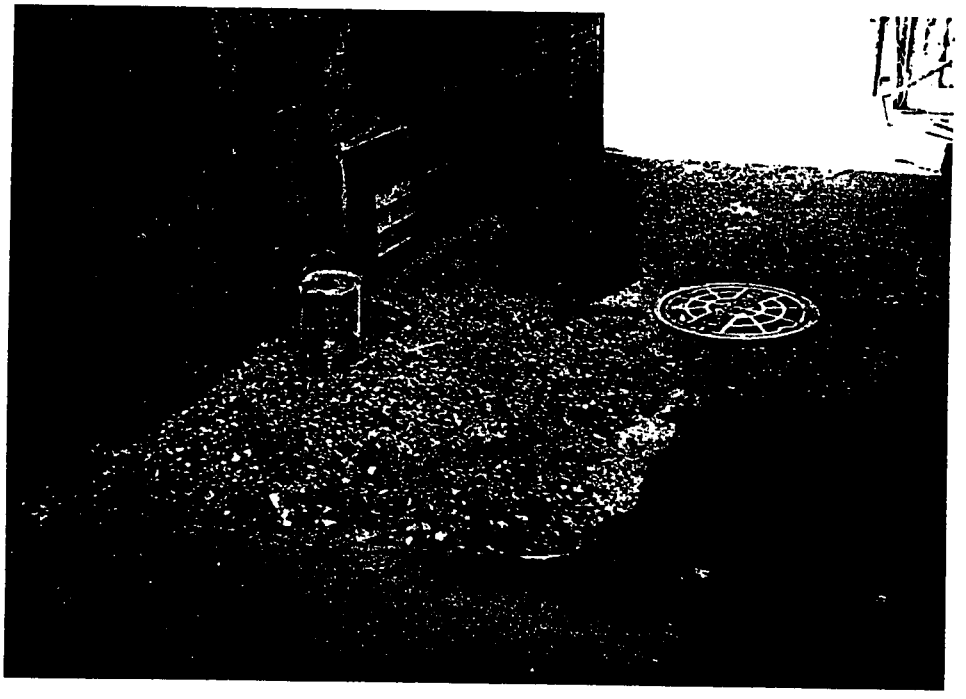
11/20/91
10:14 AM

Semi-paved area

Active tracks from the Erie Lackawanna Railroad

3 Flush mount vapor monitoring wells

photo by: J. Cusick



Unpaved area approximately 4' X 4' 11/20/91
Between build: No. 1 & No. 8 10:35AM

Note minimal vegetation

photo by: J. Cusick

Tenneco (AKA Kalama Chemical Inc, Facility)

Pile of staged soil ≈ 60' x 12' x 15' 11/20/91
photo by: J. Cusick 10 AM

MW-13 Located near large pile 11/20/91
of staged soils - Monroe St. side 10:30 AM

photo by: J. Cusick

Reference Number 1

NJDEP
Robbinsville

Ref. No. 1

Preliminary Assessment

TENNECO CHEMICAL
a.k.a. KALAMA CHEMICAL
290 RIVER ROAD
GARFIELD, BERGEN COUNTY, NEW JERSEY
EPA ID NO. NJD002005148

DUPS 65

TENNECO CHEMICAL COMPANY
A.K.A. KALAMA CHEMICAL COMPANY
290 RIVER ROAD
GARFIELD, BERGEN COUNTY, NEW JERSEY
EPA ID NO. NJD002005148

GENERAL INFORMATION AND SITE HISTORY

Tenneco Chemical is located in a commercial and residential area of the City of Garfield, Bergen County, New Jersey. The plant was originally constructed in 1900 by Von Heyden Chemical Fabrische, a german firm. The plant, closed during World War I, was subsequently owned and operated by Heyden-Newport Corporation. In early 1965, it was sold to Tennessee Gas Transmission Co. which later became Tenneco, Inc.. Kalama Chemical of Seattle, Washington purchased the property in December 1982. All owners of the site have used this facility as a chemical plant.

Salicylic acid has been manufactured at the site since 1903. Formaldehyde and methyl salicylate were also manufactured at that time. The original site contained four buildings with five additional buildings being added between 1910 and 1920. During the 1940s the manufacture of Parasepts (esters of parahydroxybenzoic acid), a proprietary product, began followed by the production of methylene disalicylic acid. A facility for the manufacturing of benzoic acid and benzaldehyde was constructed in 1967. This operation ceased permanently in 1984. Sodium, potassium, and magnesium salicylate salts were first manufactured in the 1970s. Formaldehyde production was discontinued in 1982. Although products are still manufactured on site, many of the operations have been discontinued.

An excerpt from the Eckhardt Report stated that approximately 169 hundred tons of chemical process waste was disposed of at this site through 1978. The components of the waste included acid solutions (pH<3), organics, and miscellaneous waste material. No other information could be found to document this claim.

SITE OPERATIONS OF CONCERN

Since 1903 various chemicals have been manufactured on the Tenneco Chemical Site. Each of the major products, some of which have been discontinued, were produced by different processes. The first material to be produced on site was salicylic acid in 1903. Bringing the product to spec required the heating of 99% crude salicylic acid and 1% moisture and non-volatile matter. Benzoic acid production, beginning in 1967 and discontinued in 1984, was by the direct oxidation of toluene. Periodic spills occurred in this area of production. The manufacturing of dodecal succinic anhydride (DDSA) used maleic anhydride and propylene tetromers as raw materials. Maleic anhydride was also used to produce fumaric acid. Methanol plus a catalyst were used to produce formaldehyde from the early 1900s until 1982. Also commencing in the early 1900s was the production of methyl salicylate via the esterification of methanol. During the 1940s, the manufacturing of methylene disalicylic acid was started. Formaldehyde, sulfuric acid, and salicylic acid were used to produce this material. Paraformaldehyde required 40% formaldehyde for its production. Also during the 1940s, manufacturing of parahydroxybenzoic acid and Parasepts began. Raw materials used for parahydroxybenzoic acid production included caustic potash, phenol, and carbon dioxide. Solvent carriers and an inorganic catalyst in an esterification reaction produced Parasepts. Raw materials

used included aliphatic alcohols and phenolic acids. Potassium guaicalsulfonate required guaical, while sodium benzonate required benzoic acid and sodium carbonate as raw materials for production.

A total of 27 underground storage tanks with capacities of 500 to 16,000 gallons have existed at the facility. Currently, product remains in only seven of the tanks. Three tanks contain No. 6 fuel oil, one No. 2 fuel oil, one toluene, and two tanks contain methanol. As of June 1988, eleven of the unused tanks which contained methanol, toluene, benzaldehyde, or phenol had been removed from the ground with plans for others to follow. Prior to removal, the tanks were cleaned and soil excavated. Following removal, the tanks were cut up and disposed of by a contractor for Kalama Chemicals. Soil samples were collected in the area of the tanks during the removal process. The remaining tanks are either empty or filled with water, however, no product remains in these tanks.

Thirteen aboveground storage tanks are on site. The volume of these tanks range from 1,800 to 10,000 gallons. Materials in the tanks include benzaldehyde, formaldehyde, phenol, and sulfuric acid.

A NJPDES permit (No. NJ0000124) was first issued to Tenneco Chemical by the USEPA on June 30, 1974. The permit was for two discharges to surface water and one to a sanitary wastewater transport system. Discharge 001 is called the North River Water Outfall and 002 the Central River Water Outfall. Both outfalls are to the Passaic River. Kalama Chemicals' current permit, for the discharge of four outfalls, expires December 31, 1989. Discharges 001a and 001b contain non-contact cooling water, and 002 contains non-contact cooling water as well as stormwater runoff. These discharges, flow into the Passaic River. Discharge 003 is industrial wastewater from the facility to the Passaic Valley Sewerage Commissioner's Domestic Treatment Works. Tenneco/Kalama Chemicals has received several violations for high Biological Oxygen Demand (BOD) and Total Suspended Solid (TSS) levels in their discharges.

Spill containment on site includes: concrete dikes around the aboveground storage tanks in the benzoic acid area; sand bags and an absorbent compound for oil spills; a portable pump with suction and discharge hose to pump out diked areas; and crushed stone designed to absorb heavy oil, surrounding the No. 6 fuel oil unloading area and the underground storage tank fill and vent spouts. Spills and/or releases have occurred at various times on site; although no documentation of spills prior to 1981 could be located.

In March 1981, approximately 1000 pounds of toluene was released to the atmosphere when a cooling water pump failed. In April of that year, following a gasket failure, 75 pounds of liquid benzoic acid spilled onto the ground, condensed, and was blown over the adjacent neighborhood. Another gasket failure occurred in June 1981, this time spilling approximately 50 pounds of liquid benzoic acid. Again the material condensed and was blown towards the adjacent neighborhood. An estimated 30 pounds of salicylic acid was emitted to the atmosphere in June 1984 due to a plugged spray nozzle.

During a NJDEP, Division of Water Resources Compliance Evaluation Inspection on January 21, 1986, the following deficiencies were noted: up to 11 pounds of benzoic acid powder was discharged to the ground near the truck loading area and outside building 12, and a faulty or leaking hose

connection caused the release of sulfuric acid during the unloading of a tank truck to the storage tank.

Approximately 1,000 gallons of methanol was reported to be spilled on April 6, 1987 during the unloading of a tank truck to an underground storage tank. The spill was within the diked area, however, due to a pump failure, the material was not recovered. The methanol either evaporated or seeped through to the ground. No injuries or illnesses were reported as a result of these incidents.

Between September 1987 and March 1988, nine monitoring wells were installed and sampled. High levels of benzene and toluene were detected in three of the wells. Twelve soil samples collected in December 1987 revealed high levels of toluene in four of the samples. Currently, NJDEP, BEECRA is awaiting Kalama Chemicals' sampling plan submitted for a second round of sampling and/or a cleanup plan.

GROUNDWATER ROUTE

The Tenneco Chemical site is underlain by 32 to 40 feet of unconsolidated deposits. These deposits consist of alluvial sand, silt, clay, and man-made fill. The fill consists of sand gravel, crushed stone, and brick fragments. The groundwater flow in the deposits is believed to be west towards the Passaic River.

Underlying the unconsolidated deposits is the Triassic Brunswick Formation, a bedrock formation, consisting of red and brown sandstones and shales. Weathering has resulted in the top of the bedrock's composition to consist of rock fragments in a mixture of clay, silt, and sand. The majority of area wells draw their water from the Brunswick Formation. Groundwater at the site was encountered at 2.5 to 12 feet below the ground surface.

Between September 1987 and March 1988, nine monitoring wells, seven shallow and two deep, were installed on site and sampled. The deep wells are between 31.5 and 40.0 feet deep and the shallow wells between 15.0 and 21.0 feet deep. All monitoring wells are within the unconsolidated deposits. Sampling of the wells was conducted by a contractor for Kalama Chemicals. Parameters tested on all wells included volatile organic compounds (VOCs) plus 15 peaks, base/neutral extractables plus 15 peaks, petroleum hydrocarbons (PHCs), and total phenol. Select wells were sampled for methanol, benzoic acid, benzaldehyde, formaldehyde, and inorganic compounds. In MW-7, a sample of the product layer floating on the water table revealed a concentration of 541,000 ppm toluene and 408,900 ppm PHCs. Low concentrations of base/neutrals were detected in all monitoring wells and in the floating product layer of MW-7. The highest base/neutral level detected was 570 ppb benzaldehyde in MW-5. Benzene and toluene were the most prevalent VOCs in the well samples; however, chlorobenzene, trans-1,2-dichloroethene, ethylbenzene, tetrachlorobenzene, and total xylenes were also shown to present in some of the samples. Sulfates, iron, and sodium as well as 2,570 ppm total phenols, and 120 ppm methanol were detected in MW-3, a shallow well. Total phenols were also detected in a deep well, MW-3D, and MW-4, at concentrations of 122 and 4.65 ppm, respectively. Plans for additional sampling are currently being developed.

Four public water supply systems using groundwater lie within 4 miles of the site. The nearest to the site, 0.5 mile north, is the City of Garfield Water Department with eleven wells. The wells, which draw from the

Triassic Brunswick Formation, are 170 to 710 feet deep with an average depth of 400 feet. Also drawing from the Brunswick Formation are the wells for Lodi and Wallington Boroughs. Lodi Borough has eleven wells 1.50 miles northeast of the site. These wells are 200 to 510 feet deep. Wallington Borough uses four wells which are 300 to 500 feet deep and are located 1.20 miles south of the site. These three public water supply systems serve approximately 60,000 people. The fourth system is the Hackensack Water Company. Only one well, 4 miles northeast of the site, draws from the Brunswick Formation. This well is 473 feet deep. The other three Hackensack wells are 86 to 243 feet deep and draw from Quaternary deposits. The Hackensack system serves approximately 36,000 people. Numerous industrial water supply wells are within 4 miles of the site.

Tenneco/Kalama Chemicals has never held any permits for discharge to groundwater.

SURFACE WATER ROUTE

Tenneco/Kalama Chemicals lies adjacent to the Passaic River. The facility holds a NJPDES permit (No. NJ0000124) to discharge non-contact cooling water and stormwater to the Passaic River through three outfalls. The permit, first issued June 30, 1974, expires December 31, 1989. A fourth permitted discharge is for industrial wastewater from the facility to the Passaic Valley Sewerage Commissioner's Domestic Treatment Works. The company has received violations for high Biological Oxygen Demand and Total Suspended Solids in its effluent.

No other migration pathways to downstream surface water exist. The Passaic River is tidal in the vicinity of the site; therefore, any contaminants entering the river could potentially contaminate areas upstream. The river is not used for drinking purposes within 4 miles of the site; however, it may be used for recreational purposes such as boating and/or fishing.

No freshwater or coastal wetlands are within 1 or 2 miles of the site, respectively. There are no habitats of Federally endangered species within 1 mile of the site.

AIR ROUTE

Tenneco/Kalama Chemicals has held up to 93 air pollution certificates to operate control apparatus and equipment under Plant ID No. 00053. A June 1988 inspection revealed that approximately two-thirds of the company's 93 stacks were operating. Four stacks had certificates renewed until 1993. Various spills resulting in the emission of contaminants were discussed in a previous section. On several occasions area residents have complained of smog and vapor releases as well as odors emitting from the plant. Many of the emissions were due to equipment failure.

The facility has received permit violations during inspections conducted by the NJDEP, Division of Environmental Quality. In September 1977 while filling a tank truck with formalin, air was exhausted without proper controls. A boiler heating Dow Therm to distill toluene, was discovered to be emitting smoke into the outdoor air in April 1979. Two violations were issued in December 1982. One was due to a toluene and water leak which emitted strong odors inside a plant building. The second was for the lack of water necessary to control vapors from a condensor.

A potential for air contamination by the facility is present. Some emission stacks on site are still in operation. Also, three main products continue to be manufactured on site, thus providing a potential for release if a spill occurs.

SOIL

Five soil samples were collected from soil boring locations by a contractor for Kalama Chemical on June 25, 1986. The sampling locations included a shipping/transfer area for chemicals, the area of the fuel oil and methanol underground storage tanks, the railcar loading and unloading area, the benzaldehyde production area, and the chemical transfer area near Building 32. These samples were analyzed for Hazardous Substance List Organics. Results revealed the concentration of toluene to be 2,470 ppm in an area adjacent to the benzaldehyde storage tanks. Phenol was detected at 19.8 ppm outside Building No. 32, which is used for shipping chemicals by truck. No other high concentrations were detected.

Between December 10 and 18, 1987 a contractor for Kalama Chemicals collected twelve soil samples from soil borings on site. Sample locations were similar to those used for the June 1986 sampling episode. The samples were analyzed for volatile organic compounds (VOCs), base/neutral extractable compounds, total phenols, PCBs, and selected other compounds. Four samples collected from the southeastern portion of the facility revealed extremely high levels of toluene. The highest level was 16,800,000 ppb in Soil Sample #2 at the underground storage tank for toluene. Benzene was also detected in high concentrations, up to 6,000 ppb, at two sampling locations collected from the southeastern portion of the facility. Several base/neutral extractable compounds were detected in samples collected from the southern half of the facility. Soil Sample #2 had the highest level of total base/neutral compounds, 37,760 ppb, as well as total petroleum hydrocarbons, 4,660 ppm and total phenols, 200 ppm. Benzoic acid and benzaldehyde were not detected in any of the soil samples.

DIRECT CONTACT

No incidents of direct contact have been documented. Although residential areas are adjacent to the site, the site is completely surrounded by a fence, restricting access. There is a potential for the 75 employees to come into contact with hazardous wastes on site.

FIRE AND EXPLOSION

There have been no reported incidents of fire and/or explosion on site. A potential for fire and/or explosion exists due to flammable materials that are currently used on site.

ADDITIONAL CONSIDERATIONS

No documentation states that there has been damage to flora and/or fauna. Damage may occur in areas of the site that are unpaved or if contaminants enter the Passaic River. Contaminants detected on site may bioaccumulate; therefore, a potential for contamination of the food chain exists. Damage to offsite property has not been documented, but there is a potential due to discharge and/or runoff.

PRIORITY DESIGNATION AND RECOMMENDATIONS

Based upon data collected for the Preliminary Assessment, the site poses a high environmental concern due to soil and groundwater contamination. Sampling of soil and on site monitoring wells has revealed high concentrations of toluene and benzene.

Sampling by the Bureau of Planning and Assessment (BPA) is not recommended because the Bureau of Environmental Evaluation and Cleanup Responsibility Assessment (BEECRA) is monitoring the progress of site activities. Currently, BEECRA is awaiting a sampling plan for a second round of sampling which was to have been submitted in October 1988. Also, a cleanup plan is to be presented to BEECRA for approval. A Site Inspection Review of BEECRA's sampling results by the BPA is recommended.

Surface water discharge is permitted by NJPDES. It is recommended that NJPDES continue to monitor the discharge and report additional violations.

Submitted by:

Donna J. Restivo
HSMS IV
NJDEP/Bureau of Planning and Assessment
February 28, 1989

Hours: 65

EPA

POTENTIAL HAZARDOUS WASTE SITE
PRELIMINARY ASSESSMENT
PART 1 - SITE INFORMATION AND ASSESSMENT

I. IDENTIFICATION

01 STATE: NJ | 02 SITE NUMBER: D002005148

II. SITE NAME AND LOCATION

01 SITE NAME	02 STREET, ROUTE NO., OR SPECIFIC LOCATION IDENTIFIER				
TENNECO CHEMICAL a.k.a. KALAMA CHEMICAL	290 RIVER ROAD				
03 CITY	04 STATE	05 ZIP CODE	06 COUNTY	07 COUNTY CODE	08 CONG DIST
GARFIELD	NJ	07026	BERGEN	02	07
09 COORDINATES LATITUDE	LONGITUDE				
40° 52' 59"	74° 06' 52"	BLOCKS 50.01, 50.02 LOTS 1,2			

10 DIRECTIONS TO SITE

Take the Garden State Parkway to Exit 157 (Rte. 46.). Follow Rte. 46 east to Midland Ave. and go right. Follow Midland Ave. approximately 1.5 miles to Monroe Street and make a right. The site is at the corner of Monroe St. and River Drive.

III. RESPONSIBLE PARTIES

01 OWNER	02 STREET		
KALAMA CHEMICAL	1110 BANK OF CALIFORNIA CENTER		
03 CITY	04 STATE	05 ZIP CODE	06 TELEPHONE NUMBER
SEATTLE	WA	98164	(206) 682-7890
07 OPERATOR	08 STREET		
KALAMA CHEMICAL	290 RIVER ROAD		
09 CITY	10 STATE	11 ZIP CODE	12 TELEPHONE NUMBER
GARFIELD	NJ	07026	(201) 779-8880

13 TYPE OF OWNERSHIP (Check one)

☒ A. PRIVATE ☐ B. FEDERAL: _____ ☐ C. STATE ☐ D. COUNTY ☐ E. MUNICIPAL

☐ F. OTHER: _____ ☐ G. UNKNOWN

14 OWNER/OPERATOR NOTIFICATION ON FILE (Check all that apply)

☐ A. RCRA 3001 DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☐ B. UNCONTROLLED WASTE SITE (CERCLA 103 c) DATE RECEIVED: __/__/__ (MONTH DAY YEAR) ☒ C. NONE

IV. CHARACTERIZATION OF POTENTIAL HAZARD

01 ON SITE INSPECTION

☒ YES DATE 12 / / 87 (MONTH DAY YEAR)
☐ NO

BY (Check all that apply)

☐ A. EPA ☐ B. EPA CONTRACTOR ☐ C. STATE ☒ D. OTHER CONTRACTOR
☐ E. LOCAL HEALTH OFFICIAL ☐ F. OTHER: _____

CONTRACTOR NAME(S): GERAGHTY & MILLER

02 SITE STATUS (Check one)

☒ A. ACTIVE ☐ B. INACTIVE ☐ C. UNKNOWN

03 YEARS OF OPERATION

1903 (BEGINNING YEAR) | PRESENT (ENDING YEAR) ☐ UNKNOWN

04 DESCRIPTION OF SUBSTANCES POSSIBLY PRESENT, KNOWN, OR ALLEGED

Substances discovered to be on site include toluene, benzene, phenol, benzaldehyde, methanol, xylenes, ethylbenzene, benzoic acid, and trans-1,2-dichloroethene.

Attachment: E

05 DESCRIPTION OF POTENTIAL HAZARD TO ENVIRONMENT AND/OR POPULATION

There is a potential for hazards to the environmental and/or population due to surface water, air, and groundwater contamination.

Attachments: E,J,K,L,N

V. PRIORITY ASSESSMENT

01 PRIORITY FOR INSPECTION (Check one. If high or medium is checked, complete Part 2 - Waste Information and Part 3 - Description of Hazardous Conditions and Incidents)

☒ A. HIGH ☐ B. MEDIUM ☐ C. LOW ☐ D. NONE

VI. INFORMATION AVAILABLE FROM

01 CONTACT	02 OF (Agency/Organization)	03 TELEPHONE NUMBER
ANDREW DILLMAN	NJDEP/DHWM/ECRA	(609) 633-7141

04 PERSON RESPONSIBLE FOR ASSESSMENT	05 AGENCY	06 ORGANIZATION	07 TELEPHONE NUMBER	08 DATE
DONNA J. RESTIVO	NJDEP	DHWM/BPA	(609) 984-3017	2 / 3 / 89 (MONTH DAY YEAR)

EPA FORM 2070-12 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 2 - WASTE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NJ	D002005148

II. WASTE STATES, QUANTITIES, AND CHARACTERISTICS

01 PHYSICAL STATES (Check all that apply)

- ☐ A. SOLID
- ☐ B. POWDER, FINES
- ☒ C. SLUDGE
- ☒ E. SLURRY
- ☐ F. LIQUID
- ☐ G. GAS
- ☐ D. OTHER _____ (Specify)

02 WASTE QUANTITY AT SITE (Measures of waste quantities must be independent)

TONS _____

CUBIC YARDS unknown

NO. OF DRUMS _____

03 WASTE CHARACTERISTICS (Check all that apply)

- ☒ A. TOXIC
- ☐ B. CORROSIVE
- ☐ C. RADIOACTIVE
- ☐ D. PERSISTENT
- ☒ E. SOLUBLE
- ☐ F. INFECTIOUS
- ☒ G. FLAMMABLE
- ☐ H. IGNITABLE
- ☒ I. HIGHLY VOLATILE
- ☐ J. EXPLOSIVE
- ☐ K. REACTIVE
- ☐ L. INCOMPATIBLE
- ☐ M. NOT APPLICABLE

III. WASTE TYPE

CATEGORY	SUBSTANCE NAME	01 GROSS AMOUNT	02 UNIT OF MEASURE	03 COMMENTS
SLU	SLUDGE			Spills on site may have caused contamination of groundwater and soil.
OLW	OILY WASTE			
SOL	SOLVENTS	unknown		
PSD	PESTICIDES			
OCC	OTHER ORGANIC CHEMICALS	unknown		
IOC	INORGANIC CHEMICALS			
ACD	ACIDS			
BAS	BASES			
MES	HEAVY METALS			

IV. HAZARDOUS SUBSTANCES (See Appendix for most frequently cited CAS Numbers)

01 CATEGORY	02 SUBSTANCE NAME	03 CAS NUMBER	04 STORAGE/DISPOSAL METHOD	05 CONCENTRATION	06 MEASURE OF CONCENTRATION
SOL	TOLUENE	108-88-3	UNDERGROUND STORAGE TANK	16,800,000	PPB
SOL	BENZENE	71-43-2	UNKNOWN	6,000	PPB
SOL	PHENOL	108-95-2	UNKNOWN	2,570	PPM
OCC	BENZOIC ACID	65-85-0	UNKNOWN	UNKNOWN	
OCC	BENZALDEHYDE	100-52-7	UNKNOWN	570	PPB
OCC	TRANS-1,2-DICHLOROETHENE	540-59-0	UNKNOWN	23	PPB
OCC	ETHYLBENZENE	100-41-4	UNKNOWN	15	PPB
OCC	XYLENES	1330-20-7	UNKNOWN	17	PPB
SOL	METHANOL	67-56-1	UNDERGROUND STORAGE TANK	120	PPM

V. FEEDSTOCKS (See Appendix for CAS Numbers)

CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER	CATEGORY	01 FEEDSTOCK NAME	02 CAS NUMBER
FDS			FDS		
FDS			FDS		
FDS			FDS		
FDS			FDS		

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Attachments: E - NJDEP, DHWM, ECRA

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

II. HAZARDOUS CONDITIONS AND INCIDENTS

01 [X] A. GROUNDWATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 96,000
02 [X] OBSERVED (DATE: 12/87) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

Nine monitoring wells sampled on site revealed the presence of various contaminants in the unconsolidated deposits.

Attachment: E

01 [X] B. SURFACE WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: unknown
02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

The site lies adjacent to the Passaic River and discharges effluent to the river through three outfall pipes. The Passaic River may be used for recreational purposes.

Attachment: J

01 [X] C. CONTAMINATION OF AIR
03 POPULATION POTENTIALLY AFFECTED:
02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

Tenneco has been issued violations for various spills and equipment failures that have caused the release of odors, smog, and vapors. There is a potential for air contamination on site due to spills and the volatilization of materials on site.

Attachments: K,L,N

01 [X] D. FIRE EXPLOSIVE CONDITIONS
03 POPULATION POTENTIALLY AFFECTED:
02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

A potential for fire/explosive conditions exists due to flammable materials that are used on site.

Attachments: B,V

01 [ ] E. DIRECT CONTACT
03 POPULATION POTENTIALLY AFFECTED:
02 [ ] OBSERVED (DATE:) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

The site is completely fenced, restricting access by the public and preventing contact with wastes on site.

Attachment: B

01 [X] F. CONTAMINATION OF SOIL
03 AREA POTENTIALLY AFFECTED: 8 (Acres)
02 [X] OBSERVED (DATE: 12/87) [ ] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

Soil sampling has shown the presence of high levels of toluene and benzene onsite.

Attachment: E

01 [X] G. DRINKING WATER CONTAMINATION
03 POPULATION POTENTIALLY AFFECTED: 96,000
02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

A potential for drinking water contamination exists. Drinking water is drawn from the Brunswick Formation and contamination has been discovered in the undonsolidated deposits which overlay the formation.

Attachments: B and E

01 [X] H. WORKER EXPOSURE/INJURY
03 WORKERS POTENTIALLY AFFECTED: 75
02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

There is a potential for employees to contact hazardous wastes on site.

Attachments: B,V

01 [X] I. POPULATION EXPOSURE/INJURY
03 POPULATION POTENTIALLY AFFECTED: 96,000
02 [ ] OBSERVED (DATE:) [X] POTENTIAL [ ] ALLEGED
04 NARRATIVE DESCRIPTION

There is a potential for population exposure/injury due to surface water, air, and/or groundwater contamination.

Attachments: E,J,K,L,N

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 3 - DESCRIPTION OF HAZARDOUS CONDITIONS AND INCIDENTS

I. IDENTIFICATION
01 STATE: NJ
02 SITE NUMBER: D002005148

II. HAZARDOUS CONDITIONS AND INCIDENTS (Continued)

01 [X] J. DAMAGE TO FLORA — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

A potential for damage to flora exists due to contaminants being on site and/or discharging to the Passaic River.

Attachments: E,J

01 [X] K. DAMAGE TO FAUNA — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION (Include name(s) of species)

A potential for damage to fauna exists due to contaminants being on site and/or discharging to the Passaic River.

Attachments E,J

01 [X] L. CONTAMINATION OF FOOD CHAIN — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

Contaminants detected on site may bioaccumulate; therefore, a potential for contamination of the food chain exists.

Attachment: J

01 [X] M. UNSTABLE CONTAINMENT OF WASTES (Spills Runoff Standing liquids, Leaking drums) — 02 [X] OBSERVED (DATE: various) — [ ] POTENTIAL — [ ] ALLEGED
03 POPULATION POTENTIALLY AFFECTED: _____ 04 NARRATIVE DESCRIPTION

Various spills that have occurred at the site have caused the release of vapors to the atmosphere. Also, spills have seeped through the ground. Attachments: K,L,M,N

01 [X] N. DAMAGE TO OFFSITE PROPERTY — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

There is a potential for damage to off site property due to discharge and/or runoff.

Attachment: B

01 [X] O. CONTAMINATION OF SEWERS, STORM DRAINS, WWTPs — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

A permitted discharge enters the Passaic Valley Sewerage System. If contaminants enter the discharge, the sewers may become contaminated.

Attachment: J

01 [X] P. ILLEGAL/UNAUTHORIZED DUMPING — 02 [ ] OBSERVED (DATE: _____) — [X] POTENTIAL — [ ] ALLEGED
04 NARRATIVE DESCRIPTION

There is a potential for illegal/unauthorized dumping. Early on site activities were not monitored.

Attachments: A,B

05 DESCRIPTION OF ANY OTHER KNOWN, POTENTIAL, OR ALLEGED HAZARDS

III. TOTAL POPULATION POTENTIALLY AFFECTED: 96,000

IV. COMMENTS

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Attachments: A,B,E - NJDEP, ECRA FILES
J,V - NJDEP, DWR, Central files
K,L - NJDEP, DEQ
M,N - NJDEP, DWR, Metro Office

FORM 2070-13 (7-81)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION
PART 4 - PERMIT AND DESCRIPTIVE INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NJ	D002005148

II. PERMIT INFORMATION

01 TYPE OF PERMIT ISSUED (Check all that apply)	02 PERMIT NUMBER	03 DATE ISSUED	04 EXPIRATION DATE	05 COMMENTS
☒ A. NPDES	0000124	11/15/84	12/31/89	Four discharges to the
☐ B. UIC				Passaic River.
☒ C. AIR	00053			93 Certificates have been
☐ D. RCRA				issued to the company.
☐ E. RCRA INTERIM STATUS				
☐ F. SPCC PLAN				
☐ G. STATE (Specify)				
☐ H. LOCAL (Specify)				
☐ I. OTHER (Specify)				
☐ J. NONE				

III. SITE DESCRIPTION

01 STORAGE DISPOSAL (Check all that apply)	02 AMOUNT	03 UNIT OF MEASURE
☐ A. SURFACE IMPOUNDMENT		
☐ B. PILES		
☐ C. DRUMS, ABOVE GROUND		
☒ D. TANK, ABOVE GROUND	27 tanks	
☐ E. TANK, BELOW GROUND		
☐ F. LANDFILL		
☐ G. LANDFARM		
☐ H. OPEN DUMP		
☐ I. OTHER (Specify)		

04 TREATMENT (Check all that apply)
- ☐ A. INCENERATION
- ☐ B. UNDERGROUND INJECTION
- ☐ C. CHEMICAL/PHYSICAL
- ☐ D. BIOLOGICAL
- ☐ E. WASTE OIL PROCESSING
- ☐ F. SOLVENT RECOVERY
- ☐ G. OTHER RECYCLING/RECOVERY
- ☐ H. OTHER (Specify)

05 OTHER
- ☒ A. BUILDINGS ON SITE

06 AREA OF SITE: 8 (Acres)

07 COMMENTS

A total of 27 underground storage tanks have existed at the site. Product remains in only 7 of the tanks. Eleven of the unused tanks have been removed and the remaining tanks are either empty or filled with water.

Attachment: B

IV. CONTAINMENT

01 CONTAINMENT OF WASTES (Check one)

☐ A. ADEQUATE, SECURE ☐ B. MODERATE ☒ C. INADEQUATE, POOR ☐ D. INSECURE, UNSOUND, DANGEROUS

02 DESCRIPTION OF DRUMS, DIKING, LINERS, BARRIERS, ETC.

Spill containment includes: concrete dikes around the aboveground storage tanks; sand bags and absorbent for oil spills; crushed stone to absorb heavy oil; and a pump to pump out diked areas.

Attachment: B

V. ACCESSIBILITY

01 WASTE EASILY ACCESSIBLE: ☐ YES ☒ NO

02 COMMENTS

The entire site is fenced preventing access by the general public.

Attachment: B

VI. SOURCES OF INFORMATION (Cite specific references, e.g. state files, sample analysis, reports)

Attachment: B- NJDEP, ECRA FILES

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NJ	D002005148

II. DRINKING WATER SUPPLY

01 TYPE OF DRINKING SUPPLY (Check as applicable)

	SURFACE	WELL
COMMUNITY	A. ☐	B. ☒
NON-COMMUNITY	C. ☐	D. ☐

02 STATUS

ENDANGERED	AFFECTED	MONITORED
A. ☒	B. ☐	C. ☐
D. ☐	E. ☐	F. ☐

03 DISTANCE TO SITE

A. 0.5 (mi)
B. _____ (mi)

III. GROUNDWATER

01 GROUNDWATER USE IN VICINITY (Check one)

☒ A. ONLY SOURCE FOR DRINKING ☐ B. DRINKING (Other sources available) COMMERCIAL, INDUSTRIAL, IRRIGATION (No other water sources available) ☐ C. COMMERCIAL, INDUSTRIAL, IRRIGATION (Limited other sources available) ☐ D. NOT USED, UNUSEABLE

02 POPULATION SERVED BY GROUND WATER 96,000

03 DISTANCE TO NEAREST DRINKING WATER WELL 0.5 (mi)

04 DEPTH TO GROUNDWATER 2.5 (ft)

05 DIRECTION OF GROUNDWATER FLOW West

06 DEPTH TO AQUIFER OF CONCERN 40 (ft)

07 POTENTIAL YIELD OF AQUIFER Unknown (gpd)

08 SOLE SOURCE AQUIFER ☒ YES ☐ NO

09 DESCRIPTION OF WELLS (Including usage, depth, and location relative to population and buildings)

Public supply wells lie within the Triassic Brunswick Formation except the Hackensack Water Company which uses Quaternary Deposits.

Attachments: B and E

10 RECHARGE AREA ☒ YES ☐ NO COMMENTS There is potential for this area to be a groundwater recharge area if contaminants migrate to the aquifer. Attachment: B

11 DISCHARGE AREA ☒ YES ☐ NO COMMENTS Groundwater may discharge to the Passaic River. Attachment: B

IV. SURFACE WATER

01 SURFACE WATER USE (Check one)

☒ A. RESERVOIR, RECREATION, DRINKING WATER SOURCE ☐ B. IRRIGATION, ECONOMICALLY IMPORTANT RESOURCES ☐ C. COMMERCIAL, INDUSTRIAL ☐ D. NOT CURRENTLY USED

02 AFFECTED/POTENTIALLY AFFECTED BODIES OF WATER

NAME:	AFFECTED	DISTANCE TO SITE
Passaic River	☐	100 feet (mi)
	☐	(mi)
	☐	(mi)

V. DEMOGRAPHIC AND PROPERTY INFORMATION

01 TOTAL POPULATION WITHIN

ONE (1) MILE OF SITE	TWO (2) MILES OF SITE	THREE (3) MILES OF SITE
A. 33,000 NO. OF PERSONS	B. 131,000 NO. OF PERSONS	C. 213,500 NO. OF PERSONS

02 DISTANCE TO NEAREST POPULATION 50 feet (mi)

03 NUMBER OF BUILDINGS WITHIN TWO (2) MILES OF SITE 34,500

04 DISTANCE TO NEAREST OFF-SITE BUILDING 50 feet (mi)

05 POPULATION WITHIN VICINITY OF SITE (Provide narrative description of nature of population within vicinity of site, e.g., rural, village, densely populated urban area)

The site is located in a densely populated urban area of Garfield, Bergen County. There are two schools within 600 feet east of the site.

Map 1

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 5 - WATER, DEMOGRAPHIC, AND ENVIRONMENTAL DATA

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

VI. ENVIRONMENTAL INFORMATION

01 PERMEABILITY OF UNSATURATED ZONE (Check one)

☐ A. $10^{-6} - 10^{-8}$ cm/sec ☒ B. $10^{-4} - 10^{-6}$ cm/sec ☐ C. $10^{-4} - 10^{-3}$ cm/sec ☐ D. GREATER THAN 10^{-3} cm/sec

02 PERMEABILITY OF BEDROCK (Check one)

☐ A. IMPERMEABLE (Less than 10^{-6} cm/sec) ☒ B. RELATIVELY IMPERMEABLE ($10^{-4} - 10^{-6}$ cm/sec) ☐ C. RELATIVELY PERMEABLE ($10^{-2} - 10^{-4}$ cm/sec) ☐ D. VERY PERMEABLE (Greater than 10^{-2} cm/sec)

03 DEPTH TO BEDROCK	04 DEPTH OF CONTAMINATED SOIL ZONE	05 SOIL pH
40 (ft)	Unknown (ft)	Unknown

06 NET PRECIPITATION	07 ONE YEAR 24 HOUR RAINFALL	08 SLOPE		
		SITE SLOPE	DIRECTION OF SITE SLOPE	TERRAIN AVERAGE SLOPE
12 (in)	3 (in)	<1 %	West	< 1 %

09 FLOOD POTENTIAL

SITE IS IN 500 YEAR FLOODPLAIN

10 ☐ SITE IS ON BARRIER ISLAND, COASTAL HIGH HAZARD AREA, RIVERINE FLOODWAY

11 DISTANCE TO WETLANDS (5 acre minimum)

ESTUARINE: A. >2 (mi)

OTHER: B. >1 (mi)

12 DISTANCE TO CRITICAL HABITAT (of endangered species)

>1 (mi)

ENDANGERED SPECIES: N/A

13 LAND USE IN VICINITY

DISTANCE TO:

COMMERCIAL INDUSTRIAL	RESIDENTIAL AREAS; NATIONAL STATE PARKS, FORESTS, OR WILDLIFE RESERVES	AGRICULTURAL LANDS PRIME AG LAND	AGRICULTURAL LANDS AG LAND
A. 50 feet (mi)	B. 50 feet (mi)	C. >1 (mi)	D. >1 (mi)

14 DESCRIPTION OF SITE IN RELATION TO SURROUNDING TOPOGRAPHY

The site is located in an urban area adjacent to the Passaic River. The area is relatively flat with a slight slope to the Passaic River.

Map 1

VII. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Map/- USGS Topographic Map
Attachments: B,E, - NJDEP, ECRA FILES

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 6 - SAMPLE AND FIELD INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

II. SAMPLES TAKEN

SAMPLE TYPE	01 NUMBER OF SAMPLES TAKEN	02 SAMPLES SENT TO	03 ESTIMATED DATE RESULTS AVAILABLE
GROUNDWATER	9		AVAILABLE
SURFACE WATER		GERAGHTY & MILLER, INC.	
WASTE		HACKENSACK, NJ	
AIR			
RUNOFF			
SPILL			
SOIL	17		AVAILABLE
VEGETATION			
OTHER			

III. FIELD MEASUREMENTS TAKEN

01 TYPE	02 COMMENTS

IV. PHOTOGRAPHS AND MAPS

01 TYPE ☐ GROUND ☐ AERIAL

02 IN CUSTODY OF _____ (Name of organization or individual)

03 MAPS ☒ YES ☐ NO

04 LOCATION OF MAPS NJDEP, DHWM, ECRA and BPA

V. OTHER FIELD DATA COLLECTED (Provide narrative description)

VI. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Attachments: E,U - NJDEP, ECRA FILES

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 7 - OWNER INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NJ	D002005148

II. CURRENT OWNER(S)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE
KALAMA CHEMICAL	09-289-9574	1110 BANK OF CALIFORNIA CENTER	2869	SEATTLE	WA	98164

PARENT COMPANY (if applicable)

08 NAME	09 D+B NUMBER	10 STREET ADDRESS (P.O. Box, RFD #, etc.)	11 SIC CODE	12 CITY	13 STATE	14 ZIP CODE

III. PREVIOUS OWNER(S) (List most recent first)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE
TENNECO INC.		290 RIVER ROAD		GARFIELD	NJ	07026
HEYDEN-NEWPORT CORP.		290 RIVER ROAD		GARFIELD	NJ	07026
VAN HEYDEN CHEMICAL FABRISCHE		290 RIVER ROAD		GARFIELD	NJ	07026

IV. REALTY OWNER(S) (if applicable; list most recent first)

01 NAME	02 D+B NUMBER	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	05 CITY	06 STATE	07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Attachment: A - NJDEP, ECRA FILES

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 8 - OPERATOR INFORMATION

I. IDENTIFICATION

01 STATE	02 SITE NUMBER
NJ	D002005148

II. CURRENT OPERATOR (Provide if different from owner)

01 NAME	02 D+B NUMBER
KALAMA CHEMICAL	00-200-5148

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
290 RIVER ROAD	2869

05 CITY	06 STATE	07 ZIP CODE
GARFIELD	NJ	07026

08 YEARS OF OPERATION	09 NAME OF OWNER
1982-present	

OPERATOR'S PARENT COMPANY (If applicable)

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

III. PREVIOUS OPERATOR(S) (List most recent first; provide only if different from owner)

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

PREVIOUS OPERATORS' PARENT COMPANIES (If applicable)

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

01 NAME	02 D+B NUMBER

03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE

05 CITY	06 STATE	07 ZIP CODE

08 YEARS OF OPERATION	09 NAME OF OWNER DURING THIS PERIOD

10 NAME	11 D+B NUMBER

12 STREET ADDRESS (P.O. Box, RFD #, etc.)	13 SIC CODE

14 CITY	15 STATE	16 ZIP CODE

IV. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

Attachment: A -NJDEP, ECRA FILES

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 9 - GENERATOR/TRANSPORTER INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

II. ON-SITE GENERATOR

01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE

III. OFF-SITE GENERATOR(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

IV. TRANSPORTER(S)

01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE
01 NAME	02 D+B NUMBER	01 NAME	02 D+B NUMBER
03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE	03 STREET ADDRESS (P.O. Box, RFD #, etc.)	04 SIC CODE
05 CITY	06 STATE / 07 ZIP CODE	05 CITY	06 STATE / 07 ZIP CODE

V. SOURCES OF INFORMATION (Cite specific references, e.g., state files, sample analysis, reports)

EPA

POTENTIAL HAZARDOUS WASTE SITE
SITE INSPECTION REPORT
PART 11 - ENFORCEMENT INFORMATION

I. IDENTIFICATION	
01 STATE	02 SITE NUMBER
NJ	D002005148

II. ENFORCEMENT INFORMATION N/A

01 PAST REGULATORY/ENFORCEMENT ACTION ☐ YES ☒ NO

02 DESCRIPTION OF FEDERAL, STATE, LOCAL REGULATORY/ENFORCEMENT ACTION

III. SOURCES OF INFORMATION *(Cite specific references, e.g., state files, sample analysis, reports)*

Reference Number 2

SAMPLING PLAN ADDENDUM NO. 2
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

September 6, 1991

Geraghty & Miller, Inc. is submitting this sampling plan to Kalama Chemical, Inc. for work to be performed at the Garfield, New Jersey facility. The sampling plan was prepared in conformance with Geraghty & Miller's strict quality assurance/quality control procedures. If you have any questions or comments concerning this sampling plan, please contact one of the individuals listed below.

Respectfully submitted,

GERAGHTY & MILLER, INC.

Christopher J. Motta, C.P.G.
Senior Scientist/Project Manager

Joseph Minster, C.P.G.
Senior Project Advisor/Project Officer

SAMPLING PLAN ADDENDUM NO. 2
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

September 1991

Prepared for

Kalama Chemical, Inc.
Seattle, Washington

Prepared by

Geraghty & Miller, Inc.
201 West Passaic Street
Rochelle Park, New Jersey 07662
(201) 909-0700

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2. Summary of Concerns and Proposed Investigative Work, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

3. Summary of Investigative Tasks, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

4. Proposed Soil Sampling and Analysis Program, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

5. Proposed Well Installation and Ground-Water Sampling and Analysis Programs, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

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SAMPLING PLAN ADDENDUM NO. 2
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

INTRODUCTION

In June 1986, Geraghty & Miller, Inc. (Geraghty & Miller) was retained by Kalama Chemical, Inc. of Seattle, Washington (Kalama) to conduct an environmental sampling and analysis program at the Kalama facility in Garfield, New Jersey. The purpose of the program was to evaluate the environmental conditions of the facility in support of the requirements under New Jersey's Environmental Cleanup Responsibility Act (ECRA). In December 1986, Geraghty & Miller submitted a report on its preliminary investigation of soil quality entitled "Preliminary Investigation of Soil Quality Conditions at the Kalama Chemical, Inc. Facility in Garfield, New Jersey" (Geraghty & Miller, Inc., 1986).

Geraghty & Miller prepared a sampling plan as part of the Site Evaluation Submission required under ECRA. The plan was prepared in accordance with the Draft Sampling Plan Guide for ECRA (June 1986), issued by the NJDEP, Bureau of Industrial Site Evaluation (BISE). The plan, entitled "Sampling Plan for Site Evaluation, Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1987) was submitted to the NJDEP in August 1987. The field work was conducted from September 1987 through March 1988. The results of the 1987-1988 Soil and Ground-Water Investigation (ECRA Sampling Plan Investigation or 1987-1988 Investigation) are presented in a report entitled "ECRA Soil and Ground-Water Investigation at the Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1988). That report was submitted to the NJDEP in June 1988.

Based on the results of the ECRA Sampling Plan Investigation, Geraghty & Miller concluded that uncertainties remained regarding the nature and extent of contamination.

TABLES (Continued)

6. Proposed Physicochemical Parameters for Soil and Ground-Water Samples, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

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1. Site Location Map, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

2. Existing Soil Boring and Monitoring Well Locations, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

3. Proposed Soil Boring and Monitoring Well Locations, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

4. Proposed Sampling Locations Under Buildings, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

5. Proposed Schedule, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

APPENDICES

A. Standing Water Sampling Protocol.

B. Soil Sampling Protocol.

C. Drilling Protocol.

D. Ground-Water Sampling Protocol.

E. Aquifer Pumping Test Protocol.

F. Health and Safety Plan Addendum.

G. Laboratory Quality Assurance Manual.

BACKGROUND

HISTORY OF OPERATIONS

The information in this section was researched by Kalama. It is based on a review of historical records and discussions with long-time employees.

The first buildings at the Garfield Plant were constructed in 1891 by Fritzche Brothers to facilitate chemical manufacturing. The plant has operated continuously since that time. Fritzche Brothers sold the plant to Von Heyden Chemical Fabrische around the turn of the century. The company name was changed to Von Heyden Chemicals, then to Heyden Chemicals, then to Heyden-Newport Corporation. Heyden-Newport Corporation was purchased in 1965 by the Tennessee Gas Transmission Company, which later changed its name to Tenneco, Inc. Kalama Chemical, Inc. purchased the facility from Tenneco Chemicals, Inc., a Tenneco, Inc. subsidiary, in December 1982.

The oldest existing buildings on the site were constructed about 1900. The most recent building construction took place in the late 1970s. Existing buildings are referred to by number. Buildings have been demolished, replaced and modified over the years, as have underground pipes such as chemical and sanitary sewerage lines, and structures such as catch basins and sumps. The plant is served by railroad sidings from the Erie Lackawanna Railroad, in the central and northern section of the facility. Historically, 27 underground storage tanks (USTs) at various locations throughout the site were used for the storage of fuel oil, methanol, toluene and other chemicals. The USTs were removed by Kalama and Tenneco from 1987 to 1990.

Chemicals produced at the Garfield facility are used in pharmaceuticals, cosmetics, food packaging and preservatives, synthetic flavorings, printing inks, dyestuffs and other products. The plant has been the site of salicylic acid, sodium, potassium and methyl salicylate, production since the turn of the century, and of salicylate salts from the 1930s to

Therefore, a sampling plan addendum letter, which proposed to address those uncertainties, was submitted to the NJDEP in October 1988.

An Administrative Consent Order (ACO) was executed between Kalama and the NJDEP in December 1988.

Kalama received a letter from the NJDEP on March 10, 1989 which required Kalama to submit an expanded sampling plan addendum. In response to that letter, Geraghty & Miller prepared an expanded sampling plan addendum, which was submitted to the NJDEP in April 1989 (Geraghty & Miller, Inc., 1989). Due to some deficiencies in the expanded addendum, noted in a letter from NJDEP to Kalama, dated January 8, 1990, Geraghty & Miller prepared a revised sampling plan addendum. The addendum, entitled "Revised Sampling Plan Addendum, Kalama Chemical, Inc. Facility, Garfield, New Jersey," (Geraghty & Miller, Inc., 1990) was submitted to the NJDEP in March 1990. The NJDEP approved this sampling plan, with certain conditions, in its January 3, 1991 letter to Kalama. Geraghty & Miller prepared a revised sampling plan investigation report, which includes the results of the earlier investigations, as well as the work detailed in the Revised Sampling Plan Addendum with NJDEP conditions. The report, entitled "Revised ECRA Sampling Plan Investigation Report, Kalama Chemical, Inc., Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1991) is submitted with this sampling plan under separate cover.

Geraghty & Miller has concluded, based on the data collected during all its investigations at the Kalama facility, that additional investigative work is required prior to developing a feasible and effective cleanup plan. This proposed Sampling Plan Addendum No. 2 describes the additional work and defines tasks associated with the work. Upon completion of those tasks, Geraghty & Miller will prepare and submit a report to the NJDEP.

former benzoic acid/benzaldehyde production facility in the southeastern section of the facility (immediately west of Building 23) which was constructed by Heyden-Newport in 1960 and abandoned and dismantled by Kalama in 1984.

SITE DESCRIPTION

The Kalama facility is located in the City of Garfield, Bergen County, New Jersey (Figure 1). The property owned by Kalama is designated as Block 50.01 Lot 1 and Block 50.02 Lot 1 on the assessment map for the City of Garfield. Block 50.01 Lot 1 is approximately 500 feet by 560 feet (6.4 acres) and is occupied by the manufacturing facilities. The area of manufacturing (i.e., Block 50.01 Lot 1) is referred to as the site, facility, or plant.

The second lot, Block 50.02 Lot 1, is approximately 40 feet by 560 feet (0.5 acres) and is the location of the river-water pump house and employee parking. River Drive, which trends north-south, divides the two lots.

The Passaic River, the primary regional surface-water body, is 100 feet west of the facility. The Passaic River is tidal, flows by the facility in a north to south direction, and is the receptor for the local ground-water and storm-water discharge. Mixed residential and commercial areas surround the facility on its other three sides.

Most of the facility is covered by buildings and pavement. Buildings occupy approximately 50 percent of the facility; paved areas (primarily asphalt) cover an estimated 25 percent of the facility. The remaining 25 percent of the surface is unpaved.

An extensive network of pipes and structures (both active and inactive) is present beneath the site surface. The underground pipes can be classified into the following categories:

the present. Parasepts and methylene disalicylic acid (MDA) have been produced at the plant since the 1940s. (Parasepts, sometimes called Parabens, is a registered trademark for certain methyl, ethyl, propyl and butyl esters of para-hydroxy benzoic acid). During the 1930s until 1982, formaldehyde was produced at the plant. Benzoic acid, benzaldehyde and sodium benzoate were produced in facility buildings and on diked pad in the southeastern section of the facility from 1960 until February 1984.

During the Second World War, the U.S. government installed equipment at the plant for the manufacture of Pentaerythritol, a glycerine substitute. Pentaerythritol production continued until 1962. Other historical products and processes include Resorcinol, Jet Lube, Fumaric Acid, Pentamids, DDSA, Nuosperse HOH, Nuvis HS, B-Oxynapththoic Acid and Naphthalene distillation.

Toluene was used at the site as a raw material for the production of benzoic acid and benzaldehyde in the air oxidation process. Phenol and sodium hydroxide are currently used as raw material for the production of salicylic acid in the carboxylation process. Methyl salicylate is manufactured by the esterification of salicylic acid and methanol, with sulfuric acid used as a catalyst. Formaldehyde was formerly produced by the catalytic oxidation of methanol. Benzene was formerly used in the manufacture of Resorcinol.

Manufacturing operations are conducted in approximately one half of the 39 existing buildings at the site (several of which are subdivided into separately numbered structures, for example, Buildings 10-P1 through 10-P4). The other buildings are either vacant, idle, or they are used for storage, shops or offices. Seven buildings have been dismantled (Buildings 2, 3, 37, 38 and three unnumbered buildings). The dates of construction, current use, and, to the extent known, the principal historic use of each separately identified structure are presented in Table 1.

In addition to the numbered buildings, there are and historically have been a variety of other above-ground structures and tanks on the site. Of particular significance is the

There is one 12-inch diameter sewerage line that carries sanitary waste, process waste and some storm water (via catch basins). That 12-inch line crosses the western facility boundary adjacent to Outfall 002 described above. The effluent in that sewerage line is monitored in accordance with the PVSC sewer connection permit.

There are seven other sewerage lines that cross the facility boundaries. Those lines are 4-inch or 6-inch in diameter. Five are active lines that carry sanitary waste only. Two active lines cross the eastern facility boundary. Two inactive sewerage lines cross the western facility boundary.

There are five potable water lines that cross the facility boundaries. Two of those lines cross the northern boundary and one line crosses each of the other boundaries. All five lines are active and are either 8 inches or 12 inches in diameter.

The underground structures beneath the site surface can be classified into the following categories:

- Basements.
- Elevator shafts.
- Pipe tunnels.
- Catch basins.
- Sumps.

None of the underground structures extends across the facility boundary.

Buildings 17, 32, 32-A/32-B, 33/33-A/33-B, 34, and 36 have basements. Some of the basements are flooded and may extend below the water-table. The basement of Building 32-A/32-B is intermittently flooded with water which Kalama sampled and analyzed. The analytical results indicate that the water contains concentrations of toluene up to approximately 130,000 micrograms per liter (ug/L).

- Intake lines that carry cooling water from the Passaic River to the facility.
- Outfalls that carry cooling water and storm water from the facility to the Passaic River.
- Sewerage lines that connect to the Passaic Valley Sewerage Commissioners (PVSC) system.
- Potable water lines that supply the facility with water from the Passaic Valley Water Company (PVWC) and the City of Garfield.

There are three active 12-inch or 18-inch diameter river intake lines that cross the facility boundaries. River water is pumped (via the pump house) from the Passaic River to the intake lines and is utilized as non-contact cooling water. After use, it is discharged to the river via the two outfalls described below. The active lines cross the northwestern and southern facility boundaries. There is one inactive river intake line which is 8 inches in diameter and crosses the western facility boundary.

There are a total of four outfalls that connect with the Passaic River, two of which are inactive. The two active outfalls are regulated under Kalama's NPDES permit. Those outfalls carry non-contact cooling water and some storm water (via catch basins) from the facility, under River Drive, to the Passaic River. Both active outfalls cross the western facility boundary. One of the active outfalls, designated as 001, is aligned along the northern facility boundary. It is 18 inches in diameter and crosses the facility boundary at its northwest corner. The other active outfall, designated as 002, is 24 inches in diameter and crosses the western facility boundary approximately 20 feet north of Building 34.

There is an inactive 10-inch diameter outfall that crosses the western facility boundary approximately 40 feet north of Outfall 002. That outfall was connected to the boiler room of former Building 2 and was deactivated in 1974. There is also an inactive 15-inch diameter outfall that crosses the facility boundary at its southwestern corner. That outfall has been inactive since 1969.

analyzed based on the former contents of the USTs. The UST removal program was conducted by Kalama and the prior facility owner, Tenneco.

- Kalama recovered a light non-aqueous phase liquid from a monitoring well located in the southeastern section of the facility by pumping intermittently during the period of May through November 1988. A sample of the liquid, collected prior to recovery, contained approximately 54 percent toluene and 41 percent petroleum hydrocarbons. In 1990, a similar liquid was recovered from a monitoring well also located in the southeastern section of the facility.

- In 1990 and 1991, Kalama reconstructed significant portions of the sewerage lines and associated catch basins.

- In 1991, as a result of termination of a lease to a third party, Kalama took Building 16 through a separate ECRA closure, which included asbestos removal.

Investigative Work

Geraghty & Miller has completed the following investigations at the Kalama facility:

Preliminary Investigation (1986)

The Preliminary Investigation included the drilling and sampling of five soil borings, 8 feet to 12 feet deep. Five soil and one ground-water samples were collected and tested for volatile, and base/neutral and acid extractable organic compounds, total petroleum hydrocarbons, total phenolics, benzoic acid, benzaldehyde, formaldehyde, and alcohols. Additional investigation details are included in the report entitled "Preliminary Investigation of Soil Quality Conditions at the Kalama Chemical, Inc. Facility in Garfield, New Jersey" (Geraghty & Miller, Inc., 1986).

Buildings 10-B, 12, 30, 31, 32-B, 33-A, and 36 have elevator shafts. Some elevator shafts extend below the water table. Elevator shafts in Buildings 32-B, 33-A and 36 are flooded.

The other underground structures include the following:

- Pipe tunnel system located in the north-central and eastern sections of the facility.
- Catch basins connected to both the outfalls and sewerage lines described above.
- Sumps located in several facility buildings.

The plant is presently an operating facility. As part of the plant operations, tank trucks, tractor trailers, and rail cars move around the plant regularly. This, combined with the congested ground-surface and underground conditions, complicates and, to a degree, limits the environmental investigative efforts. Despite those unfavorable conditions, a significant amount of ECRA-related remedial and investigative work has been completed at the site during the period of 1986 to 1991, as summarized below.

SUMMARY OF COMPLETED ECRA-RELATED WORK

Remedial Work

The following remedial work has been completed:

- From September 1987 through February 1990, 27 underground storage tanks (USTs) were removed, and post-excavation soil samples were collected and

- Installed twelve additional monitoring wells, ranging in depth from 12.5 feet to 36 feet.

- Conducted ten rounds of ground-water level measurements.

- Collected and analyzed ground-water samples from the monitoring wells (including wells installed during the previous investigation). Analytical parameters included volatile, and base/neutral and acid extractable organic compounds including tentatively identified compounds, total petroleum hydrocarbons, total phenolics, benzaldehyde, chloride and fecal coliform.

- Conducted field permeability slug tests in 14 monitoring wells.

- Conducted aquifer pumping tests in two monitoring wells.

- Conducted two soil vapor extraction (SVE) pilot tests.

- Conducted a well search within a 0.5-mile radius of the facility. Geraghty & Miller obtained information from the NJDEP Bureau of Water Allocation, Bergen County, and the City of Garfield.

The findings of all ECRA-related investigative work for the Kalama facility are discussed in the "Revised ECRA Sampling Plan Investigation Report" which is submitted with this sampling plan under separate cover. The conclusions of that report are presented below.

ECRA Sampling Plan Investigation (1987-1988)

The ECRA Sampling Plan Investigation included the following work: (1) installation of 13 soil borings, 3.5 feet to 22 feet deep; (2) soil sampling and analysis for volatile and base/neutral extractable organic compounds, including tentatively identified compounds, total petroleum hydrocarbons, total phenolics, benzoic acid, and benzaldehyde; (3) installation of seven shallow and two deep monitoring wells, 15 feet to 40 feet deep; (4) ground-water sampling and analysis for volatile and base/neutral extractable organic compounds, including tentatively identified compounds, total petroleum hydrocarbons, total phenolics, benzoic acid, benzaldehyde, and methanol; and (5) measurement of ground-water levels. Additional investigation details are included in the report entitled "ECRA Soil and Ground-Water Investigation at the Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1988).

Revised ECRA Sampling Plan Investigation (1991)

The revised ECRA Sampling Plan Investigation included the following tasks:

- Obtained historical aerial photographs of the facility from 1947, 1973, and 1982. The photographs were studied to identify any changes in the layout of the facility with particular emphasis on the identification of exterior material storage areas and stained areas. Certain information on the photographs was confirmed by site reconnaissance and comparison to a 1973 site plan.

- Drilled and sampled 46 soil borings, 0.5 feet to 12 feet deep. Samples from soil borings were analyzed for volatile, and base/neutral and acid extractable organic compounds including tentatively identified compounds, total petroleum hydrocarbons, total phenolics, arsenic, beryllium, cadmium, and vanadium, polychlorinated biphenyls, toluene, methanol, hexene, and pH.

5. The geology of the Kalama site is characterized by approximately 25 to 35 feet of unconsolidated deposits which are underlain by the Brunswick Formation shales and sandstones. The unconsolidated deposits generally include approximately 3 feet to 8 feet of fill over natural sand, silt, and clay. The lithology of the unconsolidated deposits varies significantly, both horizontally and vertically, across the site.

6. There is a single water-bearing zone in the unconsolidated deposits. The depth to the water table is generally 7 feet to 10 feet below ground surface and increases toward the Passaic River where the ground water discharges. There are tidal effects on ground water in the unconsolidated deposits within approximately 150 feet of the river. The significance of the tidal fluctuations for off-site contaminant migration and potential remedial alternatives for the facility is not understood at this time. Tidal fluctuations will be monitored further in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

7. There is some evidence that the apparent water-table mound in the southeastern section of the facility is a perched water body. The extent to which the anomalous ground-water conditions observed in the southeastern section of the facility impact off-site contaminant migration will be investigated further in accordance with the "Sampling Plan Addendum No. 2."

8. The general direction of ground-water flow is to the west/southwest, toward the Passaic River.

9. The soil hydraulic conductivity, based on slug tests, ranges from 0.3 feet/day (1.2 x 10^{-4} centimeters/second) to 13 feet/day (4.6 x 10^{-3} centimeters/second) with an average of 3 feet/day (1.1 x 10^{-3} centimeters/second). These values are typical for silty and clayey sands, which comprise a significant portion of the soils on the site. The overall ground-water flow gradient across the site is approximately 0.01. The hydraulic conductivity and ground-water flow gradient may range significantly across

CONCLUSIONS OF THE REVISED ECRA SAMPLING PLAN INVESTIGATION REPORT

The following conclusions are presented as they appear in the "Revised ECRA Sampling Plan Investigation Report." In some of the conclusions reference is made to this sampling plan.

1. The Kalama facility in Garfield, New Jersey is an active chemical manufacturing plant which is approximately 100 years old. Historically, the facility manufactured various chemicals, including formaldehyde, benzoic acid, benzaldehyde and salicylic acid under several ownerships. Kalama purchased the facility from Tenneco in December 1982.

2. Approximately 50 percent of the 6.4 acre facility is occupied by buildings and approximately 25 percent of the facility is covered with pavement, primarily asphalt. An extensive network of pipes and structures is present beneath the site surface. As part of the plant operations, tank trucks, tractor trailers and rail cars move around the facility daily. As such, there are extremely congested surface and underground conditions at the facility. These factors complicate the environmental investigative efforts.

3. With the exception of several buildings and the benzoic acid/benzaldehyde production facility which no longer exist, the site surface conditions have changed little over the past 44 years.

4. There are no private or public supply wells within a 0.25-mile radius from the Kalama site. Additional well search activities are proposed in the "Sampling Plan Addendum No. 2."

- Constituents, including toluene, benzene, total polycyclic aromatic hydrocarbons (PAHs), and total PHCs exceed the NJDEP-ECRA guidance levels by a significant margin at several soil sampling locations.

  - Toluene was detected in soil at concentrations up to 20,000 mg/kg.

  - Benzene was detected in soil at concentrations up to 80 mg/kg.

  - Total PAHs were detected in soil at concentrations up to 71 mg/kg.

  - Total PHCs were detected in soil at concentrations up to 4,670 mg/kg.

- The southeastern section of the facility, which includes the locations of the former toluene USTs and former production facilities that used benzene and toluene, is an area of concern because of the high concentrations of toluene, benzene and PAHs in soil. The major portion of this area of concern extends 250 feet south of the location of the former toluene USTs. Sources other than the former USTs, such as spills and leaks, probably contributed to the toluene contamination in soil.

- Total PHCs were detected at high concentrations throughout the facility and therefore are constituents of concern in soil.

- Polychlorinated biphenyls (PCBs) and metals are not constituents of concern at the facility.

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and associated elevated detection limits.

the site. Geraghty & Miller did not calculate ground-water flow velocities because of the high inhomogeneity of the unconsolidated deposits, the potential presence of preferential pathways, and tidal influences. Those conditions tend to render ground-water flow velocities unreliable for predicting ground-water time of travel.

10. The pumping tests indicate that the water-bearing zone yields variable and relatively low volumes of water to wells (0.5 gallons per minute and 3 gallons per minute). The results of the pumping tests are inconclusive. An additional pumping test will be conducted in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

11. The results of the post-excavation soil sampling and analysis program indicate the following:

    - The locations of the former methanol, methyl isobutyl ketone and hexene USTs are not areas of concern.

    - The former toluene, fuel oil and gasoline USTs appear to have been sources of soil contamination. Toluene was detected in post-excavation soil samples at concentrations up to 805 milligrams/kilogram (mg/kg). Total petroleum hydrocarbons (PHCs) were detected in concentrations up to 24,000 mg/kg. The locations of the former toluene, fuel oil and gasoline USTs are areas of concern.

    - The UST excavations were partially backfilled with the excavated soils. Soil contamination associated with the former toluene, fuel oil and gasoline USTs will be addressed in the cleanup plan.

12. The results of the soil boring sampling and analysis program indicate the following:

facility. Additional off-site and downgradient monitoring wells will be installed as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Benzene is present in ground water in the southern half of the facility at a maximum concentration of 3,500 ug/L. The area of benzene contamination in ground water extends to, and probably crosses, the southern and western facility boundaries. The source(s) of benzene contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- TCE and other chlorinated organic compounds are present in ground water at various locations across the facility. TCE was detected onsite in ground water at concentrations up to 2,700 ug/L in the southeastern section of the facility. TCE was detected "upgradient" in an off-site monitoring well at a concentration of 260 ug/L. The apparent water-table mound in the southeastern section of the facility could be responsible for this apparent upgradient and off-site contaminant migration. TCE was detected downgradients/offsite at a concentration of 18 ug/L. The source(s) of TCE and the chlorinated organic compound contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and associated elevated detection limits.

- Significant levels (up to 599,785 ug/L) of TID compounds occur in ground water.

- o Significant levels (up to 15,150 mg/kg) of tentatively identified (TID) compounds occur in soil.

- o Additional soil sampling is proposed in the "Sampling Plan Addendum No. 2."

- o The need for, and extent of, soil remediation will be addressed in the cleanup plan.

13. The results of the ground-water sampling and analysis program indicate the following:

- o Toluene, phenol, benzene, and trichloroethane (TCE) are constituents of concern in ground water.

- o Toluene is present in ground water throughout the facility. Toluene concentrations up to 110,000 micrograms/liter were detected in ground-water samples from the southern half of the facility. The toluene area of concern for soil appears to be one of the source areas for toluene in ground water. Other potential sources of toluene contamination will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- o Phenol is present in ground water throughout the facility. Phenol concentrations up to 930,000 ug/L were detected in samples from monitoring wells along the northern facility boundary. Concentrations of phenol up to 120,000 ug/L were detected in the southern half of the facility. The source(s) of phenol contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- o The areas of toluene and phenol contamination in ground water extend to, and probably cross, the northern, southern and western boundaries of the

water elevations and quality both upgradient and downgradient from the site; and the hydraulic characteristics of the overburden aquifer.

A related and critical objective of the additional work is to develop a better understanding of the effects of areas of concern on surface and subsurface conditions. Achieving that objective will require an effort focused particularly on former and current manufacturing facilities and subsurface structures as potential sources and pathways of contamination on and off the site.

Fourteen tasks, including report preparation, are proposed as part of the additional work. To the extent that tasks/work directed to the exploration of a particular constituent area, or condition of concern are redundant or duplicative of investigation of other constituents, areas, or conditions of concern, the tasks/work have been integrated to minimize duplication and maximize efficiency. In some situations, particularly with regard to the investigation of areas of concern, the ongoing development of information may suggest additional tasks or expansion of existing tasks, such as further soil or ground-water sampling, which will be proposed as necessary.

CONSTITUENTS OF CONCERN

Ground Water

Toluene, phenol, benzene, and trichloroethylene (TCE) (also other chlorinated organic compounds such as vinyl chloride) have been identified as constituents of concern in the ground water beneath the facility and the surrounding area. Additional investigation is required to better define the extent, source, and mechanisms of transport of those constituents in the ground water. The investigative work will include the placement of additional ground-water monitoring wells both onsite and offsite and additional rounds of water-level measurements in monitoring wells, well points, and piezometers. It will also include an investigation of underground utilities (both those currently in use and those that

- The need for, and extent of, ground-water remediation will be addressed in the cleanup plan.

14. The presence of non-aqueous phase liquids will continue to be monitored in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

15. A dense, non-aqueous phase liquid, which probably contains TCE, was detected at the bottom of one monitoring well located in the southeastern corner of the facility. The presence, nature, extent, and source of this non-aqueous phase liquid will be investigated further in accordance with work proposed in the "Sampling Plan Addendum No. 2."

16. A feasible and effective cleanup plan can only be developed after completion of additional investigative work. Geraghty & Miller recommends that the work proposed in the "Sampling Plan Addendum No. 2" be implemented.

ADDITIONAL WORK

PURPOSE

Additional investigative work is required at the site in order to better understand both surface and subsurface conditions, with particular emphasis on constituents of concern and on the hydrogeology of the site and surrounding area. The additional work is necessary to identify potential sources of contamination to design a feasible and effective cleanup plan that will eliminate, reduce, or control the contamination.

The principal objective of the additional investigation is to better define the extent, source, and persistence of specific compounds detected in the soil and ground water. Achieving that objective will require an understanding of the potential impact of underground utilities on ground-water flow and contaminant source and migration; ground-

Two general areas of concern have been identified as potential receptors of ground-water contamination. Those areas include the following:

- The offsite upgradient area.
- The offsite downgradient area.

CONDITIONS OF CONCERN

In addition to the constituents and areas of concern identified above, several conditions of concern that warrant investigation have been identified on the site. They are presented in Tables 2 and 3. Geraghty & Miller proposes to investigate the conditions of concern which will include, among other tasks, an underground utility survey, an investigation of building interiors for the presence of potential contamination and an asbestos inspection.

POTENTIAL CONSTITUENTS OF CONCERN

Also proposed is an evaluation of tentatively identified (TID) compounds in the soil and ground water, in order to identify groupings of constituents whose presence might have an effect on the design and performance of remedial measures. Methanol, formaldehyde benzoic acid, and benzaldehyde, which are also potential constituents of concern, will be investigated as part of the soil and ground-water sampling and analysis plan.

SAMPLING PLAN

Geraghty & Miller proposes to conduct 14 additional investigative tasks for this sampling plan including soil and ground-water sampling. Each task is presented and discussed below. The constituents, areas, and condition of concern addressed by each soil and ground-water sampling location is presented in Table 2. A summary of investigative

have been abandoned or modified during the history of the facility) and their potential impact on ground-water flow and contaminant migration. The investigation will focus as well on the sources and quality of water in the basements and elevator shafts of existing buildings, on evaluating the nature, extent and persistence of light and dense non-aqueous phase liquids in Monitoring Wells MW-7 and MW-5, and on continued NAPL monitoring of all wells.

Soil

Toluene, benzene, polycyclic aromatic hydrocarbons (PAHs) and petroleum hydrocarbons (PHCs) have been identified as constituents of concern in the soils on the site. Additional investigation will be required to better define the extent and source of these constituents in the soils. This investigation will entail the drilling of additional soil borings at several locations throughout the site, including beneath and adjacent to certain buildings, and underground structures and pipes. It will also entail an investigation of underground utilities and their potential impact on soil contamination.

AREAS OF CONCERN

Several areas of concern have been identified as potential sources of soil and ground-water contamination. Those areas include the following:

- The location of the former and current salicylic acid production facilities in the northeastern section of the plant.

- The location of the former benzoic acid/benzaldehyde production facility in the southeastern section of the plant.

- The former Resorcinol production facility (destroyed by explosion in 1951) located in the southeastern section of the plant.

TASK 2: INSPECT SUMPS AND CATCH BASINS

Sumps are located inside several facility buildings. Catch basins are located inside and outside facility buildings and they are connected to both outfalls and sewerage lines. Sumps and catch basins will be inspected to determine their status (i.e., active or inactive), size, and overall condition. Sumps and catch basins that require repair or decommissioning will be identified and addressed on an interim basis or at a later date during implementation of the cleanup plan.

TASK 3: REMOVE AND SAMPLE WATER FROM BASEMENTS AND ELEVATOR SHAFTS

The basements of Buildings 17 and 32-A/B and the elevator shafts in Buildings 32-B, 33-A, and 36 presently are flooded with water. The source of the water and its quality remain unknown. Therefore, the objective of this task is to determine the volume, source and quality of the flooding water in the basements and elevator shafts. The following scope of work will be performed to meet that objective:

- Estimate the volume of water in the basements and elevator shafts, and evaluate the logistics of pumping. Field test the water for pH and monitor vapors with an organic vapor meter as the water is agitated.

- Collect one water sample from each of the flooded basements and/or elevator shafts and analyze it for targeted compound list (TCL) volatile organic compounds (VOCs), TCL base/neutral acid extractable organic compounds (BNAs) (including benzaldehyde and benzoic acid), formaldehyde and methanol.

tasks, including the constituents, areas, and conditions of concern addressed by each task, is presented in Table 3.

TASK 1: CONDUCT UNDERGROUND UTILITY SURVEY

An extensive network of pipes and structures is present beneath the site surface. Fifteen known underground pipes, 6 inches to 24 inches in diameter, cross the western (downgradient) facility boundary, of which 5 lines were discontinued in the past and 10 lines are presently operational. Some of those pipes might have been place on and/or backfilled with crushed stone or gravel, and might act as preferential pathways for ground-water flow and associated contaminant migration.

Underground utilities have not been investigated adequately yet. A description of known pipes, based on a preliminary underground utility survey, is provided in the "Revised ECRA Sampling Plan Investigation Report" (Geraghty & Miller, Inc., 1991) which is submitted with this sampling plan under separate cover. Underground structures include sumps, catch basins, and pipe tunnels. A survey of underground utility pipes and structures at the Kalama facility, including the off-site environs, will be conducted with the objective of evaluating their potential impact on ground-water flow and contaminant migration.

Appropriate Kalama files will be reviewed, long-time employees will be interviewed and local authorities, such as the Passaic Valley Water Company (PVWC), Passaic Valley Sewerage Commissioners (PVSC), and the City of Garfield, will be contacted for information. Field observations will be made by walking the facility and environs to identify surficial evidence, such as manholes and shut-off valves associated with the underground utilities.

Exterior and interior soil borings will be sampled using standard split-spoon sampling protocol as described in Appendix B, "Soil Sampling Protocol." It is planned to collect one sample from each soil boring from above the water table. The vertical interval to be sampled will be determined in the field based on the conditions encountered during drilling/sampling.

Soil borings drilled during the conduct of this task that are not converted into monitoring well boreholes will be tremie-grouted in accordance with the protocol described in Appendix C, "Drilling Protocol." Drilling will be performed by Environmental Drilling, Inc., of West Creek, New Jersey (EDI). Chemical analyses will be performed by Envirotech Research, Inc., of Edison, New Jersey (ERI).

TASK 5: SAMPLE GROUND WATER

The objective of this task is to better define the extent of constituents of concern in ground water both on and off the site.

Subtask 5A: Install Wellpoints and Additional Monitoring Wells

Fourteen monitoring wells and 8 wellpoints will be installed at the locations identified on Figures 3 and 4. Existing monitoring well locations are shown on Figure 2. The monitoring wells will be constructed of 4-inch diameter PVC with either 10-slot or 20-slot screens. The length of the screen will be determined in the field based on the conditions encountered during drilling. Ten-foot screens are preferable and they will be used where possible. The monitoring wells will be installed and developed by EDI in accordance with the installation protocol presented in Appendix C, "Drilling Protocol."

The condition and size of the facility buildings are not conducive for the standard installation of ground-water monitoring wells. Therefore, Geraghty & Miller proposes to install wellpoints to facilitate ground-water sampling. The wellpoints will be driven in the

- Pump the water into tank trucks and locate the water entry point(s), if any. If the inflow of water is prohibitively high, the pumping will be suspended pending further evaluation.

- Selectively sample and analyze any detected seeps. The parameters to be analyzed for will be determined based on the color, odor, pH, and viscosity of the seep.

- Document the volume and appearance of the removed water.

- Monitor any reappearances of water and/or changes in water levels in the basements and elevator shafts after precipitation events.

Sampling protocol for water in basements and elevator shafts is presented in Appendix A, "Standing Water Sampling Protocol."

TASK 4: SAMPLE SOIL

The main objectives of this task are to better define the extent of ground-water constituents of concern in soil, and, if possible, identify the sources and pathways of those constituents of concern. An additional objective of this task is to assess further the overall environmental quality of soil.

A total of 10 exterior soil borings and 14 interior soil boring will be drilled at the locations identified on Figures 3 and 4. Former soil boring locations are shown on Figure 2. The proposed soil sampling and analysis program (including rationale) is presented in Table 4. Physicochemical parameters for soil samples are presented in Table 6. The constituents, areas, and conditions of concern addressed by each soil sampling location are identified in Table 2.

TASK 6: INVESTIGATE WATER-TABLE ELEVATIONS

The objectives of this task are to: (1) monitor the fluctuations of the water table at the site, including tidal fluctuations and (2) determine whether the apparent water-table mound in the southeastern section of the facility is part of the unconsolidated aquifer or is a perched water body. To meet those objectives, the following subtasks will be conducted:

Subtask 6A: Measure Water Levels

At minimum of 10 synoptic rounds of water-level measurements will be conducted in all monitoring wells, piezometers and wellpoints. Two rounds will coincide with the ground-water sampling events proposed under Task 5 above. The water level in the Passaic River will also be measured. The collected ground-water elevation data will be tabulated and used to prepare ground-water contour maps.

Subtask 6B: Evaluate Tidal Effects

Selected monitoring wells, wellpoints and piezometers will be monitored to evaluate tidal induced water table fluctuations. A minimum of two complete tidal cycles will be monitored for their effect on water table elevations. The water level elevation in the Passaic River will also be measured and compared to the water table elevations in the monitoring wells, wellpoints and piezometers.

Subtask 6C: Investigate the Apparent Water-Table Mound

Some monitoring wells in the southeastern section of the facility, in particular Monitoring Well MW-4, evidence the existence of an apparent water-table mound. The mound may be directly connected to the overburden aquifer or it could be a perched water body. If it is directly connected to the aquifer, then its impact on the direction of ground-water flow could be of concern. However, if it is a perched water body that is not directly

boreholes created in the floor during soil sampling. The screened length of the wellpoint will be driven to the desired depth below the floor. The wellpoint riser pipe will extend across and stickup above the floor. The annular space between the riser pipe and floor will be grouted and a protective casing will be installed. The wellpoint installation protocol, including development protocol, are presented in Appendix C.

Subtask 5B: Sample Monitoring Wells, Wellpoints, and Piezometers

Two additional rounds of ground-water sampling will be conducted in all monitoring wells to provide data necessary for designing a feasible and effective cleanup plan. The second sampling round will be conducted three months after the first round. The results of this sampling will also assist in better understanding the isolated instances in which a light, non-aqueous phase liquid (toluene and PHCs) was found in Monitoring Wells MW-7 and MW-5, and a dense, non-aqueous phase liquid (suspected TCE) was found in Monitoring Well MW-5.

The fourteen newly installed and 21 existing monitoring wells, and the 8 wellpoints identified on Figures 3 and 4, and the two existing piezometers located adjacent to Monitoring Well MW-4 will be sampled. The proposed well installation and ground-water sampling and analysis programs (including the rationale) are presented in Table 5. Physicochemical parameters for ground-water samples are presented in Table 6. The constituents, areas, and conditions of concern addressed by each ground-water sampling location are identified in Table 2.

The existing monitoring wells and piezometers will be redeveloped 2 weeks prior to the first round of sampling. The monitoring wells, wellpoints and piezometers will be purged and sampled using standard ground-water sampling techniques. Samples will be collected from all monitoring wells, wellpoints, and piezometers, in accordance with the protocols presented in Appendix D, "Ground-Water Sampling Protocol."

TASK 7: MONITOR FOR NAPL

The main objective of this task is to detect the presence of any dense, non-aqueous phase liquid (NAPL) in Monitoring Well MW-5 (suspected TCE), and light NAPL in Monitoring Wells MW-7 and MW-5 (toluene and PHCs). An additional objective of this task is to check for the presence of NAPL in other monitoring wells. To achieve those objectives, the water in each of the monitoring wells will be sounded with an oil-water interface probe during the water-level measurement events proposed in Subtask 6A. If a NAPL is detected, it will be sampled and analyzed for TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds.

TASK 8: CONDUCT AQUIFER PUMPING TEST

As described in the "Revised ECRA Sampling Plan Investigation Report", the aquifer pumping test results indicate that the aquifer yields variable and relatively low volumes of water to wells: 0.5 gallon per minute (gpm) at Monitoring Well MW-3D and 3 gpm at Monitoring Well MW-10. Because Monitoring Well MW-10 was pumped at a drawdown of approximately 3 feet out of available 10 feet, the maximum yield of Monitoring Well MW-10 is likely to be greater than 3 gpm, probably between 5 gpm to 8 gpm. The results of the pumping tests regarding the overburden aquifer characteristics are inconclusive, primarily because the aquifer was not stressed sufficiently and the distances to the observation wells were too great.

The objective of this task is to conduct an aquifer pumping test in Monitoring Well MW-10 under improved conditions, which will include running a 6-hour test and pumping at a higher rate, and measuring the drawdown in two additional piezometers (observation wells) to be installed 10 feet and 30 feet from Monitoring Well MW-10. The piezometers will be 3-inch diameter PVC wells with screens from approximately 3 feet to 23 feet bgs. They will be drilled, installed and developed in accordance with the protocols presented in

connected to the aquifer, then its impact on the direction of ground-water flow could be insignificant. Identification of this apparent mound will help define the hydraulically upgradient and downgradient locations in and around the southeastern section of the site, and thus determine the local direction of potential migration of contaminants in the ground water.

The objective of this subtask, therefore, is to determine whether this mound is part of the aquifer or is a perched water body. The following scope of work has been designed to meet this objective:

- Survey the top of recently installed piezometers, PZ-4S and PZ-4D, for vertical control. Piezometers PZ-4S and PZ-4D were installed in June 1991 to accelerate the resolution of the water-table mound issue. The preliminary measurements indicate that the water level in the shallow well is approximately 4 feet higher than in the deeper well. A 2.5 foot thick clay layer occurs between the screened intervals of the piezometers at a depth range of 8.5 feet to 11 feet below ground surface.

- Continuously measure the water levels in Monitoring Well MW-4, and Piezometers PZ-4S, and PZ-4D for a minimum of 4 days with an electronic data logger and transducers.

- Collect and analyze water samples from Monitoring Well MW-4, and Piezometers PZ-4S and PZ-4D (as part of the monitoring well sampling effort proposed in Task 4).

The possible causes of the apparent water-table mound will be investigated concurrently with the conduct of the underground utility survey proposed in Task 1.

- Inspect building interiors. The facility buildings will be inspected for stains, chemical residues or other indications of potential contamination. Based on this inspection, conditions of potential concern and associated constituents of concern within the facility buildings will be identified.

- Collect samples. Chip and wipe samples, as appropriate, will be collected to assess the conditions of concern identified during the inspection of building interiors.

- Analyze samples. The chip and wipe samples will be analyzed for the constituents of concern identified during the file review and building inspection.

Based on the analytical results, conditions of concern in the facility buildings, if any, will be identified and remediation, if necessary, will be proposed at a later date in the cleanup plan.

TASK 12: INSPECT FOR ASBESTOS

The objective of this task is to identify the location, form and quantity of asbestos-containing material (ACM) associated with buildings, pipes, tanks and other facility structures. ACM typically is found in three forms: (1) surfacing material that is sprayed or troweled on ceilings and walls; (2) insulation that is wrapped around pipes, ducts, boilers, and tanks; and (3) miscellaneous materials such as ceiling tiles, floor tiles, wall boards and exterior siding.

Kalama will contract this work to a specialized asbestos contractor certified in the State of New Jersey. Geraghty & Miller anticipates that this subtask will consist of the following work:

Appendix C, "Drilling Protocol." The aquifer pumping test will be performed in accordance with protocol presented in Appendix E, "Aquifer Pumping Test Protocol."

TASK 9: EVALUATE SVE PILOT TEST DATA

On June 11, 1991, Geraghty & Miller conducted two soil vapor extraction (SVE) pilot tests. The objective of conducting the tests was to determine the feasibility and potential of SVE for removing contaminants from the unsaturated (vadose) zone. The results of the SVE test will be presented and evaluated in the report proposed as Task 14.

TASK 10: EVALUATE TID COMPOUNDS

Tentatively identified TID compounds detected during the past investigations, together with the TID compounds that will be identified during the proposed sampling and analysis described in previous tasks will be evaluated. The objectives of this task are to define the classes of compounds and evaluate their potential effect on remedial options for the facility.

TASK 11: INSPECT BUILDING INTERIORS

The objective of this task is to assess the nature, extent, and source of potential contamination in facility buildings. To meet this objective, Geraghty & Miller will inspect the building interiors, identify conditions of concern and collect samples for laboratory analysis, as appropriate. This subtask will consist of the following work:

- Review appropriate Kalama files and confer with long-time employees. Manufacturing operations and associated constituents of concern that potentially could have impacted the building interiors will be identified.

- Review appropriate Kalama files and confer with long-time employees.
- Inspect facility.
- Collect samples.
- Analyze samples.

Based on the results of the asbestos inspection, the location, form and quantity of ACM will be identified. The need for repair and/or replacement of ACM will be determined and remedial action, if necessary, will be addressed on an interim basis or at a later date during implementation of the cleanup plan.

TASK 13: ASSESS LABORATORY DATA

The laboratory data assessment will consist of a technical review of the analytical data packages submitted by ERI. Emphasis will be placed on the following sample and laboratory method performance elements:

- Adherence to holding times.
- GC/MS tuning.
- Calibration.
- Field, trip and laboratory blank contamination.
- Sample reporting and limits of quantitation.
- Surrogate recovery.
- Matrix precision and accuracy.
- Field replicate precision.
- Tentatively identified compounds.

The evaluation will be based on New Jersey Department of Environmental Protection (NJDEP) Division of Hazardous Site Mitigation (DHSM) Standard Operating Procedures (SOP) Bureau of Environmental Measurements and Quality Assurance (BEMQA) 5.A.3

Guidelines for Data Validation (NJDEP, 1990). The objective of the laboratory data assessment is to determine the overall data quality and usability.

TASK 14: PREPARE REPORT

Geraghty & Miller will prepare and submit a report that presents the findings, conclusions, and recommendations. The report format will be similar to that of the "Revised ECRA Sampling Plan Investigation Report" submitted with this sampling plan under separate cover.

SCHEDULE

The tasks proposed in this sampling plan will be implemented in accordance with the schedule presented on Figure 5. The schedule will begin upon NJDEP approval of this sampling plan.

HEALTH AND SAFETY

A site-specific Health and Safety Plan (HASP) Addendum is presented in Appendix F. The HASP was submitted to the NJDEP in the "Revised Sampling Plan Addendum" (Geraghty & Miller, Inc., 1990). The requirements of the HASP and HASP Addendum will be followed during the conduct of certain field investigation activities.

QUALITY ASSURANCE PLAN

The appendices contain field protocol and the laboratory quality assurance manual (Appendix G) for the activities described in this sampling plan. Protocol for this investigation will be consistent with the guidance provided in the NJDEP Field Sampling Procedures Manual, February 1988, the protocol previously submitted to and approved by

the NJDEP in the Revised Sampling Plan Addendum (Geraghty & Miller, Inc., 1990), and the protocol describe in the appendices for this sampling plan.

#NJ03602/062491SP.AD2

REFERENCES

Geraghty & Miller, Inc., 1986. Preliminary Investigation of Soil Quality Conditions at the Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Geraghty & Miller, Inc., 1987. Sampling Plan for Site Evaluation, Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Geraghty & Miller, Inc., 1988. ECRA Soil and Ground-Water Investigation at the Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Geraghty & Miller, Inc., 1989. Sampling Plan Addendum, Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Geraghty & Miller, Inc., 1990. Revised Sampling Plan Addendum, Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Geraghty & Miller, Inc., 1991. Revised ECRA Sampling Plan Investigation Report, Kalama Chemical, Inc., Facility, Garfield, New Jersey.

Table 2. Summary of Concerns and Proposed Investigative Work, Sampling Plan Addendum No. 2. Kalama Chemical, Inc., Garfield, New Jersey.

Sampling Location	Constituents of Concern							
	Ground Water				Soil			
	Toluene	Phenol	Benzene	TCE (1)	Toluene	Benzene	PAHs	Total PHCs
B-47	--	--	--	--	x	x	x	x
B-48	--	--	--	--	x	x	x	x
B-49	--	--	--	--	x	x	x	x
B-50	--	--	--	--	x	x	x	x
B-51	--	--	--	--	x	x	x	x
B-52	--	--	--	--	x	x	x	x
B-53	--	--	--	--	x	x	x	x
B-54	--	--	--	--	x	x	x	x
B-55	--	--	--	--	x	x	x	x
B-56	--	--	--	--	x	x	x	x
SB-1	--	--	--	--	x	x	x	x
SB-2	--	--	--	--	x	x	x	x
SB-3	--	--	--	--	x	x	x	x
SB-4	--	--	--	--	x	x	x	x
SB-5	--	--	--	--	x	x	x	x
SB-6	--	--	--	--	x	x	x	x
SB-7	--	--	--	--	x	x	x	x
SB-8	--	--	--	--	x	x	x	x
SB-9	--	--	--	--	x	x	x	x
SB-10	--	--	--	--	x	x	x	x
SB-11	--	--	--	--	x	x	x	x
SB-12	--	--	--	--	x	x	x	x
SB-13	--	--	--	--	x	x	x	x
SB-14	--	--	--	--	x	x	x	x
MW-16D	x	x	x	x	--	--	--	--
MW-19	x	x	x	x	--	--	--	--
MW-20	x	x	x	x	--	--	--	--
MW-21	x	x	x	x	--	--	--	--
MW-22	x	x	x	x	--	--	--	--
MW-23	x	x	x	x	--	--	--	--
MW-24	x	x	x	x	--	--	--	--
MW-25	x	x	x	x	--	--	--	--
MW-26	x	x	x	x	--	--	--	--
MW-27	x	x	x	x	--	--	--	--
MW-28	x	x	x	x	--	--	--	--
MW-29	x	x	x	x	--	--	--	--
MW-30	x	x	x	x	--	--	--	--
MW-31	x	x	x	x	--	--	--	--
WP-1	x	x	x	x	--	--	--	--
WP-2	x	x	x	x	--	--	--	--
WP-3	x	x	x	x	--	--	--	--
WP-4	x	x	x	x	--	--	--	--
WP-5	x	x	x	x	--	--	--	--
WP-6	x	x	x	x	--	--	--	--
WP-7	x	x	x	x	--	--	--	--
WP-8	x	x	x	x	--	--	--	--

TCE Trichloroethene.
PAHs Polycyclic Aromatic Hydrocarbons.
PHCs Petroleum Hydrocarbons.
NAPL Non-Aqueous Phase Liquid.
TID Tentatively Identified.
x Sampling location has been proposed to address the indicated constituent, area, or condition of concern.
(1) In addition to TCE, other chlorinated organic compounds such as vinyl chloride are of concern.
(2) The item of concern will be addressed under the investigative tasks proposed in Table 3.
B-47 Exterior soil boring number.
SB-1 Interior soil boring number.
MW-19 Monitoring well number.
WP-1 Wellpoint number (well points are proposed to be installed inside facility buildings).
Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 4 and 5, respectively.

Table 2. Summary of Concerns and Proposed Investigative Work. Sampling Plan Addendum No. 2. Kalama Chemical. Inc., G
New Jersey.

Sampling Location	Areas of Concern: Benzoic Acid/ Benzaldehyde Production Facility (toluene)	Resorcinol Production Facility (benzene)	Salicylic Acid Production Facility (phenol)	Off-Site Upgradient	Off-Site Downgradient
B-47	--	--	x	--	--
B-48	--	--	x	--	--
B-49	--	--	x	--	--
B-50	--	--	x	--	--
B-51	--	--	x	--	--
B-52	--	--	x	--	--
B-53	x	x	--	--	--
B-54	--	--	--	--	--
B-55	--	--	--	--	--
B-56	--	--	--	--	--
SB-1	--	--	--	--	--
SB-2	--	--	--	--	--
SB-3	--	--	--	--	--
SB-4	--	--	x	--	--
SB-5	--	--	x	--	--
SB-6	--	--	x	--	--
SB-7	--	--	x	--	--
SB-8	--	--	--	--	--
SB-9	--	--	x	--	--
SB-10	--	--	x	--	--
SB-11	x	x	--	--	--
SB-12	--	--	--	--	--
SB-13	--	--	x	--	--
SB-14	x	--	--	--	--
MW-16D	x	x	--	x	--
MW-19	--	--	--	x	--
MW-20	--	--	--	x	--
MW-21	--	--	--	--	x
MW-22	--	--	--	--	x
MW-23	--	--	--	--	x
MW-24	--	--	--	--	x
MW-25	--	--	--	--	x
MW-26	--	--	x	--	--
MW-27	--	--	x	--	--
MW-28	--	--	x	--	--
MW-29	--	--	x	--	--
MW-30	--	--	--	--	--
MW-31	--	--	--	--	--
WP-1	--	--	--	--	--
WP-2	--	--	--	--	--
WP-3	--	--	x	--	--
WP-4	--	--	x	--	--
WP-5	--	--	x	--	--
WP-6	--	--	x	--	--
WP-7	x	x	--	--	--
WP-8	x	--	--	--	--

TCE Trichloroethene.
PAHs Polycyclic Aromatic Hydrocarbons.
PHCs Petroleum Hydrocarbons.
NAPL Non-Aqueous Phase Liquid.
TID Tentatively Identified.
x Sampling location has been proposed to address the indicated constituent, area, or condition of concern.
(1) In addition to TCE, other chlorinated organic compounds such as vinyl chloride are of concern.
(2) The item of concern will be addressed under the investigative tasks proposed in Table 3.
B-47 Exterior soil boring number.
SB-1 Interior soil boring number.
MW-19 Monitoring well number.
WP-1 Wellpoint number (well points are proposed to be installed inside facility buildings).
Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 4 and 5, respectively.

Table 2. Summary of Concerns and Proposed Investigative Work. Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Sampling Location	Conditions of Concern									
	Ground-Water Flow	Water Table Mound	Under-ground Pipes	Catch Basins	Sumps	Pipe Tunnel (1)	Basements/ Elevator Shafts	NAPL	Asbestos (2)	Building Interiors (2)
B-47	--	--	x	x	--	--	--	--	--	--
B-48	--	--	x	x	--	--	--	--	--	--
B-49	--	--	x	x	--	--	--	--	--	--
B-50	--	--	x	x	--	--	--	--	--	--
B-51	--	--	x	x	--	--	--	--	--	--
B-52	--	--	x	x	--	--	--	--	--	--
B-53	--	--	x	x	--	--	--	--	--	--
B-54	--	--	x	x	--	--	--	--	--	--
B-55	--	--	x	x	--	--	--	--	--	--
B-56	--	--	x	x	--	--	--	--	--	--
SB-1	--	--	--	--	x	--	x	--	--	--
SB-2	--	--	--	--	x	--	x	--	--	--
SB-3	--	--	--	--	x	--	x	--	--	--
SB-4	--	--	--	--	x	--	x	--	--	--
SB-5	--	--	--	--	x	--	x	--	--	--
SB-6	--	--	--	--	x	--	x	--	--	--
SB-7	--	--	x	x	--	--	--	--	--	--
SB-8	--	--	x	x	--	--	--	--	--	--
SB-9	--	--	x	x	--	--	--	--	--	--
SB-10	--	--	x	x	--	--	--	--	--	--
SB-11	--	--	x	x	--	--	--	--	--	--
SB-12	--	--	x	x	--	--	--	--	--	--
SB-13	--	--	x	x	--	--	--	--	--	--
SB-14	--	--	--	--	x	--	x	--	--	--
MW-16D	x	x	x	x	--	--	--	x	--	--
MW-19	x	--	x	x	--	--	--	x	--	--
MW-20	x	--	x	x	--	--	--	x	--	--
MW-21	x	--	x	x	--	--	--	x	--	--
MW-22	x	--	x	x	--	--	--	x	--	--
MW-23	x	--	x	x	--	--	--	x	--	--
MW-24	x	--	x	x	--	--	--	x	--	--
MW-25	x	--	x	x	--	--	--	x	--	--
MW-26	x	--	x	x	--	--	--	x	--	--
MW-27	x	--	x	x	--	--	--	x	--	--
MW-28	x	--	x	x	--	--	--	x	--	--
MW-29	x	--	x	x	--	--	--	x	--	--
MW-30	x	--	x	x	--	--	--	x	--	--
MW-31	x	--	x	x	--	--	--	x	--	--
WP-1	x	--	--	--	x	--	x	x	--	--
WP-2	x	--	--	--	x	--	x	x	--	--
WP-3	x	--	--	--	x	--	x	x	--	--
WP-4	x	--	--	--	x	--	x	x	--	--
WP-5	x	--	x	x	--	--	--	x	--	--
WP-6	x	--	x	x	--	--	--	x	--	--
WP-7	x	--	x	x	--	--	--	x	--	--
WP-8	x	--	--	--	x	--	x	x	--	--

TCE Trichloroethene.
PAHs Polycyclic Aromatic Hydrocarbons.
PHCs Petroleum Hydrocarbons.
NAPL Non-Aqueous Phase Liquid.
TID Tentatively Identified.
x Sampling location has been proposed to address the indicated constituent, area, or condition of concern.
(1) In addition to TCE, other chlorinated organic compounds such as vinyl chloride are of concern.
(2) The item of concern will be addressed under the investigative tasks proposed in Table 3.
B-47 Exterior soil boring number.
SB-1 Interior soil boring number.
MW-19 Monitoring well number.
WP-1 Wellpoint number (well points are proposed to be installed inside facility buildings).
Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 4 and 5, respectively.

Table 2. Summary of Concerns and Proposed Investigative Work. Sampling Plan Addendum No. 2. Kalama Chemical. Inc., Garfield. New Jersey.

Sampling Location	Potential Constituents of Concern				
	Methanol	Formaldehyde	Benzoic Acid	Benzaldehyde	TID Compounds
B-47	x	x	x	x	--
B-48	x	x	x	x	--
B-49	x	x	x	x	--
B-50	x	x	x	x	--
B-51	x	x	x	x	--
B-52	x	x	x	x	--
B-53	x	x	x	x	--
B-54	x	x	x	x	x
B-55	x	x	x	x	x
B-56	x	x	x	x	x
SB-1	x	x	x	x	x
SB-2	x	x	x	x	--
SB-3	x	x	x	x	x
SB-4	x	x	x	x	x
SB-5	x	x	x	x	--
SB-6	x	x	x	x	x
SB-7	x	x	x	x	--
SB-8	x	x	x	x	x
SB-9	x	x	x	x	--
SB-10	x	x	x	x	x
SB-11	x	x	x	x	x
SB-12	x	x	x	x	--
SB-13	x	x	x	x	--
SB-14	x	x	x	x	--
MW-16D	x	x	x	x	x
MW-19	x	x	x	x	x
MW-20	x	x	x	x	x
MW-21	x	x	x	x	--
MW-22	x	x	x	x	--
MW-23	x	x	x	x	--
MW-24	x	x	x	x	--
MW-25	x	x	x	x	--
MW-26	x	x	x	x	--
MW-27	x	x	x	x	--
MW-28	x	x	x	x	--
MW-29	x	x	x	x	--
MW-30	x	x	x	x	--
MW-31	x	x	x	x	--
WP-1	x	x	x	x	x
WP-2	x	x	x	x	x
WP-3	x	x	x	x	x
WP-4	x	x	x	x	x
WP-5	x	x	x	x	--
WP-6	x	x	x	x	x
WP-7	x	x	x	x	x
WP-8	x	x	x	x	x

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B-47 Exterior soil boring number.
SB-1 Interior soil boring number.
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WP-1 Wellpoint number (well points are proposed to be installed inside facility buildings).
Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 4 and 5, respectively.

Table 3. Summary of Investigative Tasks, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Task	Constituents of Concern							
	Ground Water				Soil			
	Toluene	Phenol	Benzene	TCE (1)	Toluene	Benzene	PAHs	Total PHCs
Sample Soil	--	--	--	--	x	x	x	x
Sample Ground Water	x	x	x	x	--	--	--	--
Survey Underground Utilities	x	x	x	x	x	x	x	x
Inspect Building Interiors	--	--	--	--	--	--	--	--
Inspect for Asbestos	--	--	--	--	--	--	--	--
Evaluate TID Compounds	--	--	--	--	--	--	--	--
Monitor for NAPL	x	--	x	x	--	--	--	--
Remove and Sample Water from Basements and Elevator Shafts	--	--	--	--	--	--	--	--
	x	x	x	x	--	--	--	--
Inspect Sumps and Catch Basins	--	--	--	--	--	--	--	--
Investigate Water Table Elevations	--	--	--	--	--	--	--	--
Conduct Pumping Test	--	--	--	--	--	--	--	--
Evaluate SVE Pilot Test Data	x	--	x	--	x	x	--	--

TCE	Trichloroethene.
PAHs	Polycyclic Aromatic Hydrocarbons.
PHCs	Petroleum Hydrocarbons.
NAPL	Non-aqueous Phase liquid.
TID	Tentatively Identified.
SVE	Soil vapor extraction.
x	Task has been proposed to address the indicated constituent, area or condition of concern.
(1)	In addition to TCE, other chlorinated organic compounds such as vinyl chloride are of concern.

Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 3 and 4, respectively.

Table 3. Summary of Investigative Tasks, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Task	Areas of Concern				
	Benzoic Acid/ Benzaldehyde Production Facility (toluene)	Resorcinol Production Facility (benzene)	Salicylic Acid Production Facility (phenol)	Off-Site Upgradient	Off-Site Downgradient
Sample Soil	x	x	x	--	--
Sample Ground Water	x	x	x	x	x
Survey Underground Utilities	x	x	x	x	x
Inspect Building Interiors	--	--	--	--	--
Inspect for Asbestos	--	--	--	--	--
Evaluate TID Compounds	--	--	--	--	--
Monitor for NAPL	x	x	--	x	x
Remove and Sample Water from Basements and Elevator Shafts	--	--	--	--	--
Inspect Sumps and Catch Basins	--	--	--	--	--
Investigate Water Table Elevations	--	--	--	x	x
Conduct Pumping Test	--	--	--	--	--
Evaluate SVE Pilot Test Data	--	--	--	--	--

TCE Trichloroethene.
PAHs Polycyclic Aromatic Hydrocarbons.
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Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 3 and 4, respectively.

Table 3. Summary of Investigative Tasks, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Task	Conditions of Concern									
	Ground–Water Flow	Water Table Mound	Underground Pipes	Catch Basins	Sumps	Pipe Tunnel	Basements/ Elevator Shafts	NAPL	Asbestos	Building Interiors
Sample Soil	--	--	x	x	x	--	x	--	--	--
Sample Ground Water	x	x	x	x	x	--	x	x	--	--
Survey Underground Utilities	x	x	x	x	x	x	--	--	--	--
Inspect Building Interiors	--	--	--	--	--	--	--	--	--	x
Inspect for Asbestos	--	--	--	--	--	--	--	--	x	--
Evaluate TID Compounds	--	--	--	--	--	--	--	--	--	--
Monitor for NAPL	--	--	--	--	--	--	--	x	--	--
Remove and Sample Water from Basements and Elevator Shafts	x	--	--	--	--	--	x	--	--	--
Inspect Sumps and Catch Basins	--	--	--	--	x	--	--	--	--	--
Investigate Water Table Elevations	x	x	--	--	--	--	--	--	--	--
Conduct Pumping Test	x	--	--	--	--	--	--	--	--	--
Evaluate SVE Pilot Test Data	--	--	--	--	--	--	--	--	--	--

TCE	Trichloroethene.
PAHs	Polycyclic Aromatic Hydrocarbons.
PHCs	Petroleum Hydrocarbons.
NAPL	Non–aqueous Phase liquid.
TID	Tentatively Identified.
SVE	Soil vapor extraction.
x	Task has been proposed to address the indicated constituent, area or condition of concern.
(1)	In addition to TCE, other chlorinated organic compounds such as vinyl chloride are of concern.

Summaries of the soil and ground–water sampling and analysis programs are presented in Tables 3 and 4, respectively.

Table 3. Summary of Investigative Tasks, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Task	Potential Constituents of Concern				
	Methanol	Formaldehyde	Benzoic Acid	Benzaldehyde	TID Compounds
Sample Soil	x	x	x	x	x
Sample Ground Water	x	x	x	x	x
Survey Underground Utilities	x	x	x	x	x
Inspect Building Interiors	--	--	--	--	--
Inspect for Asbestos	--	--	--	--	--
Evaluate TID Compounds	--	--	--	--	x
Monitor for NAPL	--	--	--	--	--
Remove and Sample Water from Basements and Elevator Shafts	x	x	x	x	--
Inspect Sumps and Catch Basins	--	--	--	--	--
Investigate Water Table Elevations	--	--	--	--	--
Conduct Pumping Test	--	--	--	--	--
Evaluate SVE Pilot Test Data	x	--	--	--	x

TCE	Trichloroethene.
PAHs	Polycyclic Aromatic Hydrocarbons.
PHCs	Petroleum Hydrocarbons.
NAPL	Non-aqueous Phase liquid.
TID	Tentatively Identified.
SVE	Soil vapor extraction.
x	Task has been proposed to address the indicated constituent, area or condition of concern.
(1)	In addition to TCE, other chlorinated organic compounds such as vinyl chloride are of concern.

Summaries of the soil and ground-water sampling and analysis programs are presented in Tables 3 and 4, respectively.

Table 4. Proposed Soil Sampling and Analysis Program, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Soil Boring Number	Soil Boring Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters
B-47	Approximately 10 feet south of existing Monitoring Wells MW-3 and MW-3D	10	Investigate the potential sources of phenol and other constituents of concern in samples from Monitoring Wells MW-3 and MW-3D. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-48	Approximately 30 feet east of existing Monitoring Wells MW-3 and MW-3D	10	Investigate the potential sources of phenol and other constituents of concern in samples from Monitoring Wells MW-3 and MW-3D. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-49	West of Building 36-A	20	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-50	South of Building 10-O	20	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-51	West of Buildings 10-A and 10-N	20	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-52	West of Building 10-P4	20	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-53	West of Building 10-P5	20	Investigate the potential sources of toluene, benzene, and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
B-54	Southern facility boundary	20	Investigate the potential sources of constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid), plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
B-55	Southern facility boundary	20	Investigate the potential sources of constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid), plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.

Notes are presented on Page 4.

Table 4. Proposed Soil Sampling and Analysis Program, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Soil Boring Number	Soil Boring Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters
B-56	North of Building 34	20	Investigate the environmental quality of soil adjacent to Outfall 002 near the location where it crosses the facility boundary.	TCL VOCs, plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid), plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-1	Basement of Building 33/33A/33B	2	Investigate the potential sources of constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-2	Basement of Building 33/33A/33B	2	Investigate the potential sources of constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
SB-3	Basement of Building 33/33A/33B	2	Investigate the potential sources of constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-4	Basement of Building 36	2	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-5	Basement of Building 36	2	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
SB-6	Basement of Building 36	2	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-7	Building 10-M	10	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.

Notes are presented on Page 4.

Table 4. Proposed Soil Sampling and Analysis Program, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Soil Boring Number	Soil Boring Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters
SB-8	Building 10-F	10	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-9	Building 10-Q2	10	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
SB-10	Building 10-P4	10	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-11	Building 10-T	10	Investigate the potential sources of toluene, benzene, phenol, and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
SB-12	Building 11	10	Investigate the potential sources of constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
SB-13	Building 36 (basement wall)	5	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
SB-14	Basement of Building 32A/32B	2	Investigate the potential sources of phenol and other constituents of concern in ground water. Assess the environmental quality of soil.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.

Notes are presented on Page 4.

Table 4. Proposed Soil Sampling and Analysis Program, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Soil Boring Number	Soil Boring Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters

TCL Targeted Compound List.
VOCs Volatile Organic Compounds.
TICs Tentatively Identified Compounds.
BNAs Base/Neutral Acid and Extractable Organic Compounds.
PHCs Petroluem Hydrocarbons.
(1) The reader is encouraged to cross reference Table 2 for the constituents, areas, and constituents of concerns addressed by each soil boring.
All soil samples will be collected from above the water table. The vertical interval to be sampled will be determined in the field based on the conditions encountered during drilling and sampling.
Five field selected soil samples will be analyzed for the physicochemical parameters presented on Table 6.
The laboratory data reports will meet the requirements of the NJDEP Tier II format.
VOCs will be analyzed using EPA Method 8240.
BNAs will be analyzed using EPA Method 8270.
Total phenolics will be analyzed using EPA Method 420.1.
Total PHCs will be analyzed using EPA Method 418.1.
Formaldehyde will be analyzed using NIOSH Method 3500
Methanol will be analyzed using EPA Method 815.
Field blank samples will be prepared at a rate of 10 percent of the total number of samples collected with a maximum of one field blank prepared per day. Field blank samples will be analyzed for the same parameters as the soil samples.
Field replicate samples will be collected at the rate of 5 percent.

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Table 5. Proposed Well Installation and Ground-Water Sampling and Analysis Programs, Sampling Plan Addendum No. 2., Kalama Chemical, Inc., Garfield, New Jersey.

Well Number	Well Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters
MW-16D	Upgradient of the southeastern section of the facility and adjacent to existing offsite Monitoring Well MW-16.	50	Better define the presence of trichloroethene, other chlorinated compounds, and other constituents in ground water upgradient of the facility. Investigate the water-table mound.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total PHCs, formaldehyde, and methanol.
MW-19	Offsite and upgradient of the northeastern section of the facility.	20	Obtain ground-water quality data and water-level elevation data from upgradient of the facility.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total PHCs, formaldehyde, and methanol.
MW-20	Offsite and upgradient of the central section of the facility.	25	Obtain ground-water quality data and water-level elevation data from upgradient of the facility.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total PHCs, formaldehyde, and methanol.
MW-21	Downgradient of the northwestern section of the facility.	20	Obtain ground-water quality data and water-level elevation data. Evaluate offsite contaminant migration.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total PHCs, formaldehyde, and methanol.
MW-22	Downgradient of the southwestern section of the facility.	20	Obtain ground-water quality data and water-level elevation data. Evaluate offsite contaminant migration.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total PHCs, formaldehyde, and methanol.
MW-23	Downgradient of the southwestern section of the facility.	20	Obtain ground-water quality data and water-level elevation data. Evaluate offsite contaminant migration.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total PHCs, formaldehyde, and methanol.
MW-24	Offsite and north of the north-central section of the facility.	20	Obtain ground-water quality data and water-level elevation data. Evaluate offsite contaminant migration.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total PHCs, formaldehyde, and methanol.
MW-25	Offsite and south of the south-central section of the facility.	20	Obtain ground-water quality data and water-level elevation data. Evaluate offsite contaminant migration.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total PHCs, formaldehyde, and methanol.
MW-26	West of Building 10-P4	20	Better define the presence of phenol and other constituents of concern in ground water.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.

Notes are presented on Page 3.

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Table 5. Proposed Well Installation and Ground–Water Sampling and Analysis Programs, Sampling Plan Addendum No. 2., Kalama Chemical, Inc., Garfield, New Jersey.

Well Number	Well Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters
MW–27	South of Building 10–O	20	Better define the presence of phenol and other constituents of concern in ground water.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
MW–28	West of Buildings 10–A and 10–N	20	Better define the presence of phenol and other constituents of concern in ground water.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
MW–29	West of Building 36–A	20	Better define the presence of phenol and other constituents of concern in ground water.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
MW–30	North of Building 34	20	Obtain ground–water quality data and water–elevation data adjacent to Outfall 002 near the location where it crosses the facility boundary.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
MW–31	West of Building 17	20	Obtain ground–water quality data and water–level elevation data.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), total phenolics, total PHCs, formaldehyde, and methanol.
WP–1	Basement of Building 33/33A/33B	10	Obtain ground–water quality data and water–level elevation data under basements.	TCL VOCs plus 15TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total PHCs, formaldehyde, and methanol.
WP–2	Basement of Building 33/33A/33B	10	Obtain ground–water quality data and water–level elevation data under basements.	TCL VOCs plus 15TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total PHCs, formaldehyde, and methanol.
WP–3	Basement of Building 36	10	Better define the presence of phenol and other constituents of concern in ground water. Obtain ground–water quality data and water–level elevation data under basements.	TCL VOCs plus 15TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
WP–4	Basement of Building 36	10	Better define the presence of phenol and other constituents of concern in ground water. Obtain ground–water quality data and water–level elevation data under basements.	TCL VOCs plus 15TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
WP–5	Building 10–M	20	Better define the presence of phenol and other constituents of concern in ground water.	TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid) total phenolics, total PHCs, formaldehyde, and methanol.

Notes are presented on Page 3.

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Table 5. Proposed Well Installation and Ground–Water Sampling and Analysis Programs, Sampling Plan Addendum No. 2., Kalama Chemical, Inc., Garfield, New Jersey.

Well Number	Well Location	Estimated Depth (feet)	Principal Rationale (1)	Analytical Parameters
WP–6	Building 10–F	20	Better define the presence of phenol and other constituents of concern in ground water.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
WP–7	Building 10–T	20	Better define the presence of toluene, benzene, and other constituents of concern in ground water.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.
WP–8	Basement of Building 32A/32B	10	Better define the presence of toluene and other constituents of concern in ground water. Obtain ground–water level elevation data under basements.	TCL VOCs plus 15 TID compounds, TCL BNAs (including benzaldehyde and benzoic acid) plus 25 TID compounds, total phenolics, total PHCs, formaldehyde, and methanol.

TCL Targeted Compound List.
VOCs Volatile Organic Compounds.
TID Tentatively Identified.
BNAs Base/Neutral and Acid Extractable Organic Compounds.
(1) The reader is encouraged to cross reference Table 2 for the constituents, areas, and conditions of concern addressed by each well.

Two rounds of quarterly ground–water sampling will be conducted for both the 14 newly installed monitoring wells, the 8 newly installed well points, the 21 existing monitoring wells, and the 2 existing piezometers (a total of 45 ground–water samples per round).
The 21 existing monitoring wells and 2 existing piezometers will be analyzed for TCL VOCs, TCL BNAs (including benzaldehyde and benzoic acid), formaldehyde, and methanol.
Twenty percent of the ground–water samples will be analyzed for the physicochemical parameters presented on Table 6.
All ground–water samples will be field tested for conductivity, pH, and temperature.
The analytical parameters for the second round may be modified based on the first round results. The NJDEP will be notified of the proposed modifications prior to sampling.
The laboratory data reports will meet the requirements of the NJDEP Tier II format.
VOCs will be analyzed using EPA method 624
BNAs will be analyzed using EPA method 625
Total phenolics will be analyzed using EPA method 420.1
Total PHCs will be analyzed using EPA method 418.1
Formaldehyde will be analyzed using NIOSH method 3500
Methanol will be analyzed using EPA method 815
Field blank samples will be prepared at a rate of one per day and analyzed for the same parameters as the ground–water samples.
Field replicate samples will be collected at a rate of 5 percent.
Trip blank samples will be included with each sample shipment and analyzed for VOCs plus 15 TID compounds.

Table 6. Proposed Physicochemical Parameters for Soil and Ground–Water Samples, Sampling Plan Addendum No. 2, Kalama Chemical, Inc., Garfield, New Jersey.

Parameter	Soil (1)	Ground Water (2)
Total Dissolved Solids	--	X
Total Suspended Solids	--	X
Major and Minor Ions	--	X
Alkalinity	--	X
Hardness	--	X
Biological Oxygen Demand	--	X
Chemical Oxygen Demand	--	X
Carbon Dioxide	--	X
Ion Exchange Capacity	5	--
Grain Size	5	--
Bacterial Evaluation (3)	5	--
Free Ammonia	5	X
Phosphate	5	X
Nitrite/Nitrate	5	X
Total Organic Carbon	5	X
Dissolved Oxygen (field tested)	--	(4)
Conductivity (field tested)	--	(4)
pH (field tested)	--	(4)
Temperature (field tested)	--	(4)

(1) Five soil samples will be field selected and tested for the specified parameters.
(2) Twenty percent of the ground–water samples presented in Table 5 will be analyzed for the specified parameters.
(3) Bacterial evaluation also includes analyses of free ammonia, phosphate, percent moisture, pH and total petroleum hydrocarbons.
(4) All ground–water samples will be field tested for conductivity, pH, temperature, and dissolved oxygen

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Reference Number 3

REVISED ECRA SAMPLING PLAN
INVESTIGATION REPORT
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

VOLUME 1 OF 2

September 1991

Prepared for

Kalama Chemical, Inc.
Seattle, Washington

Prepared by

Geraghty & Miller, Inc.
201 West Passaic Street
Rochelle Park, New Jersey 07662
(201) 909-0700

REVISED SAMPLING PLAN
INVESTIGATION REPORT
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

September 6, 1991

Geraghty & Miller, Inc. is submitting this report to Kalama Chemical, Inc. for work performed at the Garfield, New Jersey facility. The report was prepared in conformance with Geraghty & Miller's strict quality assurance/quality control procedures to ensure that the report meets the highest standards in terms of the methods used and the information presented. If you have any questions or comments concerning this report, please contact one of the individuals listed below.

Respectfully submitted,

GERAGHTY & MILLER, INC.

Robert Burns
Staff Scientist/Geologist

Christopher J. Motta
Senior Scientist/Project Manager

Joseph Minster
Senior Project Advisor/Project Officer

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REVISED SAMPLING PLAN
INVESTIGATION REPORT
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

EXECUTIVE SUMMARY

This report is submitted pursuant to the requirements of the Administrative Consent Order between Kalama Chemical, Inc. of Seattle, Washington (Kalama) and the New Jersey Department of Environmental Protection (NJDEP), dated December 8, 1988.

The subject of this report is a 100-year old chemical manufacturing facility which occupies a 6.4-acre site located at 290 River Drive, Garfield, New Jersey, approximately 100 feet east of the Passaic River. The facility has been owned and operated by Kalama since December 1982. Buildings occupy approximately 50 percent of the facility; paved areas cover an estimated 25 percent of the facility. The facility has a extensive network of underground pipes and structures. River outfalls and intake lines, sewerage lines, and potable water lines cross the facility boundaries. The facility is active and tank trucks, tractor trailers and rail cars move around it regularly.

Since retained by Kalama in June 1986, Geraghty & Miller, Inc. (Geraghty & Miller) conducted three investigations at the Kalama facility in Garfield, New Jersey (facility or site):

- The Preliminary Investigation in 1986.
- The ECRA Sampling Plan Investigation in 1987-1988.
- The present Revised ECRA Sampling Plan Investigation.

From 1986 to the present, Geraghty & Miller completed the following investigative work:

- Drilled and sampled 64 soil borings, and analyzed the soil samples for various chemical constituents.

- Installed 21 monitoring wells (18 shallow wells and three deep wells), collected two rounds of samples from nine wells and one round of samples from 12 wells, and analyzed the ground-water samples for various chemical constituents.

- Conducted a well search within a 0.5-mile radius of the facility.

- Reviewed historical aerial photographs of the facility from 1947, 1973, and 1982.

- Conducted 13 rounds of ground-water level measurements in monitoring wells.

- Conducted field permeability slug tests in 14 monitoring wells.

- Conducted pumping tests in two monitoring wells.

- Conducted two soil vapor extraction pilot tests (the results will be submitted with the cleanup plan).

- Installed a cluster of two piezometers to investigate further the apparent water-table mound in the southeastern section of the facility. (the results will be presented in the proposed Sampling Plan Addendum No. 2 Investigation Report).

- Conducted a preliminary survey of underground utilities.

In addition to the investigative work, the following remedial work was completed:

- From September 1987 through February 1990, 27 underground storage tanks (USTs) were removed, and post-excavation soil samples were collected and analyzed based on the former contents of the USTs. The UST removal program was conducted by Kalama and the prior facility owner, Tenneco, Inc.

- Kalama recovered a light non-aqueous phase liquid from a monitoring well located in the southeastern section of the facility by pumping intermittently during the period of May through November 1988. A sample of the liquid, collected prior to recovery, contained approximately 54 percent toluene and 41 percent petroleum hydrocarbons. In 1990, a similar liquid was recovered from a monitoring well also located in the southeastern section of the facility.

- In 1990 and 1991, Kalama reconstructed significant portions of the sewerage lines and associated catch basins.

- In 1991, Kalama took Building 16 (which had been leased to a third party) through a separate ECRA closure, which included asbestos removal.

Based on the results of the investigative and remedial work, Geraghty & Miller has concluded the following:

1. With the exception of several buildings and the benzoic acid/benzaldehyde production facility which no longer exist, the site surface conditions have changed little over the past 44 years.

2. There are no private or public supply wells within a 0.25-mile radius from the Kalama site. Additional well search activities are proposed in the "Sampling Plan Addendum No. 2."

3. The geology of the Kalama site is characterized by approximately 25 to 35 feet of unconsolidated deposits which are underlain by the Brunswick Formation shales and sandstones. The unconsolidated deposits generally include approximately 3 feet to 8 feet of fill over natural sand, silt, and clay. The lithology of the unconsolidated deposits varies significantly, both horizontally and vertically, across the site.

4. There is a single water-bearing zone in the unconsolidated deposits. The depth to the water table is generally 7 feet to 10 feet below ground surface and increases toward the Passaic River where the ground water discharges. There are tidal effects on ground water in the unconsolidated deposits within approximately 150 feet of the river. The significance of the tidal fluctuations for off-site contaminant migration and potential remedial alternatives for the facility is not understood at this time. Tidal fluctuations will be monitored further in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

5. There is some evidence that the apparent water-table mound in the southeastern section of the facility is a perched water body. The extent to which the anomalous ground-water conditions observed in the southeastern section of the facility impact off-site contaminant migration will be investigated further in accordance with the "Sampling Plan Addendum No. 2."

6. The general direction of ground-water flow is to the west/southwest, toward the Passaic River.

7. The soil hydraulic conductivity, based on slug tests, ranges from 0.3 feet/day (1.2 x 10^{-4} centimeters/second) to 13 feet/day (4.6 x 10^{-3} centimeters/second) with an average of 3 feet/day (1.1 x 10^{-3} centimeters/second). These values are typical for silty and clayey sands, which comprise a significant portion of the soils on the site. The overall ground-water flow gradient across the site is approximately 0.01. The hydraulic conductivity and ground-water flow gradient may range significantly across

the site. Geraghty & Miller did not calculate ground-water flow velocities because of the high inhomogeneity of the unconsolidated deposits, the potential presence of preferential pathways, and tidal influences. Those conditions tend to render ground-water flow velocities unreliable for predicting ground-water time of travel.

8. The pumping tests indicate that the water-bearing zone yields variable and relatively low volumes of water to wells (0.5 gallons per minute and 3 gallons per minute). The results of the pumping tests are inconclusive. An additional pumping test will be conducted in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

9. The results of the post-excavation soil sampling and analysis program indicate the following:

   - The locations of the former methanol, methyl isobutyl ketone and hexene USTs are not areas of concern.

   - The former toluene, fuel oil and gasoline USTs appear to have been sources of soil contamination. Toluene was detected in post-excavation soil samples at concentrations up to 805 milligrams/kilogram (mg/kg). Total petroleum hydrocarbons (PHCs) were detected in concentrations up to 24,000 mg/kg. The locations of the former toluene, fuel oil and gasoline USTs are areas of concern.

   - The UST excavations were partially backfilled with the excavated soils. Soil contamination associated with the former toluene, fuel oil and gasoline USTs will be addressed in the cleanup plan.

10. The results of the soil boring sampling and analysis program indicate the following:

- Constituents, including toluene, benzene, total polycyclic aromatic hydrocarbons (PAHs), and total PHCs exceed the NJDEP-ECRA guidance levels by a significant margin at several soil sampling locations.

  - Toluene was detected in soil at concentrations up to 20,000 mg/kg.

  - Benzene was detected in soil at concentrations up to 80 mg/kg.

  - Total PAHs were detected in soil at concentrations up to 71 mg/kg.

  - Total PHCs were detected in soil at concentrations up to 4,670 mg/kg.

- The southeastern section of the facility, which includes the locations of the former toluene USTs and former production facilities that used benzene and toluene, is an area of concern because of the high concentrations of toluene, benzene and PAHs in soil. The major portion of this area of concern extends 250 feet south of the location of the former toluene USTs. Sources other than the former USTs, such as spills and leaks, probably contributed to the toluene contamination in soil.

- Total PHCs were detected at high concentrations throughout the facility and therefore are a constituent of concern in soil.

- Polychlorinated biphenyls (PCBs) and metals are not constituents of concern at the facility.

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and associated elevated detection limits.

- Significant levels (up to 15,150 mg/kg) of tentatively identified (TID) compounds occur in soil.

- Additional soil sampling is proposed in the "Sampling Plan Addendum No. 2."

- The need for, and extent of, soil remediation will be addressed in the cleanup plan.

11. The results of the ground-water sampling and analysis program indicate the following:

    - Toluene, phenol, benzene, and trichloroethane (TCE) are constituents of concern in ground water.

    - Toluene is present in ground water throughout the facility. Toluene, concentrations up to 110,000 micrograms/liter were detected in ground-water samples from the southern half of the facility. The toluene area of concern for soil appears to be one of the source areas for toluene in ground water. Other potential sources of toluene contamination will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

    - Phenol is present in ground water throughout the facility. Phenol concentrations up to 930,000 ug/L were detected in samples from monitoring wells along the northern facility boundary. Concentrations of phenol up to 120,000 ug/L were detected in the southern half of the facility. The source(s) of phenol contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

    - The areas of toluene and phenol contamination in ground water extend to, and probably cross, the northern, southern and western boundaries of the

facility. Additional off-site and downgradient monitoring wells will be installed as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Benzene is present in ground water in the southern half of the facility at a maximum concentration of 3,500 ug/L. The area of benzene contamination in ground water extends to, and probably crosses, the southern and western facility boundaries. The source(s) of benzene contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- TCE and other chlorinated organic compounds are present in ground water at various locations across the facility. TCE was detected onsite in ground water at concentrations up to 2,700 ug/L. TCE was detected "upgradient" in an off-site monitoring well at a concentration of 260 ug/L. The apparent water-table mound in the southeastern section of the facility could be responsible for this apparent upgradient and off-site contaminant migration. TCE was detected downgradient/offsite at a concentration of 18 ug/L. The source(s) of TCE and the chlorinated organic compound contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and associated elevated detection limits.

- Significant levels (up to 599,785 ug/L) of TID compounds occur in ground water.

- The need for, and extent of, ground-water remediation will be addressed in the cleanup plan.

12. The presence of non-aqueous phase liquids will continue to be monitored in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

13. A dense, non-aqueous phase liquid, which probably contains TCE, was detected at the bottom of one monitoring well located in the southeastern corner of the facility. The presence, nature, extent, and source of this non-aqueous phase liquid will be investigated further in accordance with work proposed in the "Sampling Plan Addendum No. 2."

14. A feasible and effective cleanup plan can only be developed after completion of additional investigative work. Geraghty & Miller recommends that the work proposed in the "Sampling Plan Addendum No. 2" be implemented.

REVISED SAMPLING PLAN
INVESTIGATION REPORT
KALAMA CHEMICAL, INC. FACILITY
GARFIELD, NEW JERSEY

ECRA CASE NO. 86B73

INTRODUCTION

PURPOSE

In June 1986, Geraghty & Miller, Inc. (Geraghty & Miller) was retained by Kalama Chemical, Inc. of Seattle, Washington (Kalama) to conduct an environmental sampling and analysis program at its chemical manufacturing facility in Garfield, New Jersey. The purpose of the program was to evaluate the environmental conditions of the facility in support of the requirements under New Jersey's Environmental Cleanup Responsibility Act (ECRA). Kalama submitted the General Information Submission (GIS) to the New Jersey Department of Environmental Protection (NJDEP) in 1986. Kalama submitted the Site Evaluation Submission (SES) and the Request for Hydrogeologic Assessment to the NJDEP in January 1987 and August 1987, respectively. An Administrative Consent Order (ACO) was executed between Kalama and the NJDEP in December 1988.

From June 1986 through June 1991, Geraghty & Miller conducted three ECRA-related investigations at the facility. Those investigations are described in a subsequent section entitled "History of Investigations."

This report was prepared for the following purpose:

- To summarize the findings of all Geraghty & Miller ECRA-related investigations at the Kalama facility, including the present Revised ECRA Sampling Plan Investigation.

- To provide the information necessary to design and implement an additional investigative program which is required to develop a feasible and effective cleanup plan.

FACILITY LOCATION

The Kalama facility is located in the City of Garfield, Bergen County, New Jersey. The property owned by Kalama is designated as Block 50.01 Lot 1 and Block 50.02 Lot 1 on the assessment map for the City of Garfield. Block 50.01 Lot 1 is approximately 500 feet by 560 feet (6.4 acres) and is occupied by the manufacturing facilities. The area of manufacturing (i.e., Block 50.01 Lot 1) is referred to as the site, facility or plant.

The second lot, Block 50.02 Lot 1, is approximately 40 feet by 560 feet (0.5 acres) and is the location of the river-water pump house and employee parking. River Drive, which trends north-south, divides the two lots. The Passaic River flows along the western boundary of Block 50.02 Lot 1. A site location map is provided as Figure 1.

HISTORY OF OPERATIONS

The information in this section was researched by Kalama. It is based on a review of historical records and discussions with long-time employees.

The first buildings at the Garfield Plant were constructed in 1891 by Fritzche Brothers to facilitate chemical manufacturing. The plant has operated continuously since that time. Fritzche Brothers sold the plant to Von Heyden Chemical Fabrische around the turn of the century. The company name was changed to Von Heyden Chemicals, then to Heyden Chemicals, then to Heyden-Newport Corporation. Heyden-Newport Corporation was purchased in 1965 by the Tennessee Gas Transmission Company, which later changed its name to Tenneco, Inc. Kalama Chemical, Inc. purchased the facility from Tenneco Chemicals, Inc., a Tenneco, Inc. subsidiary, in December 1982.

The oldest existing buildings on the site were constructed about 1900. The most recent building construction took place in the late 1970s. Existing buildings are referred to by number, as shown on Figure 2. Buildings have been demolished, replaced and modified over the years, as have underground pipes such as chemical and sanitary sewerage lines, and structures such as catch basins and sumps. The plant is served by railroad sidings from the Erie Lackawanna Railroad, in the central and northern section of the facility. Historically, 27 underground storage tanks (USTs) at various locations throughout the site were used for the storage of fuel oil, methanol, toluene and other chemicals. The USTs were removed by Kalama and Tenneco from 1987 to 1990.

Chemicals produced at the Garfield facility are used in pharmaceuticals, cosmetics, food packaging and preservatives, synthetic flavorings, printing inks, dyestuffs and other products. The plant has been the site of salicylic acid production since the turn of the century, and of salicylate salts from the 1930s to the present. Parasepts and methylene disalicylic acid (MDA) have been produced at the plant since the 1940s. (Parasepts, sometimes called Parabens, is a registered trademark for certain methyl, ethyl, propyl and butyl esters of para-hydroxy benzoic acid). During the 1930s until 1982, formaldehyde was produced at the plant. Benzoic acid, benzaldehyde and sodium benzoate were produced in facility buildings and on diked pad in the southeastern section of the facility from 1960 until February 1984.

During the Second World War, the U.S. government installed equipment at the plant for the manufacture of Pentaerythritol, a glycerine substitute. Pentaerythritol production continued until 1962. Other historical products and processes include Resorcinol, Jet Lube, Sodium, Potassium and Methyl Salicylate, Fumaric Acid, Pentamids, DDSA, Nuosperse HOH, Nuvis HS, B-Oxynapththoic Acid and Naphthalene distillation.

Toluene was used at the site as a raw material for the production of benzoic acid and benzaldehyde in the air oxidation process. Phenol and sodium hydroxide are currently used as raw material for the production of salicylic acid in the carboxylation process. Methyl

salicylate is manufactured by the esterification of salicylic acid and methanol, with sulfuric acid used as a catalyst. Formaldehyde was formerly produced by the catalytic oxidation of methanol. Benzene was formerly used in the manufacture of Resorcinol.

Manufacturing operations are conducted in approximately one half of the 39 existing buildings at the site (several of which are subdivided into separately numbered structures, for example, Buildings 10-P1 through 10-P4). The other buildings are either vacant, idle, or they are used for storage, shops or offices. Seven buildings have been dismantled (Buildings 2, 3, 37, 38 and three unnumbered buildings). The dates of construction, current use, and, to the extent known, the principal historic use of each separately identified structure are presented in Table 1.

In addition to the numbered buildings, there are and historically have been a variety of other above-ground structures and tanks on the site. Of particular significance is the former benzoic acid/benzaldehyde production facility in the southeastern section of the facility (immediately west of Building 23) which was constructed by Heyden-Newport in 1960 and abandoned and dismantled by Kalama in 1984.

Geraghty & Miller will investigate further the historic operations at the facility as part of the work proposed in the "Sampling Plan Addendum No. 2" which is submitted under separate cover.

HISTORY OF INVESTIGATIONS

Geraghty & Miller conducted a Preliminary Investigation of Soil Quality Conditions in 1986 (Preliminary Investigation or 1986 Investigation). The field work associated with the Preliminary Investigation was conducted in June 1986. The results of that investigation are presented in a report entitled "Preliminary Investigation of Soil Quality Conditions at the Kalama Chemical, Inc. Facility in Garfield, New Jersey" (Geraghty & Miller, Inc., 1986).

Geraghty & Miller prepared a sampling plan as part of the Site Evaluation Submission required under ECRA. The plan was prepared in accordance with the Draft Sampling Plan Guide for ECRA (June 1986), issued by the NJDEP, Bureau of Industrial Site Evaluation (BISE). The plan, entitled "Sampling Plan for Site Evaluation, Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1987) was submitted to the NJDEP in August 1987. The field work was conducted from September 1987 through March 1988. The results of the 1987-1988 Soil and Ground-Water Investigation (ECRA Sampling Plan Investigation or 1987-1988 Investigation) are presented in a report entitled "ECRA Soil and Ground-Water Investigation at the Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1988). That report was submitted to the NJDEP in June 1988.

Based on the results of the ECRA Sampling Plan Investigation, Geraghty & Miller concluded that uncertainties remained regarding the nature and extent of contamination. Therefore, a sampling plan addendum letter, which proposed to address those uncertainties, was submitted to the NJDEP in October 1988.

Kalama received a letter from the NJDEP on March 10, 1989 which required Kalama to submit an expanded sampling plan addendum. In response to that letter, Geraghty & Miller prepared an expanded sampling plan addendum which was submitted to the NJDEP in April 1989 (Geraghty & Miller, Inc., 1989). Due to some deficiencies in the expanded addendum, noted in a letter from NJDEP to Kalama, dated January 8, 1990, Geraghty & Miller prepared a revised sampling plan addendum. The addendum, entitled "Revised Sampling Plan Addendum, Kalama Chemical Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1990), was submitted to the NJDEP in March 1990. The NJDEP approved the Revised Sampling Plan Addendum with certain conditions by letter to Kalama, dated January 3, 1991.

The work detailed in the Revised Sampling Plan Addendum and the work required by the NJDEP conditions began in January 1991 and is completed with the submittal of this

report and the proposed "Sampling Plan Addendum No. 2." That work constitutes the Revised Sampling Plan Investigation for the facility.

The scope of work for each of the investigations referred to above is summarized in the following section.

TECHNICAL OVERVIEW

PRELIMINARY INVESTIGATION (1986)

The Preliminary Investigation included the drilling of five soil borings, designated as B-1 through B-5, at the locations depicted on Figure 2. The soil borings were drilled in June 1986 using hollow-stem augering techniques. Samples for laboratory chemical analysis were collected from each soil boring using split-spoon sampling techniques. The soil borings ranged in depth from 8 feet to 12 feet below ground surface (bgs). In addition, a water sample from soil boring B-4 was collected for laboratory analysis. Laboratory chemical analyses were conducted by General Testing Corporation of Hackensack, New Jersey (GTC) and Environmental Testing and Certification of Edison, New Jersey (ETC). Samples from soil borings were analyzed for the following parameters:

- Volatile, base/neutral and acid extractable organic compounds.
- Total petroleum hydrocarbons.
- Total phenolics.
- Benzoic acid.
- Benzaldehyde.
- Formaldehyde.
- Alcohols.

A summary of the sampling and analysis program for the Preliminary Investigation is presented in Table 2.

Additional investigation details are included in the report entitled "Preliminary Investigation of Soil Quality Conditions at the Kalama Chemical, Inc. Facility in Garfield, New Jersey" (Geraghty & Miller, Inc., 1986).

ECRA SAMPLING PLAN INVESTIGATION (1987-1988)

The ECRA Sampling Plan Investigation included the drilling of soil borings, installation of ground-water monitoring wells, sampling of soil and ground water and measuring water levels. Laboratory chemical analyses were conducted by GTC and Envirotech Research Inc. of Edison, New Jersey (ERI).

During the time of the ECRA Sampling Plan Investigation, Kalama and the prior owner, Tenneco jointly initiated the removal of USTs at the facility. Also during that time, Kalama removed a light, non-aqueous phase liquid (LNAPL) from Monitoring Wells MW-5 and MW-7.

The following technical overview summarizes the major tasks conducted during the ECRA Sampling Plan Investigation. Additional investigation details are included in the report entitled "ECRA Soil and Ground-Water Investigation at the Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1988).

Soil Sampling

Thirteen soil borings, designated as S-1 through S-13, were drilled using hollow-stem augering techniques and sampled using split-spoon sampling techniques (one soil sample was collected using a hand auger) in December 1987. Soil boring locations are depicted on Figure 2. The borings ranged in depth from 3.5 feet to 22 feet below ground surface. Samples from soil borings were analyzed for the following parameters:

- Volatile and base/neutral extractable organic compounds including tentatively identified compounds.
- Total petroleum hydrocarbons.
- Total phenolics.
- Benzoic acid.
- Benzaldehyde.

A summary of the soil sampling and analysis program for the ECRA Sampling Plan Investigation is presented in Table 3.

Ground-Water Sampling

Nine monitoring wells were installed in December 1987, including three monitoring wells installed in converted soil borings. The monitoring wells are designated as MW-1, MW-2, MW-3, MW-3D, MW-4, MW-5, MW-6, MW-6D, and MW-7. The monitoring wells locations are depicted on Figure 2. The monitoring wells range in depth from 15 feet to 40 feet bgs. All monitoring wells were constructed of 4-inch diameter PVC with 20-slot screens. Samples from the monitoring wells were analyzed for the following parameters:

- Volatile and base/neutral extractable organic compounds including tentatively identified compounds.
- Total petroleum hydrocarbons.
- Total phenolics.
- Benzoic acid.
- Benzaldehyde.
- Methanol.

One round of ground-water sampling was conducted in January 1988. In addition to the parameters listed above, the sample from Monitoring Well MW-3 was analyzed for selected inorganic constituents (i.e., major ions). Ground water from Monitoring Well MW-

7 was not sampled. Instead, a sample of the LNAPL present in the monitoring well was collected and analyzed for volatile and base/neutral extractable organic compounds, and total petroleum hydrocarbons.

A summary of the ground-water sampling and analysis program for the ECRA Sampling Plan Investigation is presented in Table 4.

Water-Level Measurements

Three rounds of ground-water level measurements were conducted in January, February, and March 1990.

LNAPL Recovery

Kalama removed the LNAPL present in Monitoring Well MW-7 by pumping on seven occasions during the period of May through November 1988. Kalama also removed the LNAPL present in Monitoring Well MW-5.

Underground Storage Tank Removal

Eleven of the 27 USTs were removed during the ECRA Sampling Plan Investigation. The additional 16 USTs were removed in April and May 1988, September and October 1988, January 1989, and February 1990. All USTs were removed under the supervision of Kalama and Tenneco personnel. The locations of the former USTs are shown on Figure 2. Post-excavation soil samples were collected by Geraghty & Miller and submitted to GTC and ERI for laboratory analyses. The soil samples were collected with a hand auger, and/or the backhoe bucket. The analytical parameters were based on the former contents of the USTs and included the following:

- Total petroleum hydrocarbons.

- o Toluene.
- o Hexene.
- o Methanol.
- o Methyl isobutyl ketone.

REVISED ECRA SAMPLING PLAN INVESTIGATION (1991)

The Revised ECRA Sampling Plan Investigation was conducted in accordance with the "Revised Sampling Plan Addendum, Kalama Chemical Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, Inc., 1990), as conditioned and approved by the NJDEP (Revised Plan). The technical overview of the Revised ECRA Sampling Plan Investigation is presented below by task.

Task 1: Aerial Photograph History

Geraghty & Miller obtained historical aerial photographs of the facility from 1947, 1973 and 1982. The photographs were studied to identify changes in the layout of the facility with particular emphasis on the identification of exterior material storage areas and stained areas. Certain information on the photographs was confirmed by site reconnaissance and comparison to a 1973 site plan. The findings of this task are discussed in a subsequent section entitled "Site Conditions."

Task 2: Soil Sampling

Forty-six soil borings, designated as B-1 through B-46, were sampled in January 1991 using split-spoon sampling techniques and hand-auguring drilling techniques (five of the soil samples were collected using hand-augering techniques). The soil boring locations are depicted on Figure 2. The soil borings ranged in depth from 0.5 feet to 12 feet below ground surface. Samples from the soil borings were analyzed by ERI for the following parameters:

- Volatile, and base/neutral and acid extractable organic compounds including tentatively identified compounds.
- Total petroleum hydrocarbons.
- Total phenolics.
- Arsenic, beryllium, cadmium, and vanadium.
- Polychlorinated biphenyls.
- Toluene.
- Methanol.
- Hexene.
- pH.

A summary of the soil sampling and analysis program for the Revised ECRA Sampling Plan Investigation is presented in Table 5. The findings of this task are discussed in subsequent sections entitled "Site Geology and Hydrogeology" and "Soil Quality."

Task 3: Installation of Additional Monitoring Wells

Twelve additional monitoring wells, designated MW-8 through MW-18 and MW-5D, were installed using hollow-stem augering techniques at the locations depicted on Figure 2. The monitoring wells, installed in January 1991 and April 1991, range in depth from 12.5 feet to 35 feet bgs. All monitoring wells are constructed of 4-inch diameter PVC with 20-slot screens. The location and elevation of each monitoring well, including those previously installed, were surveyed by the Geod Corporation of Newfoundland, New Jersey.

To investigate further whether the apparent ground-water mound in the southeastern section of the facility is part of the overburden aquifer or is a perched water body, a pair of clustered piezometers designated as PZ-4S and PZ-4D was installed approximately 6 feet northwest of existing Monitoring Well MW-4 in June 1991. Piezometer PZ-4S is screened from 2 feet to 8 feet bgs; Piezometer PZ-4D is screened from 12 feet to 16 feet bgs. Both piezometers are constructed of 2-inch diameter PVC with 20-slot screens. The installation

of piezometers was not required by the Revised Plan. Piezometers PZ-4S and PZ-4D will be surveyed and the water levels will be monitored as part of the additional investigative work proposed for the facility. Details of that work are described in the "Sampling Plan Addendum No. 2" which is submitted under separate cover.

Task 4: Water-Level Measurement Events

Ten rounds of water level measurements were conducted during the Revised ECRA Sampling Plan Investigation in April, May, and June 1991. The presence of LNAPL and dense non-aqueous phase liquid (DNAPL) was monitored concurrently during the first nine rounds of water-level measurements with an oil/water interface probe. The findings of this task are discussed in subsequent sections entitled "Site Geology and Hydrogeology" and "Ground-Water Quality."

Task 5: Monitoring Well Sampling

One round of ground-water sampling was conducted in April 1991. Ground-water samples from monitoring wells, including wells installed during the previous investigation, were analyzed during the Revised ECRA Sampling Plan Investigation for the following parameters:

- Volatile, and base/neutral and acid-extractable organic compounds including tentatively identified compounds.
- Total petroleum hydrocarbons.
- Total phenolics.
- Benzaldehyde.
- Chloride.
- Fecal coliform.

A summary of the ground-water sampling and analysis program for the Revised ECRA Sampling Plan Investigation is presented in Table 6. The findings of this task are discussed in a subsequent section entitled "Ground-Water Quality".

Task 6: Pumping Tests

Two 24-hour pumping tests were conducted in May 1991. The first test was conducted utilizing Monitoring Well MW-3D as the pumping well and Monitoring Wells MW-2, MW-3, MW-13, and MW-18 as observation wells. The second test was conducted utilizing Monitoring Well MW-10 as the pumping well and Monitoring Wells MW-4, MW-5, MW-5D, MW-9, MW-11, and MW-17 as observation wells.

Although not required by the Revised Plan, Geraghty & Miller conducted slug tests in 14 monitoring wells (MW-1, MW-2, MW-3D, MW-5D, MW-6, MW-6D, MW-8, MW-10, MW-11, MW-13, MW-14, MW-15, MW-16, and MW-18) in April 1991. The purpose of slug testing was to obtain soil permeability data. The results of the slug tests and pumping tests are discussed in a subsequent section entitled "Site Geology and Hydrogeology."

Task 7: Underground Storage Tank Removal

As indicated above, all USTs at the facility were removed by February 1990 (i.e., prior to the conduct of the Revised ECRA Sampling Plan Investigation). A summary of the post-excavation soil sampling program, including the sample locations and the analytical data results, is presented in the Revised Plan and is discussed in a subsequent section of this report entitled "Soil Quality."

Task 8: Soil Venting

In June 1991, Geraghty & Miller conducted soil vapor extraction (SVE) pilot tests. The objective of the tests was to determine the feasibility and potential of SVE for removing contaminants from the unsaturated (vadoze) zone. As approved by the NJDEP, Geraghty & Miller will present and discuss the results of the SVE pilot tests at a later date in the cleanup plan.

Well Search

As part of the preparation of the Revised Plan, Geraghty & Miller conducted a well search within a 0.5-mile radius of the Kalama facility. Geraghty & Miller obtained information from the NJDEP Bureau of Water Allocation, Bergen County and the City of Garfield. The findings of the well search are included in Appendix B of the Revised Plan and are summarized and discussed in a subsequent section of this report entitled "Site Conditions."

VARIANCES

Between January and July 1991, Geraghty & Miller executed the tasks presented in the Revised Plan. There were variances to the required scope of work. A discussion of the variances is presented in Appendix A.

LABORATORY DATA ASSESSMENT

Geraghty & Miller assessed the Revised ECRA Sampling Plan Investigation laboratory analytical data generated by ERI. The analytical data include the results of soil and ground-water chemical analyses. The results of the assessment are presented in Appendix B.

FINDINGS AND DISCUSSION

SITE CONDITIONS

Surface Conditions

The Kalama facility is located in the City of Garfield, Bergen County, New Jersey (Figures 1 and 2). The property owned by Kalama consists of two lots. One lot, Block 50.01 Lot 1, is approximately 500 feet by 560 feet (6.4 acres) and is occupied by manufacturing facilities. That lot is referred to as the site, facility, or plant. Most of the investigative work has been conducted within the facility boundary.

The second lot, Block 50.02 Lot 1, is approximately 40 feet by 560 feet (0.5 acres) and is the location of the river-water pump house and employee parking. River water is pumped to the facility and used for non-contact cooling. River Drive, which trends north-south, divides the two lots.

The Passaic River, the primary regional surface-water body, is located 100 feet west of the facility. The Passaic River is tidal, flows by the facility in a north to south direction, and is the receptor for the local ground-water and storm-water discharge. Mixed commercial and residential areas surround the facility on its other three sides.

Most of the facility is covered by buildings and pavement. Buildings occupy approximately 50 percent of the facility; paved areas (primarily asphalt) cover an estimated 25 percent of the facility. The remaining 25 percent of the surface is unpaved. As part of the plant operations, tank trucks, tractor trailers, and rail cars move around the facility regularly.

An asbestos inspection has not been conducted. Therefore, Geraghty & Miller proposes to conduct an asbestos inspection as part of the work presented in the "Sampling

Plan Addendum No. 2." The objective of the inspection will be to identify the location, form and quantity of asbestos containing material.

Subsurface Conditions

An extensive network of pipes and structures (both active and inactive) is present beneath the site surface. Those pipes and structures have not yet been investigated completely. Therefore, Geraghty & Miller proposes to conduct a comprehensive underground utility survey. The objective of the survey will be to evaluate the impact of pipes and structures on ground-water flow and contaminant migration. Details of the proposed underground utility survey are provided in the "Sampling Plan Addendum No. 2", which is submitted under separate cover.

In July 1991, Geraghty & Miller conducted a preliminary underground utility survey. The survey consisted of reviewing maps on file with Kalama and discussing the information on the maps with Kalama personnel. A summary of the preliminary underground utility survey is presented below.

The network of pipes beneath the site surface can be classified into the following categories:

- Intake lines that carry cooling water from the Passaic River to the facility.
- Outfalls that carry cooling water and storm water from the facility to the Passaic River.
- Sewerage lines that connect to the Passaic Valley Sewerage Commissioners (PVSC) system.
- Potable water lines that supply the facility with water from the Passaic Valley Water Company (PVWC) and the City of Garfield.

There are three active 12-inch or 18-inch diameter river intake lines that cross the facility boundaries. River water is pumped (via the pump house) from the Passaic River to the intake lines and is utilized as non-contact cooling water. After use, it is discharged to the river via the two outfalls described below. The active lines cross the northwestern and southern facility boundaries. There is one inactive river intake line which is 8 inches in diameter and crosses the western facility boundary.

There are a total of four outfalls that connect with the Passaic River, two of which are inactive. The two active outfalls are regulated under Kalama's NPDES permit. Those outfalls carry non-contact cooling water and some storm water (via catch basins) from the facility, under River Drive, to the Passaic River. Both active outfalls cross the western facility boundary. One of the active outfalls, designated as 001, is aligned along the northern facility boundary. It is 18 inches in diameter and crosses the facility boundary at its northwest corner. The other active outfall, designated as 002, is 24 inches in diameter and crosses the western facility boundary approximately 20 feet north of Building 34.

There is an inactive 10-inch diameter outfall that crosses the western facility boundary approximately 40 feet north of Outfall 002. That outfall was connected to the boiler room of former Building 2 and was deactivated in 1974. There is also an inactive 15-inch diameter outfall that crosses the facility boundary at its southwestern corner. That outfall has been inactive since 1969.

There is one 12-inch diameter sewerage line that carries sanitary waste, process waste and some storm water (via catch basins). That 12-inch line crosses the western facility boundary adjacent to Outfall 002 described above. The effluent in that sewerage line is monitored in accordance with the PVSC sewer connection permit.

There are seven other sewerage lines that cross the facility boundaries. Those lines are 4-inch or 6-inch in diameter. Five are active lines that carry sanitary waste only. Two

active lines cross the eastern facility boundary. Two inactive sewerage lines cross the western facility boundary.

There are five potable water lines that cross the facility boundaries. Two of those lines cross the northern boundary and one line crosses each of the other boundaries. All five lines are active and are either 8 inches or 12 inches in diameter.

The underground structures beneath the site surface can be classified into the following categories:

- Basements.
- Elevator shafts.
- Pipe tunnels.
- Catch basins.
- Sumps.

None of the underground structures extends across the facility boundary.

Buildings 17, 32, 32-A/32-B, 33/33-A/33-B, 34, and 36 have basements. Some of the basements are flooded and may extend below the water-table. The basement of Building 32-A/32-B is intermittently flooded with water which Kalama sampled and analyzed. The analytical results indicate that the water contains concentrations of toluene up to approximately 130,000 micrograms per liter (ug/L).

Buildings 10-B, 12, 30, 31, 32-B, and 36 have elevator shafts. Some elevator shafts extend below the water table. Elevator shafts in Buildings 32-B, 33 and 36 are flooded. Flooded basements and elevator shafts will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

The other underground structures include the following:

- o Pipe tunnel system located in the north-central and eastern sections of the facility.
- o Catch basins connected to both the outfalls and sewerage lines described above.
- o Sumps located in several facility buildings.

The pipe tunnel system, catch basins, and sumps will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

Aerial Photograph Study

Geraghty & Miller evaluated historical aerial photographs from 1947, 1973, and 1982, and confirmed certain information on the photographs by site reconnaissance and comparison to a 1973 site plan. The aerial photographs indicate that the present plant layout differs slightly from that recorded on the 1947 photograph in that three (unnumbered) buildings located along the southern-central facility boundary, adjacent to Monitoring Well MW-10, are no longer present. Buildings 2 and 3, formerly located adjacent to River Drive, were demolished in 1990 and 1988, respectively. Building 37, formerly located in the southeastern section of the facility, was demolished in 1990. Building 38, formerly located in the northwestern section of the facility, was demolished in 1988. The benzoic acid/benzaldehyde production facility was dismantled in 1984.

The aerial photograph taken in 1973 shows a mottled area near Building 12. Soil borings B-10, B-44, and B-46 were drilled during the Revised ECRA Sampling Plan Investigation in or near the mottled area. An area containing approximately 100 drums is evident to the south and west of Building 23. The drums appear to be upright and orderly.

Soil borings B-13, B-14, B-15, B-16, B-17, B-26, B-27 and S-8, and Monitoring Well MW-4 were drilled/installed in that area.

The 1982 aerial photograph, shows an estimated 100 to 150 drums on the ground in the area east of Building 16. Soil borings B-28, B-29, and B-30 were drilled within 50 feet of that area; Monitoring Well MW-1 is located within 15 feet of that area. Approximately 100 drums are evident south of Building 23. A cluster of approximately 25 drums is evident on the ground south of Building 8.

The presence of drums, as documented in the aerial photographs, is consistent with facility operations. Those operations include the storage of raw material and the packaging of finished product in drums. Drums were routinely moved about the facility to accommodate daily activities. The aerial photographs do not indicate any excavation or landfilling activities.

To summarize, our evaluation of historical aerial photographs and current site conditions indicates that, with the exception of seven buildings and the benzoic acid/benzaldehyde production facility that no longer exist, the site surface conditions have changed little over the past 44 years. The information obtained from the aerial-photograph study does not indicate any areas of concern that are not covered by soil borings and/or monitoring wells.

Well Search

Twenty-three wells were identified within a 0.5-mile radius of the site (Table 7). The wells are classified as follows: seven monitoring wells (MW), one test well (TW), five industrial supply wells (ISW), one private well (PW), one product recovery well (PRW), three industrial recharge wells (IRW), one public supply well (PSW), and four wells which have not been type-classified. The locations of the wells are shown on Figure 3.

Of the seven monitoring wells identified, six are owned by E.C. Electroplating and are located at the northeast periphery of the 0.5-mile radius of the site. Those six wells range in depth from 17 feet to 20 feet and are screened in the unconsolidated deposits. The remaining monitoring well, which is 20 feet deep, and three other not type-classified wells, are owned by Dundee Water Power and Land Company and are located west of the Passaic River.

The test well, owned by the Borough of Wallington, is located south of the site near the convergence of the Passaic River and Saddle River. That well is located at the edge of the 0.5-mile radius and is a 400-foot deep bedrock well.

The five industrial supply wells are located outside of the 0.25-mile radius of the site. Two wells are located northeast of the site; the other three wells are west of the Passaic River. All five wells tap the bedrock aquifer and range in depth from 275 feet to 505 feet.

The three industrial recharge wells are located adjacent to the test well owned by the Borough of Wallington. Those wells are bedrock wells that range in depth from 392 feet to 397 feet.

One private well, which is a 130-foot deep bedrock well, is located approximately 0.25-mile east of the site. That well supplies a sprinkling system. The public supply well, which is operated by the City of Garfield, is located approximately 0.3-mile southeast of the site and is a 400-foot deep bedrock well.

The remaining two wells are near each other and are located approximately 0.1 mile from the site in a due north direction. One well, which is 17 feet deep, is a product recovery well owned by the NJDEP. The other well, which has not been type-classified, is a 276-foot deep bedrock well owned by the City of Garfield.

According to Kalama several industrial supply well were formerly operated at the facility. The number, locations, and depths of the wells presently is not known.

To summarize, the well search indicates that there are no private or public supply wells within a 0.25-mile radius from the Kalama site. However, there is uncertainty regarding the type, depth, location, and status of some of the wells identified in the well search, and former on-site industrial supply wells. Additional well search activities are necessary to address this uncertainty and to assess possible off-site sources of contaminants. The additional proposed well search activities are described in the "Sampling Plan Addendum No. 2" which is submitted under separate cover.

REGIONAL GEOLOGY AND HYDROGEOLOGY

Regional Geology

The facility is located in the Piedmont Lowland Physiographic Province. Bedrock within this Province consists of sedimentary and igneous formations of the Triassic and Jurassic Periods. Unconsolidated glacial and fluvial deposits of the Pleistocene and Recent Epochs cover the bedrock in most areas of the Province, especially in lowland areas.

Bedrock underlying the Kalama facility belongs to the sedimentary Brunswick Formation, which is composed primarily of reddish-brown sandstones and shale beds that dip generally 10 degrees to 15 degrees to the northwest. Within the site, approximately 30 feet of unconsolidated deposits overlie the bedrock. The top several feet of the Brunswick Formation are usually weathered and consist of rock fragments embedded in a matrix of clay, silt, and/or sand derived from the bedrock.

Regional Hydrogeology

Regionally, there are two aquifers: the overburden aquifer in the unconsolidated deposits and the bedrock aquifer in the Brunswick Formation. Ground water in the overburden aquifer generally flows to local and regional discharge points, such as the Passaic River. Ground water in the bedrock aquifer occurs in fractures, such as bedding planes, and flows through the fractures to local and regional points of discharge.

SITE GEOLOGY AND HYDROGEOLOGY

Beneath the facility is a complex sequence of unconsolidated deposits, consisting primarily of sand with discontinuous layers of silt and clay, and fill. Fill is present immediately beneath the facility. Generally, the thickness of fill material is approximately 3 feet to 8 feet. Typically, the fill consists of a mixture of sand, gravel, crushed stone, and brick fragments. At some locations, ground water occurs in the fill. The fill is underlain by natural deposits consisting of sand with discontinuous silt and clay layers. The unconsolidated deposits are approximately 25 feet to 35 feet in thickness. Generally, ground water in the unconsolidated deposits occurs about 7 feet to 10 feet bgs. The depth to the water table increases towards the Passaic River.

The silt and clay layers constitute an appreciable component of the unconsolidated deposits. Where saturated, the unconsolidated deposits underlying the facility (including fill) contain one water-bearing zone. However, because of the variation in lithology of the unconsolidated deposits, the water-bearing zone is nonhomogeneous and therefore its hydraulic characteristics will vary significantly both horizontally and vertically across the site.

Evidence of the presence of weathered bedrock was encountered in monitoring-well borehole MW-5D at a depth of about 35 feet bgs, and in monitoring-well boreholes MW-3D and MW-6D at a depth of 36 feet and 30 feet bgs, respectively. The borings logs for several wells identified in the 0.5-mile radius well search indicate a depth to bedrock that ranges

from 20 feet to 30 feet. Soil-boring and monitoring-well borehole details are presented in Table 8. Soil-boring and monitoring-well borehole logs are presented in Appendix C. The locations of geologic cross sections are shown on Figure 4. Geologic cross sections are presented on Figures 5, 6 and 7.

Ground-Water Elevations and Shallow Flow Direction

Monitoring well construction details are presented in Table 9 and Appendix C. Monitoring well Forms A and B are included in Appendix D.

Ground-water elevations measured during the ECRA Sampling Plan Investigation are similar to those measured during the Revised ECRA Sampling Plan Investigation. The ground-water levels recorded during the Revised ECRA Sampling Plan Investigation are discussed in this report and summarized in Table 10 and on Figure 8.

The ground-surface elevation at the site is relatively flat and its elevation ranges from approximately 16 feet mean sea level (msl) to 19 feet msl. Ground water occurs under most of the facility from 7 feet to 10 feet bgs. However, in the southeastern section of the facility in the vicinity of Monitoring Well MW-4, anomalously high ground-water levels were observed: the depth to water generally was 3 feet to 4 feet higher than the levels observed in near by monitoring wells. This condition is referred to as an apparent water-table mound.

During the period of record from April 10, 1991 through June 17, 1991, ground-water elevations in the shallow monitoring wells ranged from a high of 14.1 feet msl in Monitoring Well MW-5 to a low of 6.9 feet msl in Monitoring Well MW-6. Elevations observed in Monitoring Well MW-15 located near the Passaic River, ranged from 2.2 feet msl to 4.4 feet msl during the period of record. However, because Monitoring Well MW-15 is affected by tidal fluctuations in the Passaic River, the ground-water elevations in Monitoring Well MW-15 are not discussed further in this section. For the deep monitoring wells, the ground-water

elevations ranged from a high of 11.5 feet msl in Monitoring Well MW-5D to a low of 6.4 feet msl in Monitoring Well MW-6D.

For clustered Monitoring Wells MW-3/MW-3D and MW-6/MW-6D, the ground-water elevations in the deeper monitoring well were consistently lower than those in the adjacent shallow monitoring well. The magnitude of the difference for Monitoring Wells MW-3/MW-3D ranged from 3.0 feet to 3.7 feet. The magnitude of the difference for Monitoring Wells MW-6/MW-6D ranged from 0.1 foot to 0.6 foot. These differences indicate the potential for a downward component of the ground-water flow under portions of the facility. The vertical gradient observed at the location of Monitoring Well MW-3/MW-3D probably is due to the presence of a 12-foot thick clay layer between the screens of the two monitoring wells. The borehole log for Monitoring Well MW-6 does not indicate the presence of a clay layer or other low permeability layer that would account for the observed vertical gradients. Tidal fluctuations of up to 0.7 foot were measured in Monitoring Well MW-6D. Those fluctuations may have caused the observed slight downward vertical gradient.

During eight of the ten water-level measurement events, the ground-water elevations in deep Monitoring Well MW-5D were higher than those in the adjacent shallow Monitoring Well MW-5. The magnitude of the differences ranged from 0.3 feet to 0.4 feet. On two occasions, the ground-water elevations in Monitoring Well MW-5 were higher than those in Monitoring Well MW-5D. The magnitude of the difference was 2.6 feet. The apparent change in the magnitude and direction resulted from an anomalous 3-foot rise in the ground-water elevations measured in Monitoring Well MW-5.

The lack of a correlative response in any of the adjacent wells and deep monitoring well MW-5D with the response observed in Monitoring Well MW-5 indicates that the change in ground-water elevation is a localized "point phenomenon".

Geraghty & Miller proposes to investigate further the anomalous ground-water elevations in accordance with the "Sampling Plan Addendum No. 2" which is submitted under separate cover.

Water-table contours are shown on Figures 9 and 10. The contours indicate a general westerly/southwesterly direction of ground-water flow across the site toward the Passaic River. They also indicate a local southwesterly component of ground-water flow in the northern section of the site towards the middle of the site. The inferred direction of ground-water flow may be biased due to the lack of monitoring wells in the northern section of the facility. If such a flow component is accurate, it would indicate a potential ground-water draining effect occurring in the middle of the site area. There are two potential conditions that could cause a ground-water draining effect in that area:

- A higher permeability soil zone that trends east-west.
- High-permeability backfill material around a pipe that extends across the western boundary of the site.

As discussed in a previous section entitled "Site Conditions", there are pipes that extend across the western facility boundary. Their depths relative to the water table and whether they have high-permeability backfill material around them is not presently known. The soil permeability across the site varies significantly, but, Geraghty & Miller's investigations have not identified any zones of consistently higher soil permeability. Therefore, existence of such a zone although possible, is not likely. In the "Sampling Plan Addendum No. 2" which is submitted under separate cover, Geraghty & Miller proposes to investigate further the apparent southwesterly flow component by measuring water levels in existing and proposed monitoring wells and by conducting an underground utility survey.

Anomalously high ground-water elevations measured in the southeastern section of the facility indicate an apparent water-table mound in the vicinity of Monitoring Well MW-4. In June 1991, Geraghty & Miller installed a piezometer cluster: PZ-4S (a shallow

piezometer screened above the clay layer occurring at 8.5 to 11 feet bgs) and PZ-4D (a deeper piezometer screened below the clay layer). The piezometers were developed, but not surveyed. The preliminary measurements indicate that the water level in the shallow piezometer is approximately 4 feet higher than that in the deeper piezometer. Based on the preliminary water-level measurements, the apparent water-table mound in the vicinity of Monitoring Well MW-4 could be a water body that is locally perched by the underlying clay layer. In the "Sampling Plan Addendum No. 2," Geraghty & Miller proposes to resolve the water-table mound issue by comparing ground-water levels and ground-water quality in Monitoring Well MW-4, and piezometers PZ-4S and PZ-4D, and other monitoring wells. Anomalously high ground-water elevations were observed in Monitoring Wells MW-7, MW-9, and MW-17. They may also be due to local perched conditions.

The source of the apparent water-table mound in the vicinity of Monitoring Well MW-4 remains unknown. The persistent nature of the observed condition indicates that it may be caused by a leaking pipe or pipes, including exfiltration from catch basins. Precipitation in combination with preferential surface runoff and/or ponding in the vicinity of the monitoring wells may also be responsible for the apparent water-table mound. It is possible that the apparently subdued water-table mounding observed in the vicinity of Monitoring Wells MW-7, MW-9, and MW-17 are independent from MW-4 and each other, and therefore, are caused by different sources.

The extent, if any, to which the anomalous ground-water conditions observed in the southeastern section of the facility impacts contaminant migration will be investigated further as part of the work proposed in the "Sampling Plan Addendum No. 2."

Soil Permeability

The horizontal hydraulic conductivities of the soils underlying the facility were evaluated based on the slug-test results. The hydraulic conductivities data calculated from

slug test data are summarized in Table 11. The slug-test data plots are included in Appendix E.

The slug test results indicate that the hydraulic conductivity of the soils varies from 0.3 feet/day (1.2 x 10^{-4} cm/sec) to 13 feet/day (4.6 x 10^{-3} cm/sec) with an average of 3 feet/day (1.1 x 10^{-3} cm/sec). These values are typical for silty and clayey sand, which comprise a significant portion of the soils at the site. Locally more coarse and/or less silty or clayey sand could exhibit higher hydraulic conductivities.

The pumping-test results indicate that the water-bearing zone yields variable and relatively low volumes of water to wells: 0.5 gallon per minute (gpm) at Monitoring Well MW-3D and 3 gpm at Monitoring Well MW-10. Because Monitoring Well MW-10 was pumped at a drawdown of approximately 3 feet out of an available 10 feet, the maximum available yield of Monitoring Well MW-10 can be assumed to be greater than 3 gpm, probably between 5 gpm and 8 gpm.

The results of the pumping tests are inconclusive, primarily because the water-bearing zone was not stressed sufficiently and the distances to the observation wells were too great. Those conditions resulted in very small (less than 0.1 foot) drawdown in most of the observation wells or no observed drawdown. The drawdown values, if used, would result in unrealistically high transmissivity values. Consequently, the pumping tests data were not used to evaluate the transmissivity and storativity of the water-bearing zone. In the "Sampling Plan Addendum No. 2," Geraghty & Miller proposes to conduct a second pumping test in Monitoring Well MW-10 under improved conditions, which would include running a 6-hour test while pumping at a higher rate, and measuring the drawdown in two additional piezometers (observation wells) to be installed 10 feet and 30 feet from Monitoring Well MW-10.

To summarize, based on the presently available data, the horizontal hydraulic conductivity of the soils across the facility is estimated to range from 0.3 feet/day to 13 feet/day. The actual hydraulic conductivities of soils may vary significantly across the site.

Flow Gradient and Ground-Water Velocity

As discussed above, the hydraulic conductivities based on the slug test data ranged from a minimum of 0.3 feet/day (1.2×10^{-4} cm/sec) to a maximum of 13 feet/day (4.6×10^{-3} cm/sec). These hydraulic conductivities are consistent with the grain size and density of the unconsolidated materials underlying facility.

The overall ground-water flow gradient across the site is approximately 0.01. This gradient does not consider the apparent water-table mound observed in the southeastern section of the site. The gradient may vary significantly across the site.

Geraghty & Miller did not estimate the ground-water flow velocity because of high inhomogeneity of the unconsolidated deposits, the potential presence of preferential pathways and tidal influences. Those conditions tend to render the ground-water flow velocities unreliable for predicting time of travel. In addition, ground-water flow velocities often are not indicative of the rate of contaminant migration. Physicochemical interactions among the aquifer matrix, the ground water, and the contaminants tend to retard the rate of contaminant migration.

SOIL QUALITY

The results of the UST post-excavation and soil boring sampling and analysis programs are discussed in this section. The laboratory analytical results for various parameters are evaluated by comparing them to the NJDEP-ECRA guidance levels. Those levels are specified below:

Parameter	Guidance Level milligram per kilogram (mg/kg)
Total Volatile Organic Compounds (VOCs)	1
Total Base Neutral Organic Compounds (BNs)	10
Total Acid Extractable Organic Compounds (AEs)	10
Total Petroleum Hydrocarbons (PHCs)	100
Total Polycyclic Aromatic Hydrocarbons (PAHs)	10
Total Polychlorinated Biphenyls (PCBs)	5
Toluene	1
Methanol	100
Hexene	1
Benzene	1

The guidance levels for toluene, methanol and hexene were provided in the NJDEP approval letter. As part of the evaluation, the presence, concentration, and distribution of individual constituents and groups of constituents are assessed to identify potential source areas and/or patterns, and the extent of contamination. The use of NJDEP-ECRA guidance levels does not imply cleanup criteria for the facility. Instead, the levels are used to help identify and delineate areas and/or conditions of concern.

Post-Excavation Sampling and Analysis Program

A summary of constituents detected in the UST post-excavation soil samples is presented in Table 12. Those constituents that exceed the NJDEP-ECRA guidance levels are plotted on Figure 11. For this discussion, the constituent concentrations have been rounded to the nearest whole number.

Eleven USTs (A-27, A-24, E-13, A-14, A-15, A-16, A-17, A-18, A-21, A-20 and A-19) that formerly contained methanol were removed during the period of October 1987 through

February 1989. Three to five post-excavation soil samples were collected from around each former tank and analyzed for methanol. One of the four soil samples collected from the excavation around former tank E-13 exhibited a concentration of methanol that slightly exceeds the NJDEP-ECRA guidance level of 100 mg/kg. The detected concentration is 116 mg/kg. Similarly, one of the three soil samples collected from the excavation around former Tank A-14 exhibited a concentration of methanol (122 mg/kg) that slightly exceeds the NJDEP-ECRA guidance level (100 mg/kg). None of the other 38 post-excavation soil samples associated with the former methanol tanks exceeded the NJDEP-ECRA guidance level of 100 mg/kg.

Four USTs (A-9, A-10, A-11, and A-12) that formerly contained toluene were removed in October 1987. Three to five post-excavation soil samples were collected and analyzed for toluene. All soil samples collected from the excavations around former tanks A-10, A-11 and A-12 exhibited concentrations of toluene that exceed the NJDEP-ECRA guidance level of 1 mg/kg. The detected concentrations for soil samples associated with former tank A-10 ranged from 261 mg/kg to 342 mg/kg. The detected concentrations for soil samples associated with former tank A-11 ranged from 73 mg/kg to 130 mg/kg. The detected concentrations for soil samples associated with former tank A-12 ranged from 3 mg/kg to 594 mg/kg. Three of the five soil samples associated with tank A-9 exhibited concentrations of toluene that exceed the NJDEP-ECRA guidance level of 1 mg/kg. The concentrations in those three soil samples ranged from 27 mg/kg to 805 mg/kg.

Nine USTs (A-25, C-3, A-4, C-2, E-1, E-5, E-6, A-7, and E-8) that formerly contained fuel oil were removed. Tanks A-25, C-3, A-4, C-2, and E-1 contained No. 2 fuel oil and were removed during the period of September through November 1987. Tanks E-5, E-6, A-7, and E-8 contained No. 6 fuel oil and were removed in February 1990. Four to eight post-excavation soil samples were collected from around each former tank, including the excavated material, and analyzed for total PHCs. With the exception of soil samples associated with former tank A-25, at least two soil samples associated with each of the tanks exhibited concentrations of total PHCs that exceed the NJDEP-ECRA guidance level of 100

mg/kg. The concentrations detected in soil samples associated with the eight tanks that exceed the NJDEP-ECRA guidance level ranged from 116 mg/kg to 24,000 mg/kg. Notable concentrations (i.e., above 10,000 mg/kg) were reported for soil samples associated with former underground storage tanks E-1 and A-7. Soil samples associated with former underground storage tank A-25 did not exhibit concentrations of total PHCs above the NJDEP-ECRA guidance level.

One underground storage tank (A-26) that formerly contained gasoline and one underground storage tank (A-22) that formerly contained methyl isobutyl ketone (MIBK) were removed in October 1987 and January 1989, respectively. Of the four post-excavation soil samples associated with former tank A-26 and analyzed for total PHCs, three soil samples exhibited concentrations that exceed the NJDEP-ECRA guidance level of 100 mg/kg. Those three soil samples exhibited total PHC concentrations of 419 mg/kg, 489 mg/kg, and 1,250 mg/kg. None of the five post-excavation soil samples associated with former tank A-22 exhibited concentrations of MIBK that exceed the NJDEP-ECRA guidance level of 1 mg/kg.

One underground storage tank (A-23) that formerly contained hexene was removed in October 1988. Four post-excavation soil samples were collected and submitted for laboratory analysis of hexene. However, the laboratory misplaced the soil samples and therefore did not perform the analyses. Soil borings were drilled during the Revised ECRA Sampling Plan Investigation to obtain samples from around the former hexene UST. Hexene was not detected in those samples.

The results of the post-excavation soil sampling and analysis program indicate the following:

- For the 11 methanol tanks, 37 out of 39 soil samples exhibited methanol concentrations below the NJDEP-ECRA guidance level. Two samples exhibited methanol concentrations (122 mg/kg and 116 mg/kg) that exceed

slightly the NJDEP-ECRA guidance level of 100 mg/kg. The locations of the former methanol USTs are not areas of concern.

- The location of the former toluene USTs is an area of concern. The former toluene USTs appear to have been a source of soil and ground-water contamination.

- With the exception of the location of former UST A-25, and the possible exception of the location of former UST C-3, the locations of the former fuel oil USTs are areas of concern. The former fuel oil USTs appear to have been a source of soil and ground-water contamination.

- The location of the former gasoline UST, A-26, is an area of concern. The former gasoline UST appears to have been a source of soil and ground-water contamination.

- The locations of the former MIBK and hexene USTs are not areas of concern.

- The UST excavations were partially backfilled with the excavated soils. Soil contamination associated with the former toluene, fuel oil and gasoline USTs will be addressed in the cleanup plan.

The UST removal program was completed before the start of the Revised ECRA Sampling Plan Investigation. The results of the UST removal program were used to guide the selection of the soil boring and monitoring well locations proposed for the Revised ECRA Sampling Plan Investigation and the selection of analytical parameters. The results for soil borings drilled during the Preliminary Investigation and ECRA Sampling Plan Investigation were also used for that purpose.

The results of the post-excavation soil sampling were submitted to the NJDEP in the Revised Plan. Based on those results, the NJDEP requested that the UST-related soil contamination be further delineated as part of the soil boring sampling and analysis program.

Soil Boring Sampling and Analysis Program

Summaries of the constituents detected in soil samples from soil borings are presented in Tables 13 through 23. Those tables summarize the soil quality data from the Preliminary Investigation (Tables 13 through 15), the ECRA Sampling Plan Investigation (Tables 16 through 18), and the Revised ECRA Sampling Plan Investigation (Tables 19 through 23). The analytical data reports for the Revised Sampling Plan Investigation (prepared by ERI) are submitted with this report under separate cover. The analytical data reports for the Preliminary Investigation and ECRA Sampling Plan Investigation were submitted previously to the NJDEP.

The soil-quality constituents that exceed the NJDEP-ECRA guidance levels are plotted on Figure 12. The totals of the tentatively identified (TID) compounds for VOCs, BNs and AEs that exceed 1 mg/kg, 10 mg/kg, and 10 mg/kg, respectively, are plotted on Figure 12. Other constituents that were detected but do not have an NJDEP-ECRA guidance level are also plotted on Figure 12.

This discussion is based primarily on the results shown on Figure 12. To facilitate this discussion of the soil boring sampling and analysis program, the following conventions have been adopted:

- Individual constituents and groups of constituents that exceed NJDEP-ECRA guidance levels are presented and discussed.

- Individual constituents within these groups (e.g., VOCs) that exceed an NJDEP-ECRA guidance level are also presented and selectively discussed.

- PAHs comprised most of the constituents under the BN group. The total PAHs are presented when the total BN group exceeds the NJDEP-ECRA guidance level.

- Phenol comprises all of the AE group when that group exceeds the NJDEP-ECRA guidance level and is presented and discussed.

- Total TID VOCs, total TID BNs, and total TID base/neutral and acid extractable organic compounds (BNAs) are presented only when they exceed 1 mg/kg, 10 mg/kg, and 10 mg/kg, respectively.

- Total phenolics data are presented for each sample that showed detectable concentrations.

- For field duplicate samples, the higher concentration values are presented.

- The "J" qualified concentration values (i.e., estimated values which are less than the detection limit) are included in the sum of a group of compounds and are presented in this text without the qualifier.

- The reported concentrations of chemical constituents are rounded to the nearest 0.1 mg/kg.

Four soil borings, B-18, B-19, B-20, and B-21, were drilled around the location of former soil boring S-7 to further delineate the VOCs and total PHCs detected in the sample collected from that former soil boring during the ECRA Sampling Plan Investigation. A sample was not taken from soil boring B-21 because of poor material recovery and because

the nature of the recovered material was not suitable for analysis. One of the two samples collected from soil boring B-20 exhibited concentrations of toluene (230 mg/kg) that exceed the NJDEP-ECRA guidance level of 1 mg/kg. The sample from soil boring B-18 exhibited concentrations of toluene (890 mg/kg) and total PHCs (206 mg/kg) that exceed the NJDEP-ECRA guidance levels of 1 mg/kg and 100 mg/kg, respectively.

Six soil borings, B-6, B-7, B-8, B-9, B-26, and B-27, were drilled in the vicinity of former soil borings S-2 and B-4 (1986) to further delineate the VOCs and total PHCs detected in samples from those former soil borings. Soil borings B-6, B-7, B-8, and B-9 were also drilled to further delineate the total phenolics and BNs detected in the sample from former soil boring S-2. Toluene was detected in each of the samples from soil borings B-6 and B-8 at a concentration of 360 mg/kg and in the samples from soil boring B-7 and B-9 at concentrations of 17 mg/kg and 2.4 mg/kg, respectively. Each of these detected concentrations of toluene exceeds the NJDEP-ECRA guidance level of 1 mg/kg. Total PAHs were detected in the sample from soil boring B-6 at a concentration of 12.5 mg/kg. Total PHCs in samples from soil borings B-6 (547 mg/kg), B-8 (576 mg/kg) and B-9 (153 mg/kg) exceed the NJDEP-ECRA guidance level of 100 mg/kg. Total phenolics were detected in the samples from soil boring B-7 (5.6 mg/kg), B-8 (40 mg/kg), and B-9 (7.4 mg/kg). The total phenolics detected in the sample from former soil boring S-2 was 200 mg/kg.

Toluene and benzene were detected in the sample from soil boring B-26 at concentrations of 20,000 mg/kg and 80 mg/kg, respectively, which exceed the NJDEP-ECRA guidance levels of 1 mg/kg for both constituents. Total PHCs (4,430 mg/kg) and total PAHs (71.3 mg/kg) in the sample from soil boring B-26 exceed the NJDEP-ECRA guidance levels of 100 mg/kg and 10 mg/kg, respectively. Toluene was detected in the sample from soil boring B-27 at a concentration of 160 mg/kg.

Soil borings B-13, B-14, B-15, B-16, B-17, and B-22 were drilled to delineate further the VOCs and total PHCs detected at the location of former soil boring S-8 and to

investigate further the soil quality in the vicinity of the former gasoline UST, A-26. Specifically, soil boring B-14 was drilled to "resample" a location formerly sampled (A-26-C) during the post- excavation soil sampling event. Soil sample A-26-C exhibited a total PHC concentration of 1,250 mg/kg. Samples from soil borings B-13, (3,400 mg/kg), B-14 (620 mg/kg) and B-16 (12 mg/kg) exhibited concentrations of toluene that exceed the NJDEP-ECRA guidance level of 1 mg/kg. The sample from soil boring B-16 exhibited concentrations of less than 1 mg/kg for benzene, total xylene, and carbon tetrachloride. Trichlorofluoromethane was detected in the sample from soil boring B-16 at a concentration of 1.6 mg/kg. Total PHCs detected in the samples from soil borings B-13 (1,630 mg/kg) and B-14 (1,410 mg/kg) exceed the NJDEP-ECRA guidance level of 100 mg/kg. Because of poor material recovery during split-spoon sampling, a sample from soil boring B-17 was not collected.

As previously stated, the post-excavation soil samples were misplaced by the laboratory, therefore soil borings B-23, B-24, and B-25 were drilled to sample soils around the former hexene UST. Hexene was not detected in the soil boring samples. However, for one of the three soil boring samples the detection limit (2.5 mg/kg) was above the 1 mg/kg NJDEP-ECRA guidance level.

Soil borings B-28, B-29, and B-30 were drilled to investigate further the soil conditions around former fuel oil UST C-3. Specifically, soil boring B-29 was drilled to "resample" a location (C-3-A) previously sampled during the post-excavation soil sampling event. Soil sample C-3-A exhibited a total PHC concentration of 424 mg/kg. None of the samples from soil borings B-28, B-29 and B-30 exceeds the 100 mg/kg NJDEP-ECRA guidance level.

Soil boring B-42 was drilled to investigate the stained area east of Building 25. Total PAHs were detected at 19.6 mg/kg. The NJDEP-ECRA guidance level for PAHs is 10 mg/kg. Total PHCs were detected (207 mg/kg) above the NJDEP-ECRA guidance level of 100 mg/kg. PCBs were not detected. The PCB detection limit was 0.16 mg/kg.

Soil boring B-41 was drilled to investigate the transformer area south of Building 1. Concentrations of constituents were not detected above NJDEP-ECRA guidance levels. PCBs were not detected. The PCB detection limit was 0.16 mg/kg.

Soil borings B-1, B-2, B-3, B-4, and B-5 were drilled to investigate further the conditions in the vicinity of the former toluene USTs and former soil boring S-1. Toluene was detected in soil borings B-4 and B-3 at concentrations of 17,000 mg/kg and 2.4 mg/kg, respectively, which exceed the NJDEP-ECRA guidance level of 1 mg/kg. Total PHCs were detected in soil borings B-2 (148 mg/kg) and B-4 (4,670 mg/kg) above the NJDEP-ECRA guidance level of 100 mg/kg.

Soil borings B-44 and B-46 were drilled to investigate the area around the transformer located northeast of Building 12. Total PHCs were detected in the samples from B-44 (737 mg/kg) and B-46 (400 mg/kg) above the NJDEP-ECRA guidance level of 100 mg/kg. PCBs were not detected in the sample from soil boring B-46. PCB-1260 was detected in the samples from soil boring B-44 at concentrations of 0.47 mg/kg and 2.2 mg/kg in the original sample and field duplicate sample, respectively.

Soil borings B-10, B-11, B-12, and B-40 were drilled to investigate further the soil quality in the vicinity of former UST A-4. Specifically, soil boring B-40 was drilled to "resample" a location (A-4-A) formerly sampled during the post-excavation sampling event. Soil sample A-4-A exhibited a total PHC concentration of 3,410 mg/kg. Total PHCs detected in samples from soil borings B-10 (193 mg/kg) and B-40 (4,040 mg/kg) exceed the NJDEP-ECRA guidance level of 100 mg/kg.

Soil boring B-43 was drilled to investigate the soil quality adjacent to the steam cleaning pad. Soil boring B-45 was drilled to investigate the stained area adjacent to the loading dock at Building 36. Total PHCs were detected in the sample from soil boring B-43 (320 mg/kg) above the NJDEP-ECRA guidance level of 100 mg/kg. Constituents that

exceed NJDEP-ECRA guidance levels were not detected in the samples from soil boring B-45.

Soil borings B-31, B-32, B-33, B-34, B-35, and B-39 were drilled to investigate further the soil quality around former fuel oil USTs E-5, E-6, E-8, and A-7. Total PHCs were detected in the samples from soil borings B-33 (1,820 mg/kg), B-34 (1,770 mg/kg), B-35 (1,550 mg/kg), and B-39 (672 mg/kg) at concentrations of which exceed the NJDEP-ECRA guidance level of 100 mg/kg. Total PAHs were detected in the samples from borings B-33 and B-44 at concentrations of 15.3 mg/kg and 11.1 mg/kg, respectively, which exceed the NJDEP-ECRA guidance level of 10 mg/kg.

Soil borings B-36 through B-39 were drilled to investigate further the soil conditions around the former methanol underground storage tanks. Methanol was not detected above the NJDEP-ECRA guidance level of 100 mg/kg.

Benzoic acid, benzaldehyde and formaldehyde were not detected in the soil samples analyzed for those constituents (Tables 2 and 3). The samples from soil borings B-43 and B-45 scheduled for pH analysis were analyzed 25 days after sample collection during which time the pH may have changed substantially. Therefore, the pH values are not presented. Benzoic acid, benzaldehyde, and formaldehyde in soil, and soil pH will be investigated further as part of the work proposed in the "Sampling Plan Addendum No. 2" which is submitted under separate cover.

TID VOCs were detected in samples from two ECRA Sampling Plan Investigation soil borings, S-9 (1.0 mg/kg) and S-10 (0.8 mg/kg). TID BNs were detected in all soil samples from the ECRA Sampling Plan Investigation at concentrations that ranged from 1,218 mg/kg to 1.4 mg/kg. TID VOCs were not detected in 2 of the 23 soil samples from the Revised ECRA Sampling Plan Investigation that were analyzed for those compounds at concentrations of 2.0 mg/kg and 0.3 mg/kg. TID BNs were detected at concentrations that ranged from 15,150 mg/kg to 0.2 mg/kg in the 16 soil samples from the Revised ECRA

Sampling Plan Investigation that were analyzed for those compounds. A summary of the TID compounds detected in soil samples from both the ECRA Sampling Plan Investigation and the Revised ECRA Sampling Plan Investigation is presented in Appendix F.

Geraghty & Miller proposes to conduct additional soil sampling and analyses, including TID analyses as part of the "Sampling Plan Addendum No. 2." The TID compounds detected during previous investigations will be evaluated together with the TID compounds that will be identified during the proposed sampling and analysis. The evaluation will define the classes of compounds and consider their effect on the potential remedial alternatives for the facility.

The results of the soil boring sampling and analysis program indicate the following:

- Constituents, including toluene, benzene, PAHs, and total PHCs exceed the NJDEP-ECRA guidance levels by a significant margin at several soil sampling locations.

  - Toluene was detected in soil at concentrations up to 20,000 mg/kg
  - Benzene was detected in soil at concentrations up to 80 mg/kg
  - Total PAHs were detected in soil at concentrations up to 71 mg/kg
  - Total PHCs were detected in soil at concentrations up to 4,670 mg/kg

- The southeastern section of the facility, which includes the location of the former toluene USTs and former production facilities that used toluene and benzene, is an area of concern because of the high concentrations of toluene, benzene, and PAHs. The major portion of this area of concern extends 250 feet south of the location of the former toluene USTs. Sources, other than the former USTs, such as spills and leaks, probably contributed to the toluene contamination in soil.

- Total PHCs were detected at high concentrations throughout the facility and are a constituent of concern in soil.

- PCBs and metals are not constituents of concern at the facility.

- Because of the high concentrations of certain constituents, some samples were diluted to facilitate laboratory analysis. Other constituents potentially present at may not have been detected due to sample dilution and associated elevated detection limits.

- Significant levels (up to 15,150 mg/kg) of TID compounds occur in soil.

- Additional soil sampling is proposed in the "Sampling Plan Addendum No. 2." The need for, and extent of, soil remediation will be addressed in the cleanup plan.

GROUND-WATER QUALITY

The results of all ECRA-related ground-water sampling at the facility are discussed in this section.

The laboratory analytical results are evaluated by comparing them to the NJDEP-ECRA guidance levels. Those levels are specified below:

Parameter	Guidance Level micrograms per liter (ug/L)
Total VOCs	10
Total BNs	50
Total AEs	50
Total PHCs	1,000

As part of the evaluation, the presence, concentration, and distribution of individual constituents and groups of constituents are assessed to delineate any potential plumes or other contamination patterns at the facility. The use of NJDEP-ECRA guidance levels does not imply cleanup criteria for the facility. Instead, the levels are used to help identify and delineate areas and/or conditions of concern.

Ground-Water Sampling and Analysis Program

Tables 24 through 30 summarize the ground-water quality data from both the ECRA Sampling Plan Investigation (Tables 24 through 26) and the Revised ECRA Sampling Plan Investigation (Tables 27 through 30). The monitoring well purging and sampling data for the Revised ECRA Sampling Plan Investigation are included in Appendix G. The analytical data reports for the Revised ECRA Sampling Plan Investigation (prepared by ERI) are submitted with this report under separate cover. The analytical data for the Preliminary Investigation and the ECRA Sampling Plan Investigation were submitted previously to the NJDEP.

A summary of the constituents detected in samples from monitoring wells, including total TID compounds, is presented on Figure 13. That figure is designed to facilitate a comparison of the two rounds of ground-water sampling and analysis data. Figures 14 and 15 present the detected concentrations of toluene and phenol in ground water, respectively.

This discussion is based primarily on the results shown on Figure 13. To facilitate this presentation and discussion of the ground-water analytical data, the following conventions have been adopted:

- The reported concentrations of chemical constituents are rounded to the nearest whole unit.

- The "J" qualified concentration values (i.e. estimated values which are less than the detection limit) are included in the sum of a group of compounds and are presented in this text without the qualifier.

- Because the total VOCs reported for each monitoring well sample exceed the NJDEP-ECRA guidance level of 10 ug/L, each VOC is presented and discussed.

- The total BNs for samples from Monitoring Wells MW-2 and MW-4 exceed the NJDEP-ECRA guidance level of 50 ug/L. The PAHs are the primary constituents that contribute to the total BNs when they exceed the guidance level. The BNs are presented and discussed as a group of compounds without reference to individual constituents.

- Phenol is the primary and often the only AE detected. In addition to the total AEs, the analytical results for phenol are presented and discussed.

- For field duplicate samples, the higher concentration values are presented.

The primary constituents of concern in ground water are toluene, phenol and benzene. The highest reported concentration of toluene is 110,000 ug/L detected in the sample from Monitoring Well MW-11. Samples from Monitoring Wells MW-4 and MW-17 contained 100,000 ug/L of toluene. Concentrations of toluene, 64,000 ug/L, 18,000 ug/L, 15,000 ug/L, 12,000 ug/L, and 5,640 ug/L were detected in samples from Monitoring Wells MW-14, MW-6, MW-5, MW-10, and MW-3, respectively.

Toluene was detected at 110 ug/L in one of the samples from Monitoring Well MW-1. Toluene was detected between 100 ug/L and 10 ug/L in the other sample from Monitoring Wells MW-1 and the sample from MW-9, and between 10 ug/L and 1 ug/L (inclusive) in samples from Monitoring Wells MW-2, MW-3D, MW-6D, MW-8, and MW-12.

Toluene was not detected in samples from Monitoring Wells MW-5D, MW-7, MW-15, MW-16, and MW-18.

The highest reported concentration of phenol is 930,000 ug/L, which was detected in the sample from Monitoring Well MW-3D. Samples from Monitoring Wells MW-3 and MW-6 contained 240,000 ug/L and 120,000 ug/L of phenol, respectively, and samples from Monitoring Wells MW-11 and MW-6D contained 54,000 ug/L and 15,000 ug/L, respectively. Phenol was detected at concentrations between 10,000 ug/L and 1,000 ug/L in samples from Monitoring Wells MW-4, MW-12, MW-13, and MW-17, and between 1,000 ug/L and 100 ug/L in Monitoring Wells MW-10 and MW-14. Phenol was detected at concentrations between 100 ug/L and 10 ug/L in samples from Monitoring Wells MW-1, MW-2, MW-5D, and MW-9, and at 10 ug/L or less in samples from Monitoring Wells MW-5 and MW-7. Phenol was not detected in samples from Monitoring Wells MW-8 and MW-16.

The highest reported concentration of benzene is 3,500 ug/L detected in Monitoring Well MW-4. Benzene was detected in the sample from Monitoring Well MW-14 at a concentration of 1,700 ug/L, and in the samples from Monitoring Wells MW-1, MW-9 and MW-10 at concentrations of 1,000 ug/L, 490 ug/L, and 140 ug/L, respectively. Benzene was detected in the samples from Monitoring Wells MW-7 and MW-8 at concentrations of 29 ug/L and 10 ug/L, respectively, and below 10 ug/L in samples from Monitoring Wells MW-2 and MW-6D. Benzene was not detected in samples from Monitoring Wells MW-3, MW-3D, MW-5, MW-5D, MW-6, MW-11, MW-13, MW-15, MW-16, MW-17, and MW-18.

Another constituent of concern is trichloroethene (TCE) which was detected at a maximum concentration of 2,700 ug/L in the sample from Monitoring Well MW-5D. TCE was detected at concentrations of 1,400 ug/L, 900 ug/L, 550 ug/L, and 260 ug/L in samples from Monitoring Wells MW-5, MW-9, MW-18, and MW-16, respectively, and in the sample from Monitoring Well MW-15 at a concentration of 18 ug/L. Trace concentrations, less than 10 ug/L, of trichloroethene were detected in samples from Monitoring Wells MW-3D and MW-6D. Trichloroethene was not detected in samples from Monitoring Wells MW-1,

MW-2, MW-3, MW-4, MW-6, MW-7, MW-8, MW-10, MW-11, MW-13, MW-14, and MW-17.

Trans-1,2-Dichloroethene (DCE) was detected in samples from Monitoring Wells MW-3D (24 ug/L), MW-6D (44 ug/L), MW-9 (32 ug/L), MW-12 (18 ug/L), MW-15 (19 ug/L), and MW-18 (49 ug/L). The reported concentration of DCE in the sample from Monitoring Well MW-16 is 2 ug/L.

Vinyl chloride was detected in samples from Monitoring Wells MW-3D (12 ug/L), MW-9 (20 ug/L), MW-12 (5 ug/L), and MW-18 (24 ug/L). Tetrachloroethene was detected in samples from Monitoring Wells MW-5D (26 ug/L), MW-9 (11 ug/L), MW-12 (9 ug/L), and MW-16 (5 ug/L).

1,1,1-Trichloroethane (TCA) was detected in samples from two monitoring wells MW-5D and MW-16, at concentrations of 80 ug/L and 17 ug/L, respectively. Chloroform was detected in samples from Monitoring Wells MW-8 (1 ug/L) and MW-16 (5 ug/L). 1,1-Dichloroethene was detected in Monitoring Well MW-16, at a concentration of 1 ug/L.

Ethylbenzene was detected in samples from Monitoring Wells MW-1 and MW-9 at concentrations of 15 ug/L and 32 ug/L, respectively. Total xylenes were detected in samples from Monitoring Well MW-1 and MW-9 at concentrations of 26 ug/L and 44 ug/L, respectively. Trace concentrations, less than 10 ug/L, of total xylenes were detected in samples from Monitoring Wells MW-6, MW-8, and MW-12.

Chlorobenzene was detected in samples from Monitoring Wells MW-2, MW-9, MW-12, and MW-18 at concentrations of 29 ug/L, 19 ug/L, 10 ug/L, and 35 ug/L, respectively. Trace concentrations, less than 10 ug/L, of chlorobenzene were reported for Monitoring Wells MW-1, MW-3D, MW-6D, and MW-8.

The water sample collected from soil boring B-4 during the Preliminary Investigation contained 5,400,000 ug/L of toluene, 68,000 ug/L of benzene, and 12,000 ug/L of methylene chloride. The LNAPL collected from Monitoring Well MW-7 contained 541,000 mg/kg (54 percent) of toluene and 408,900,000 ug/L (41 percent) of PHCs.

Chloride was detected in the sample from Monitoring Well MW-5 at a concentration of 130 milligram/liter (mg/L). Fecal coliform was not detected (0 colonies/100 milliliters) in that sample. Major ions detected in the sample from Monitoring Well MW-3 include sulfate (36,000 mg/L), sodium (4,130 mg/L), iron (2,280 mg/L), and chloride (763 mg/L). Total dissolved solids in that sample were detected at a concentration of 37,400 mg/L. Major and minor ions in ground water will be investigated further as part of the work proposed in the "Sampling Plan Addendum No. 2."

TID VOCs were detected in four samples from monitoring wells during the ECRA Sampling Plan Investigation at concentrations that ranged from 71 ug/L to 4.6 ug/L. TID VOCs were detected in samples from 11 monitoring wells during the Revised ECRA Sampling Plan Investigation at concentrations that ranged from 760 ug/L to 11 ug/L.

TID BNAs were detected in samples from all monitoring wells during the ECRA Sampling Plan Investigation at concentrations from 17,324 ug/L to 48 ug/L and in all but one monitoring well during the Revised ECRA Sampling Plan Investigation at concentrations that ranged from 599,785 ug/L to 53 ug/L. A summary of TID compounds detected in ground-water samples is presented in Appendix F.

An evaluation of the TID compounds detected in ground-water samples from previous investigations together with those that will be detected during the proposed sampling and analysis will be conducted as part of the work proposed in the "Sampling Plan Addendum No. 2." The evaluation will define the classes of compounds and consider their effect on the potential remedial alternatives for the facility.

The results of the ground-water sampling and analysis program indicate the following:

- Toluene, phenol, benzene and TCE are constituents of concern in ground water.

- Toluene is present in ground water throughout the facility. Toluene concentrations up to 110,000 ug/L were detected in ground-water samples from the southern half of the facility. The toluene area of concern for soil, appears to be a source for toluene in ground water. Other potential sources of toluene will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Phenol is present in ground-water throughout the facility. Phenol concentrations up to 930,000 ug/L were detected in samples from monitoring wells along the northern facility boundary. Concentrations of phenol up to 120,000 ug/L were detected in the southern half of the facility. The source(s) of phenol contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- The areas of toluene and phenol contamination in ground water extend to, and probably cross, the northern, southern and western boundaries of the facility. Additional off-site and downgradient monitoring wells will be installed, as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Benzene is present in ground water in the southern half of the facility at a maximum concentration of 3,500 ug/L. The area of benzene contamination in groundwater extends to, and probably crosses, the southern and western facility boundaries. The source(s) of benzene contamination is presently not

known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- TCE and other chlorinated organic compounds are present in ground water at various locations across the facility. The maximum on-site concentration of TCE, 2,700 ug/L, was detected in a sample from a monitoring well located in the southeastern section of the facility. TCE was detected in the sample from an adjacent shallow monitoring well, at a concentration of 1,400 ug/L. TCE was detected in a sample from a monitoring well located in the central section of the facility at a concentration of 550 ug/L. Trace concentrations (less than 10 ug/L) of TCE were detected in ground-water samples from three other monitoring wells across the facility. TCE was detected in an "upgradient" and off-site monitoring well at a concentration of 260 ug/L, and in a downgradient/offsite monitoring well at a concentration of 18 ug/L. The apparent water-table mound in the southeastern section of the facility could be potentially responsible for localized upgradient and off-site contaminant migration. The source(s) of TCE and the chlorinated organic compound contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and resultant elevated detection limits.

- Significant levels (up to 199,785 ug/L) of TID compounds occur in ground water.

- The need for and extent of ground-water remediation will be addressed in the cleanup plan.

Ground-water quality will be investigated further to define better the presence, concentration, distribution and source of constituents of concern both onsite and offsite. As proposed in the "Sampling Plan Addendum No. 2," two rounds of ground-water sampling will be conducted. Samples will be collected from all existing and proposed monitoring wells.

LNAPL and DNAPL Recovery

According to Kalama, the recovery effort in Monitoring Well MW-7 consisted of pumping the LNAPL out on seven occasions during the period of May through November 1988. The LNAPL thickness was measured before and after each pumping event. Prior to the first event, approximately 1 foot of LNAPL was measured, prior to the second event, approximately 0.6 foot was measured; and prior to the third and fourth event, approximately 0.3 foot was measured. The LNAPL thickness after each of the first four pumping events was not measurable with the oil/water interface probe, but a trace amount of LNAPL was observed. Prior and subsequent to the fifth, sixth and seventh event, the LNAPL thickness was not measurable with the oil-water interface probe, but only a trace amount of LNAPL was observed.

During the ECRA Sampling Plan Investigation, a sample of the LNAPL in Monitoring Well MW-7 was collected and analyzed for VOC and BNs plus TID compounds, and total PHCs. That sample was collected in January 1988, prior to the LNAPL recovery effort. Toluene was detected in the sample at a concentration of 541,000 mg/kg, indicating that 54 percent of the mass of the product phase consists of toluene. TID BNAs were detected at a concentration of 222,700 mg/kg (which included TID toluene at a concentration of 150,000 mg/kg). The total PHC concentration was reported as 408,900,000 ug/L. The PHC concentrations might have been affected by the presence of toluene. Toluene was not detected at a detection limit of 5 ug/L in the sample collected from Monitoring Well MW-7 during the Revised ECRA Sampling Plan Investigation (April 1991), but total PHCs were detected at a concentration of 4,100 ug/L in that sample.

According to Kalama, LNAPL was detected in Monitoring Well MW-5. Kalama recovered the LNAPL which was not analyzed but is similar to the LNAPL recovered from Monitoring Well MW-7.

The presence and thickness of free LNAPL and DNAPL were monitored concurrently during the initial nine rounds of water-level measurements for the Revised ECRA Sampling Plan Investigation with an oil/water interface probe. LNAPL was not detected. Monitoring Well MW-5 was the only well that evidenced the presence of DNAPL. A dark-brown DNAPL was detected at the bottom of Monitoring Well MW-5. The DNAPL was observed initially on April 12, 1991. The measured thickness, based on the coating on the probe, was approximately 0.3 feet. On April 20, 1991, a product thickness of 0.4 feet was measured. On April 22, 1991, the well was purged with a suction pump with the intake at about 4 feet above the bottom of the well. Ground water was sampled as part of the regular sampling event in all monitoring wells, but the DNAPL was not sampled. Based on the concentration of constituents in the sample from Monitoring Well MW-5, which contained 1,400 ug/L of TCE, the DNAPL probably contains TCE. Following the ground-water sampling event, product thicknesses of 0.4 feet, 0.5 feet and 0.2 feet were measured on April 25, May 3, and May 17, 1991, respectively.

The presence of non-aqueous phase liquids (LNAPL and DNAPL) will be monitored in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

CONCLUSIONS

1. The Kalama facility in Garfield, New Jersey is an active chemical manufacturing plant which is approximately 100 years old. Historically, the facility manufactured various chemicals, including formaldehyde, benzoic acid, benzaldehyde and salicylic acid under several ownerships. Kalama purchased the facility from Tenneco in December 1982.

2. Approximately 50 percent of the 6.4 acre facility is occupied by buildings and approximately 25 percent of the facility is covered with pavement, primarily asphalt. An extensive network of pipes and structures is present beneath the site surface. As part of the plant operations, tank trucks, tractor trailers and rail cars move around the facility daily. As such, there are extremely congested surface and underground conditions at the facility. These factors complicate the environmental investigative efforts.

3. With the exception of several buildings and the benzoic acid/benzaldehyde production facility which no longer exist, the site surface conditions have changed little over the past 44 years.

4. There are no private or public supply wells within a 0.25-mile radius from the Kalama site. Additional well search activities are proposed in the "Sampling Plan Addendum No. 2."

5. The geology of the Kalama site is characterized by approximately 25 to 35 feet of unconsolidated deposits which are underlain by the Brunswick Formation shales and sandstones. The unconsolidated deposits generally include approximately 3 feet to 8 feet of fill over natural sand, silt, and clay. The lithology of the unconsolidated deposits varies significantly, both horizontally and vertically, across the site.

6. There is a single water-bearing zone in the unconsolidated deposits. The depth to the water table is generally 7 feet to 10 feet below ground surface and increases toward the Passaic River where the ground water discharges. There are tidal effects on ground water in the unconsolidated deposits within approximately 150 feet of the river. The significance of the tidal fluctuations for off-site contaminant migration and potential remedial alternatives for the facility is not understood at this time. Tidal fluctuations will be monitored further in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

7. There is some evidence that the apparent water-table mound in the southeastern section of the facility is a perched water body. The extent to which the anomalous ground-water conditions observed in the southeastern section of the facility impact off-site contaminant migration will be investigated further in accordance with the "Sampling Plan Addendum No. 2."

8. The general direction of ground-water flow is to the west/southwest, toward the Passaic River.

9. The soil hydraulic conductivity, based on slug tests, ranges from 0.3 feet/day (1.2 x 10^{-4} centimeters/second) to 13 feet/day (4.6 x 10^{-3} centimeters/second) with an average of 3 feet/day (1.1 x 10^{-3} centimeters/second). These values are typical for silty and clayey sands, which comprise a significant portion of the soils on the site. The overall ground-water flow gradient across the site is approximately 0.01. The hydraulic conductivity and ground-water flow gradient may range significantly across the site. Geraghty & Miller did not calculate ground-water flow velocities because of the high inhomogeneity of the unconsolidated deposits, the potential presence of preferential pathways, and tidal influences. Those conditions tend to render ground-water flow velocities unreliable for predicting ground-water time of travel.

10. The pumping tests indicate that the water-bearing zone yields variable and relatively low volumes of water to wells (0.5 gallons per minute and 3 gallons per minute). The results of the pumping tests are inconclusive. An additional pumping test will be conducted in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

11. The results of the post-excavation soil sampling and analysis program indicate the following:

- The locations of the former methanol, methyl isobutyl ketone and hexene USTs are not areas of concern.

- The former toluene, fuel oil and gasoline USTs appear to have been sources of soil contamination. Toluene was detected in post-excavation soil samples at concentrations up to 805 milligrams/kilogram (mg/kg). Total petroleum hydrocarbons (PHCs) were detected in concentrations up to 24,000 mg/kg. The locations of the former toluene, fuel oil and gasoline USTs are areas of concern.

- The UST excavations were partially backfilled with the excavated soils. Soil contamination associated with the former toluene, fuel oil and gasoline USTs will be addressed in the cleanup plan.

12. The results of the soil boring sampling and analysis program indicate the following:

- Constituents, including toluene, benzene, total polycyclic aromatic hydrocarbons (PAHs), and total PHCs exceed the NJDEP-ECRA guidance levels by a significant margin at several soil sampling locations.

  - Toluene was detected in soil at concentrations up to 20,000 mg/kg.

  - Benzene was detected in soil at concentrations up to 80 mg/kg.

  - Total PAHs were detected in soil at concentrations up to 71 mg/kg.

  - Total PHCs were detected in soil at concentrations up to 4,670 mg/kg.

- The southeastern section of the facility, which includes the locations of the former toluene USTs and former production facilities that used benzene and

toluene, is an area of concern because of the high concentrations of toluene, benzene and PAHs in soil. The major portion of this area of concern extends 250 feet south of the location of the former toluene USTs. Sources other than the former USTs, such as spills and leaks, probably contributed to the toluene contamination in soil.

- Total PHCs were detected at high concentrations throughout the facility and therefore are a constituent of concern in soil.

- Polychlorinated biphenyls (PCBs) and metals are not constituents of concern at the facility.

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and associated elevated detection limits.

- Significant levels (up to 15,150 mg/kg) of tentatively identified (TID) compounds occur in soil.

- Additional soil sampling is proposed in the "Sampling Plan Addendum No. 2."

- The need for, and extent of, soil remediation will be addressed in the cleanup plan.

13. The results of the ground-water sampling and analysis program indicate the following:

- Toluene, phenol, benzene, and trichloroethane (TCE) are constituents of concern in ground water.

- Toluene is present in ground water throughout the facility. Toluene concentrations up to 110,000 micrograms/liter were detected in ground-water samples from the southern half of the facility. The toluene area of concern for soil appears to be one of the source areas for toluene in ground water. Other potential sources of toluene contamination will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Phenol is present in ground water throughout the facility. Phenol concentrations up to 930,000 ug/L were detected in samples from monitoring wells along the northern facility boundary. Concentrations of phenol up to 120,000 ug/L were detected in the southern half of the facility. The source(s) of phenol contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- The areas of toluene and phenol contamination in ground water extend to, and probably cross, the northern, southern and western boundaries of the facility. Additional off-site and downgradient monitoring wells will be installed as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Benzene is present in ground water in the southern half of the facility at a maximum concentration of 3,500 ug/L. The area of benzene contamination in ground water extends to, and probably crosses, the southern and western facility boundaries. The source(s) of benzene contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- TCE and other chlorinated organic compounds are present in ground water at various locations across the facility. TCE was detected onsite in ground water at concentrations up to 2,700 ug/L in the southeastern section of the

facility. TCE was detected "upgradient" in an off-site monitoring well at a concentration of 260 ug/L. The apparent water-table mound in the southeastern section of the facility could be responsible for this apparent upgradient and off-site contaminant migration. TCE was detected downgradients/offsite at a concentration of 18 ug/L. The source(s) of TCE and the chlorinated organic compound contamination presently is not known but will be investigated as part of the work proposed in the "Sampling Plan Addendum No. 2."

- Because of the high concentrations of certain constituents, samples were diluted to facilitate laboratory analysis. Other constituents potentially present may not have been detected due to sample dilution and associated elevated detection limits.

- Significant levels (up to 599,785 ug/L) of TID compounds occur in ground water.

- The need for, and extent of, ground-water remediation will be addressed in the cleanup plan.

14. The presence of non-aqueous phase liquids will continue to be monitored in accordance with the work proposed in the "Sampling Plan Addendum No. 2."

15. A dense, non-aqueous phase liquid, which probably contains TCE, was detected at the bottom of one monitoring well located in the southeastern corner of the facility. The presence, nature, extent, and source of this non-aqueous phase liquid will be investigated further in accordance with work proposed in the "Sampling Plan Addendum No. 2."

16. A feasible and effective cleanup plan can only be developed after completion of additional investigative work. Geraghty & Miller recommends that the work proposed in the "Sampling Plan Addendum No. 2" be implemented.

RECOMMENDATIONS

Based on the data presented and evaluated in this report, Geraghty & Miller recommends that an additional investigation be conducted in accordance with the "Sampling Plan Addendum No. 2" prior to submitting a cleanup plan to the NJDEP. The additional investigation proposed includes the following:

- Inspection of building interiors.
- Asbestos inspection.
- Installation of additional monitoring wells including off-site wells.
- Sampling and analysis of soil and ground-water.
- Survey of underground utilities.
- Pumping test.
- Investigation of the apparent water-table mound.
- Evaluation of LNAPL, DNAPL and TID compounds.

Geraghty & Miller anticipates that a cleanup plan will be submitted with the report on the additional investigative work.

CM:nr:lmm:ae/dh
NJ03602/report.kal

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Geraghty & Miller, Inc., 1986. Preliminary Investigation of Soil Quality Conditions at the Kalama Chemical, Inc. Facility in Garfield, New Jersey.

Geraghty & Miller, Inc., 1987. Sampling Plan for Site Evaluation, Kalama Chemical, Inc. Facility, Garfield, New Jersey.

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Geraghty & Miller, Inc., 1989. Sampling Plan Addendum, Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Geraghty & Miller, Inc., 1990. Revised Sampling Plan Addendum, Kalama Chemical, Inc. Facility, Garfield, New Jersey.

Table 1. Historic and Current Use of Facility Buildings, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
1	1900	Boiler house, originally coal, changed to No. 6 Fuel Oil in 1940s.
2	1900	Originally offices, later cafeteria, demolished in 1990.
3	1900	Methyl Salicylate production (1950–1969), waste acid neutralization (1970–1988), demolished in 1988.
4	1903	Methyl Salicylate drumming and storage.
7	1900	Copper/Sheet Metal Shop (maintenance).
8	1900	Formaldehyde distillation (1900–1982), vacant since 1982.
9	1945	Scale house, locker room, lunchroom.
10A (39A)	1922 (1977)	Building 10A demolished in 1977, replaced by Building 39A. Salicylic and Parahydroxybenzoic Acid production (1922–1965), vacant (1965–1977), Methyl Salicylate distillation and Methanol storage (1977–1991).
10B, C, D	1922	Salicylic and Parahydroxybenzoic Acid production (1922–1965), storage of Sodium Salicylate and Salicylic Acid (1965–1991).
10E	1915	Sodium and Potassium Salicylate production (1915–1965), Methylene Disalicylic Acid production on second floor (1965–1991), storage of filters and drums on first floor (1965–1991).
10F	1915	Benzyl, Benzoin and Propyl Gallate production (1968), Methylene Disalicylic Acid and Parasepts production (1965–1991).

The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long–time employees.

Table 1. Historic and Current Use of Facility Buildings, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
10G	1907	Kettle room, Parahydroxybenzoic Acid storage and production (1965–1991).
10H	1907	Boiler room (1907–1965), vacant (1965–1991).
10M	1921; 1968	Salicylic Acid production (1921–1965), destroyed by explosion in 1965, rebuilt in 1968, Parasepts production (1968–1991), pharmaceutical grade Benzoic Acid production (1968–1991).
10N (39)	1922 (1977)	Building 10N demolished in 1977, replaced by Building 39, B–Oxynaphthoic Acid production (1950–1965), Methyl Salicylate and drum packaging (1977–1991).
10O	1915	Storage of Parasepts and other drums (1960–1991).
10P1, P2, P3, P4	1924	Raw material storage including Potassium Hydroxide, Sodium Salicylate, Caustic Soda and Phenol. Building 10P3 houses a freon chiller (1924–1991).
10P5	1942	Research laboratory (1942–1963), Benzoic Acid production control center (1963–1982), vacant (1982–1989), instrument shop (1989–1991).
10Q1	1929	Raw material storage, kettle room for Salicylic Acid (1929–1991).
10Q2	1924	Kettle room for Salicylic Acid (1924–1991).
10R	1929	Lockers and Salicylic Acid storage (1924–1991).
10S	1929	Kettle room for Salicylic Acid, and Soda Ash storage (1929–1991).

The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long–time employees.

Table 1. Historic and Current Use of Facility Buildings, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
10T	1942	Resorcinol production (1942–1951), Sodium Benzoate, Benzoic Acid and Benzaldehyde production (1960–1984), vacant (1984–1991).
11	pre–1940	Naphthalene distillation (1950–1965), vacant (1965–1991).
12	1922	Para–formaldehyde production (1930s–1982), vacant (1982–1990), drum storage and electrical shop (1990–1991).
16	1916	Warehouse (1916–1987), partially rented (1987–1990), warehouse (1990–1991).
17	1928	Laboratory (1928–1991), pilot plant (1940s–1969), partially rented.
18	1942	Maintenance shop.
20, 20A	1917	Research laboratory (1917–1967), maintenance office (1967–1991).
21	unknown	Meterhouse.
22A, 22B	1941	Garages (1941–1960s), product storage (1960s–1991).
23	1944	Garage, drum storage (1944–1991).
25	1916	Carpentry shop.
29	pre–1940	Laboratory.

The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long–time employees.

Table 1. Historic and Current Use of Facility Buildings, Kalama Chemical, Inc., Garfield, New Jersey.

Building No.	Date Constructed (approx.)	Historic and Current Use
30	1929	Spare parts stock room and maintenance shop (1929–1991).
31	1929	Formaldehyde production (1929–1982), vacant (1983–1991).
32	1941	Formaldehyde production (1941–1982), vacant (1983–1991).
32A	1941	Formaldehyde production (1941–1982), vacant (1982–1991).
32B	1941	Parasepts production (1941–1991) Nuosperse HOH, Nuvis HS, Pentamids, Jet Lube, DDSA production (1941–1970s).
33, 33A, 33B	1941	Pentaerythritol production (1941–1960), Fumaric Acid production (1961–1983), warehouse and shipping (1984–1991).
34	1941	Offices and document storage (1941–1991).
35	unknown	Pumphouse (river water).
36	1945	Pentaerythritol production (1945–1960), Formic Acid production (1945–1968), Salicylic Acid, Sodium, Potassium and Magnesium Salicylate production (1969–1991).
36A	1968	Salicylic Acid sublimer and warehouse (1968–1991).
37	1970's	Benzaldehyde drumming (1970s–1984), demolished in 1990.
38	unknown	Battery charging, demolished in 1988.
39A, 39	1977	Replaced Buildings 10A and 10N. Methyl Salicylate production and storage (1977–1991). See descriptions for Buildings 10A and 10N.

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The information on this table was researched by Kalama. It is based on a review of historical records and discussions with long–time employees.

Table 2. Summary of the Sampling and Analysis Program for the 1986 Preliminary Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Matrix	Boring Number	Sample Number	Sample Depth (1)	VOCs	BNs	AEs	Total Phenolics	Total PHCs	Benzoic Acid	Benzaldehyde	Formaldehyde	Alcohols
Soil	B-1	B-1	2-4	x	--	--	--	x	--	--	--	--
	B-2	B-2	8-10	x	x	x	--	x	--	--	--	x
	B-3	B-3	4-6	x	x	x	x	x	--	x	x	--
	B-4	B-4	2-4	x	--	--	--	--	--	x	--	--
		B-4 comp(2)	0-8	--	x	x	--	x	x	--	--	--
	B-5	B-5	4-6	x	--	--	--	--	--	--	x	x
		B-5 comp(2)	4-8	--	x	x	x	x	--	--	--	--
Aqueous	B-4	B-4	2.5	x	--	--	--	--	--	--	--	--

(1) Feet below ground surface.

(2) Composite samples.

x Tested.

-- Not tested.

NJ03402-1/tab61

Table 3. Summary of the Soil Sampling and Analysis Program for the 1987–1988 ECRA Sampling Plan Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Matrix	Boring Number	Sample Number	Sample Depth (1)	VOCs + 15	BNs + 15	Total PHCs	Total Phenolics	Benzoic Acid	Benzaldehyde
Soil	S–1 (MW–7)	S–1	7–9	--	x	x	x	--	--
		S–1	9–11	x	--	--	--	--	--
	S–2	S–2	2–4	x	x	x	x	x	x
	S–3 (MW–1)	S–3	2.5–4.5	--	x	x	x	--	--
		S–3	8.5–10.5	x	--	--	--	--	--
	S–4	S–4	1–1.5	--	x	x	x	--	--
		S–4	3–3.5	x	--	--	--	--	--
	S–5	S–5	0.5–2.5	--	x	x	x	--	--
		S–5	2.5–4.5	x	--	--	--	--	--
	S–6	S–6	1–3	--	x	x	x	--	--
		S–6	3–5	x	--	--	--	--	--
	S–7	S–7	2–4	x	x	x	x	--	--
	S–8	S–8	2.5–4.5	--	x	x	x	x	x
		S–8	6.5–8.5	x	--	--	--	--	--
	S–9	S–9	2.5–3	--	x	x	x	--	--
		S–9	3–3.5	x	--	--	--	--	--
	S–10	S–10	2.5–4.5	x	x	x	x	--	--
	S–11	S–11	1–3	--	x	x	x	--	--
		S–11	5–7	x	--	--	--	--	--
	S–12	S–12	1.5–3.5	x	x	x	x	--	--
	S–13 (MW–5)	S–13	2–4	--	--	--	--	x	x
Aqueous	Field Blank	FB–1		x	--	--	--	--	--

(1) Feet below ground surface.
x Tested.
-- Not tested.
(MW–7) Monitoring well number. Indicates that the soil boring was converted into a monitoring well.

NJ0302–1/tab882

Table 4. Summary of the Ground-Water Sampling and Analysis Program for the 1987-1988 ECRA Sampling Plan Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Matrix	Monitoring Well Number	Sample Number	Monitoring Well Screened Interval(1)	VOCs + 15	BNs + 15	Total PHCs	Total Phenolics	Major Ions	Benzoic Acid	Benzaldehyde	Formaldehyde	Methanol
Aqueous	MW-1	MW-1	6-21	x	x	x	x	--	--	--	x	x
	MW-1	MW-8 (Duplicate)	6-21	x	x	x	x	--	--	--	--	--
	MW-2	MW-2	5.5-15.5	x	x	x	x	--	--	--	--	x
	MW-3	MW-3S	5-15	x	x	x	x	x	--	--	--	x
	MW-3D	MW-3D	35-40	x	x	x	x	--	--	--	--	--
	MW-4	MW-4	1-16	x	x	x	x	--	--	x	--	--
	MW-5	MW-5	4-19	x	x	x	x	--	--	x	--	--
	MW-6	MW-6S	5.5-21.5	x	x	x	x	--	--	--	--	--
	MW-6D	MW-6D	26.5-31.5	x	x	x	x	--	--	--	--	--
	MW-7	MW-7 (2)	6-26	x	x	x	--	--	--	--	--	--
Aqueous	Field Blank	Field Blank		x	--	--	--	--	--	--	--	--
	Trip Blank	Trip Blank		x	--	--	--	--	--	--	--	--

(1) Feet below ground surface.
(2) Floating product sample.
x Tested.
-- Not tested.
Duplicate Field duplicate sample MW-8, as designated on the chain-of-custody, is identified as MW-1 (Duplicate) in this report.

NJ03602-1/ta1873

Table 5. Summary of the Soil Sampling and Analysis Program for the 1991 Revised ECRA Sampling Plan Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Matrix	Boring Number	Sample Number	Sample Depth (1)	VOCs+15	BNs+15	AEs + 10	PCBs	Total Phenolics	Metals (2)	Total PHCs	Methanol	Toluene	Hexene	pH
Soil	B-1	B-1	4.0-5.0	---	---	---	---	---	---	---	---	x	---	---
	B-2	B-2	2.0-2.7	x	---	---	---	---	---	x	---	---	---	---
	B-3	B-3	2.3-2.9	---	---	---	---	---	---	---	---	x	---	---
	B-4	B4-01	4.0-6.0	x	---	---	---	---	---	x	---	---	---	---
		B4-02	8.0-9.0	x	---	---	---	---	---	x	---	---	---	---
	B-5	B5-01	4.0-5.0	x	---	---	---	---	---	x	---	---	---	---
		B5-02	8.0-9.7	x	---	---	---	---	---	x	---	---	---	---
	B-6	B6-01	4.0-5.0	x	x(4)	---	---	x	---	x	---	---	---	---
		B6-02(D)	4.0-5.0	x	x	---	---	x	---	x	---	---	---	---
	B-7	B-07-01	0.8-1.4	x	x	---	---	x	---	x	---	---	---	---
		B-07-02	6.0-7.9	x	x	---	---	x	---	x	---	---	---	---
	B-8	B-08-01	4.0-6.0	x	x(4)	---	---	x	---	x	---	---	---	---
	B-9	B-09-01	6.0-8.0	x	x	---	---	x	---	x	---	---	---	---
	B-10	B-10-01	4.0-4.5	---	---	---	---	---	---	x	---	---	---	---
	B-11	B-11-01	6.3-8.0	---	---	---	---	---	---	x	---	---	---	---
	B-12	B-12-01	6.0-8.0	---	---	---	---	---	---	x	---	---	---	---
	B-13	B-13-01	6.0-7.0	x	---	---	---	---	---	x	---	---	---	---
	B-14	B-14-01	4.0-4.8	x	---	---	---	---	---	x	---	---	---	---
		B-14-02	6.0-7.4	x	---	---	---	---	---	x	---	---	---	---
	B-15	B-15-01	3.0-3.5	x	---	---	---	---	---	x	---	---	---	---
	B-16	B-16-01	3.2-3.8	x	---	---	---	---	---	---	---	---	---	---
	B-17	NS	NS	---	---	---	---	---	---	---	---	---	---	---
	B-18	B-18-01	3.0-3.5	x	---	---	---	---	---	x	---	---	---	---
	B-19	B-19-01	2.0-2.6	x	---	---	---	---	---	x	---	---	---	---
	B-20	B-20-01	0.5-2.0	x	---	---	---	---	---	x	---	---	---	---
		B-20-02	2.0-2.8	x	---	---	---	---	---	x	---	---	---	---
	B-21	NS	NS	---	---	---	---	---	---	---	---	---	---	---
	B-22	B-22-01	0.9-1.7	x	---	---	---	---	---	x	---	---	---	---
	B-23	B-23-01	2.0-2.4	---	---	---	---	---	---	---	---	---	x	---
	B-24	B-24-01	3.0-3.6	---	---	---	---	---	---	---	---	---	x	---
	B-25	B-25-01	2.0-3.0	---	---	---	---	---	---	---	---	---	x	---
	B-26	B-26-01	1.5-2.0	x	x(4)	---	---	---	---	x	---	---	---	---
	B-27	B-27-01	1.0-1.8	x	---	---	---	---	---	x	---	---	---	---
	B-28	B-28-01	6.0-7.8	---	---	---	---	---	---	x	---	---	---	---
	B-29	B-29-01	6.0-7.4	---	x	---	---	---	---	x	---	---	---	---

Notes are presented on Page 2.

Table 5. Summary of the Soil Sampling and Analysis Program for the 1991 Revised ECRA Sampling Plan Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Matrix	Boring Number	Sample Number	Sample Depth (1)	VOCs+15	BNs+15	AEs + 10	PCBs	Total Phenolics	Metals (2)	Total PHCs	Methanol	Toluene	Hexene	pH
	B-30	B-30-01	8.0-9.2	---	---	---	---	---	---	x	---	---	---	---
	B-31	B-31-01	6.0-7.0	---	---	---	---	---	---	x	---	---	---	---
	B-32	B-32-01	0.6-1.1	---	x	---	---	---	x	x	---	---	---	---
	B-33	B-33-01	4.0-4.3	---	x(4)	---	---	---	x	x	---	---	---	---
	B-34	B-34-01	4.0-4.9	---	x(4)	---	---	---	x	x	---	---	---	---
	B-35	B-35-01	4.0-4.4	---	x(4)	---	---	---	x	x	---	---	---	---
	B-36	B-36-01	6.0-6.9	---	---	---	---	---	---	---	x	---	---	---
	B-37	B-37-01	6.0-6.5	---	---	---	---	---	---	---	x	---	---	---
	B-38	B-38-01	4.0-5.0	---	---	---	---	---	---	---	x	---	---	---
		B-38-02(D)	4.0-5.0	---	---	---	---	---	---	---	x	---	---	---
	B-39	B-39-01	6.0-8.0	---	---	---	---	---	---	x	x	---	---	---
	B-40	B-40-01	4.0-6.0	---	x(4)	---	---	---	---	x	---	---	---	---
	B-41	B-41-01	1.5-2.0	---	---	---	x	---	---	x	---	---	---	---
	B-42	B-42-01	0.2-0.6	---	x	---	x	---	---	x	---	---	---	---
	B-43	B-43A	0.8-1.3	---	x	x	---	---	---	x	---	---	---	x
		B-43B	2.3-2.8	x(3)	---	---	---	---	---	---	---	---	---	---
	B-44	B-44-01	0.3-0.8	---	---	---	x	---	---	x	---	---	---	---
		B-44-02 (D)	0.3-0.8	---	---	---	x	---	---	x	---	---	---	---
	B-45	B-45A	0.6-1.1	---	x	x	---	---	---	x	---	---	---	x
		B-45B	2.1-2.6	x(3)	---	---	---	---	---	---	---	---	---	---
	B-46	B-46-01	1.0-1.5	---	---	---	x	---	---	x	---	---	---	---
Aqueous	Field Blank	FB-01-18-91		x	x	---	---	x	---	x	---	---	---	---
	Trip Blank	TB-01-18-91		x	---	---	---	---	---	---	---	---	---	---
	Field Blank	FB-01-21-91		x	x	---	---	x	---	x	---	---	---	---
	Trip Blank	TB-01-21-91		x	---	---	---	---	---	---	---	---	---	---
	Field Blank	FB-01-22-91		x	---	---	---	---	---	x	---	---	---	---
	Field Blank	FB-01-23-91		x	---	---	---	---	---	x	---	---	x	---
	Field Blank	FB-01-24-91		x	x	---	---	---	---	x	---	---	x	---
	Field Blank	FB-01-25-91		---	x	---	---	---	x	x	---	---	---	---
	Field Blank	FB-01-28-91		---	x	---	x	---	---	x	x	---	---	---
	Field Blank	FB-01-30-91		x(3)	x	x	x	---	---	x	---	---	---	---

(1) Feet below ground surface.
(2) Includes arsenic, beryillium, cadmium, and vanadium.
(3) Library search was not performed.
(4) Analyzed for polycyclic aromatic hydrocarbons (PAHs) only.
(D) Field duplicate sample.
NS Not sampled due to poor recovery and/or recovery not appropriate for analysis.

Soil samples which were analyzed for BNs+15, were also analyzed for total PHCs.
If the total PHC concentrations exceeded 500 ppm, clean up methods 3611 and 3650 were employed.

Table 6. Summary of the Ground-Water Sampling and Analysis Program for the 1991 Revised ECRA Sampling Plan Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Matrix	Monitoring Well Number	Sample Number	Monitoring Well Screened Interval (1)	VOCs+15	BNAs+25	Total Phenolics	Total PHCs	Benzaldehyde	Chloride	Fecal Coliform
Aqueous	MW-1	MW-1	6.0-21.0	x	x	---	---	---	---	---
	MW-1	MW-22 (Duplicate)		x	---	---	---	---	---	---
	MW-2	MW-2	5.5-15.5	x	x	---	---	---	---	---
	MW-2	MW-24 (Duplicate)		x	---	---	---	---	---	---
	MW-3	MW-3	5.0-15.0	x	x	x	---	---	---	---
	MW-3D	MW-3D	35.0-40.0	x	x	x	---	---	---	---
	MW-4	MW-4	1.0-16.0	x	x	x	---	x	---	---
	MW-5	MW-5	4.0-19.0	x	x	---	---	---	x	x
	MW-5D	MW-5D	25.0-35.0	x	x	---	---	x	---	---
	MW-6	MW-6	5.5-20.5	x	x	---	---	---	---	---
	MW-6D	MW-6D	26.5-31.5	x	x	---	---	---	---	---
	MW-7	MW-7	6.0-26.0	x	x	---	x	---	---	---
	MW-8	MW-8	5.0-25.0	x	x	---	---	---	---	---
	MW-9	MW-9	6.0-26.0	x	x	x	x	---	---	---
	MW-10	MW-10	3.0-23.0	---	x	x	---	x	---	---
	MW-10	MW-23	3.0-23.0	x	---	---	---	---	---	---
	MW-11	MW-11	5.0-25.0	x	x	---	---	x	---	---
	MW-12	MW-12	5.0-25.0	x	x	---	x	---	---	---
	MW-13	MW-13	2.5-12.5	x	x	---	x	---	---	---
	MW-14	MW-14	3.0-18.0	x	x	x	---	---	---	---
	MW-15	MW-15	5.0-25.0	x	x	---	---	---	---	---
	MW-16	MW-16	10.0-30.0	x	x	---	---	---	---	---
	MW-17	MW-17	2.0-22.0	x	x	---	---	---	---	---
	MW-18	MW-18	4.0-24.0	x	x	---	---	---	---	---
	Field Blank	FB-001		x	x	x	---	---	---	---
	Trip Blank	TB-001		x	---	---	---	---	---	---
	Field Blank	FB-04-23-91		x	x	---	---	x	---	---
	Trip Blank	TB-004		x	---	---	---	---	---	---
	Trip Blank	TB-003		x	---	---	---	---	---	---
	Field Blank	FB-102		x	x	x	x	x	x	---
	Trip Blank	TB-002		x	---	---	---	---	---	---
	Field Blank	FB-101		x	x	x	x	x		

Duplicate — Field duplicate samples MW-22 and MW-24, as designated on the chain-of-custody, are identified as MW-1 (Duplicate) and MW-2 (Duplicate), respectively, in this report.

(1) — Monitoring well screened interval is presented in feet below ground surface.

x — Tested.

--- — Not tested.

Sample MW-23, as designated on the chain-of-custody, is identified as MW-10 in this report.

NJ03602-1/table.cik

Table 7. Summary of Wells Located Within a One-Half Mile Radius of the Site, Kalama Chemical, Inc., Garfield, New Jersey.

Well No.	Well Location	Well Owner	Type of Well	Owners Well I.D.		NJDEP Permit No.	Date of Installation	Depth of Well (ft)
1	Pantasote, 26 Jefferson Street, Passaic	Dundee Water Power and Land Co.	ND	ND		ND	NI	
2	The Okonite Co., 1940 Canal St., Passaic	Dundee Water Power and Land Co.	MW	BMW-1		2613118-8	5/20/88	20
3	Tuck Ind., 1 Market Street, Passaic	Dundee Water Power and Land Co.	ND	ND	ND	ND	ND	
4	Passaic Ind., 90 Dayton Ave, Passaic	Dundee Water Power and Land Co.	ND	ND	ND	ND	ND	
5	Main Street and Midland Ave, Wallington	Borough of Wallington	TW	Test Well		26-3608	11/17/65	400
6	125 Clark Street, Garfield	E. C. Electroplating	MW	Well No. 1		26-06544-4	12/29/83	19
7	125 Clark Street, Garfield	E. C. Electroplating	MW	Well No. 2		26-06545-2	12/29/83	19
8	125 Clark Street, Garfield	E. C. Electroplating	MW	Well No. 3		26-06546-1	12/30/89	17
9	125 Clark Street, Garfield	E. C. Electroplating	MW	Well No. 4		26-06547-9	12/30/89	17
10	125 Clark Street, Garfield	E. C. Electroplating	MW	4R		26-6602	03/03/84	19.5
11	125 Clark Street, Garfield	E. C. Electroplating	MW	Well No. 5		26-06548-7	12/30/89	18
12	113 Farnham Ave., Garfield	Yoo-Hoo Beverage	ISW	Well No. 1		26-2067	07/31/59	303
13	520 Main Ave., Wallington	Tube Reducing Corp.	IRW	Well No. 1		26-811	02/22/54	397
14	520 Main Ave., Wallington	Tube Reducing Corp.	IRW	None		26-812A	04/54	392
15	520 Main Ave., Wallington	Tube Reducing Corp.	IRW	None		26-812	04/54	392
16	Passaic and Marsellins Place, Garfield	Most Holy Name Church	PW	None		263410	09/22/65	130
17	Hobart Street, Garfield	City of Garfield	PSW	R-1		26-5331	02/10/82	400
18	Grand and Cambridge Streets, Garfield	NJDEP	PRW	None		26-5149	03/07/81	17
19	Grand Street, Garfield	City of Garfield	ND	5B		26-4010	04/21/67	276
20	541 Midland Ave., Garfield	Joseph Reis	ISW	Well No. 1		26-600	12/10/52	275
21	26 Jefferson Street, Passaic	Pantasote Co.	ISW	Well No. 1		26-3147	05/01/67	400
22	26 Jefferson Street, Passaic	Pantasote Co.	ISW	Well No. 2		26-3147	06/01/66	505
23	26 Jefferson Street, Passaic	Pantasote Co.	ISW	Well No. 3		26-3148	05/01/67	500

Information obtained from NJDEP Bureau of Water Allocation as of January 18, 1990.
Well logs and other information obtained from NJDEP are included in the "Revised Sampling. Plan Addendum, Kalama Chemical, Inc. Facility, Garfield, New Jersey" (Geraghty & Miller, 1990).

MW Monitoring well.
TW Test well.
ISW Industrial supply well.
IRW Industrial recharge well.
PSW Private well (sprinkling system).
PRW Product recovery well.
ND Not determined.

N10302-1/KALWELL

Table 8. Soil Boring and Monitoring Well Borehole Details, Kalama Chemical, Inc., Garfield, New Jersey.

Boring Number	Month and Year of Installation	Ground Surface Elevation	Total Depth (ft)	Bottom Elevation	Depth to Bedrock (ft)	Bedrock Elevation
1986 INVESTIGATION						
B-1	Jun 1986	NM	10	NM	NE	---
B-2	Jun 1986	NM	12	NM	NE	---
B-3	Jun 1986	NM	12	NM	NE	---
B-4	Jun 1986	NM	8	NM	NE	---
B-5	Jun 1986	NM	8	NM	NE	---
1987-1988 INVESTIGATION						
S-1 (MW-7)	Dec 1987	17.56	22	-4.44	NE	---
S-2	Dec 1987	NM	4	NM	NE	---
S-3 (MW-1)	Dec 1987	16.85	22	-5.15	NE	---
S-4	Dec 1987	NM	3.5	NM	NE	---
S-5	Dec 1987	NM	8.5	NM	NE	---
S-6	Dec 1987	NM	8.5	NM	NE	---
S-7	Dec 1987	NM	4	NM	NE	---
S-8	Dec 1987	NM	8.5	NM	NE	---
S-9	Dec 1987	NM	3.5	NM	NE	---
S-10	Dec 1987	NM	4.5	NM	NE	---
S-11	Dec 1987	NM	9	NM	NE	---
S-12	Dec 1987	NM	5.5	NM	NE	---
S-13 (MW-5)	Dec 1987	17.33	21	-3.67	NE	---
MW-1	Dec 1987	16.85	22	-5.15	NE	---
MW-2	Dec 1987	16.87	17	-0.13	NE	---
MW-3	Dec 1987	19.13	15	4.13	NE	---
MW-3D	Dec 1987	19.23	42	-22.77	36	?17
MW-4	Dec 1987	16.47	17	-0.53	NE	---
MW-5	Dec 1987	17.33	21	-3.67	NE	---
MW-6	Dec 1987	16.64	20.5	-3.86	NE	---
MW-6D	Dec 1987	16.60	32.5	-15.90	30	?13
MW-7	Dec 1987	17.56	22	-4.44	NE	---
1991 INVESTIGATION						
MW-5D	Jan 1991	16.53	36	-19.47	35	?18
MW-8	Apr 1991	23.91	25	-1.09	NE	---
MW-9	Jan 1991	17.14	27	-9.86	NE	---
MW-10	Jan 1991	18.03	23	-4.97	NE	---
MW-11	Jan 1991	17.49	25	-7.51	NE	---
MW-12	Jan 1991	17.42	25	-7.58	NE	---
MW-13	Jan 1991	17.99	17	.99	NE	---
MW-14	Jan 1991	15.78	19	-3.22	NE	---
MW-15	Apr 1991	14.16	25	-10.84	NE	---
MW-16	Apr 1991	27.91	30	-2.09	NE	---
MW-17	Apr 1991	16.67	23	-6.33	NE	---
MW-18	Apr 1991	17.33	24	-6.67	NE	---
MW-4R-A	Jun 1991	NS	18	NS	NE	---
MW-4R-B	Jun 1991	NS	18	NS	NE	---

Notes are presented on Page 2.

Table 8. Soil Boring and Monitoring Well Borehole Details, Kalama Chemical, Inc., Garfield, New Jersey.

Boring Number	Month and Year of Installation	Ground Surface Elevation	Total Depth (ft)	Bottom Elevation	Depth to Bedrock (ft)	Bedrock Elevation
1991 INVESTIGATION (Continued)						
B-1	Jan 1991	NM	6	NM	NE	---
B-2	Jan 1991	NM	8	NM	NE	---
B-3	Jan 1991	NM	8	NM	NE	---
B-4	Jan 1991	NM	10	NM	NE	---
B-5	Jan 1991	NM	10	NM	NE	---
B-6	Jan 1991	NM	6	NM	NE	---
B-7	Jan 1991	NM	10	NM	NE	---
B-8	Jan 1991	NM	8	NM	NE	---
B-9	Jan 1991	NM	10	NM	NE	---
B-10	Jan 1991	NM	8	NM	NE	---
B-11	Jan 1991	NM	10	NM	NE	---
B-12	Jan 1991	NM	8	NM	NE	---
B-13	Jan 1991	NM	8	NM	NE	---
B-14	Jan 1991	NM	8	NM	NE	---
B-15	Jan 1991	NM	8	NM	NE	---
B-16	Jan 1991	NM	8	NM	NE	---
B-17	Jan 1991	NM	4.3	NM	NE	---
B-18	Jan 1991	NM	8	NM	NE	---
B-19	Jan 1991	NM	8	NM	NE	---
B-20	Jan 1991	NM	8	NM	NE	---
B-21	Jan 1991	NM	8	NM	NE	---
B-22	Jan 1991	NM	10	NM	NE	---
B-23	Jan 1991	NM	6	NM	NE	---
B-24	Jan 1991	NM	8	NM	NE	---
B-25	Jan 1991	NM	6	NM	NE	---
B-26	Jan 1991	NM	6	NM	NE	---
B-27	Jan 1991	NM	6	NM	NE	---
B-28	Jan 1991	NM	10	NM	NE	---
B-29	Jan 1991	NM	8	NM	NE	---
B-30	Jan 1991	NM	10	NM	NE	---
B-31	Jan 1991	NM	10	NM	NE	---
B-32	Jan 1991	NM	10	NM	NE	---
B-33	Jan 1991	NM	10	NM	NE	---
B-34	Jan 1991	NM	10	NM	NE	---
B-35	Jan 1991	NM	8	NM	NE	---
B-36	Jan 1991	NM	10	NM	NE	---
B-37	Jan 1991	NM	8	NM	NE	---
B-38	Jan 1991	NM	7.4	NM	NE	---
B-39	Jan 1991	NM	10	NM	NE	---
B-40	Jan 1991	NM	8	NM	NE	---
B-41	Jan 1991	NM	2	NM	NE	---
B-42	Jan 1991	NM	0.5	NM	NE	---
B-43	Jan 1991	NM	2.8	NM	NE	---
B-44	Jan 1991	NM	0.8	NM	NE	---
B-45	Jan 1991	NM	2.5	NM	NE	---
B-46	Jan 1991	NM	1.5	NM	NE	---

NE Not encountered.
NS Not surveyed.
? The reported depth to bedrock is based on the recovery in the split-spoon sampler.
Elevations are reported in feet, mean sea level (msl) datum.

NJ03602-1tab.bwd

Table 9. Monitoring Well Construction Details, Kalama Chemical, Inc., Garfield, New Jersey.

Well Number	Top of Monitoring Zone		Bottom of Monitoring Zone		Type of Well	Diameter of Well (in)	Screen Length (ft)	Strata Monitored
	Depth (ft)	Elevation	Depth (ft)	Elevation				
1987–1988 INVESTIGATION								
MW–1	6	10.85	21	–4.15	UW	4	15	Fill/Unconsolidated
MW–2	5.5	11.37	15.5	1.37	UW	4	10	Fill/Unconsolidated
MW–3	5	14.13	15	4.13	UW	4	10	Fill/Unconsolidated
MW–3D	35	–15.77	40	–20.77	UW	4	5	Unconsolidated
MW–4	1	15.47	16	0.47	UW	4	15	Fill/Unconsolidated
MW–5	4	13.33	19	–1.67	UW	4	15	Fill/Unconsolidated
MW–6	6	10.64	21	–4.36	UW	4	15	Fill/Unconsolidated
MW–6D	27	–10.40	32	–15.40	UW	4	5	Unconsolidated
MW–7	6	11.56	21	–3.44	UW	4	15	Fill/Unconsolidated
1991 INVESTIGATION								
MW–5D	25	–8.47	35	–18.47	UW	4	10	Unconsolidated
MW–8	5	18.91	25	–1.09	UW	4	20	Fill/Unconsolidated
MW–9	6	11.14	26	–8.86	UW	4	20	Fill/Unconsolidated
MW–10	3	15.03	23	–4.97	UW	4	20	Fill/Unconsolidated
MW–11	5	12.49	25	–7.51	UW	4	20	Fill/Unconsolidated
MW–12	5	12.42	25	–7.58	UW	4	20	Fill/Unconsolidated
MW–13	2.5	15.49	12.5	5.49	UW	4	10	Fill/Unconsolidated
MW–14	3	12.78	18	–2.22	UW	4	15	Fill/Unconsolidated
MW–15	5	9.16	25	–10.84	UW	4	20	Fill/Unconsolidated
MW–16	10	17.91	30	–2.09	UW	4	20	Fill/Unconsolidated
MW–17	2	14.67	22	–5.33	UW	4	20	Fill/Unconsolidated
MW–18	4	13.33	24	–6.67	UW	4	20	Fill/Unconsolidated
MW–4R–A	2	NS	8	NS	UW	2	6	Fill/Unconsolidated
MW–4R–B	12	NS	16	NS	UW	2	6	Unconsolidated

Elevations are reported in feet, mean sea level (msl) datum.

UW Unconsolidated well.

NS Not surveyed.

NJ03402-1\tbl 2\m

Table 10. Summary of Ground–Water Elevations, Kalama Chemical, Inc., Garfield, New Jersey.

	Reference Elevation (Top of PVC Riser)	April 10, 1991		April 12, 1991		April 20, 1991	
		Depth to Water (ft)	Water Table Elevation	Depth to Water (ft)	Water Table Elevation	Depth to Water (ft)	Water Table Elevation
MW–1	18.04	10.30	7.74	10.32	7.72	10.54	7.50
MW–2	16.59	8.07	8.52	8.05	8.54	7.77	8.82
MW–3	20.50	9.43	11.07	9.42	11.08	9.36	11.16
MW–3D	21.23	13.43	7.80	13.44	7.79	13.47	7.76
MW–4	17.94	4.31	13.63	4.40	13.54	4.25	13.69
MW–5	19.55	8.53	11.02	8.56	10.99	8.66	10.89
MW–5D	16.25	4.81	11.44	4.84	11.41	5.01	11.24
MW–6	18.01	11.08	6.93	11.07	6.94	11.07	6.94
MW–6D	18.89	12.26	6.63	12.33	6.56	12.15	6.74
MW–7	18.61	8.01	10.60	7.99	10.62	7.78	10.83
MW–8	23.51	12.29	11.22	12.35	11.16	12.35	11.16
MW–9	17.14	6.43	10.71	6.53	10.61	7.59	9.55
MW–10	19.91	9.99	9.92	10.00	9.91	10.25	9.66
MW–11	19.52	11.03	8.49	11.06	8.46	11.17	8.35
MW–12	17.08	9.51	7.57	9.51	7.57	9.17	7.91
MW–13	20.49	9.87	10.62	9.87	10.62	9.81	10.68
MW–14	17.91	10.70	7.21	10.69	7.22	10.84	7.07
MW–15	16.71	14.50	2.21	14.48	2.23	13.53	4.38
MW–16	27.39	16.56	10.83	16.52	10.87	16.64	10.75
MW–17	16.30	5.05	11.25	5.39	10.91	5.53	10.77
MW–18	16.81	8.64	8.17	8.69	8.12	8.59	8.22
Passaic River	5.04	4.93	0.11	4.86	0.18	2.33	2.71

Elevations are reported in feet, mean sea level (msl) datum.

NM Not measured.

N.J03602/Table4ge

Table 10. Summary of Ground–Water Elevations, Kalama Chemical, Inc., Garfield, New Jersey.

	Reference Elevation (Top of PVC Riser)	April 25, 1991		May 3, 1991		May 17, 1991	
		Depth to Water (ft)	Water Table Elevation	Depth to Water (ft)	Water Table Elevation	Depth to Water (ft)	Water Table Elevation
MW–1	18.04	10.17	7.87	10.33	7.71	10.40	7.64
MW–2	16.59	7.69	8.90	7.92	8.67	7.96	8.63
MW–3	20.50	8.89	11.61	9.19	11.31	9.39	11.11
MW–3D	21.23	13.29	7.94	13.05	8.18	13.15	8.08
MW–4	17.94	5.95	11.99	5.99	11.95	6.20	11.74
MW–5	19.55	8.51	11.04	8.38	11.17	5.41	14.14
MW–5D	16.25	4.95	11.30	4.73	11.52	4.79	11.46
MW–6	18.01	10.78	7.23	10.86	7.15	10.94	7.07
MW–6D	18.89	11.89	7.00	11.95	6.94	11.94	6.95
MW–7	18.61	8.43	10.18	18.23	11.38	8.46	10.15
MW–8	23.51	12.21	11.30	12.06	11.45	12.08	11.43
MW–9	17.14	9.10	8.04	6.95	10.19	6.17	10.97
MW–10	19.91	9.79	10.12	9.96	9.95	10.03	9.88
MW–11	19.52	10.89	8.63	10.98	8.54	10.98	8.54
MW–12	17.08	9.18	7.90	8.27	8.81	9.29	7.79
MW–13	20.49	9.40	11.09	9.68	10.81	9.81	10.68
MW–14	17.91	10.42	7.49	10.56	7.35	10.66	7.25
MW–15	16.71	12.68	4.03	13.36	3.35	13.50	3.21
MW–16	27.39	16.48	10.91	16.36	11.03	16.39	11.00
MW–17	16.30	4.53	11.77	4.50	11.80	4.15	12.15
MW–18	16.81	8.37	8.44	8.33	8.48	8.38	8.43
Passaic River	5.04	2.01	3.03	NM	---	2.83	2.21

Elevations are reported in feet, mean sea level (msl) datum.

NM Not measured.

NJ0602/Table4gw

Table 10. Summary of Ground–Water Elevations, Kalama Chemical, Inc., Garfield, New Jersey.

	Reference Elevation (Top of PVC Riser)	May 22, 1991		May 23, 1991	
		Depth to Water (ft)	Water Table Elevation	Depth to Water (ft)	Water Table Elevation
MW–1	18.04	10.56	7.48	10.65	7.39
MW–2	16.59	8.09	8.50	8.11	8.48
MW–3	20.50	9.51	10.99	9.55	10.95
MW–3D	21.23	13.42	7.81	13.72	7.51
MW–4	17.94	6.41	11.53	6.42	11.52
MW–5	19.55	8.53	11.02	5.58	13.97
MW–5D	16.25	4.87	11.38	4.91	11.34
MW–6	18.01	11.05	8.50	11.11	6.90
MW–6D	18.89	12.45	6.44	12.49	6.40
MW–7	18.61	8.96	9.65	9.05	9.56
MW–8	23.51	12.28	11.23	12.34	11.17
MW–9	17.14	6.23	10.91	6.38	10.76
MW–10	19.91	10.19	9.72	10.31	9.60
MW–11	19.52	11.12	8.40	11.14	8.38
MW–12	17.08	9.47	7.61	9.48	7.60
MW–13	20.49	9.92	10.57	9.92	10.57
MW–14	17.91	10.78	7.13	10.85	7.06
MW–15	16.71	14.44	2.27	14.39	2.32
MW–16	27.39	16.60	10.79	16.54	10.85
MW–17	16.30	4.42	11.88	4.71	11.59
MW–18	16.81	8.58	8.23	8.64	8.17
Passaic River	5.04	3.91	1.13	5.59	–0.55

Elevations are reported in feet, mean sea level (msl) datum.
NM Not measured.

NJ03602–1tabin4g

Table 10. Summary of Ground–Water Elevations, Kalama Chemical, Inc., Garfield, New Jersey.

	Reference Elevation (Top of PVC Riser)	May 24, 1991		June 17, 1991	
		Depth to Water (ft)	Water Table Elevation	Depth to Water (ft)	Water Table Elevation
MW–1	18.04	10.63	7.41	10.83	7.21
MW–2	16.59	8.12	8.47	8.11	8.48
MW–3	20.50	9.56	10.94	9.78	10.72
MW–3D	21.23	13.72	7.51	13.86	7.37
MW–4	17.94	6.40	11.54	7.48	10.46
MW–5	19.55	8.58	10.97	9.03	10.52
MW–5D	16.25	4.91	11.34	5.35	10.90
MW–6	18.01	11.11	6.90	11.04	6.97
MW–6D	18.89	12.43	6.46	12.32	6.57
MW–7	18.61	9.02	9.59	8.63	9.98
MW–8	23.51	12.29	11.22	12.79	10.72
MW–9	17.14	6.31	10.83	7.13	10.01
MW–10	19.91	10.26	9.65	10.73	9.18
MW–11	19.52	11.15	8.37	11.28	8.24
MW–12	17.08	9.45	7.63	9.43	7.65
MW–13	20.49	9.91	10.58	10.11	10.38
MW–14	17.91	10.87	7.04	10.86	7.05
MW–15	16.71	14.24	2.47	13.98	2.73
MW–16	27.39	16.55	10.84	17.00	10.39
MW–17	16.30	4.96	11.34	4.96	11.34
MW–18	16.81	8.58	8.23	8.74	8.07
Passaic River	5.04	4.03	1.01	NM	---

Elevations are reported in feet, mean sea level (msl) datum.
NM Not measured.
NJ03402–1/table4g

Table 11. Summary of Hydraulic Conductivities Calculated from Slug Test Data, Kalama Chemical, Inc., Garfield, New Jersey.

Monitoring Well Identification	Type of Test	Hydraulic Conductivity (ft/day)	Average Hydraulic Conductivity (1) (ft/day)
MW-1	Falling Head	0.35	0.34
MW-1	Rising Head	0.32	
MW-2	Falling Head	2.84	3.70
MW-2	Rising Head	4.56	
MW-3D	Falling Head	0.63	0.52
MW-3D	Rising Head	0.40	
MW-5D	Falling Head	2.04	2.03
MW-5D	Rising Head	2.00	
MW-6	Falling Head	2.02	3.77
MW-6	Rising Head	5.53	
MW-6D	Falling Head	0.33	
MW-6D	Rising Head	0.32	0.33
MW-8	Falling Head	1.47	
MW-8	Rising Head	14.54	7.98
MW-10	Falling Head	4.68	
MW-10	Rising Head	2.38	3.53
MW-11	Falling Head	0.46	
MW-11	Rising Head	0.59	0.53
MW-13	Falling Head	0.41	
MW-13	Rising Head	0.59	0.50
MW-14	Falling Head	4.29	
MW-14	Rising Head	4.03	4.16
MW-15	Falling Head	0.64	
MW-15	Rising Head	0.56	0.60
MW-16	Falling Head	9.33	
MW-16	Rising Head	17.42	13.04
MW-18	Falling Head	1.00	
MW-18	Rising Head	1.06	1.03
		Total average =	3.00

(1) Represents the arithmetic average of the rising and falling head tests.

NJ03602-1\slgtst.wk1

Table 12. Summary of Constituents Detected in UST Post–Excavation Soil Samples, Kalama Chemical, Inc., Garfield, New Jersey.

Tank	Date Sampled	Sample ID	Depth of Sample (ft)	Parameter Analyzed	Concentration (mg/kg)	Laboratory Analyzed
A–25	9–22–87	A–25(1)	7.5–8.5	TPHC	10U	ERI
		A–25(2)	7.5–8.5	TPHC	10U	ERI
		A–25(3)	7.5–8.5	TPHC	10U	ERI
		A–25(4)	7.5–8.5	TPHC	10.2	ERI
C–3	10–1–87	C–3(A)	7.0–7.5	TPHC	424	ERI
		C–3(B)	7.0–7.5	TPHC	10U	ERI
		C–3(C)	7.0–7.5	TPHC	75	ERI
		C–3(D)	7.0–7.5	TPHC	23	ERI
		C–3(E)	7.0–7.5	TPHC	89	ERI
		C–3(F)	7.0–7.5	TPHC	24	ERI
		C–3(Fill)	NA	TPHC	18	ERI
		C–3(Excv)	NA	TPHC	369	GTC
A–26	10–5–87	A–26(A)	3.75–4.25	TPHC	419	ERI
		A–26(B)	3.75–4.25	TPHC	58	ERI
		A–26(C)	3.75–4.25	TPHC	1250	ERI
		A–26(D)	3.75–4.25	TPHC	489	ERI
A–27	10–5–87	A–27(A)	4.0–4.5	Methanol	2.0U	ERI
		A–27(B)	4.0–4.5	Methanol	15.8	ERI
		A–27(C)	4.0–4.5	Methanol	2.0U	ERI
		A–27(D)	4.0–4.5	Methanol	2.0U	ERI
A–4	10–7–87	A–4(A)	9.5–10.5	TPHC	3410	ERI
		A–4(B)	9.5–10.5	TPHC	72	ERI
		A–4(C)	9.5–10.5	TPHC	291	ERI
		A–4(D)	9.5–10.5	TPHC	10U	ERI
		A–4(E)	10.5–11.0	TPHC	87	ERI
		A–4(Excv)	NA	TPHC	96	ERI
A–9	10–14–87	A–9(A)	8.5–9.0	Toluene	0.064	GTC
		A–9(B)	8.5–9.0	Toluene	0.039	GTC
		A–9(C)	8.5–9.0	Toluene	805	GTC
		A–9(D)	10.5–12.5	Toluene	130	GTC
		A–9(Excv)	NA	Toluene	26.8	GTC
A–10	10–20–87	A–10(A)	10.0–12.0	Toluene	299	GTC
		A–10(B)	10.0–12.0	Toluene	342	GTC
		A–10(C)	10.0–12.0	Toluene	261	GTC
A–11	10–22–87	A–11(A)	12.0–14.0	Toluene	110	GTC
		A–11(B)	12.0–14.0	Toluene	72.6	GTC
		A–11(C)	12.0–14.0	Toluene	130	GTC
A–12	10–26–87	A–12(A)	10.5–11.5	Toluene	3.33	GTC
		A–12(B)	12.5–13.5	Toluene	594	GTC
		A–12(C)	10.5–11.5	Toluene	34.6	GTC
		A–12(D)	10.5–11.5	Toluene	64.6	GTC

Notes are presented on Page 3.

Table 12. Summary of Constituents Detected in UST Post–Excavation Soil Samples, Kalama Chemical, Inc., Garfield, New Jersey.

Tank	Date Sampled	Sample ID	Depth of Sample (ft)	Parameter Analyzed	Concentration (mg/kg)	Laboratory Analyzed
C–2	11–18–87	C–2(A)	5.0	TPHC	9160	GTC
		C–2(B)	6.0	TPHC	3230	GTC
		C–2(C)	3.5	TPHC	7520	GTC
		C–2(D)	1.5	TPHC	2160	GTC
		C–2(E)	12.0	TPHC	37.0U	GTC
		C–2(Excv)	NA	TPHC	2470	GTC
E–1	11–23–87	E–1(A)	8.0–10.0	TPHC	1750	GTC
		E–1(B)	8.0–10.0	TPHC	18,500	GTC
		E–1(C)	8.0–10.0	TPHC	5150	GTC
		E–1(D)	8.0–10.0	TPHC	3390	GTC
		E–1(E)	8.0–10.0	TPHC	6820	GTC
		E–1(Excv)	NA	TPHC	38.6	GTC
A–24	4–11–88	A–24(1)	6.0	Methanol	5.0U	GTC
		A–24(2)	6.0	Methanol	5.0U	GTC
		A–24(3)	6.0	Methanol	5.0U	GTC
		A–24(4)	6.0	Methanol	5.0U	GTC
E–13	5–4–88	E–13(A)	13.0	Methanol	2.0U	GTC
		E–13(B)	13.0	Methanol	2.0U	GTC
		E–13(C)	13.0	Methanol	116	GTC
		E–13(D)	13.0	Methanol	35.5	GTC
A–14	5–4–88	A–14(A)	13.0	Methanol	66.3	GTC
		A–14(B)	13.0	Methanol	122	GTC
		A–14(C)	13.0	Methanol	69.3	GTC
A–15	5–23–88	A–15(1)	12.0	Methanol	2.0U	GTC
		A–15(2)	12.0	Methanol	4.30	GTC
		A–15(3)	12.0	Methanol	2.15	GTC
		A–15(4)	12.0	Methanol	4.74	GTC
A–16	9–16–88	A–16(1)	12.0	Methanol	5.0U	GTC
		A–16(2)	12.0	Methanol	5.0U	GTC
		A–16(3)	12.0	Methanol	5.0U	GTC
A–17	9–19–88	A–17(1)	12.0	Methanol	5.0U	GTC
		A–17(2)	12.0	Methanol	5.0U	GTC
A–18	9–20–88	A–18(1)	12.0	Methanol	5.0U	GTC
		A–18(2)	12.0	Methanol	5.0U	GTC
		A–18(3)	12.0	Methanol	5.0U	GTC
A–23*	10–21–88	A–23(1)	11.5			
		A–23(2)	11.5			
		A–23(3)	11.5			
		A–23(4)	11.5			
A–22	1–25–89	A–22(1)	12.0–12.5	MIBK	0.0198	GTC
		A–22(2)	12.0–12.5	MIBK	0.0184	GTC
		A–22(3)	12.0–12.5	MIBK	0.0069	GTC
		A–22(4)	12.0–12.5	MIBK	0.0212	GTC
		A–22(5)	12.0–12.5	MIBK	0.005U	GTC

Notes are presented on Page 3.

Table 12. Summary of Constituents Detected in UST Post–Excavation Soil Samples, Kalama Chemical, Inc., Garfield, New Jersey.

Tank	Date Sampled	Sample ID	Depth of Sample (ft)	Parameter Analyzed	Concentration (mg/kg)	Laboratory Analyzed
A–21	1–27–89	A–21(1)	12.0–12.5	Methanol	2.0U	GTC
		A–21(2)	12.0–12.5	Methanol	2.0U	GTC
		A–21(3)	12.0–12.5	Methanol	2.0U	GTC
		A–21(4)	12.0–12.5	Methanol	2.0U	GTC
A–20	2–1–89	A–20(1)	12.0–12.5	Methanol	2.5	GTC
		A–20(2)	12.0–12.5	Methanol	3.5	GTC
		A–20(3)	12.0–12.5	Methanol	2.0U	GTC
A–19	2–7–89	A–19(1)	12.0–12.5	Methanol	16.7	GTC
		A–19(2)	12.0–12.5	Methanol	2.0U	GTC
		A–19(3)	12.0–12.5	Methanol	2.0U	GTC
		A–19(4)	12.0–12.5	Methanol	8.7	GTC
		A–19(5)	12.0–12.5	Methanol	2.0U	GTC
E–5	2–1–90	E–5(A)	6.0–6.5	TPHC	206	GTC
		E–5(B)	8.0–8.5	TPHC	4190	GTC
		E–5(C)	6.0–6.5	TPHC	96.4	GTC
		E–5(D)	6.0–6.5	TPHC	34.1U	GTC
		E–5(E)	12.0–12.5	TPHC	32.0U	GTC
		E–5(Excv)	NA	TPHC	116	GTC
E–6	2–2–90	E–6(A)	7.0–7.5	TPHC	2860	GTC
		E–6(B)	8.0–8.5	TPHC	352	GTC
		E–6(C)	9.5–10.0	TPHC	988	GTC
		E–6(D)	7.0–7.5	TPHC	1750	GTC
A–7**	2–6–90	A–7(A)	10.0	TPHC	98.5	GTC
		A–7(B)	10.0	TPHC	2230	GTC
		A–7(C)	10.0	TPHC	24000	GTC
		A–7(D)	12.0	TPHC	916	GTC
E–8	2–8–90	E–8(A)	10.0–10.5	TPHC	2450	GTC
		E–8(B)	11.0–11.5	TPHC	3520	GTC
		E–8(C)	9.0–9.5	TPHC	2130	GTC
		E–8(D)	11.0–11.5	TPHC	30.8U	GTC

TPHC Total petroleum hydrocarbons.
MIBK Methyl isobutyl ketone.
ERI Envirotech Research, Inc., of Edison, New Jersey.
GTC General Testing Corporation of Hackensack, New Jersey.
mg/kg Milligram per kilogram which is equivalent to parts per million (ppm) units.
NA Not applicable.
U Undetected (the prefix shows detection limit).
Excv Sample of excavated material.
* Samples were collected for hexene analysis, but the laboratory lost the samples.
** Labeled as A–17 in the laboratory data report.
Fill Sample of fill material.

NJ03602–1/table9sc

Table 13. Summary for Detected Concentrations of Volatile Organic Compounds in Preliminary Investigation Soil Samples Collected in June 1986 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-1 (2-4')	B-2 (8-10')	B-3 (4-6')	B-4 (2-4')	B-5 (4-6')
	Date	25-Jun-86	25-Jun-86	25-Jun-86	25-Jun-86	25-Jun-86
Bromoform		.035	NA	NA	NA	NA
Dibromochloromethane		.011	NA	NA	NA	NA
1,1,1-Trichloroethane		.0036	.017	.02	NA	NA
Toluene		.0097	.011	.116	2470	.73
Benzene		NA	NA	NA	15	.066
Methylene chloride		NA	NA	NA	15	NA
1,1,2,2-Tetrachloroethane		NA	NA	NA	4.4	NA
Ethylbenzene		NA	NA	NA	NA	.0042
TOTAL VOCS:		.0593	.028	.136	2504.4	.8002

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by General Testing Corporation of Hackensack, New Jersey

NA Not applicable.

Table 14. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Preliminary Investigation Soil Samples Collected in June 1986 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-2 (8-10')	B-3 (4-6')	B-4 (0-8')	B-5 (4-8')
	Date	25-Jun-86	25-Jun-86	25-Jun-86	25-Jun-86
Anthracene		.0979	NA	NA	NA
Benzo(a)anthracene		.743	NA	<.250 L	NA
Benzo(a)pyrene		.459	NA	.129	NA
Benzo(b)fluoranthene		.836	NA	NA	NA
Benzo(ghi)perylene		.322	NA	NA	NA
Chrysene		.377	NA	.299	NA
Fluoranthene		1.16	<.067 L	1.9	NA
Indeno(1,2,3-c,d)pyrene		.195	NA	NA	NA
Phenanthrene		.582	<.160 L	2.35	<.180 L
Pyrene		1.11	NA	1.28	.118
bis(2-ethylhexyl) phthalate		.654	NA	NA	1.3
di-n-butyl-phthalate		<.310 L	<.300 L	.408	<.330 L
Phenol		.0941	.232	.341	19.8
Benzo(k)fluoranthene		NA	NA	.442	NA
Fluorene		NA	NA	.6	.379
Naphthalene		NA	NA	.0706	NA
butyl benzyl phthalate		NA	NA	<.320 L	<.330 L
TOTAL BNA:		6.63	.232	7.8196	21.597

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Environmental Testing and Certification of Edison, New Jersey

L The value is the method detection limit.
< Less than. Where an analyte has not been detected, a reporting limit is given.

NA Not applicable.

Table 15. Summary for Detected Concentrations of Other Constituents in Preliminary Investigation Soil Samples Collected in June 1986 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-3 (4-6')	B-4 (0-8')	B-5 (4-8')
	Date	25-Jun-86	25-Jun-86	25-Jun-86
Petroleum hydrocarbons		1070	236	100
Total phenolics		9.6	NA	9.3

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by General Testing Corporation of Hackensack, New Jersey

NA Not applicable.

Table 16. Summary for Detected Concentrations of Volatile Organic Compounds in ECRA Sampling Plan Investigation Soil Samples Collected in December 1987 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	S-1 (9-11') (MW-7)	S-2 (2-4')	S-3 (8.5-10.5')	S-4 (3-3.5')	S-5 (2.5-4.5')	S-6 (3-5')	S-7 (2-4')	S-8 (6.5-8.5')	S-9 (3-3.5')	S-10 (2.5-4.5')	S-11 (5-7')	S-12 (1.5-3.5')	Field Blank 1
	Date	14-Dec-87	18-Dec-87	10-Dec-87	18-Dec-87	17-Dec-87	17-Dec-87	18-Dec-87	18-Dec-87	18-Dec-87	18-Dec-87	17-Dec-87	18-Dec-87	18-Dec-87
Toluene		36.6	16800	NA	.019 J	NA	.049	5280	1120	NA	.014 J	.013 J	.072	NA
Trichlorofluoromethane		.51 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xylenes (total)		1.1 J	NA	NA	NA	NA	NA	4.5 J	1.2 J	NA	NA	NA	.026	NA
Methylene chloride		NA	NA	.0078 JB	.0088 JB	.0074 JB	.0083 JB	NA	NA	.0089 JB	.0096 JB	NA	NA	.0138
Tetrachloroethene		NA	NA	NA	NA	.008 J	NA	NA	NA	NA	NA	NA	.016 J	NA
Benzene		NA	NA	NA	NA	NA	NA	6	5.6	NA	NA	NA	NA	NA
Ethylbenzene		NA	NA	NA	NA	NA	NA	1.7 J	NA	NA	NA	NA	NA	NA
Chlorobenzene		NA	NA	NA	NA	NA	NA	NA	NA	.01 J	NA	NA	NA	NA
TOTAL VOCS:		38.21	16800	.0078	.0278	.0154	.0573	5292.2	1126.8	.0189	.0236	.013	.114	.0138

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 17. Summary for Detected Concentrations of Base Neutral Compounds in ECRA Sampling Plan Investigation Soil Samples Collected in December 1987 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	S-1 (7-9') (MW-7)	S-2 (2-4')	S-3 (2.5-4.5) (MW-1)	S-4 (1-1.5')	S-5 (0.5-2.5')	S-6 (1-3')	S-7 (2-4')	S-8 (2.5-4.5')	S-9 (2.5-3')	S-10 (2.5-4.5')	S-11 (1-3')	S-12 (1.5-3.5')
	Date	14-Dec-87	18-Dec-87	10-Dec-87	18-Dec-87	17-Dec-87	17-Dec-87	18-Dec-87	18-Dec-87	18-Dec-87	18-Dec-87	17-Dec-87	18-Dec-87
Bis(2-ethylhexyl) phthalate		.63	2.7	.28 J	.1 J	.2 J	.065 J	.61	.048 J	.1 J	.064 J	.091 J	NA
Dibutyl phthalate		.05 JB	NA	NA	.07 JB	NA	.046 JB	NA	.03 JB	NA	.087 JB	.02 JB	NA
Fluoranthene		.04 J	4.1	.32 J	.51	.07 J	NA	.51	.04 J	1.4	.17 J	.02 J	.33
Fluorene		.09 J	NA	NA	NA	NA	NA	NA	NA	NA	.16 J	NA	NA
Phenathrene		.1 J	3.4	.15 J	.22 J	.04 J	NA	1	.062 J	.63	.099 J	.008 J	.08 J
Pyrene		.07 J	6.91	.4555	.65	.07 J	NA	.3 J	.038 J	1.6	.13 J	.02 J	.34
Anthracene		NA	.85	.054 J	.06 J	NA	NA	.1 J	NA	.2 J	.02 J	NA	NA
Benzo(a)anthracene		NA	3	.32 J	.48	.05 J	NA	.2 J	.02 J	1.1	.07 J	.02 J	.33
Benzo(a)pyrene		NA	2.4	.37	.61	.05 J	NA	.08 J	.01 J	1.3	.068 J	.02 J	.56
Benzo(b)fluoranthene		NA	5.69	.765	.81	.05 J	NA	.28 J	.03 J	1.9	.13 J	.04 J	1
Benzo(ghi)perylene		NA	.96	1.6 J	.3 J	NA	NA	.03 J	NA	.67	.03 J	NA	.24 J
Chrysene		NA	4	.39	.59	.06 J	NA	.2 J	.02 J	1.3	.097 J	.02 J	.42
Indeno(1,2,3-c,d)pyrene		NA	.95	.17 J	.31 J	NA	NA	.08 J	.007 J	.64	.038 J	NA	.27 J
Naphthalene		NA	2.8	.2 J	NA	NA	NA	.77	.2 J	NA	NA	NA	NA
Acenaphthene		NA	NA	.01 J	NA	NA	NA	NA	NA	.03 J	NA	NA	NA
Acenaphthylene		NA	NA	.15 J	.2 J	NA	NA	NA	NA	.39	NA	NA	NA
Dibenzo(a,h)anthracene		NA	NA	.06 J	.07 J	NA	NA	NA	NA	.2 J	NA	NA	.04 J
TOTAL BN:		.98	37.76	5.2945	4.98	.59	.111	4.16	.505	11.46	1.163	.259	3.61

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 18. Summary for Detected Concentrations of Other Constituents in ECRA Sampling Plan Investigation Soil Samples Collected in December 1987 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	S-1 (7-9') (MW-7)	S-2 (2-4')	S-3 (2.5-4.5) (MW-1)	S-7 (2-4')	S-8 (2.5-4.5')	S-12 (1.5-3.5')
	Date	14-Dec-87	18-Dec-87	10-Dec-87	18-Dec-87	18-Dec-87	18-Dec-87
Petroleum hydrocarbons		1070	4660	63	600	180	300
Total Phenolics		8.7	200	NA	NA	NA	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Table 19. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-2 (2-2.7')	B-3 (2.3-2.9')	B4-01 (4-6')	B4-02 (8-9')	B5-01 (4-5')	B6-01 (4-5')	B6-01 (4-5') Duplicate	B-07-01 (.8-1.4)	B-07-02 (6-7.9')	B-08-01 (4-6')	B-09-01 (6-8')	B-13-01 (6-7')	B-14-01 (4-4.8')
	Date	17-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	22-Jan-91	22-Jan-91
Methylene chloride		.015 JB	NA	.019 JB	NA	NA	.66 B	NA	NA	NA	NA	NA	NA	NA
Toluene		.024 J	2.4	.11	17000	.012 J	62	360	17	.085	360	2.4	3400	.47
Benzene		NA	NA	NA	NA	NA	NA	NA	.21 J	.24	NA	.28	NA	NA
Xylenes (total)		NA	NA	NA	NA	NA	NA	NA	NA	.018 J	NA	.33	NA	NA
Ethylbenzene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	.16	NA	NA
Carbon tetrachloride		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL VOCS:		.039	2.4	.129	17000	.012	62.66	360	17.21	.343	360	3.17	3400	.47

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 19. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-14-02 (6-7.4')	B-15-01 (3-3.5')	B-16-01 (3.2-3.8')	B-18-01 (3-3.5')	B-19-01 (2-2.6')	B-20-01 (.5-2')	B-20-02 (2-2.8')	B-22-01 (.9-1.7')	B-26-01 (1.5-2')	B-27-01 (1-1.8')	B-43B (2.3-2.8')	FB-01-22 [mg/L]	FB-01-24 [mg/L]
	Date	22-Jan-91	22-Jan-91	22-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	24-Jan-91	24-Jan-91	30-Jan-91	22-Jan-91	24-Jan-91
Methylene chloride		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		620	.091	12	890	.83	.067	230	.094	20000	160	.0064 J	.0027 J	.0033 J
Benzene		NA	NA	.13 J	NA	NA	NA	NA	NA	80	NA	NA	NA	NA
Xylenes (total)		NA	NA	.64	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride		NA	NA	.43 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichlorofluoromethane		NA	NA	1.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL VOCS:		620	.091	14.8	890	.83	.067	230	.094	20080	160	.0064	.0027	.0033

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 20. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B6-01 (4-5')	B6-01 (4-5') Duplicate	B-07-01 (.8-1.4)	B-07-02 (6-7.9')	B-08-01 (4-6')	B-09-01 (6-8')	B-26-01 (1.5-2')	B-29-01 (6-7.4')	B-32-01 (.6-1.1')	B-33-01 (4-4.3')	B-34-01 (4-4.9')	B-35-01 (4-4.4')	B-40-01 (4-6')
	Date	18-Jan-91	18-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	24-Jan-91	24-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91	28-Jan-91
Naphthalene		.75 J	.3 J	NA	NA	.28 J	1.5 J	11 J	NA	NA	8.6	5.7	1.3 J	NA
Fluorene		4.1	1.7 J	.19 J	NA	.32 J	3.2 J	10 J	NA	NA	.65 J	.39 J	NA	NA
Phenathrene		1.9 J	.96 J	.047 J	.067 J	.25 J	1.1 J	18 J	NA	.22 J	1.4 J	.89 J	.6 J	.15 J
Anthracene		.35 J	.13 J	NA	NA	.026 J	.42 J	NA	NA	.05 J	.14 J	.091 J	.097 J	NA
Fluoranthene		1.1 J	.23 J	.042 J	.11 J	.15 J	.64 J	12 J	NA	.33	.45 J	.5 J	.51 J	.22 J
Pyrene		.89 J	.15 J	.03 J	.1 J	.12 J	.5 J	10 J	.0055 J	.27 J	.78 J	.61 J	.58 J	.26 J
Chrysene		.74 J	.091 J	NA	.085 J	.11 J	.25 J	4.9 J	NA	.18 J	.42 J	.42 J	.42 J	.22 J
benzo(a)anthracene		.55 J	NA	NA	.066 J	.068 J	NA	5.4 J	NA	.17 J	.31 J	.27 J	.3 J	.15 J
Benzo(b)fluoranthene		1.2 J	.11 J	NA	.14 J	.12 J	.4 J	NA	NA	.28 J	.42 J	.42 J	.58 J	.37 J
Benzo(a)pyrene		.58 J	NA	NA	.099 J	.054 J	NA	NA	NA	.15 J	.26 J	.26 J	.29 J	.2 J
Indeno(1,2,3-c,d)pyrene		.21 J	NA	NA	.044 J	NA	NA	NA	NA	.082 J	.15 J	.16 J	.19 J	NA
Benzo(ghi)perylene		.15 J	NA	NA	.037 J	NA	NA	NA	NA	.071 J	.29 J	.21 J	.24 J	NA
bis(2-ethylhexyl) phthalate		NA	NA	.24 J	.34	NA	NA	NA	NA	.038 J	NA	NA	NA	NA
Acenaphthene		NA	NA	NA	.016 J	NA	NA	NA	NA	.019 J	1.4 J	1.2 J	.53 J	NA
dibutyl phthalate		NA	NA	NA	NA	NA	NA	NA	.041 JB	.044 JB	NA	NA	NA	NA
Acenaphthylene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL BNA:		12.52	3.671	.549	1.104	1.498	8.01	71.3	.0465	1.904	15.27	11.121	5.637	1.57

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 20. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-42-01 (.2-.6')	B-43A (.8-1.3')	B-45A (.6-1.1')	FB-01-21 [mg/L]
	Date	30-Jan-91	30-Jan-91	30-Jan-91	21-Jan-91
Naphthalene		NA	NA	NA	NA
Fluorene		NA	NA	NA	NA
Phenathrene		3.4 J	.018 J	.077 J	NA
Anthracene		NA	NA	NA	NA
Fluoranthene		4 J	NA	.22 J	NA
Pyrene		3.7 J	NA	.19 J	NA
Chrysene		2.2 J	NA	.31 J	NA
benzo(a)anthracene		2.3 J	NA	.29 J	NA
Benzo(b)fluoranthene		4 J	NA	.63	NA
Benzo(a)pyrene		NA	NA	.47	NA
Indeno(1,2,3-c,d)pyrene		NA	NA	.25 J	NA
Benzo(ghi)perylene		NA	NA	.26 J	NA
bis(2-ethylhexyl) phthalate		NA	NA	NA	.0055 J
Acenaphthene		NA	NA	NA	NA
dibutyl phthalate		NA	NA	NA	NA
Acenaphthylene		NA	NA	.06 J	NA
Dibenzo(a,h)anthracene		NA	NA	.071 J	NA
TOTAL BNA:		19.6	.018	2.828	.0055

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

B Compound is also detected in the laboratory blank.
J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 21. Summary for Detected Concentrations of Metals in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-32-01 (.6-1.1')	B-33-01 (4-4.3')	B-34-01 (4-4.9')	B-35-01 (4-4.4')
	Date	25-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91
Arsenic		1.5	4.8	4.4	6
Vanadium		18	32	34	36

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

Table 22. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-2 (2-2.7')	B4-01 (4-6')	B4-02 (8-9')	B5-01 (4-5')	B5-02 (8-9.7')	B6-01 (4-5')	B6-01 (4-5') Duplicate	B-07-01 (.8-1.4)	B-07-02 (6-7.9')	B-08-01 (4-6')	B-09-01 (6-8')	B-10-01 (4-4.5')	B-13-01 (6-7')
	Date	17-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	18-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	21-Jan-91	22-Jan-91
Petroleum hydrocarbons		148	2860	4670	88	55	547	347	51	NA	576	153	193	1630
Total Phenolics		NA	NA	NA	NA	NA	NA	NA	NA	5.6	40	7.4	NA	NA
PCB-1260		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Table 22. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-14-01 (4-4.8')	B-14-02 (6-7.4')	B-15-01 (3-3.5')	B-18-01 (3-3.5')	B-19-01 (2-2.6')	B-20-01 (.5-2')	B-20-02 (2-2.8')	B-22-01 (.9-1.7')	B-26-01 (1.5-2')	B-27-01 (1-1.8')	B-28-01 (6-7.8')	B-30-01 (8-9.2')	B-31-01 (6-7')
	Date	22-Jan-91	22-Jan-91	22-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	23-Jan-91	24-Jan-91	24-Jan-91	24-Jan-91	25-Jan-91	25-Jan-91
Petroleum hydrocarbons		1410	160	40	206	48	60	89	99	4430	69	32	31	52
Total Phenolics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1260		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Table 22. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-32-01 (.6-1.1')	B-33-01 (4-4.3')	B-34-01 (4-4.9')	B-35-01 (4-4.4')	B-39-01 (6-8')	B-40-01 (4-6')	B-41-01 (1.5-2')	B-42-01 (.2-.6')	B-43A (.8-1.3')	B-44-01 (.3-8')	B-44-02 (.3-8')	B-46-01 (1-1.5')
	Date	25-Jan-91	25-Jan-91	25-Jan-91	25-Jan-91	28-Jan-91	28-Jan-91	28-Jan-91	30-Jan-91	30-Jan-91	30-Jan-91	30-Jan-91	30-Jan-91
Petroleum hydrocarbons		59	1820	1770	1550	672	4040	27	207	320	737	370	400
Total Phenolics		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCB-1260		NA	NA	NA	NA	NA	NA	NA	NA	NA	.47	2.2	NA

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Table 23. Summary for Detected Concentrations of Methanol in Revised ECRA Sampling Plan Investigation Soil Samples Collected in January 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	B-36-01 (6-6.9')	B-37-01 (6-6.5')	B-38-01 (4-5')	B-38-02 (4-5')	B-39-01 (6-8')
	Date	28-Jan-91	28-Jan-91	28-Jan-91	28-Jan-91	28-Jan-91
Methanol		3.5	.22	2.6	1.9	2.2

Analyte concentrations in milligrams per kilogram [parts per million (ppm)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

Table 26. Summary for Detected Concentrations of Other Constituents in ECRA Sampling Plan Investigation Ground-Water Samples Collected in January 1988 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-1 (6-21')	MW-1 (6-21') Duplicate	MW-2 (5.5-15.5')	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-7 (6-21')
	Date	5-Jan-88	5-Jan-88	5-Jan-88	5-Jan-88	6-Jan-88	6-Jan-88	6-Jan-88
Total Phenolics		200	150	NA	2570000	122000	4650	NA
Methanol		5900	NA	NA	120000	NA	NA	NA
Petroleum hydrocarbons		NA	NA	2600	NA	NA	8000	408900000c
Benzaldehyde		NA	NA	NA	NA	NA	570 J	NA

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.
c Floating product sample; therefore analyte concentrations in milligrams per kilogram [parts per million (ppm)].

NA Not applicable.

Table 24. Summary for Detected Concentrations of Volatile Organic Compounds in ECRA Sampling Plan Investigation Ground-Water Samples Collected in January 1988 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-1 (6-21')	MW-1 (6-21') Duplicate	MW-2 (5.5-15.5')	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-5 (4-19')	MW-6S (6-21')	MW-6D (27-32')	MW-7 (6-21')	Field Blank	Trip Blank
	Date	5-Jan-88	5-Jan-88	5-Jan-88	5-Jan-88	6-Jan-88	6-Jan-88	6-Jan-88	5-Jan-88	6-Jan-88	6-Jan-88	5-Jan-88	6-Jan-88
Benzene		676	960	1.5 J	NA	NA	3400 J	NA	NA	NA	NA	NA	NA
Chlorobenzene		4.7 J	5.6	2.9 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene		15	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		22	24	1.1 J	5640	5.1	96700	6370	NA	2.5 J	541000 c	1.8 J	1.5 J
Xylenes (total)		17	16	NA	NA	NA	NA	NA	3 J	NA	NA	NA	3.4 J
Tetrachloroethene		NA	NA	1.5 J	NA	NA	NA	NA	NA	NA	NA	1 J	NA
Trans-1,2-Dichloroethene		NA	NA	NA	NA	23	NA	NA	NA	NA	NA	NA	NA
Trichloroethene		NA	NA	NA	NA	4 J	NA	1400	NA	1.8 J	NA	NA	NA
TOTAL VOCS:		734.7	1020.6	7	5640	32.1	100100	7770	3	4.3	541000	2.8	4.9

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.
c Floating product sample; therefore analyte concentrations in milligrams per kilogram [parts per million (ppm)].

NA Not applicable.

Table 25. Summary for Detected Concentrations of Base Neutral Compounds in ECRA Sampling Plan Investigation Ground-Water Samples Collected in January 1988 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-1 (6-21')	MW-1 (6-21') Duplicate	MW-2 (5.5-15.5')	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-5 (4-19')	MW-6S (6-21')	MW-6D (27-32')	MW-7 (6-21')
	Date	5-Jan-88	5-Jan-88	5-Jan-88	5-Jan-88	6-Jan-88	6-Jan-88	6-Jan-88	5-Jan-88	6-Jan-88	6-Jan-88
Fluorene		.7 J	.7 J	9.3 J	NA	NA	6.1 J	.4 J	.4 J	NA	340 c
Naphthalene		1.8 J	1.9 J	37 J	2 J	1 J	60.6	.6 J	NA	NA	580 c
Phenathrene		NA	.1 J	1.2	NA	NA	16.6	.2 J	NA	NA	760 c
1,2,4-Trichlorobenzene		NA	NA	.5 J	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene		NA	NA	5.5 J	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene		NA	NA	4 J	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene		NA	NA	7.9 J	NA	NA	NA	NA	NA	NA	NA
Acenaphthene		NA	NA	4.3 J	NA	NA	NA	NA	NA	NA	150 Jc
Anthracene		NA	NA	.9 J	NA	NA	3.4 J	NA	NA	NA	60 Jc
Fluoranthene		NA	NA	.2 J	NA	NA	9.3 J	.1 J	NA	NA	170 Jc
Pyrene		NA	NA	.3 J	NA	NA	6.9 J	NA	NA	NA	160 Jc
bis(2-ethylhexyl) phthalate		NA	NA	1.2 J	NA	1 J	6.3 J	NA	NA	2.5 J	NA
Acenaphthylene		NA	NA	NA	NA	NA	.4 J	NA	NA	NA	NA
Benzo(a)pyrene		NA	NA	NA	NA	NA	2.4 J	NA	NA	NA	60 Jc
Benzo(ghi)perylene		NA	NA	NA	NA	NA	1 J	NA	NA	NA	NA
Chrysene		NA	NA	NA	NA	NA	3 J	NA	NA	NA	80 Jc
Di-n-octyl phthalate		NA	NA	NA	NA	NA	24.7	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene		NA	NA	NA	NA	NA	1 J	NA	NA	NA	20 Jc
N-Nitrosodiphenylamine		NA	NA	NA	NA	NA	.3 J	NA	NA	NA	NA
benzo(a)anthracene		NA	NA	NA	NA	NA	3 J	NA	NA	NA	70 Jc
Benzo(b)fluoranthene		NA	NA	NA	NA	NA	NA	NA	NA	NA	40 Jc
TOTAL BN:		2.5	2.7	72.3	2	2	145	1.3	.4	2.5	2490

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.
c Floating product sample; therefore analyte concentrations in milligrams per kilogram [parts per million (ppm)].

NA Not applicable.

Table 27. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-1 (6-21')	MW-1 (6-21') Duplicate	MW-2 (5.5-15.5')	MW-2 (5.5-15.5')	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-5 (4-19')	MW-5D (25-35')	MW-6S (6-21')	MW-6D (27-32')	MW-7 (6-21')	MW-8 (5-25')
	Date	20-Apr-91	20-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	23-Apr-91	20-Apr-91	21-Apr-91	21-Apr-91	23-Apr-91
Benzene		860	1000	NA	NA	NA	NA	3500 J	NA	NA	NA	4.7 J	29	10
Ethylbenzene		14 J	15 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		110	87	NA	NA	1200	6.3	100000	15000	NA	18000	8.3	NA	1.4 J
Xylenes (total)		26	13 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.8
Chlorobenzene		NA	NA	27	29	NA	1.9 J	NA	NA	NA	NA	1.1 J	NA	4.5 J
trans-1,2-Dichloroethene		NA	NA	NA	NA	NA	24	NA	NA	NA	NA	44	NA	NA
Trichloroethene		NA	NA	NA	NA	NA	2.1 J	NA	540	2700	NA	3.4 J	NA	NA
Vinyl chloride		NA	NA	NA	NA	NA	12	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene		NA	NA	NA	NA	NA	NA	NA	NA	26 J	NA	NA	NA	NA
1,1,1-Trichloroethane		NA	NA	NA	NA	NA	NA	NA	NA	80	NA	NA	NA	NA
Chloroform		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 J
1,1-Dichloroethene		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL VOCS:		1010	1115	27	29	1200	46.3	103500	15540	2806	18000	61.5	29	22.8

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 27. Summary for Detected Concentrations of Volatile Organic Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-9 (6-26')	MW-10 (3-23')	MW-11 (5-25')	MW-12 (5-25')	MW-13 (2.5-12.5')	MW-14 (3-18')	MW-15 (5-25')	MW-16 (10-30')	MW-17 (2-22')	MW-18 (4-24')
	Date	22-Apr-91	21-Apr-91	21-Apr-91	22-Apr-91	22-Apr-91	20-Apr-91	23-Apr-91	23-Apr-91	23-Apr-91	23-Apr-91
Benzene		490	140 J	NA	23	NA	1700 J	NA	NA	NA	NA
Ethylbenzene		32 J	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toluene		43 J	12000	110000	4 J	24	64000	NA	NA	100000	NA
Xylenes (total)		44 J	NA	NA	3.1 J	NA	NA	NA	NA	NA	NA
Chlorobenzene		19 J	NA	NA	10	NA	NA	NA	NA	NA	35 J
trans-1,2-Dichloroethene		32 J	NA	NA	18	NA	NA	19	1.6 J	NA	49 J
Trichloroethene		900	NA	NA	5.6	NA	NA	18	260	NA	550
Vinyl chloride		20 J	NA	NA	5.4 J	NA	NA	NA	NA	NA	24 J
Tetrachloroethene		11 J	NA	NA	8.6	NA	NA	NA	4.9 J	NA	NA
1,1,1-Trichloroethane		NA	NA	NA	NA	NA	NA	NA	17	NA	NA
Chloroform		NA	NA	NA	NA	NA	NA	NA	4.9 J	NA	NA
1,1-Dichloroethene		NA	NA	NA	NA	NA	NA	NA	1.4 J	NA	NA
TOTAL VOCS:		1591	12140	110000	77.7	24	65700	37	289.8	100000	658

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 28. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-1 (6-21')	MW-2 (5.5-15.5')	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-5 (4-19')	MW-5D (25-35')	MW-6S (6-21')	MW-6D (27-32')	MW-7 (6-21')	MW-9 (6-26')	MW-10 (3-23')	MW-11 (5-25')
	Date	20-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	22-Apr-91	23-Apr-91	20-Apr-91	21-Apr-91	21-Apr-91	22-Apr-91	21-Apr-91	21-Apr-91
Naphthalene		2.4 J	1.6 J	NA	3.5 J	49 J	NA	NA	1 J	NA	NA	NA	NA	NA
Phenol		72	26	240000	930000	1200	10 J	58	120000	15000	3.4 J	14 J	520	54000
1,3-Dichlorobenzene		NA	7.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene		NA	18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene		NA	3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene		NA	3.5 J	NA	NA	NA	NA	NA	NA	NA	1.9 J	NA	NA	NA
Fluorene		NA	.97 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenathrene		NA	NA	NA	NA	13 J	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde		NA	NA	NA	NA	32 J	NA	NA	NA	NA	NA	NA	NA	50 J
2-Nitrophenol		NA	NA	NA	NA	16 J	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene		NA	NA	NA	NA	NA	NA	NA	NA	NA	1.1 J	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA	NA	NA	NA	NA	1.3 J	NA	NA	NA
bis(2-ethylhexyl) phthalate		NA	NA	NA	NA	NA	NA	NA	NA	NA	9.6 J	NA	NA	NA
4-Nitrophenol		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
TOTAL BNA:		74.4	60.27	240000	930003.5	1310	10	58	120001	15000	17.3	14	520	54050

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 28. Summary for Detected Concentrations of Base Neutral and Acid Extractable Compounds in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-12 (5-25')	MW-13 (2.5-12.5')	MW-14 (3-18')	MW-17 (2-22')	MW-18 (4-24')
	Date	22-Apr-91	22-Apr-91	20-Apr-91	23-Apr-91	23-Apr-91
Naphthalene		NA	NA	15	13 J	NA
Phenol		8900	5100	950	1900	NA
1,3-Dichlorobenzene		NA	NA	NA	NA	NA
1,4-Dichlorobenzene		NA	NA	NA	NA	4.6 J
1,2-Dichlorobenzene		NA	NA	NA	NA	36
Acenaphthene		NA	NA	NA	NA	NA
Fluorene		NA	NA	NA	NA	NA
Phenathrene		NA	NA	NA	NA	NA
Benzaldehyde		NA	NA	NA	NA	NA
2-Nitrophenol		NA	NA	35	NA	NA
Fluoranthene		NA	NA	NA	NA	NA
Pyrene		NA	NA	NA	NA	NA
bis(2-ethylhexyl) phthalate		NA	NA	NA	NA	NA
4-Nitrophenol		NA	NA	20 J	NA	NA
TOTAL BNA:		8900	5100	1020	1913	40.6

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

J Result is detected below the reporting limit or is an estimated concentration.

NA Not applicable.

Table 29. Summary for Detected Concentrations of Other Constituents in Revised ECRA Sampling Plan Investigation Ground-Water Samples Collected in April 1991 at Kalama Chemical, Inc., Garfield, New Jersey.

Analyte	Sample ID	MW-3S (5-15')	MW-3D (35-40')	MW-4 (1-16')	MW-7 (6-21')	MW-9 (6-26')	MW-14 (3-18')	FB-001
	Date	22-Apr-91	22-Apr-91	22-Apr-91	21-Apr-91	22-Apr-91	20-Apr-91	20-Apr-91
Total Phenolics		241000	878000	172	NA	351	763	NA
Petroleum hydrocarbons		NA	NA	NA	4100	NA	NA	NA
Phenols		NA	NA	NA	NA	NA	NA	1300

Analyte concentrations in micrograms per liter [parts per billion (ppb)].
Analyses were performed by Envirotech Research Inc, Edison, New Jersey

NA Not applicable.

Table 30. Field Tested Ground–Water Parameter Results for the 1991 Revised ECRA Sampling Plan Investigation, Kalama Chemical, Inc., Garfield, New Jersey.

Monitoring Well Designation	Date of Testing	Temperature (degree centigrade)	pH	Specific Conductance (umhos/cm)
MW–1	4/20/91	12.5	6.57	1110
MW–2	4/22/91	12.4	6.93	440
MW–3	4/22/91	12.7	6.37	6760
MW–3D	4/22/91	15.1	7.76	16050
MW–4	4/22/91	10.6	6.63	630
MW–5	4/22/91	11.7	6.51	590
MW–5D	4/23/91	13.6	7.59	600
MW–6	4/20/91	14.1	6.59	1760
MW–6D	4/21/91	15.6	6.95	1130
MW–7	4/21/91	15.6	6.95	1130
MW–8	4/23/91	14.9	7.50	2320
MW–9	4/22/91	14.2	6.92	1190
MW–10	4/21/91	8.5	7.10	140
MW–11	4/21/91	14.4	6.51	1000
MW–12	4/22/91	14.8	6.90	2210
MW–13	4/22/91	12.9	7.24	5330
MW–14	4/20/91	11.6	6.36	570
MW–15	4/23/91	11.7	7.22	790
MW–16	4/23/91	14.2	6.93	540
MW–17	4/23/91	12.4	6.06	190
MW–18	4/23/91	18.0	7.17	1350

umhos/cm Micro mhos per centimeter.

Table 30

Reference Number 4

Ref. No. 7

(continued)

Nov. 20, 1991
9:30 J. Cosick, J. Cattlanes
E. Aguado [illegible] on-site
Sunny, mild 60°, wind 5-10 mph through build. area ...
9:45 Meet w/ Tom Lobue.

9:50 Meet w/ Hari Goel for tour of site
25% site is asphalt
HNu Background: 2 ppm
1) Riser well (2)
Back/Front Entrance

~ 50% plant is in operation

① Staged soils PILE - 60 x 12 x 15
l x h x w
analyses -
disposed of as non haz.
② PILE 20 x 4 x 15
l x h x w

Black tank vacant - AST
is no empty
age unknown
prev. content unknown

gpc 11/20/91

Building 8 being removed
Build 12 Vacant

Build 32 partially active (back part)

pict # 24
only doing - (extraction remediation)

Build 32

pict # 26 10F-3 10 H2O / Oil

Liquid nitrogen

25 - MCC

Waste H2O to POTW
very little solid waste

Most processes are batch

Down grade product FOOD GRADE
Pharm "
Tech "

JC 11/30/91

JC 11/30/91

Do not end up w/ much reprocessing

All materials are basically reusable

Tar/Carbon Material from distillation columns

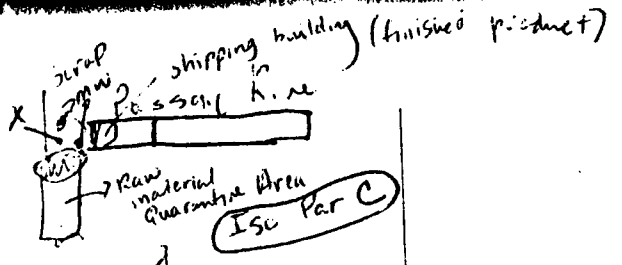
Active tanks

[illegible]

Finished product storage area
Benzyl alcohol
Hexyl Cinnamic Aldehyde

Methyl salicylate "Bon Gay"

JC 11/20/91



W. exchanger Cooling

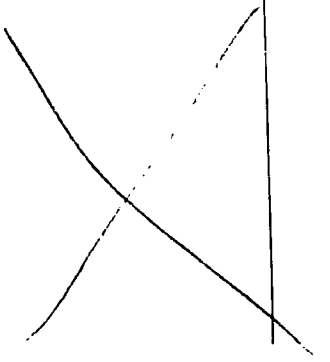
(x - Boring 5-8 ppm)

Reaction vessel?

Scrap

Staged soils near entrance pipes on side of building

only improved areas where UST's were



JC 11/20/91

#2 New Vapor extracting wells
4 MW - behind staged soil
6 MW
7 tranformers building 36
#1 8 MW outside # 32
9 MW outside left of 37 between and # of 31
10
11 } MW's out back entrance

Unpaved areas

No discoloration in asphalt

Surrounded on 3 sides by residence
1 side by River

SPDES permit - Stormwater to River

Passaic Valley Sewage Authority
pre-treated only for PH adjustment

JC 11/20/91

JC 11/20/91

11:~~40~~ 50 J. Cusick, E. Aguado, J. Castellanos
go to other side of street to check Passaic
River for discharge and any other extraordinary
features

11:45 J. Cusick, J. Castellanos, E. Aguado
off-site

JC
11/20/91

Reference Number 5

Ref 1.2.2

GERAGHTY & MILLER, INC.

PRELIMINARY INVESTIGATION OF SOIL QUALITY CONDITIONS AT THE KALAMA CHEMICAL, INC. FACILITY IN GARFIELD, NEW JERSEY

December 1986

Geraghty & Miller, Inc.
7 Atlantic Street
Hackensack, New Jersey 07601

4'

PRELIMINARY INVESTIGATION OF SOIL QUALITY CONDITIONS AT THE KALAMA CHEMICAL, INC. FACILITY IN GARFIELD, NEW JERSEY

INTRODUCTION

In June 1986, Geraghty & Miller, Inc. was retained by Kalama Chemical, Inc. to conduct a preliminary soil sampling and analysis program at the Kalama Chemical, Inc. facility in Garfield, New Jersey. The purpose of this preliminary investigation was to assess soil quality conditions as a result of past plant activities.

Background

The Kalama Chemical, Inc. facility has been the site of chemical manufacture for at least 80 years. Kalama Chemical, Inc. bought the facility in 1982; prior to that time, the facility was operated by several previous owners. Several organic chemicals have been manufactured at the facility; current production is greatly reduced from what was normal under previous ownership.

Scope of Work

The program consisted of the drilling of five (5) soil borings from land surface to the top of the water table or a maximum depth of twelve (12) feet, and the collection of soil samples for chemical analysis. The investigation was focused on areas where chemicals were

transferred to or stored in underground tanks, or where spills may have occurred in the past. One sample was submitted for analysis from each boring; the individual samples were analyzed for parameters that would reflect materials handled at each location.

In addition, one fluid sample was collected from the subsurface at the location of Boring B-4. Boring B-4 is located in the benzaldehyde production area.

FIELD PROGRAM

Soil Sampling

On June 25, 1986, five soil borings were drilled by Environmental Drilling, Inc. of Mt. Arlington, New Jersey, under the supervision of a Geraghty & Miller, Inc. scientist and Mr. Hari Goel, Technical Superintendant at the Kalama Chemical, Inc. facility. The location of the boreholes are shown on Figure 1. The soil sampling locations were selected in accordance with the following criteria:

- Borings located a safe distance from potential dangers such as buried utility lines and pipes. These utilities were delineated by plant personnel.
- Completion of as many borings as possible in one day of field work.
- Borings located where spills, chemical transfer or storage took place, and where the potential for past spills exists.

The rationale for the selection of boring locations was as follows:

B-1: This area has been used as a shipping/transfer area for chemicals.

B-2: Underground storage tanks containing methanol and fuel oil are located in this area.

B-3: This location has been used for loading and unloading chemicals, primarily formaldehyde, from and to rail cars.

B-4: Benzaldehyde production area.

B-5: Chemical transfer area, primarily formaldehyde.

The borings were drilled with a hollow stem auger rig, to depths of 8 to 12 feet below ground surface, in order to obtain samples of the geologic materials in the unsaturated zone, above the water table. Soil samples were collected continuously in two-feet intervals with split-spoon samplers. Prior to drilling and sampling at each boring location, the auger flytes and split-spoons were decontaminated in order to prevent cross-contamination between borings.

At each boring, the soil samples were described by the Geraghty & Miller, Inc. hydrogeologist, and screened with a portable organic vapor analyzer (OVA) meter. The geologic boring logs are presented in Appendix A. The samples with the greatest indications of potential contamination were transferred to 40 ml vials and 120 ml jars for analysis; the soil samples were delivered to General Testing Corporation of Hackensack, New Jersey. All of the soil samples were analyzed for volatile organic compounds (VOCs) and total petroleum hydrocarbons (TPHC). At locations where certain chemicals were known to be stored, transported, or used, additional parameters were selected for analysis.

In addition, a fluid sample was collected at Boring B-4, as water was encountered at a relatively shallow depth (2.5 feet below land surface). The fluid sample was transferred to a 40 ml. vial, and submitted for a VOC analysis.

At the completion of sampling at each boring location, the holes were backfilled and sealed with bentonite.

Analytical Results

The results of the analysis of the soil and fluid samples are summarized in Tables 1, 2, and 3; the complete laboratory reports are presented in Appendix B. The results indicate the presence of a variety of base/neutral extractable organic compounds at location B-2. Toluene was detected in all soil samples and the fluid sample from Boring B-4. The soil and fluid samples from Boring B-4 had toluene concentrations of approximately 0.2 percent and 0.5 percent, respectively. Phenol (at a concentration of 19.8 ppm) was detected in the soil sample from Boring B-5.

Respectfully Submitted,

GERAGHTY & MILLER, INC.

Jeffrey T. Melby,
Scientist

Daniel A. Nachman
Senior Scientist

Vincent W. Uhl, Jr.
Associate

APPENDIX A

Geologic Logs

GERAGHTY & MILLER, INC.

APPENDIX A

Geologic Logs of Soil Borings at Kalama Chemical, Inc., Garfield, New Jersey, June 25, 1986.

Bore Hole No.	Description	Depth (ft)
1	Fill, silt, asphalt, and clay, brown, and red. Dry.	0 - 0.5
	Fill, silt, asphalt, and clay, black. Dry.	0.5 - 2
	Silt, clay, and fine sand, brown. Dry.	2 - 4
	Sand, medium to coarse, with some fine gravel. Dry.	4 - 10
2	Silt, fine sand, and fine gravel, brown. Dry.	0 - 2
	Silt, sand, fine gravel, with some clay, dark brown. Dry.	2 - 4
	Sand, medium to coarse. (OVA=3 ppm)* Dry to moist.	4 - 6
	Silt, sand, fine gravel, with some red streaks of silt, clay, and fine sand, moist, black. (OVA=200-300 ppm).* Water encountered at approximately 9 feet below land surface.	6 - 10
	Silt with fine gravel, loose, wet.	10 - 11
	Sand, very fine, with silt and some clay, moist. (OVA = 70 ppm).* Wet.	11 - 12
3	Silt, fine sand, fine gravel, black. (OVA = 100 ppm).* Dry.	0 - 2
	Sand, fine to medium, fine gravel, cinders?, black and gray. (OVA=85 ppm).* Dry.	2 - 3.5
	Silt and clay, dark brown to black.	3.5 - 4
	Sand, medium to coarse, brown. (OVA = >100 ppm). Dry.	4 - 6

* OVA readings are relative, and are approximately reflective of relative concentrations of benzene.

GERAGHTY & MILLER, INC.

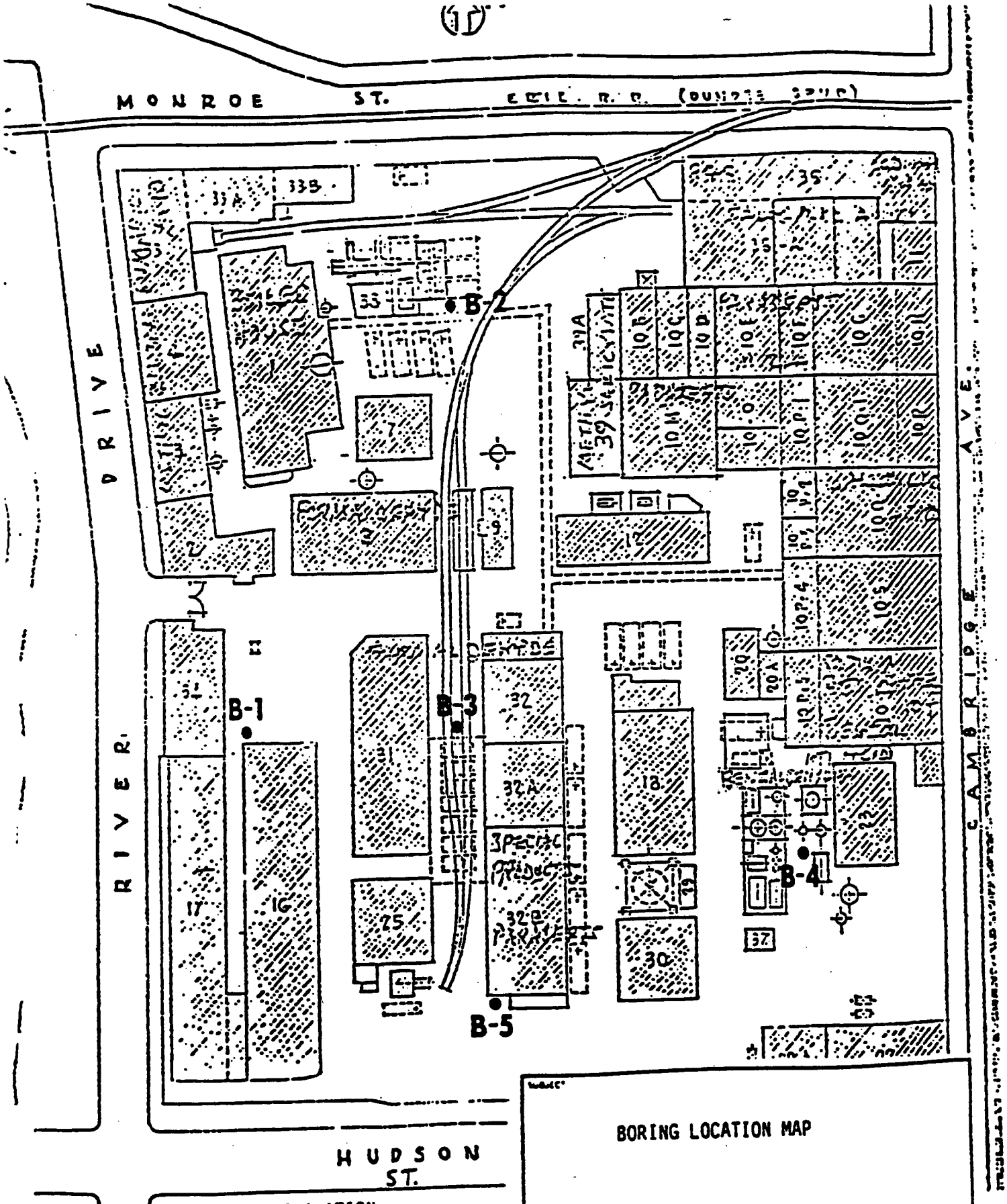
APPENDIX A

Geologic Logs of Soil Borings at Kalama Chemical, Inc., Garfield, New Jersey, June 25, 1986.

Bore Hole No.	Description	Depth (ft)
3 Cont'd.		
	Sand, medium to coarse, brown with lens of red medium sand. (OVA=200 ppm).* Moist.	6 - 8
	Sand, coarse, with fine gravel, black and white, with lens of red sand. (OVA = 200-300 ppm).* Moist.	8 - 10
	Sand, coarse, black and white. (OVA=800 ppm).* Moist.	10 - 11
	Sand, coarse, with some silt, black.	11 - 12
4	Fill, silt, sand, ash ?, brown and gray. (OVA=>1000 ppm).* Moist.	0 - 2
	Sand, coarse, with fine to medium gravel fill. Water encountered at 2.5 feet below land surface. (OVA=>1000 ppm).*	2 - 4
	Sand, fine to medium, wet. (OVA=>1000 ppm).*	4 - 6
	Silt, loose, with some fine sand, black. (OVA=>1000 ppm).* Wet.	6 - 8
5	No recovery.	0 - 2
	Fill, asphalt, cinders? with some silt, fine sand, black. (OVA=100 ppm at 4 ft, OVA=700 ppm at 6 feet).* Water encountered at 4.5 feet.	2 - 6
	Clay, with some silt, brown. (OVA=600 ppm).* Wet.	6 - 8

* OVA readings are relative, and are approximately reflective of relative concentrations of benzene.

#J1080GF1\Report.K



BORING LOCATION MAP

KALAMA CHEMICALS, INC.

Geraghty & Miller, Inc.

COMPILED BY J. MELBY
DRAWN BY J. MELBY
PROJECT MGR D. NACHMAN

SCALE

DATE 9-86

FIGURE 1

EXPLANATION

B-1 ● EXPLORATORY BORING

GERAGHTY & MILLER, INC.

Table 1: Concentrations of Miscellaneous Parameters in Soil Samples

	B-1	B-2	B-3	B-4*	B-5*
Total Petroleum Hydrocarbons	<47.9	<40.9	1070	236	100
Benzoic Acid				<100	
Benzaldehyde			< 200	<200	
Formaldehyde			< 100		< 100
Total Phenolics			9.6		9.3
Alcohols		<100			< 100

Notes:

Blank = not analyzed
* Composite sample.
All concentrations in ppm.
Analysis performed by General Testing Corporation of Hackensack, NJ.

Table 2: Concentrations of Organic Compounds in Soil Samples

	B-1	B-2	B-3	B-4	B-5
Volatile Organic Compounds					
Benzene	ND	ND	ND	15.0	0.066
Toluene	0.0097	0.011	0.116	2470.0	0.730
Ethylbenzene	ND	ND	ND	ND	0.0042
Methylene Chloride	ND	ND	ND	15.0	ND
1,1,1-Trichloroethane	0.0036	0.017	0.020	ND	ND
Dibromochloromethane	0.011	ND	ND	ND	ND
Bromoform	0.035	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	4.40	ND

Acid Extractable Organic Compounds

	B-1	B-2	B-3	B-4	B-5
Phenol		0.0941	0.232	0.341	19.800

Base/Neutral Extractable Organic Compounds

	B-1	B-2	B-3	B-4	B-5
Anthracene		0.0979	ND	ND	ND
Benzo (a) anthracene		0.743	ND	BMDL	ND
Benzo (a) pyrene		0.459	ND	0.129	ND
Benzo (b) fluoroanthene		0.836	ND	ND	ND
Benzo (ghi) perylene		0.322	ND	ND	ND
Benzo (k) fluoranthene		ND	ND	0.422	ND
bis (2-Ethylhexyl) phthalate		0.654	ND	ND	1.30
Butyl benzyl phthalate		ND	ND	BMDL	BMDL
Chrysene		0.377	ND	0.299	ND
Di-n-butyl phthalate		BMDL	BMDL	0.408	BMDL
Fluoranthene		1.16	BMDL	1.90	ND
Fluorene		ND	ND	0.600	0.379
Indeno (1,2,3-c,d) pyrene		0.195	ND	ND	ND
Napthalene		ND	ND	.0706	ND
Phenanthrene		0.582	BMDL	2.35	BMDL
Pyrene		1.11	ND	1.28	0.118

Notes:

ND = Not detected.
Blank = Not analyzed.
Concentrations in ppm.
Volatile organic analyses performed by General Testing Corporation of Hackensack, NJ.
Acid extractable and Base/Neutral Extractable Organic Analysis ETC of Edison, NJ.

Table 3: Concentrations of Volatile Organic Compounds in Water Sample from Boring B-4

Volatile Organic Compound	
Methylene Chloride	12.000
Benzene	68.000
Toluene	5,400.000

Notes:

Concentrations in ppm.
Analysis performed by General Testing Corporation of Hackensack, NJ.

Reference Number 6

Ref No. 6

ECRA SOIL AND GROUND-WATER INVESTIGATION AT THE KALAMA CHEMICAL, INC. FACILITY, GARFIELD, NEW JERSEY

June 1988

Geraghty & Miller, Inc.
7 Atlantic Street
Hackensack, New Jersey 07601

E'

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TABLES

1. Summary of Tank Removal Activities at Kalama Chemical Facility, Garfield, New Jersey.
2. Monitoring Well Construction Details.
3. Analytical Parameters for Soil Samples.
4. Analytical Parameters for Ground-Water Samples.
5. Summary of Water-Level Data.
6. Constituent Concentrations in Soil Samples Collected around Underground Storage Tanks.
7. Constituent Concentrations in Soil Samples from Exploratory Soil Borings.
8. Constituent Concentrations in Ground-Water Samples from Monitoring Wells.
9. Constituent Concentrations in Floating Product Sample Collected from Monitoring Well MW-7.
10. Concentrations of Inorganic Constituents in Sample from Monitoring Well MW-3.
11. Summary of Product Removal Data - Monitoring Well MW-7.

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FIGURES

1. Monitoring Well and Soil Boring Location Map.
2. Water-Level Contour Map, March 11, 1988.

APPENDICES

A. Tank Removal Location Sketches.
B. Monitoring Well Construction Diagrams.
C. Geologic Logs for Monitoring Wells and Soil Borings.
D. Laboratory Reports for Tank Removal Soil Samples (separate volume).
E. Laboratory Reports for Soil Samples (separate volume).
F. Laboratory Reports for Ground-Water Samples (separate volume).

ECRA SOIL AND GROUND-WATER
INVESTIGATION AT THE KALAMA CHEMICAL, INC.
FACILITY, GARFIELD, NEW JERSEY

INTRODUCTION

In March 1987, Geraghty & Miller, Inc. was retained by Kalama Chemical, Inc. to design and conduct an investigation of soil and ground-water quality conditions at the Kalama facility in Garfield, New Jersey in compliance with New Jersey's Environmental Cleanup Responsibility Act (ECRA) under N.J.A.C. 7:1-3 and 4. A workplan was prepared based on information provided by Kalama personnel and data collected during a preliminary soil boring program conducted by Geraghty & Miller, Inc. in 1985. The results of this preliminary program were included in the workplan, which was submitted to the New Jersey Department of Environmental Protection (NJDEP) for review on August 13, 1987. Since the NJDEP indicated that it would not review the workplan for at least six months, Kalama Chemical, Inc. decided to implement the workplan prior to the assignment of an ECRA case manager. The field work was carried out from September 1987 to March 1988. This report summarizes the results of the implementation of the investigation workplan.

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FIELD PROGRAM

The ECRA site investigation was carried out by implementing several tasks, including:

- The removal of 11 of the 27 underground storage tanks, and the collection of soil samples in the tank excavations. Additional tanks are scheduled to be removed in the near future.

- The installation and sampling of seven shallow and two deeper monitoring wells.

- The collection of soil samples at 13 locations for chemical analysis.

- The measurement of three synoptic rounds of ground-water levels in the nine monitoring wells.

Underground Storage Tank Removal Program

There were a total of 27 underground storage tanks at the Kalama facility, with capacities ranging from 500 to 16,000 gallons. All the tanks were made of steel of varying thicknesses and were used to store a variety of products. Kalama was using only seven tanks at the time of the initiation of this program. The remaining tanks were either empty or filled with water. The tank removal program began in late September 1987; to date, 11 tanks have been removed from the ground. Additional tanks are scheduled to be removed in 1988.

The cleaning of the tanks, the excavation prior to removal, and the cutting and disposal of the tanks were carried out by a contractor under the supervision of Kalama personnel. A Geraghty & Miller, Inc. representative was on site during the tank removal program to document

tank conditions, photograph the tanks and excavations, and collect soil samples from the excavated pits for chemical analysis. Table 1 summarizes pertinent information regarding tank dimensions, products stored, and the number and depth of collected soil samples.

The number of soil samples collected from each tank excavation was based on the size of the tank and the relative location/orientation of the tank with respect to other tanks in a tank farm. The locations and depths of the collected soil samples are shown in the location sketches provided in Appendix A.

The soil samples were collected from the excavation with either a hand-held auger, a backhoe bucket, or a combination of both. The backhoe bucket was cleaned between individual tank locations. The hand-held bucket auger and other sampling gear were decontaminated prior to and in between sampling events by washing with a laboratory grade detergent and rinsing with potable water, followed by a rinse with distilled water.

Monitoring Well Installation

Nine monitoring wells were drilled at seven locations from December 2 to December 17, 1987 by a licensed driller in the employ of Environmental Drilling, Inc. of Mount Arlington, New Jersey. Geologic samples were described and monitoring well construction details were documented by an attending Geraghty & Miller, Inc. scientist. The wells were drilled by the hollow-stem auger method, using 6-1/4 inch inside diameter hollow-stem augers. The wells were constructed of four-inch diameter, 0.020-inch slot, PVC screen and four-inch diameter PVC casing. Well construction details are summarized in Table 2; individual monitoring well construction diagrams are presented in Appendix B. Monitoring well locations are shown on Figure 1.

Continuous geologic samples were collected at each monitoring well location from ground surface to the water table. Formation

samples were collected at approximately five-foot intervals below the water table. Geologic logs for monitoring wells are included in Appendix C. The shallow monitoring wells were constructed with ten or fifteen feet of well screen, set with a few feet of the screen above the water table.

The monitoring wells were developed on December 21, 1987 by Environmental Drilling, Inc. under the supervision of a Geraghty & Miller, Inc. representative. The wells were developed by working a surge block up and down in the well and by pumping with a centrifugal or submersible pump. Monitoring wells MW-2, MW-3, and MW-4, completed in clay and/or silt, went dry several times during development. The tops of the monitoring well casings were surveyed relative to mean sea level by a New Jersey-licensed surveyor.

Soil Borings

Soil samples were collected from three monitoring well and ten soil boring locations between December 10 and 18, 1987. Of the ten soil borings, eight were collected with a drilling rig using 3-3/4 inch internal diameter hollow-stem augers; the remaining samples were collected with a bucket-type hand auger. The soil samples collected from the borings for two monitoring wells, MW-1 and MW-7, were designated as S-3 and S-1, respectively. The soil sample from monitoring well MW-5 was designated as MW-5.

No soil sample was taken from the boring of monitoring well MW-4, (as originally specified in the workplan) as the top of the water table was encountered immediately below the concrete surface at a depth of approximately 1.5 feet below ground surface. The material above the water table was primarily concrete and gravel and no soil was available for sampling. Geologic logs for soil borings are included in Appendix C.

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Soil samples were collected in accordance with the protocol presented in Appendix C of the workplan (Geraghty & Miller, Inc., 1987). Analytical parameters, sample depths, and other pertinent information for each soil sample are summarized in Table 3.

A field blank was collected for the analysis of volatile organic compounds. All samples were submitted to Envirotech Research of Edison, New Jersey for chemical analysis.

Collection of Ground-Water Samples

The monitoring wells were sampled on January 5 and 6, 1988 for the parameters listed in Table 4. The water-level in each well was measured prior to well evacuation and sampling. The monitoring wells were evacuated in accordance with protocols presented in Appendix D of the sampling plan (Geraghty & Miller, Inc., 1987). Pumping rates in low yielding wells were kept to a minimum to prevent the wells from going dry rapidly. Wherever possible, three to five times the volume of standing water in each well was evacuated prior to sampling. Wells that went dry repeatedly (even at low pumping rates) were allowed to recover prior to sampling.

A replicate sample was collected from monitoring well MW-1 for the parameters listed in Table 4 and was labelled MW-8. A field blank sample was collected using blank water supplied by Envirotech Research of Edison, New Jersey to document the thoroughness of equipment decontamination procedures. Travel blanks were also enclosed for analysis. All samples were submitted for chemical analysis to Envirotech Research. Field parameters (pH, specific conductance, and temperature) were measured with portable field instruments.

Water-Level Measurements

Ground-water levels in the nine monitoring wells were measured during three synoptic events; these water-level data are summarized in Table 5.

E8

HYDROGEOLOGIC CONDITIONS

Geology

The Kalama facility was built over a sequence of unconsolidated deposits consisting of fine to coarse sand, silt, and clay. Large portions of the site are paved with asphalt; imported fill consisting of mixtures of sand, gravel, crushed stone, and brick fragments were encountered underneath the asphalt in places. The thickness of the unconsolidated deposits under the site ranges from 32 to 40 feet.

Underlying the unconsolidated deposits is a bedrock formation consisting of red and brown sandstones and shales. This bedrock formation is referred to as the Brunswick Formation of Triassic age. The top of the bedrock is weathered, consisting of rock fragments in a mixture of clay, silt, and sand.

Ground-Water Flow Conditions

The water-level data collected on March 11, 1988 were used to prepare the water-level contour map shown on Figure 2. The horizontal component of ground-water flow in the uppermost saturated unit is generally from northeast to southwest, discharging to the Passaic River. Relatively elevated water levels have consistently been observed in monitoring well MW-4. Elevated water levels in this area have apparently created a "mound" in the water table under the southeastern portion of the facility; ground water flows radially in all directions from this mound until being deflected to flow with the prevailing northeast to southwest flow regime.

The two monitoring well clusters (MW-3/3D and MW-6/6D) indicate that there is a downward component to ground-water flow under portions of the facility. The downward component is slight at the MW-6/6D

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cluster, and is more pronounced at the MW-3/3D cluster. The difference in the magnitude of the vertical component to ground-water flow at these two clusters may be due to the presence of a low permeability clay layer at the location of MW-3/3D. The shallow monitoring well (MW-3) is screened above this clay layer, while the deeper well (MW-3D) is screened in a sand and silt unit below the clay layer (see Figure B-3 in Appendix B).

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SOIL QUALITY

Underground Storage Tank Program

Analytical data for soil samples collected during the tank excavation program are presented in Table 6. Soil samples collected around tanks that held fuel oil or gasoline were analyzed for total petroleum hydrocarbons (TPHC), while samples collected around tanks that held toluene or methanol were analyzed for those specific target compounds. For each tank excavation, soil sample locations are shown on the location sketches included in Appendix A. The data summarized in Table 6 indicate that soil-quality conditions around all the tanks, with the exception of Tank A-25 and possibly Tanks C-3 and A-27, have been impacted to some degree by the products stored in the tanks.

Exploratory Soil Boring Program

The analytical results for soil samples collected during the soil boring program are summarized in Table 7; the complete laboratory reports are presented in Appendix E. Soil boring locations are shown on Figure 1; the dates and depths of sample collection are summarized in Table 3.

Toluene was the volatile organic compound (VOC) detected in highest concentrations, and was found at relatively high levels in soil samples collected from the southeastern portion of the facility (soil samples S-1, S-2, S-7, and S-8). Benzene was also detected in high concentrations in soil samples S-7 and S-8.

Several base/neutral extractable organic (B/N) compounds were detected in soil samples collected from the southern half of the facility. Of the detected compounds, a number of them were below the method detection limit. Detectable levels of TPHC were found in soil samples S-1, S-2, S-3, S-7, S-8, and S-12. Total phenols were detected in samples S-1 and S-2 at concentrations of 8.7 and 200 mg/kg, respectively.

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GROUND-WATER QUALITY

Concentrations of organic constituents in ground-water samples are summarized in Table 8. Benzene and toluene ~~and~~ were the principal VOCs detected in monitoring well samples. In addition, monitoring well MW-5 showed the presence of trichloroethene. Other VOCs detected at lower concentrations (below or approximately near the detection limits) include chlorobenzene, trans-1,2-dichloroethene, ethylbenzene, tetrachloroethene, and total xylenes. Monitoring wells MW-2, MW-6, and MW-6D had total VOC concentrations of less than 10 ug/L, while MW-3D had one VOC (ethylbenzene) at a concentration of 23 ug/L.

A sample of the product layer floating on the water table was collected from monitoring well MW-7; no ground-water sample was collected from this well, since the possibility of introducing droplets of the floating product layer into the water sample could not be precluded. The results of the analysis of the product sample is summarized in Table 9. Toluene was detected in the product phase of this product sample at a concentration of 541,000 mg/kg, indicating that apparently 54 percent of the mass of this product phase consists of toluene. The TPHC concentration was reported as 408,900 mg/L, equivalent to approximately 41 percent (by mass).

Several B/N compounds were detected in relatively low concentrations (slightly above to below the detection limits) in all monitoring well samples. Benzaldehyde was detected in the sample collected from monitoring well MW-5 at a concentration of 570 ug/L. The sample of the floating product phase collected from MW-7 indicated the presence of several B/N compounds.

Due to a high measured field conductivity, a sample collected from monitoring well MW-3 was analyzed for selected inorganic parameters. The results of this inorganic analysis, summarized in Table 10, indicate that sulfate, sodium, and iron account for the majority of the dissolved solids in this ground-water sample.

TABLES FIGURES

Total phenols were detected in samples from monitoring wells MW-3, MW-3D, and MW-4 at concentrations of 2570, 122 and 4.65 mg/L, respectively. All other monitoring wells showed phenol concentrations below 1 mg/L. No formaldehyde was detected in the sample from monitoring well MW-1; no other samples were analyzed for this parameter. Methanol was analyzed in the samples from monitoring wells MW-1, MW-2, and MW-3 and was detected at concentrations of 5.9, less than 2.0, and 120 mg/L, respectively. Complete laboratory reports for ground-water samples are presented in Appendix F.

DATA GAPS

At present, there are several uncertainties regarding ground-water flow conditions and the extent of ground-water quality problems underlying the Kalama facility. These data gaps include the following:

- Currently, none of the installed monitoring wells serve as a true upgradient well for the facility. Monitoring well MW-3 is not upgradient of the entire facility and monitoring well MW-5 appears to be downgradient of the mound in the water table that apparently exists in the vicinity of monitoring well MW-4.

- The cause of the apparent mounding of the water table in the vicinity of MW-4 cannot be determined at present. Possible factors creating elevated water levels in this area could include a source of artificial recharge (e.g. leaking water lines) located on-site, or possibly a leaking water main or some other source of artificial recharge on Hudson Street, to the south of the facility.

- The horizontal extent of the floating product layer detected in monitoring well MW-7 has not been defined. The extent of elevated concentrations of toluene in ground water detected in the northeastern portion of the facility (monitoring well MW-3) and the southeastern portion of the facility (monitoring wells MW-5 and MW-4) is not currently known.

TABLES
FIGURES
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ADDITIONAL INVESTIGATIVE PROGRAM

The information compiled through the implementation of the sampling plan has been used to develop a preliminary understanding of ground-water flow and quality conditions underlying the site, and has also led to the identification of certain ground-water quality problems. Additional data will be needed to fully delineate the extent of these problems, to determine the cause of the elevated water levels detected in the southeast portion of the plant, and to establish ground-water quality conditions upgradient of the facility. The following program is proposed to address the water-quality problems and other issues identified in the section entitled "Data Gaps".

Resampling of Selected Wells

The initial round of ground-water sampling has indicated potential ground-water quality problems in portions of the facility. Prior to developing a detailed program for additional monitoring wells to refine the delineation of the extent of these problems, or a program designed to assess the feasibility of ground-water remediation, a second round of ground-water samples will be collected from selected monitoring wells and analyzed for VOCs. The wells to be resampled will be those that have shown elevated VOC concentrations: MW-1, MW-3, MW-4, and MW-5. Based on the analytical results, the need to conduct additional investigative work will be assessed.

Floating Product Recovery

A program has been initiated to remove the floating product from monitoring well MW-7. This monitoring well (MW-7) is being used as a

TABLES
FIGURES

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recovery well on a regular basis. Prior to product recovery, the thickness of the floating layer is measured. The product is being removed with a centrifugal pump, and the amount of product removed is being measured and recorded. The thickness of the product layer after bailing is also being measured and noted. The data collected in the first three episodes are summarized in Table 11.

The use of monitoring well MW-7 as a recovery well will continue for several weeks. Based on the amount of product removed and the observed persistence of this product layer, the effectiveness of using this well for recovery will be evaluated and the need for additional monitoring wells or recovery points will be assessed. The results from the three recovery episodes indicate a significant decrease in measured product thickness in monitoring well MW-7.

Additional Monitoring Wells

The results of the second round of ground-water sampling will be utilized to evaluate the need for additional monitoring wells to better delineate the extent of tentatively identified problems and data gaps. At present, it appears that none of the existing monitoring wells serves as an upgradient well, as monitoring well MW-3 has shown potential ground-water quality impacts from plant activities. It appears that an upgradient well can only be located off Kalama property; the installation of this well will be contingent on obtaining permission from the City of Garfield to install the well on a public sidewalk.

As stated earlier, a mound of elevated ground-water levels has been identified in the southeast portion of the facility, near monitoring well MW-4. Kalama is currently investigating the possibility of a leak in an underground water pipe or a break in the Passaic Valley water header that is located on Hudson Street, along

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the south side of the property. Based on these investigations, and the results of the second round of sampling, the need for additional monitoring wells will be addressed.

Respectfully Submitted,

GERAGHTY & MILLER, INC.

Chittaranjan Ray

Chittaranjan Ray
Staff Scientist

Daniel A. Nachman
Associate

Vincent W. Uhl, Jr.
Vice President

#J1080GF2/010588.

TABLES

FIGURES

Table 1. Summary of Tank Removal Activities at Kalama Chemical Facility, Garfield, New Jersey.

Tank #	Product Stored	Date Removed	Length/ Diameter (ft/ft)	Excavation Depth (ft)	Tank Volume (gallons)	Tank Material	Number of Soil Samples Collected	Analytical Parameter	Depth to Water (ft bgs)	Sample Depth (ft-ft)	Organic Vapor conc.(ppm)*	Laboratory	Visual Observations
A-25	#2 Fuel Oil	9/22/87	16/10	10	9400	Steel	4	TPHC	9.0	7.5-8.5	0.2-1.2	Envirotech	
C-3	#2 Fuel Oil	10/1/87	24/6	7.5	5000	Steel	6	TPHC	NE	7.0-7.5	25-92	Envirotech	Strong odors emitted from excavated soil and samples; appears to be chemical odor.
A-26	Gasoline	10/2/87	6/4	4.0	560	Steel	4	TPHC	NE	3.75-4.25	18-452	Envirotech	Strong chemical odors from excavated soil and samples.
A-27	Methanol	10/5/87	6/4	4.0	560	Steel	4	Methanol	NE	4.0-4.5	0.3-0.7	Envirotech	
A-4	#2 Fuel Oil	10/7/87	21.5/8	10	8000	Steel	5	TPHC	10.0	9.5-11.0	0.5-1.2	Envirotech	A chemical sewer was broken just prior to the completion of sampling.
A-9	Toluene	10/13/87	28/10	10	16,500	Steel	4	Toluene	12.0	8.5-12.0	1.6-36	Gen. Testing	Plant sprinkler line was broken by the backhoe. The hole was pumped dry prior to sampling.
A-10	Toluene	10/20/87	28/10	10	16,500	Steel	3	Toluene	>12.0	10.0-12.0	ND	Gen. Testing	Samples had strong odor.
A-11	Toluene	10/22/87	28/10	10	16,500	Steel	3	Toluene	>12.0	12.0-14.0	ND	Gen. Testing	Samples had strong odor.
A-12	Toluene	10/26/87	28/10	10	16,500	Steel	4	Toluene	11.0	10.5-13.5	ND	Gen. Testing	Excavated soil and samples had strong odor. Floating solvent, soil was saturated with orange color solvent.
C-2	#2 Fuel Oil	11/18/87	24/6	8	5000	Steel	5	TPHC	10.0	3.0-12.0	2-500	Gen. Testing	Strong odor, oily, appears to be a mixture of fuel oil and chemicals.
E-1	#2 Fuel Oil	11/23/87	28/10	10	16,500	Steel	5	TPHC	10.0	8.0-10.0	ND	Gen. Testing	Strong odor, oily, appears to be a mixture of fuel oil and chemicals.

Notes:

Depth of collection of individual samples presented in location sketches in Appendix A.

* A HNU(TM) Organic Vapor Monitor with Photoionization Detector was used for monitoring vapor concentration for tank C-2, other tank excavations were monitored with a TIP (TM) photoionization meter. Vapor concentrations are expressed in parts per million (ppm), equivalent to ppm of benzene.

ppm - Parts per million.

NE - Not encountered.

ND - Not obtained.

bgs - below ground surface.

TPHC - Total Petroleum Hydrocarbons.

General Testing Corporation and Envirotech Research are located in Hackensack, NJ and Edison, NJ, respectively.

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Table 2. Monitoring Well Construction Details.

Well Number	Date Installed	Total Depth (ft-bgs)	Well Diameter	Screen (ft-bgs)	Elev. of MP(*) (ft-msl)	Elev. of MP(**) (ft-msl)	Type of Protective Casing
MW-1	12/11/87	21.0	4-inch	6.0-21.0	18.12	19.51	Stick-up
MW-2	12/17/87	15.5	4-inch	5.5-15.5	16.70	16.95	Flush
MW-3	12/9/87	15.0	4-inch	5.0-15.0	20.54	21.79	Stick-up
MW-3D	12/8/87	40.0	4-inch	35.0-40.0	21.25	21.50	Stick-up
MW-4	12/16/87	16.0	4-inch	1.0-16.0	18.56	19.35	Stick-up
MW-5	12/10/87	19.0	4-inch	4.0-19.0	19.61	20.47	Stick-up
MW-6	12/4/87	20.5	4-inch	5.5-20.5	18.05	19.63	Stick-up
MW-6D	12/3/87	31.5	4-inch	26.5-31.5	18.90	19.19	Stick-up
MW-7	12/14/87	21.0	4-inch	6.0-21.0	18.66	20.08	Stick-up

Notes:

Elev. - Elevation.
MP - Measuring Point.
ft-bgs - feet below land surface.
ft-msl - feet above mean sea level.
(*) - Top of PVC casing.
(**) - Top of steel (protective) casing.
The monitoring wells were installed by Environmental Drilling, Inc. of Mount Arlington, New Jersey.

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APPENDIX A
APPENDIX B
APPENDIX C
FIGURES

Table 3. Analytical Parameters for Soil Samples.

Sample Number	Date Sampled	Date Shipped	DTW (ft-bgs)	Depth Range (ft-bgs)	HNU* Reading (ppm)	Analytical Parameters
S-1#	12/14/87	12/15/87	11.0	7.0-9.0	10	B/N+15 , TPHC, Total Phenol
				9.0-11.0	50	VOCs+15
S-2	12/18/87	12/18/87	4.0	2.0-4.0	600	B/N+15 , TPHC, Total Phenol, Benzoic Acid, and Benzaldehyde
S-3#	12/10/87	12/10/87	11.0	2.5-4.5	0	B/N+15 , TPHC, Total Phenol
				8.5-10.5	2	VOCs+15
S-4**	12/18/87	12/18/87	?	1.0-1.5	0	B/N+15 , TPHC, Total Phenol
				3.0-3.5	0	VOCs+15
S-5	12/17/87	12/18/87	8.5	0.5-2.5	0	B/N+15 , TPHC, Total Phenol
				2.5-4.5	0	VOCs+15
S-6	12/17/87	12/18/87	8.5	1.0-3.0	0	B/N+15 , TPHC, Total Phenol
				3.0-5.0	0	VOCs+15
S-7	12/18/87	12/18/87	4.0	2.0-4.0	650	VOCs+15, B/N+15, TPHC, Total Phenol
S-8	12/18/87	12/18/87	8.5	2.5-4.5	20	B/N+15 , TPHC, Total Phenol, Benzoic Acid, and Benzaldehyde
				6.5-8.5	500	VOCs+15
S-9**	12/18/87	12/18/87	?	2.5-3.0	0	B/N+15 , TPHC, Total Phenol
				3.0-3.5	0	VOCs+15
S-10	12/18/87	12/18/87	4.0	2.5-4.5	0.2	VOCs+15, B/N+15 , TPHC, Total Phenol
S-11	12/17/87	12/18/87	8.0	1.0-3.0	0	B/N+15 , TPHC, Total Phenol
				5.0-7.0	0.5	VOCs+15
S-12	12/18/87	12/18/87	4.0	1.5-3.5	2	VOCs+15, B/N+15, TPHC, Total Phenol
MW-5	12/9/87	12/10/87	7.0	2.0-4.0	2	Benzoic Acid and Benzaldehyde

Notes:

DTW - Depth to water below land surface.
* - HNU organic vapor monitor with photoionization detector.
** - Sample collected with hand auger.
# - S-1 collected from MW-7 and S-3 collected from MW-1.
ft-bgs - feet below land surface.
B/N - Base/Neutral Extractable Organic Compounds.
VOCs - Volatile Organic Compounds.
TPHC - Total Petroleum Hydrocarbons.

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Table 4. Analytical Parameters for Ground-Water Samples.

Well Number	Date Sampled	Volume Evacuated (gal)	Analytical Parametrs	Color	Odor	pH
MW-1	1-5-88	13.0	VOCs+15, B/N+15, TPHC, Total Phenol, Methanol, Formaldehyde	None	None	6.8
MW-2	1-5-88	30.0	VOCs+15, B/N+15, TPHC, Total Phenol, Methanol	Yellow	Strong	6.4
MW-3	1-5-88	25.0	VOCs+15, B/N+15, TPHC, Total Phenol, Methanol, Inorganic Constituents	Red-brown	Strong	5.9
MW-3D	1-6-88	55.0	VOCs+15, B/N+15, TPHC, Total Phenol	Brown	Slight	7.6
MW-4	1-6-88	24.0	VOCs+15, B/N+15, TPHC, Total Phenol, Benzoic acid, Benzaldehyde	Grey-brown	Strong	6.7
MW-5	1-6-88	37.0	VOCs+15, B/N+15, TPHC, Total Phenol, Benzoic acid, Benzaldehyde	Pale-Brown	None	7.6
MW-6	1-5-88	21.0	VOCs+15, B/N+15, TPHC, Total Phenol	None	None	6.7
MW-6D	1-6-88	36.5	VOCs+15, B/N+15, TPHC, Total Phenol	None	None	7.2
MW-7	1-6-88	None	VOCs+15, B/N+15, TPHC	Product- Strong odor, black		
MW-8#	1-5-88	13.0	VOCs+15, B/N+15, TPHC, Total Phenol	None	None	6.8
Field Blank	1-5-88	None	VOCs+15			
Trip Blank	1-6-88	None	VOCs+15			

Notes:

VOCs+15 - Volatile organic compounds by USEPA Method 624 with library search for 15 additional peaks.
B/N+15 - Base/Neutral Extractable Organic Compounds by USEPA Method 625 with library search for 15 additional peaks.
TPHC - Total petroleum hydrocarbons.
- MW-8 is a coded replicate of MW-1.
All analyses with the exception of methanol and inorganic constituents were conducted by Envirotech Research of Edison, New Jersey.
Methanol and inorganic constituents were analyzed by General Testing Corporation of Hackensack, New Jersey.

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Table 5. Summary of Water-Level Data.

Well	Elev. M.P.# (ft-msl)	Jan 5/6, 1988 DTW (ft)	Product Thickness (ft)	Corrected Thickness (ft)	Elev. Water Surface (ft-msl)	Feb 24, 1988 DTW (ft)	Product Thickness (ft)	Corrected Thickness (ft)	Elev. Water Surface (ft-msl)	Mar 11, 1988 DTW (ft)	Product Thickness (ft)	Corrected Thickness (ft)	Elev. Water Surface (ft-msl)
MW-1	19.51	13.15	-	-	6.36	12.37	-	-	7.14	12.50	-	-	7.01
MW-2	16.95	7.55	-	-	9.40	7.92	-	-	9.03	8.01	-	-	8.94
MW-3	21.79	10.24	-	-	11.55	9.67	-	-	12.12	9.99	-	-	11.80
MW-3D	21.50	14.43	-	-	7.07	13.46	-	-	8.04	13.64	-	-	7.86
MW-4	19.35	8.68	-	-	10.67	4.41	-	-	14.94	4.97	-	-	14.38
MW-5	20.47	11.06	-	-	9.41	10.50	-	-	9.97	10.31	-	-	10.16
MW-6	19.63	14.03	-	-	5.60	13.37	-	-	6.26	13.52	-	-	6.11
MW-6D	19.19	13.64	-	-	5.55	13.10	-	-	6.09	13.27	-	-	5.92
MW-7*	20.08	13.17	~2	1.70	8.61	12.35	1.96	1.67	9.40	12.75	2.29	1.95	9.28

Notes:

- Elevation of Measuring Point (measured from the top of steel protective casing).
DTW - Depth to Water.
msl - Mean Sea Level.
Elev. - Elevation.
(*) Well contains product, a correction was made for product density.

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Table 6. Constituent Concentrations in Soil Samples Collected around Underground Storage Tanks

Tank	Date Sampled	Sample ID	Parameter Analyzed	Concentration	Laboratory
A-25	9-22-87	A-25(1)	TPHC	10U	Envirotech
		A-25(2)	TPHC	10U	
		A-25(3)	TPHC	10U	
		A-25(4)	TPHC	10.2	
C-3	10-1-87	C-3(A)	TPHC	424	Envirotech
		C-3(B)	TPHC	10U	
		C-3(C)	TPHC	75	
		C-3(D)	TPHC	23	
		C-3(E)	TPHC	89	
		C-3(F)	TPHC	24	
		C-3(Fill)	TPHC	369	
		C-3(Excv)	TPHC	18	
A-26	10-5-87	A-26(A)	TPHC	419	Envirotech
		A-26(B)	TPHC	58	
		A-26(C)	TPHC	1250	
		A-26(D)	TPHC	489	
A-27	10-5-87	A-27(A)	Methanol	2.0U	Envirotech
		A-27(B)	Methanol	15.8	
		A-27(C)	Methanol	2.0U	
		A-27(D)	Methanol	2.0U	
A-4	10-7-87	A-4(A)	TPHC	3410	Envirotech
		A-4(B)	TPHC	72	
		A-4(C)	TPHC	291	
		A-4(D)	TPHC	10U	
		A-4(E)	TPHC	87	
		A-4(Excv)	TPHC	96	
A-9	10-14-87	A-9(A)	Toluene	0.064	General Testing
		A-9(B)	Toluene	0.039	
		A-9(C)	Toluene	605	
		A-9(D)	Toluene	130	
		A-9(Comp)	Toluene	26.8	
A-10	10-20-87	A-10(A)	Toluene	299	General Testing
		A-10(B)	Toluene	342	
		A-10(C)	Toluene	261	
A-11	10-22-87	A-11(A)	Toluene	110	General Testing
		A-11(B)	Toluene	72.6	
		A-11(C)	Toluene	130	
A-12	10-26-87	A-12(A)	Toluene	3.33	General Testing
		A-12(B)	Toluene	594	
		A-12(C)	Toluene	34.6	
		A-12(D)	Toluene	64.6	
C-2	11-18-87	C-2(A)	TPHC	9160	General Testing
		C-2(B)	TPHC	3230	
		C-2(C)	TPHC	7520	
		C-2(D)	TPHC	2160	
		C-2(E)	TPHC	<37.0	
		C-2(F)	TPHC	2470	
E-1	11-23-87	E-1(A)	TPHC	1750	General Testing
		E-1(B)	TPHC	18,500	
		E-1(C)	TPHC	5150	
		E-1(D)	TPHC	3330	
		E-1(E)	TPHC	6820	

Notes:

TPHC - Total Petroleum Hydrocarbons
All concentrations are in ug/g (ppm).
U - Undetected; the prefix shows detection limit.
Excv - Excavated material.
Comp - Composite sample.
Envirotech Research of Edison, New Jersey and General Testing Corporation of Hackensack, New Jersey performed the analytical work.
Sample C-3(Excv) was analyzed by General Testing Corporation.

gf26.wk1

APPENDIX A

APPENDIX B

APPENDIX C

FIGURES

Table 7. Constituent Concentrations in Soil Samples from Exploratory Soil Borings.

Parameters	S-1	S-2	S-3	S-4	S-5	S-6	S-7	S-8	S-9	S-10	S-11	S-12	MW-5	Field Blank
Volatile Organic Compounds														
Benzene							6000	5600						
Chlorobenzene									10J				NA	
Ethyl benzene							1700J						NA	
Methylene chloride			7.8JB	8.8JB	7.4JB	8.3JB			8.9JB	9.6JB			NA	13.8
Tetrachloroethene					8.0J							16J	NA	
Toluene	36600	16800000		19J		49	5280000	1120000		14J	13J	72	NA	
Trichlorofluoromethane	510J												NA	
Xylenes (Total)	1100J						4500J	1200J				26	NA	
Total Volatiles	38210	16800000	7.8	27.8	15.4	57.3	5292200	1126800	18.9	23.6	13	114	NA	13.8
Base/Neutral Extractable Organic Compounds														
Naphthalene		2800	20J				770	200J						
Acenaphthylene			150J	200J					390					NA
Acenaphthene			10J						30J					NA
Fluorene	90J									160J				NA
Phenanthrene	100J	3400	150J	220J	40J		1000	62J	630	99J	8J	80J		NA
Anthracene		850	54J	60J			100J		200J	20J				NA
Dibutyl phthalate	50J			70JB		46JB		30JB		87JB	20JB			NA
Fluoranthene	40J	4100	320J	510	70J		510	40J	1400	170J	20J	330		NA
Pyrene	70J	6910	455	650	70J		300J	38J	1600	130J	20J	340		NA
Bis(2-ethylhexyl) phthalate	630	2700	280J	100J	200J	65J	610	48J	100J	64J	91J			NA
Chrysene		4000	390	590	60J		200J	20J	1300	97J	20J	420		NA
Benzo(a)anthracene		3000	320J	480	50J		200J	20J	1100	70J	20J	330		NA
Benzo(b)fluoranthene		5690	765	810	50J		280J	30J	1900	130J	40J	1000		NA
Benzo(a)pyrene		2400	370	610	50J		80J	10J	1300	68J	20J	560		NA
Indeno(1,2,3-c,d)pyrene		950	170J	310J			80J	7J	640	38J		270J		NA
Dibenzo(a,h)anthracene			60J	70J					200J			40J		NA
Benzo(ghi)perylene		960	160J	300J			30J		670	30J		240J		NA
Total Base/Neutral Extractable Organic Compounds	980	37760	3674	4980	590	111	4100	505	11460	1163	259	3610	0	NA
Total Petroleum Hydrocarbons (mg/kg)	1070	4660	63				600	180				300		NA
Total Phenol (mg/kg)	9.7	200												
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA
Benzaldehyde	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA		NA

Notes:

Samples were collected between December 9 and 17, 1987 and were analyzed by Envirotech Research of Edison, New Jersey.

The field blank was collected on December 17, 1987.

All concentrations are in ug/kg units unless specified.

E24

APPENDIX A END APPENDIX C FIGURE

Table 8. Constituent Concentrations in Ground-Water Samples from Monitoring Wells.

Parameters	MW-1	MW-8W (MW-1 Replicate)	MW-2	MW-3	MW-3D	MW-4	MW-5	MW-6	MW-6D	Field Blank	Trip Blank
Volatile Organic Compounds											
Benzene	676	960	1.5J			3400J					
Chlorobenzene	4.7J	5.6J	2.9J								
trans-1,2-Dichloroethene					23						
Ethyl benzene	15	15									
Tetrachloroethene			1.5J							1.0J	
Toluene	22	24	1.1J	5640	5.1	96700	6370		2.5J	1.8J	1.5J
Trichloroethene					4.0J		1400		1.8J		
Total Xylenes	17	16						3.0J			3.4J
Total Volatiles	734.7	1020.6	7.0	5640	32.1	100100	7770	3.0	4.3	2.8	4.9
Base/Neutral Extractable Organic Compounds											
1,3-Dichlorobenzene			4.0J							NA	NA
1,4-Dichlorobenzene			7.9J							NA	NA
1,2-Dichlorobenzene			5.5J							NA	NA
1,2,4-Trichlorobenzene			0.5J							NA.	NA
Naphthalene	1.8J	1.9J	37.0	2J	1.0J	60.6	0.6J			NA	NA
Acenaphthene			4.3J			0.4J				NA	NA
Fluorene	0.7J	0.7J	9.3J			6.1J	0.4J	0.4J		NA	NA
N-Nitrosodiphenylamine						0.3J				NA	NA
Phenanthrene		0.1J	1.2J			16.6	0.2J			NA	NA
Anthracene			0.9J			3.4J				NA	NA
Fluoranthene			0.2J			9.3J	0.1J			NA	NA
Pyrene			0.3J			6.9J				NA	NA
Bis(2-ethylhexyl) phthalate			1.2J		1.0J	6.3J			2.5J	NA	NA
Chrysene						3.0J				NA	NA
Benzo(a)anthracene						3.0J				NA	NA
Di-n-octyl phthalate						24.7				NA	NA
Benzo(b)fluoranthene										NA	NA
Benzo(a)pyrene						2.4J				NA	NA
Indeno(1,2,3-c,d)pyrene						1.0J				NA	NA
Benzo(ghi)perylene						1.0J				NA	NA
Total Base/Neutral Extractable Organic Compounds	2.5	2.7	72.3	2	2.0	145	1.3	0.4	2.5	NA	
Benzoic Acid	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	NA	NA	NA	NA	NA	570		NA	NA	NA	NA
Other Parameters (mg/L)											
Total Petroleum Hydrocarbons			2.6			8.0			NA	NA	
Phenols	0.20	0.15		2570	122	4.65			NA	NA	
Formaldehyde		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methanol	5.9	NA	<2.0	120	NA	NA	NA	NA	NA	NA	NA

Notes:

Samples were collected between January 5 and 6, 1988.
Analyses were conducted by Envirotech Research of Edison, New Jersey.
Methanol samples were analyzed by General Testing Corporation of Hackensack, New Jersey.
NA - Not Analyzed.
J - Compound detected below method detection limit.
All concentrations are in ug/L unless otherwise noted.

GF27.wk1

APPENDIX A
APPENDIX B
APPENDIX C
FIGURES

E25

Table 9. Constituent Concentrations in Fl g Product Sample Collected from Monitoring Well MW-7.

Parameters	Concentration
Volatile Organic Compounds	
Benzene	
Chlorobenzene	
trans-1,2-Dichloroethene	
Ethylbenzene	
Tetrachloroethene	
Toluene	541000
Trichloroethene	
Total Xylenes	
Base/Neutral Extractable Organic Compounds	
1,3-Dichlorobenzene	
1,4-Dichlorobenzene	
1,2-Dichlorobenzene	
1,2,4-Trichlorobenzene	
Naphthalene	580
Acenaphthene	150J
Fluorene	340
N-Nitrosodiphenylamine	
Phenenthrene	760
Anthracene	60J
Fluorenthene	170J
Pyrene	160J
Bis(2-ethylhexyl)phthalate	
Chrysene	80J
Benzo(a)anthracene	70J
Di-n-octyl phthalate	
Benzo(b)fluoranthene	40J
Benzo(a)pyrene	60J
Indeno(1,2,3-c,d)pyrene	20J
Benzo(ghi)perylene	
Benzoic Acid	NA
Benzaldehyde	NA
Other Parameters (mg/L)	
Total Petroleum Hydrocarbons	408900

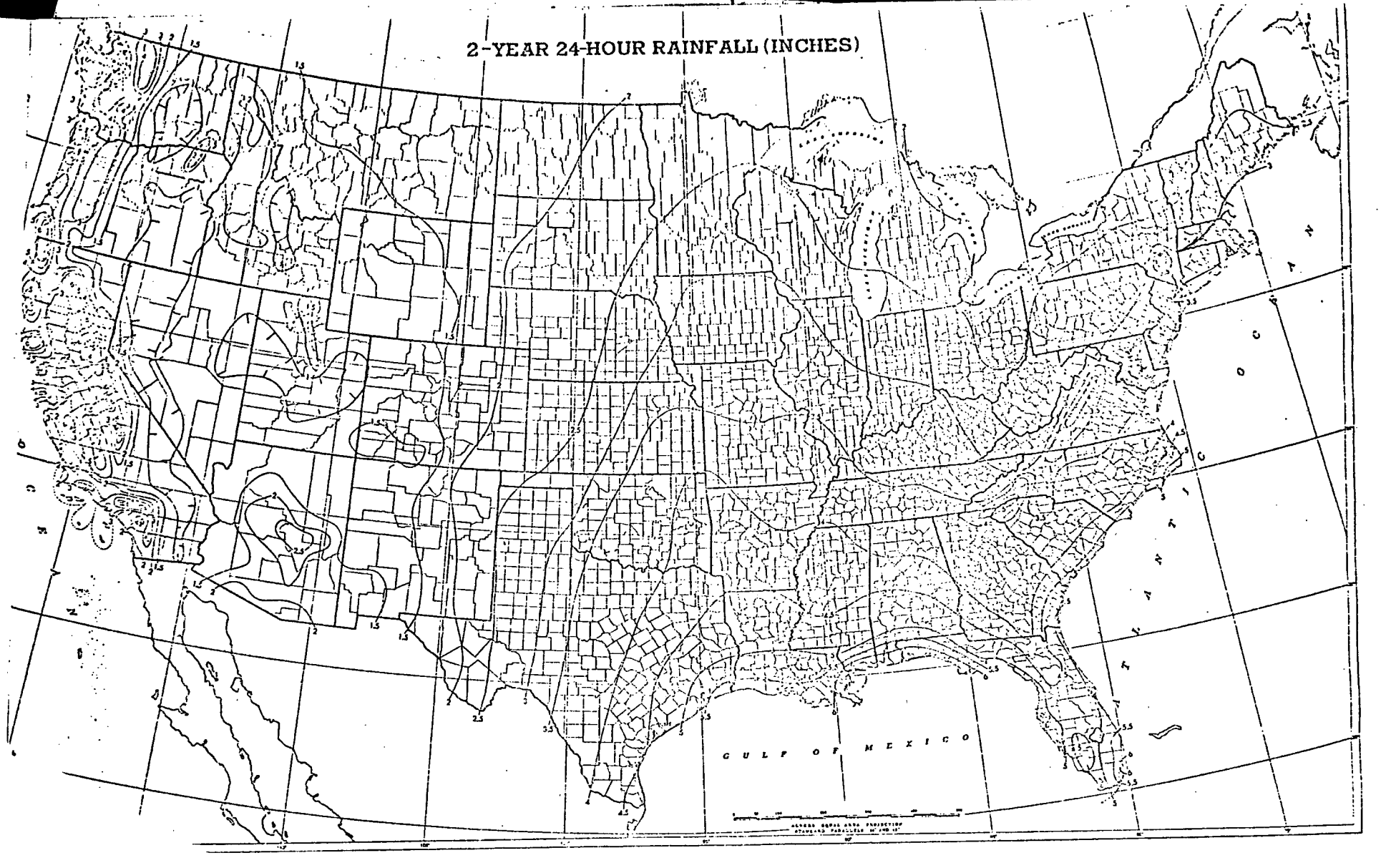
Notes:

Sample was collected on January 6, 1988.
Analysis was performed by Envirotech Research of Edison, New Jersey.
NA - Not Analyzed.
J - Compound detected below method detection limit.
All concentrations are in mg/kg unless otherwise noted.

6F30.wk1

APPENDIX A APPENDIX C FIGURES

2-YEAR 24-HOUR RAINFALL (INCHES)



ME/AQ GROUP

U.S. DEPARTMENT OF COMMERCE

WEATHER BUREAU 3/31/80
Return To T. Pogue

TECHNICAL PAPER NO. 40

RAINFALL FREQUENCY ATLAS OF THE UNITED STATES

for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years

NOTICE

Rainfall-frequency information for durations of 1 hour and less for the Central and Eastern States has been superseded by NOAA Technical Memorandum NWS HYDRO-35, "5 to 60 Minute Precipitation Frequency for Eastern and Central United States."

THIS ATLAS IS OBSOLETE FOR THE FOLLOWING 11 WESTERN STATES:

Vol.	State	Price
I	Montana	$ 8.35
II	Wyoming	8.45
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IV	New Mexico	8.45
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VI	Utah	10.10
VII	Nevada	8.45
VIII	Arizona	8.35
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WASHINGTON, D.C.
May 1961
Reprinted and Reprinted January 1963

Ref. No 8

13773

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
JOHN FITCH PLAZA, P. O. BOX 2807, TRENTON, N. J. 08625

ORDER

To: Tenneco Inc.
Corporation Trust Co., Registered Agent
28 West State Street
Trenton, New Jersey 08608

Re: N.J.A.C. 7:27- 8.3(e)2
Plant Identification No. 80053
Violation Occured on Premises Known As:
290 River Drive, Block 50, Lot 1, Garfield City, Bergen County, New Jersey

WHEREAS, the State Department of Environmental Protection has determined by investigation(s) or inspection(s) made pursuant to the Provisions of the New Jersey Air Pollution Control Act that on September 6, 1977 you did violate Title 7, Chapter 27, Subchapter 8, Section 8.3(e)2, of the New Jersey Administrative Code.

The investigation(s) discloses the use of the tank truck formalin filling and vent system without all components in use functioning properly in accordance with Permit P-31604 and Certificate CT-31604 on the premises identified above.

NOW, THEREFORE, YOU ARE HEREBY ORDERED, to cease violation of said Subchapter on the premises owned, leased, operated or maintained by you on or before December 15, 1977.

Dated: November 30, 1977

Herbert Wortreich
Herbert Wortreich, Chief
Bureau of Air Pollution Control

cc: Local District Field Office — Garfield City, Newark

CERTIFIED MAIL

VAP001
Jul. 76

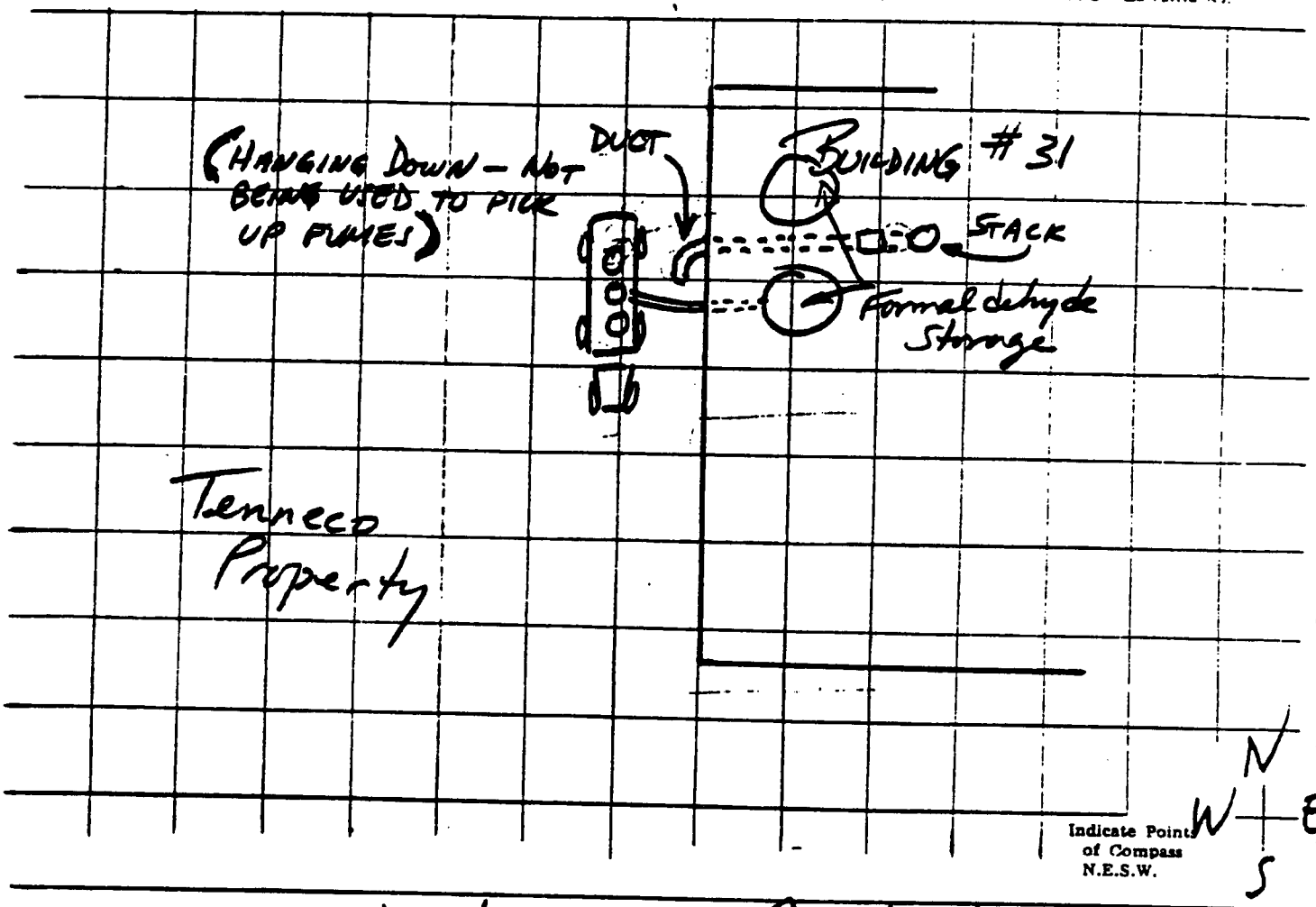
FIELD OFFICE - ENFORCEMENT FILE

51

ATURE OF OPERATION (Check one applies)

	a. Agriculture (Includes farming, fishing, forestry)		g. Utilities
	b. Mining		h. Business and Personal Services (Includes Banks, Real Estate Co., Insurance Co., Hotels, Recreational Services i.e. Movies
	c. Construction		
2818	d. Manufacturing (type)		
	e. Transportation		i. Salvage
	f. Wholesale and Retail Trade (Includes restaurants)		j. Refuse and Garbage Disposal
			k. Government (Includes Federal, State and Local)
			l. Other

Draw Diagram Below Showing Location, Streets And Distances Of Violation With Respect To Streets And/Or Landmarks.



Indicate Points of Compass N.E.S.W.

Comments on Location Industrial – Residential

Statements about violation made by person interviewed He instructed the operator to use the duct to pull fumes from the truck area.

File #1

16255

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
JOHN FITCH PLAZA, P. O. BOX 2807, TRENTON, N. J. 08625

ORDER

To: Tenneco Chemicals, Inc.
Corporation Trust Co., Registered Agent
28 West State Street
Trenton, New Jersey 08608

Re: N.J.A.C. 7:27- 3.2(a)
Plant Identification No. 00053
Violation Occurred on Premises
Known As:
290 River Road, Plate 3, Lot 1, Block 50, Garfield City, Bergen County, New Jersey

WHEREAS, the State Department of Environmental Protection has determined by investigation(s) or inspection(s) made pursuant to the Provisions of the New Jersey Air Pollution Control Act that on April 9, 1979 you did violate Title 7, Chapter 27, Subchapter 3, Section 3.2(a), of the New Jersey Administrative Code.

The investigation(s) discloses visible smoke being emitted into the outdoor air from the combustion of fuel in the Strathers Wells boiler on the premises identified above.

NOW, THEREFORE, YOU ARE HEREBY ORDERED, to cease violation of said Subchapter on the premises owned, leased, operated or maintained by you on or before June 28, 1979.

Dated: June 13, 1979

Edward J. Londres
Edward J. Londres
Assistant Chief
Bureau of Air Pollution Control

cc: Local District Garfield City
Field Office Newark

CERTIFIED MAIL

VAP001
Jul. 76

54

Stack Description 3 ft diameter, steel plate, round

Observation Point Hudson St.

Direction to Stack north

Distance to Base of Stack 200 ft Height of Stack 70 ft

Wind Direction south east Wind Velocity 4-6 mph

Weather overcast

Background gray sky

Plume Color & Description black & forming

Instrument and No. MSA Smokescope #527

Fuel Burning Equipment:

Type: ☐ Stationary Indirect Heat Exchanger

Internal Stack Dimension (Dip) _____

Rated Heat Input ~~75~~ 65 million BTU's / hr.

☐ Other (specify) _____

Fuel – ☐ Coal, ☑ # 2 Oil, ☐ Other _____ (specify)

Was a new fire being built or the firebox being cleaned during the period of observation? ☐ Yes ☑ No

Manufacturing Process:

Source (specify) _____

Air Contaminant Emitted (specify) _____

Incinerator:

Type: ☐ Common ☐ Special

Type of Waste: No. _____

Was a new fire being built? ☐ Yes ☐ No

Comments: Boiler - Strathers Wells
Boiler heats Dow Therm; using the heat to distill Toluene to produce Benzoic Acid

Signed: Glen Moll Title Air Health Aide

Numbers in the left hand column represent emission densities equivalent to Ringelmann's Scale for Grading the Density of Smoke published by the U. S. Bureau of Mines (Rn), and equivalent opacities in % of total obscuration. Numbers across the chart define the hour of the day and minutes during which observations were made.

The shaded horizontal traces are the grades of Ringelmann's Scale or equivalent opacities and the duration of that grade of emissions during the period of observation. Vertical traces have been inserted only to provide a clearer graphical illustration of the variations of emissions.

S – denotes start of observation.

Tenneco Chemicals
A Tenneco Company

290 River Road
Garfield, N.J. 07026
(201) 646-4900

#3

May 14, 1981

Bergen County Dept. of Health
and Environmental Protection
327 E. Ridgewood Avenue
Paramus, New Jersey 07652

Attention: Mr. A. DeCandia

Dear Mr. DeCandia:

As you know, during your visit on May 13, 1981, a source of odor was located at Cambridge Avenue and Commerce Street, which may have been the reason for recent complaints to your office by a neighbor. Steam was coming from a roofline vent which would normally be condensed by a stream of river water in a contact scrubber. This steam comes from boiling off the Sodium Benzoate reactors. It contains trace amounts of the hydrocarbon biphenyl which although unreactive has a very strong unpleasant odor. I called the department foreman to investigate. He found that the scrubber water had stopped flowing due to a temporary blockage in the valve used to adjust water flow. When he opened the valve and cleared the plug, the steam from the vent stopped. As you know when we later checked on Commerce Street the odor had dissipated, and we concluded that the vent had been the probable cause.

Since we have had trouble with this river water throttling type valve blocking before, I have agreed to replace it with an open/shut type of valve sized to pass the correct amount of water. This should eliminate the possibility of accidental cut-off of the scrubber water, and avoid a recurrence of this odor problem.

Very truly yours,

TENNECO CHEMICALS, INC.
Organics Division

A. W. Dege
Technical Superintendent

AWD:pr
cc: Mr. E. Burbank
Garfield Board of Health

P.S. Under present N.J.D.E.P. regulations, this vent does not require a permit. Biphenyl is not a volatile organic solvent as defined in Sub-Chapter XVI.

City of Garfield
New Jersey

BOARD OF HEALTH

19 COMMERCE ST.
GARFIELD, N. J. 07026

CITY HALL ANNEX
Telephone 478-7040

October 11, 1978

Mr. Paul Arbesman, Director
Division of Environmental Quality
N.J. State Dept. of Environmental Protection
Div. of Environmental Quality
John Fitch Plaza
P.O. Box 2807
Trenton, N.J. 08625

Dear Sir:

The Board of Health has asked me to write this letter in regards to chemical plants in Garfield. **There are many pungent and noxious odors hovering throughout Garfield** due to these plants. The Garfield Health Dept. is less than a block away from the Tenneco Chemical Plant and we believe they contribute greatly towards these odors. Very often all the windows in the Health Dept. must be closed because of these odors. A schoolhouse nearby must also shut their windows and they will testify to this fact.

I have read in the newspapers of your department having instruments to detect and measure pollutants in the air. I will be more than pleased to avail the facilities of the Garfield Health Dept. for your instruments. I will provide you with whatever assistance you may require and I am able to give in any survey for air pollution you conduct in Garfield.

Tenneco has informed me that they prevent their volatile chemicals from emanating into the atmosphere by holding a nitrogen gas in these tanks. These tanks contain a benzaldehyde compound. This is an aromatic chemical and the odors we detect at our Health Dept. are definately an aromatic.

We would appreciate any kind of testing you can perform in Garfield for the detection of any air pollutant. Once the pollutant is found then perhaps you can advise the violator on how best to abate these odors.

R7

The Board of Health and all the residents of Garfield would be deeply greatful of any steps you take to alleviate these odors. I hope to hear from you soon.

Sincerely yours,

John Vertino
Health Officer

JV/jr

R3

#3

To: Tom Leonard + File

Date 3-17-81

From: John Strong

Subject: Tenneco Chemical, Garfield I.D. 00053

Observations: At approx 4:05 P.M a call was received from Mr August Dege (Tech. Super.) for Tenneco Chemical. Mr Dege wished to inform the Department that at approx 3:40 P.M a cooling water pump failed which resulted in a ruptured disk serving the toluene stripping column for the production of benzoic acid. The result of this ruptured disk was that approx. 1000 lbs of Toluene was released to the atmosphere. At this time a team is installing a new disk on the stripping column and the toluene emission has ceased

John Strong
Env Spec.

K'

April 13, 1981

N.J. Dept. of Environmental Protection
Air Pollution Control Division
120 Route 156
Yardville, New Jersey 08620

REPORT NO. 81-4-10-7

Attention: Mr. Ostrander

Dear Sir:

Confirming our telephone report, this is to advise you that on April 6, 1981 at 9:10 a.m. there occurred an emission of Benzoic Acid dust into the atmosphere from the Tenneco plant at 290 River Drive, Garfield, N.J. 07026. It continued for about 5 minutes. It was caused by a gasket failure in the re-circulating piping of one of our stills, which allowed about 75 pounds of liquid Benzoic Acid to spill on the ground. It being a windy day, vapors from the hot materials condensed into a fine dust and were blown south and east over the adjacent neighborhood.

We were able to locate the leak and shut off the pipeline within a few minutes. The spilled acid was neutralized and washed to the sewer. The dust emission ceased as soon as the leak was stopped, and left no visible residue.

Very truly yours,

TENNECO CHEMICALS, INC.
Organics Division

A. W. Dege
Technical Superintendent

AWD:pr

bcc: H. Goel
R. Glueck
R. Lareau
J. Mayer
J. Sandstedt
A. Walters

K2

neco Chemica
nneco Company

290 River Road
Garfield, N.J. 07026
(201) 646-4900

June 11, 1981

Mr. Bart F. Didovich, Director
Civil Defense & Disaster Control
City Hall
Garfield, New Jersey 07026

Dear Mr. Didovich:

As you know, we had an emission of Benzoic Acid dust into the atmosphere yesterday from our Garfield facility. In accordance with your request, the following is a description of the incident:

At about 11:45 A.M. on June 10, 1981, we had a gasket failure in the discharge piping of one of our stills causing an emission of Benzoic Acid dust into the atmosphere. The leak was discovered immediately by the operator and the line was shutoff. The incident lasted for about 5 minutes.

Approximately 50 pounds of liquid Benzoic Acid was lost on the ground and a portion of the vapors from the hot material which condensed into a fine dust was blown eastward towards the adjacant neighborhood.

To minimize recurrence of this problem, we are planning to replace the present gaskets in this critical area with a new improved design gasket material during our annual shutdown this summer.

We trust that this explanation is satisfactory.

Very truly yours,

TENNECO CHEMICALS, INC.
Organics Division

H. A. Goel
Manager Mfg. Services

HAG:pr

cc: Mr. E. Burbank
Garfield Board of Health

bcc: A. W. Dege
R. Glueck
R. Lareau
J. Mayer
J. Sandstedt

#3

To: Tom Leonard

From: John Strong

Subject: Tenneco Chemicals Inc.
280 River Rd, Garfield

Date of Investigation: "6-12-81"

Purpose of Investigation: Complaint Investigation - See Attached

Person(s) Interviewed: Hari Goel - Mgr Manufacturing - Tenneco

Observations: The undersigned met with Mr Goel and discussed the attached complaint. Per Mr Goel subject company had an accident with a discharge line where a broken gasket released Benzoic Acid dust. See Attached letter from Tenneco describing the accident. Letter dated 6-11-81.

Conclusion: The upset at Tenneco occured around the time that the complaint was received. The undersigned attempted to contact the complaintant but was unable to reach her. Complaint verified.

Recommendation: Company was informed to contact the NFO the next time that an upset occurs. Company is planning to replace many of their old gaskets with a new design. This should eliminate this recurring problem.

John Strong
Env. Spec.

K

#3

To: Tom Leonard

From: John Strong

Subject: Tenneco Chemicals Inc.
280 River Rd, Garfield

Date of Investigation: 6-12-81

Purpose of Investigation: Complaint Investigation - See attached

Person(s) Interviewed: Hari Goel - Mgr Manufacturing - Tenneco

Observations: The undersigned met with Mr Goel and discussed the attached complaint. Per Mr Goel subject company had an accident with a discharge line where a broken gasket released Benzoic acid dust. See attached letter from Tenneco describing the accident. Letter dated 6-11-81

Conclusion: The upset at Tenneco occured around the time that the complaint was received. The undersigned attempted to contact the complainant but was unable to reach her. Complaint verified.

Recommendation: Company was informed to contact the NFO the next time that an upset occurs. Company is planning to replace many of their old gaskets with a new design. This should eliminate this recurring problem.

John Strong
E.H.O. Spec

Form DEQ-012
5/81

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY

AIR POLLUTION CONTROL CODE

FIELD RECORD OF VIOLATION

I.D. 00053

DATE 12-14-82 TIME AT SITE 9:45 (a.m.) p.m. from 12:30 a.m. (p.m.) to

STATE HEALTH DISTRICT Newark COUNTY Bergen

PERSON IN VIOLATION

FULL BUSINESS NAME Kalama Chemicals Inc (Formally Tenneco Chemical Inc.)

MAILING ADDRESS 280 (No.) River Rd (Street) Garfield (City) 07026 (Zip Code)

TYPE OF OWNERSHIP: ☐ Individual ☐ Partnership ☒ Corporation ☐ Municipal _____ (Type)

NAME OF OWNER, PARTNERS, OFFICERS, OFFICIALS Bob Kirchner

TITLE President

PERSONS INTERVIEWED Harry Goel

PERSON AUTHORIZED TO RECEIVE PROCESSES Harry Goel (Name)

MAILING ADDRESS 280 (No.) River Rd (Street) Garfield (City) 07026 (Zip Code)

REMARKS:

LOCATION OF VIOLATION

LOCATION ADDRESS 280 (No.) River Rd (Street) Garfield (City)

(Show details on reverse side) Book Plate _____ Lot 1 Block 50

PREMISES OCCUPIED AS: ☒ Owner ☐ Lessee ☐ Tenant

OWNER Kalama Chemical Inc. (Name) 280 (Street) River Rd Garfield (City)

DETAILS OF VIOLATION

CODE REFERENCE: Chapter(s) N.J.A.C. 7:27 Section(s) 8.3 Paragraph(s) (e)2

DETAILS The investigation disclosed that subject company was operating equipment and control apparatus covered by Temp. Permit # 60937, NJ25 not in accordance with Permit, by having no coolant flowing through condenser. Equipment consists of still, reactor, Hold tank, receiver, crystallizer, mother liquor TANK [redacted] All which vent to a common receiver with vapors controlled by condenser. little water flowing through condenser*. Solvent still and receiver were

REMARKS in operation. Company informed violation would be written.

* Very, Very little water (droplets) detected on discharge side of condenser Permit states 50 G.P.M

RECOMMENDED ACTION Issue NOP. See 8.3(e)2 Dept. Order dated 11-30-77

SIGNED: [signature] TITLE: Env. Spec. 12/16/82

OK [signature] 12/20/82

(OVER)

DEQ-012

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY

AIR POLLUTION CONTROL CODE

FIELD RECORD OF VIOLATION

I.D. 00053

DATE 12-14-82 TIME AT SITE 9:45 (a.m.) p.m. from 12:30 a.m. (p.m.) to

STATE HEALTH DISTRICT Newark COUNTY Bergen

PERSON IN VIOLATION (Sec. A)

FULL BUSINESS NAME Kalama Chemical Inc (Formally Tennecc Chemical Inc)

MAILING ADDRESS 280 (No.) River Rd (Street) Garfield (City) 07026 (Zip Code)

TYPE OF OWNERSHIP: ☐ Individual ☐ Partnership ☒ Corporation ☐ Municipal ____ (Type)

NAME OF OWNER, PARTNERS, OFFICERS, OFFICIALS Bob Kirchner

TITLE President

PERSONS INTERVIEWED Harry Goel

PERSON AUTHORIZED TO RECEIVE PROCESSES Harry Goel (Name)

MAILING ADDRESS 280 (No.) River Rd (Street) Garfield (City) 07026 (Zip Code)

REMARKS:

LOCATION OF VIOLATION (Sec. B)

LOCATION ADDRESS 280 (No.) River Rd (Street) Garfield (City)

(Show details on reverse side) Book Plate ____ Lot 1 Block 50

PREMISES OCCUPIED AS: ☒ Owner ☐ Lessee ☐ Tenant

OWNER Kalama Chemical Inc (Name), 280 River Rd (Street) Garfield (City)

DETAILS OF VIOLATION (Sec. C)

CODE REFERENCE: Chapter(s) N.J.A.C. 7:27 Section(s) 16.6 Paragraph(s) (a)

DETAILS The investigation discloses that a visible liquid VOS leak (Toluene + Water) was observed coming from a condenser / sight glass fitting connection. Which does not involve any moving parts. Above leak and equipment are located in BLDG. 10-M, Fourth Floor. Company informed that a violation would be written

REMARKS Strong solvent odors detected in the area. Per Mr Goel the leak had been fixed before in the past. Leak was quite obvious

RECOMMENDED ACTION Issue Order

SIGNED: [signature] TITLE: Env. Spec.

12/14/82

(OVER) OK Gw 12/20/82

12/21/82

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
JOHN FITCH PLAZA, CN027, TRENTON, N.J. 08625

ORDER

TO: Kalama Chemicals, Inc.
Bob Kirchner, President
280 River Road
Garfield, New Jersey 07026

RE: N.J.A.C. 7:27-8.3(e)2
Plant ID # Not listed
Violation Occurred on
Premises Known As:

280 River Road, Garfield City,
Lot 1, Block 50, Bergen County,
New Jersey

WHEREAS, the State Department of Environmental Protection has determined by investigation(s) made pursuant to the Provisions of the New Jersey Air Pollution Control Act that on December 14, 1982 you did violate Title 7, Chapter 27, Subchapter 8, Section 8.3(e)2, of the New Jersey Administrative Code.

The investigation(s) disclosed the use of the process equipment without coolant flowing through condenser, therefore not functioning properly in accordance with Permit (P-60937) and Certificate (CT-60937).

NOW, THEREFORE, YOU ARE HEREBY ORDERED, to cease violation(s) of said Subchapter on the premises owned, leased, operated or maintained by you on or before January 13, 1983.

DATED December 29, 1982

for Harold E. Christ
Thomas A. Pluta, Assistant Director
Enforcement Branch

cc: Newark Field Office

LOG #20110

CERTIFIED MAIL

59

To: File

From: John Strong

Date: 6/27/84

Subject: Equipment Upset at Kalama Chemical

At approx 12:15 pm Mr Harry Goel, plant engineer notified the writer of a equipment upset which occurred in bldg #36 involving the uncontrolled release of possibly 25-40 lbs of salicylic acid. Per Mr Goel, sometime in the early morning hours a nozzel in the caustic scrubber serving a steam dryer became clogged. The problem was discovered around 6-6:30 AM and the operation was shut down. The equipment involved is located in bldg #36 and listed under NS stack #14. Mr Goel will be sending a letter further detailing the incident

John Strong

KALAMA CHEMICAL INC.
290 RIVER DRIVE
GARFIELD, N.J. 07026

PHONE 201-779-8880
TWX 710-989-7001

June 29, 1984

Mr. John Strong
N. J. Department of Environmental Protection
Bureau of Air Pollution Control
Newark Field Office
1100 Raymond Blvd.
Newark, N. J. 07102

Dear Mr. Strong:

Confirming our telephone report, I wish to advise you that on June 27, 1984 at about 2:00 a.m. we had an emission of Salicylic Acid powder into the atmosphere from our plant in Garfield, N. J. The emission lasted for about four hours and an estimated 30 lbs of Salicylic Acid powder was lost during this period. The problem occurred due to a plugged spray nozzle in the Salicylic Acid dryer scrubber system. The pluggage caused the Salicylic Acid powder to escape without getting scrubbed and removed from the exhaust system.

As you know, Salicylic Acid is not a hazardous substance but the dust can be irritating to eyes, nose and throat. The powder had blown over some of the neighbors' cars. We advised them to get their cars washed and were reimbursed for the same.

We are extremely sorry and regret the inconvenience it caused our neighbors. We are looking at this system and making every effort to avoid recurrence of this problem.

Very truly yours,

KALAMA CHEMICAL INC.

H. A. Goel
Technical Superintendent

HAG:pb

DEQ-062
1/88

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
BUREAU OF ENFORCEMENT OPERATIONS

FIELD INVESTIGATION ASSIGNMENT REPORT

PLANT ID #	INSPECTOR ASSIGNED
00053	621

DATE ASSIGNED	DATE DUE
04-11-88	11 8
DATE COMPLETED	COUNTY
6-13-88	ESX

COMPANY NAME KALAMA CHEMICAL INC
LOCATION Garfield

TYPE OF ASSIGNMENT
☐ Complaint ☒ APEDS
☐ Order Followup
☐ Other (by code) _____

CYCLE: 4

CDS CLASS: A1 VOS A2 ___ B ___ NSPS ___ NESHAPS ___ PSD ___

AIR GRANT (105): ☐ Yes ☐ No PLLT: PT ___ S2 ___ CO ___ N2 ___ VO ___ Other ___

COMPLAINANT NAME _____ PHONE # _____
COMPLAINANT ADDRESS _____
DATE RECEIVED _____ TIME RECEIVED _____ RECORDED BY _____

ASSIGNMENT CHANGE TO CYCLE 1
STACK 84 + 24 MORE (INCL. EXP'D's)

PLANT CONTACT Hari Goel
TITLE Technical Superintendent
ARRIVAL TIME AT PLANT 9:00
TOTAL ASSIGNMENT TIME 328
STACKS INSPECTED 31 TEMPS 0
TOTAL SOURCES INSPECTED 38
.Q-012 COMPLETED FOR SUBCHAPTERS

SUBCHAPTER	# INSP
6	17
7	1
6	20
16	12
OTHER	

COMPLAINT

TYPE	NUMBER

Time/Date at Complainant ____/____
Verified: ☐ Yes ☐ No
Give details below

VIOLATION FOLLOWUP INSPECTION
Violation Log # _____
Order Dated _____
Subchapter Violated _____
Compliance Achieved ☐ Yes ☐ No
Give details below

TYPE SAMPLE COLLECTED _____
OF SAMPLES COLLECTED _____
COMMENTS (by code) _____

DETAILS OF INSPECTION SEE ME - LB

The company is presently operating only 1/3 of its 93 stacks. According to Hari Goel the company is in ECRA. Kalama currently produces only three main products - Salicylic acid, methyl salicylate, and paracepts. MDA is produced in a very small amount. Formaldehyde and benzoic acid production is shut down. The company sent in a termination request on the renewal form for most of the exp. ct's. Stack #41, 48, 49, and 50 have been renewed until 1993.

INSPECTOR'S SIGNATURE John C Smith
TITLE: _____

SEE ATTACHED FOR ADDITIONAL INFORMATION: ☑ YES ☐ NO

SUPERVISOR'S REVIEW
INITIALS [illegible] DATE: 6-20-88

Reference Number 20

11046/8-74

Ref. No. 20

RECORD OF TELEPHONE CONVERSATION

DATE Dec. 10, 1991

TO EPA SSI / Tenneco (aka Kalama Chemical Co.)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA / Tenneco (aka Kalama Chemical Co.)

SUBJECT Populations in Garfield / School System

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.770

DISCUSSION WITH Office of the Superintendent of Schools
City of Garfield (201) 340-5006

Schools and population (# of students)

Garfield H.S. Pallisade and Outwater La.	736
School # 5	
" " 6	228
" " 7	303
" " 8	409
" " 9	385
	390

COMMENTS

BY J. Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 21

Tenneco Chemicals
Tenneco Company

290 River Road
Garfield, N.J. 07026
(201) 646-4900

Ref. No.

TENNECO

June 11, 1981

Mr. Bart F. Didovich, Director
Civil Defense & Disaster Control
City Hall
Garfield, New Jersey 07026

Dear Mr. Didovich:

As you know, we had an emission of Benzoic Acid dust into the atmosphere yesterday from our Garfield facility. In accordance with your request, the following is a description of the incident:

At about 11:45 A.M. on June 10, 1981, we had a gasket failure in the discharge piping of one of our stills causing an emission of Benzoic Acid dust into the atmosphere. The leak was discovered immediately by the operator and the line was shutoff. The incident lasted for about 5 minutes.

Approximately 50 pounds of liquid Benzoic Acid was lost on the ground and a portion of the vapors from the hot material which condensed into a fine dust was blown eastward towards the adjacant neighborhood.

To minimize recurrence of this problem, we are planning to replace the present gaskets in this critical area with a new improved design gasket material during our annual shutdown this summer.

We trust that this explanation is satisfactory.

Very truly yours,

TENNECO CHEMICALS, INC.
Organics Division

H. A. Goel
Manager Mfg. Services

HAG:pr

cc: Mr. E. Burbank
Garfield Board of Health

bcc: A. W. Dege
R. Glueck
R. Lareau
J. Mayer
J. Sandstedt

K4

Reference Number 22

11046/8-74

Ref. No. 22

RECORD OF TELEPHONE CONVERSATION

DATE 12/16/91

TO EPA SSI / Tenneco (Aka Kalama Chemical)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA / SSI

SUBJECT Population densities

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Drew Pavlica, City Clerk, City of Garfield
(201) 340-2001

Garfield population density — 11,551 /mi²

All information was taken from
The Planner's Data Book for Bergen County

Roseville Park 4,978/mi²

Wallington 10,435/mi²

Ledi 9,881/mi²

Elmwood Park 6,549/mi²

COMMENTS

East Rutherford 2,039/mi²

Saddle Brook 5,106/mi²

Saddle River 610/mi²

Rutherford 6,379/mi²

Fairlawn 5,739/mi²

Hasbrouck Hts. 620/mi²

Teterboro 20/mi²

Woodridge 6,971/mi²

S. Hackensack 4,044/mi²

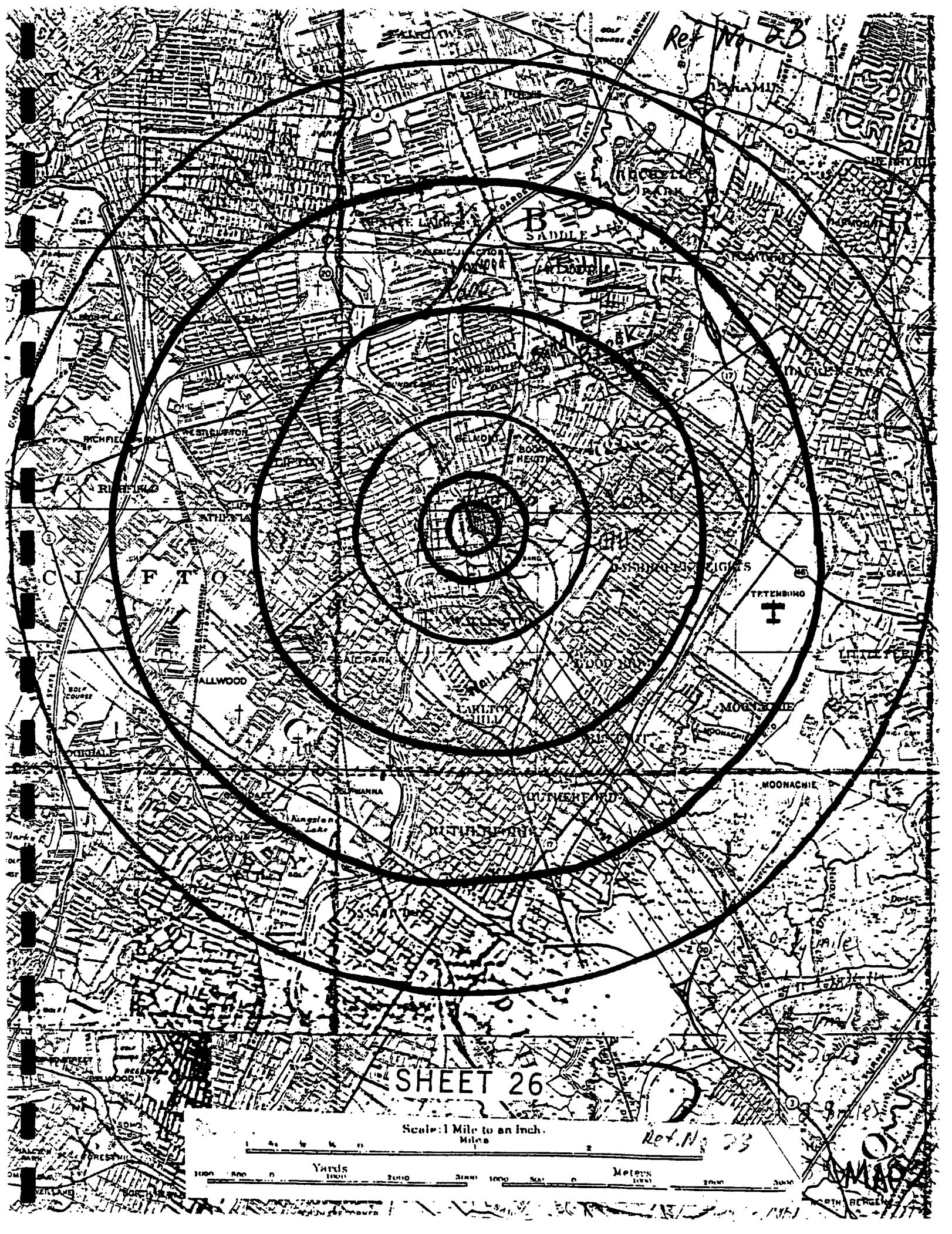
BY _____ NAME _____ TITLE _____ DEPT. NO.

CC:

Hackensack 8,636/mi²

Maywood 9,906/mi²

Reference Number 23


Ref No. 23
SADDLE
CLIFTON
ALLWOOD
PASSAIC PARK
CARLTON HILL
MOONACHIE
TETENBORO
DELAWANNA
RUTHERFORD
SHEET 26
Scale: 1 Mile to an Inch.
Miles
Yards
Meters
Ref. No. 23

EBASCO SERVICES INCORPORATED

BY _____ DATE _____ SHEET ____ OF ____

CHKD. BY _____ DATE _____ OFS NO. _____ DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

population density #5
Ref. No. 22

0 - 1/4 mile - total people = 2913

area circle = 0.196 $(\pi)(r^2)$

0.098 sq. mi — 0.098 sq.mi.

Passaic — Garfield

pop. density 18,140 people/sq.mi. — p.d = 11,551 people/sq.mi.

1781 people — 1132 people

1/4 mi - 1/2 mi. = area between "ring" = 0.79 - 0.196 = 0.594

area circle = $\pi(.5^2)$ = 0.79 sq.mi.

0.297 sq.mi. — 0.297 sq.mi.

Passaic — Garfield

pd. = 18,140 people/sq.mi — 11,551 people/sqm.

5388 people — 3431 people

Total people 8819

1/2 mile - 1 mile

area = $\pi(1^2)$ = 3.14 sq.mi.

area of pop betw. "ring" = 3.14 - 0.79 = 2.35 sq.mi.

Passaic	Wallington	Hasbrouck Hts.	Woodridge
0.1667 of area	0.1667 of area	0.083	0.083
area = 0.39	0.39	0.195	0.195
pd = 18140 people/sm = 7075	pd = 10,435 4070	pd = 7620 1486	pd = 6971 1360
Lodi		Clifton	Garfield
0.083		0.1667 of area	0.25 of area
0.195		0.39	0.59
pd = 9881		pd = 6349	11,551
1927		2477	6815

Total people = 25,210

581 2-88

EBASCO SERVICES INCORPORATED

BY _____ DATE _____ SHEET _____ OF _____

CHKD. BY _____ DATE _____ OFS NO. _____ DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

1 - 2 miles area: "ring" 12.56 - 3.14 = 9.42 **Total = 94,770**

Clifton	Passaic	Wallington	Woodridge	Hasbrouck Hts
0.1667	0.1667	0.1667	0.0625	0.0625
1.6 s.m.	1.6 s.m.	1.6 s.m.	0.58 s.m.	0.58 s.m.
pd = 6349	pd = 18,140	pd = 10,435	pd = 6971	pd = 7620
10,159	29,024	16,696	4043	4420

Lodi	Saddle Brook	Elmwood Park	Garfield
0.083	0.083	0.083	0.125
0.78 sm.	0.78 sm.	0.78 s.m.	1.18 sm.
pd = 9,881	pd = 5106	pd 6549	pd = 11,551
7707	3983	5108	13,630

2-3 miles area ring 28.27 - 12.56 = 15.7 s.m.

Garfield	Clifton	Elmwood Park	Saddle Brook	Hackensack	Hasbrouck Hts.
0	0.25	0.05	0.10	0.15	0.10
pd = 11,551	3.925 s.m.	0.785 s.m.	1.57 s.m	2.355 sm	1.57 sm
	pd = 6349	pd = 6549	pd: 5106	pd = 8656	pd 7620
	24920	5141	8017	20,385	11,964

Teterboro	Lodi	Moonachie	Rutherford	Passaic
0.05	0.05	0.0625	0.0625	0.125
0.785 sm	0.785 sm	0.98 s.m.	0.98 s.m.	1.97
pd = 20	pd = 9881	pd = 2906	pd = 6379	pd = 18,140
15.7 ≈ 16	7,757	2848	6252	35,736

Total = 123,036

581 2-88

EBASCO SERVICES INCORPORATED

BY _____ DATE _____ SHEET _____ OF _____

CHKD. BY _____ DATE _____ OFS NO. _____ DEPT. NO. _____

CLIENT _____

PROJECT _____

SUBJECT _____

3-4 miles area = 50.26 - 28.27 = 21.99
"rings"

Rochelle Park	Maywood	Hackensack	(Little Ferry)
0.0625	0.125	0.20	
1.38 s.m	2.75 s.m.	4.39 sm	
pd = 4978	pd = ~4044	pd = 8656	
6870	11,121	38,000	

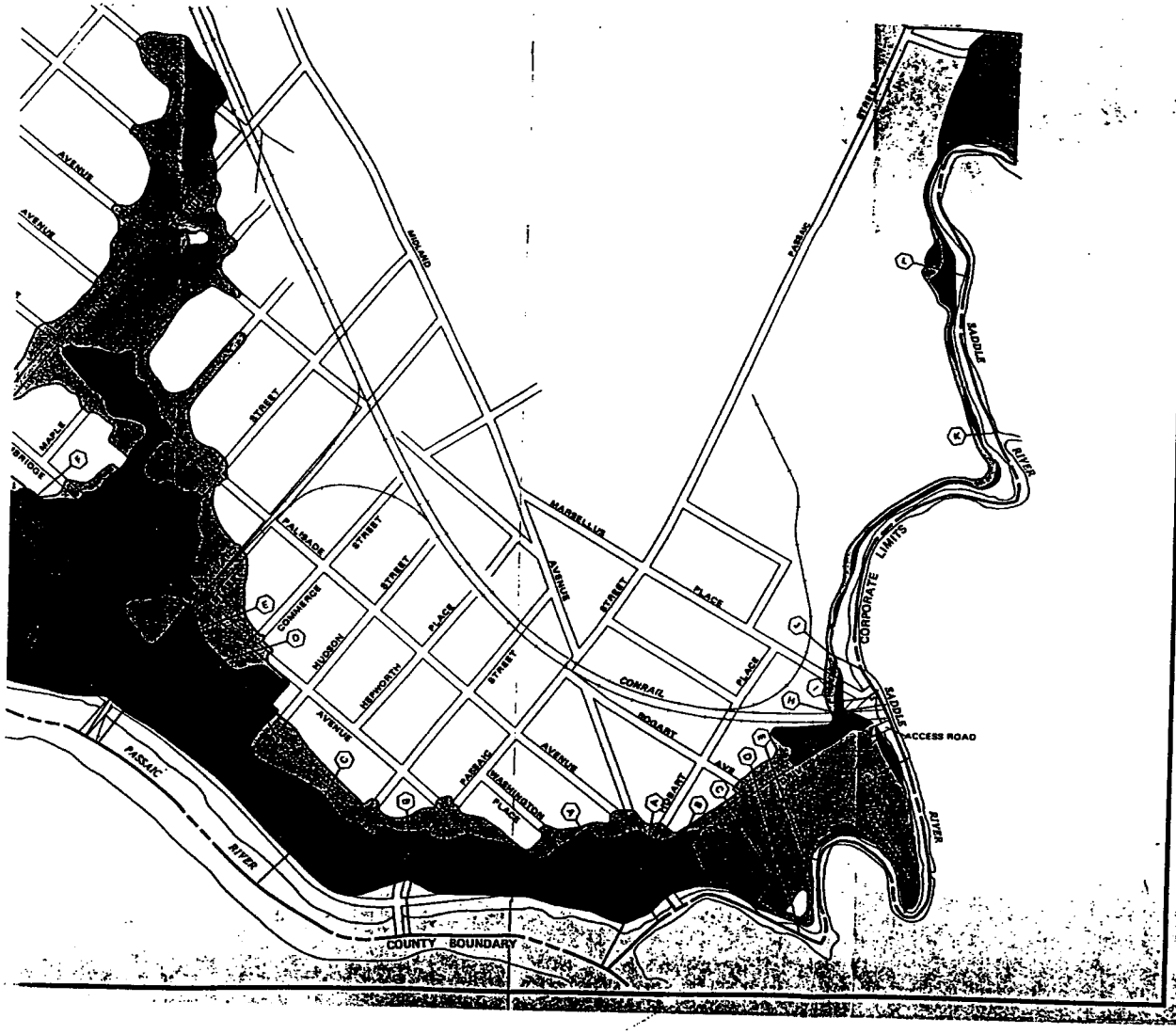
Moonachie	Rutherford	(Nutley)	Clifton
0.0625	0.15		0.3
1.38 s.m.	3.3 s.m.		6.5 Sm
pd = 2906	pd = 6379		pd = 6349
4,010	21,050		41,269

Patterson	Rochelle Park
0.	0.1
	2.19 Sm
	pd = 4978
	10,902

Total - 133,222

581 2-88

Reference Number 24



APPROXIMATE SCA

400 0

NATIONAL FLOOD I

FLOODW

FLOOD BOUND/

FLOODWAY MAP

CITY OF
GARFIELD,
NEW JERSEY
BERGEN COUNTY

ONLY PANEL PRINTED

OFFICE COPY
PLEASE RETURN TO FILE

COMMUNITY-PANEL NUMBER
340037 0001

MAP REVISED:
NOVEMBER 1, 1984

Federal Emergency Management Agency

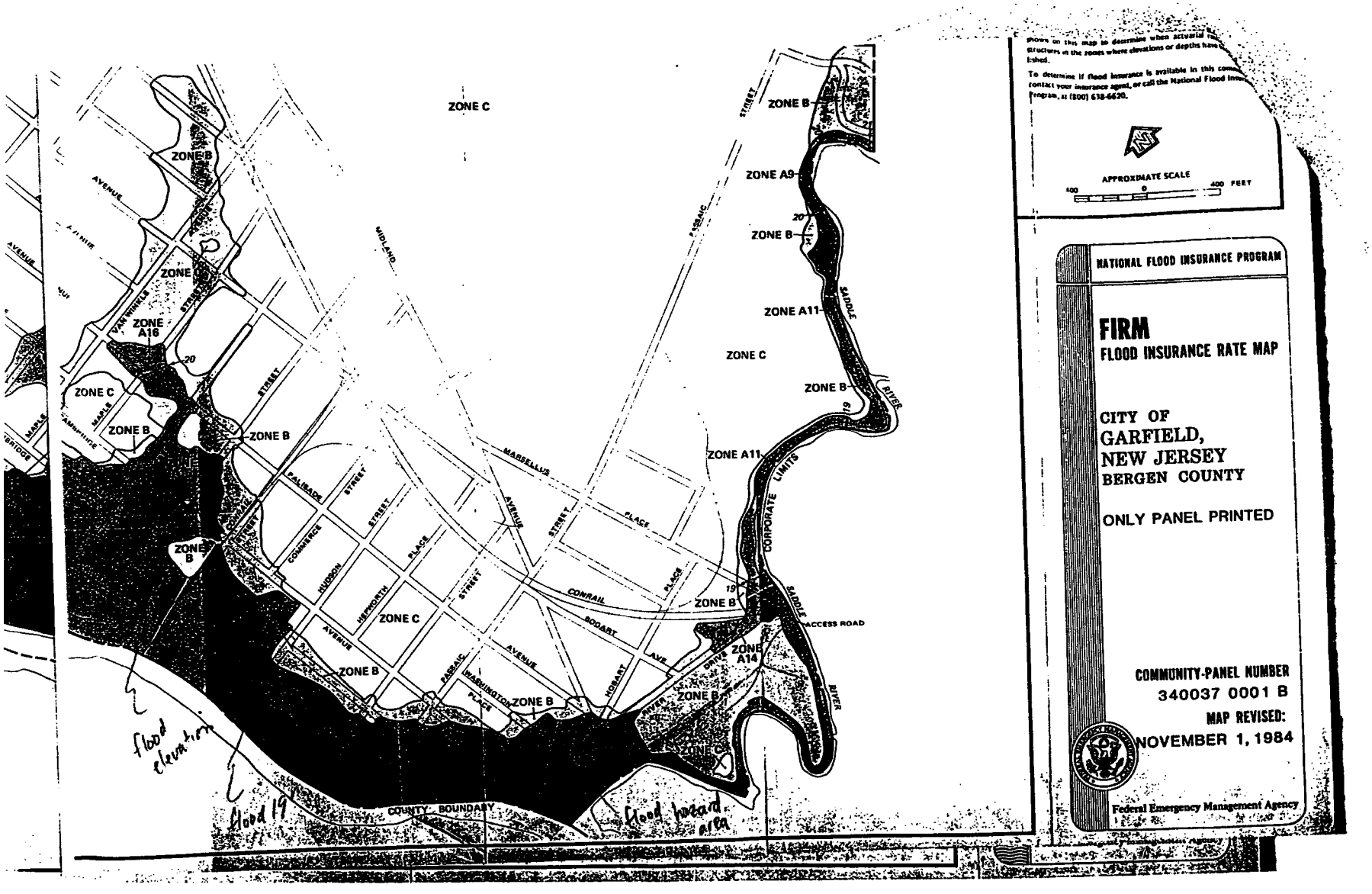
New Jersey State Department of Environmental Protection

Clark D. Gilman, P.E.
Division of Coastal Resources
Flood Plain Management Section

CN 401
Trenton, NJ 08625

Telephone
(609) 292-2296

Ref. No. 24



shown on this map to determine when actuarial ra
structures in the zones where elevations or depths have
lished.

To determine if flood insurance is available in this comm
contact your insurance agent, or call the National Flood Insu
rogram, at (800) 638-6620.

APPROXIMATE SCALE
400 0 400 FEET

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
GARFIELD,
NEW JERSEY
BERGEN COUNTY

ONLY PANEL PRINTED

COMMUNITY-PANEL NUMBER
340037 0001 B

MAP REVISED:
NOVEMBER 1, 1984

Federal Emergency Management Agency

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 12/20/91

TO EPA SSI / Tenneco (aka Kalama Chemical Inc. Facility)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA SSI / Tenneco (aka Kalama)

SUBJECT Floodplain

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Clark Gilman
Division of Coastal Resources

Garfield - flood hazard area was incorrect
URS in Montvale

(AC) Core Study of Garfield
Garfield was done by a private fir

A14 - Cut in half - av. diff between 10 + 100 year flood
A - area of special flood hazard
COMMENTS

Acq. protected area

Cross - section } where floodway has been computed

BY _____ NAME _____ TITLE _____ DEPT. NO.

CC:

P-10

(1)

net precip
Garfield, NJ →
yrly avg.

(flood plain → Garfield)

2yr
24hr } rainfall (2)

↓

3.25"

Reference Number 9

→ Long Lat
→ Check →

NUMBER	NAME	SOURCEID	LOCID	LAT	LON	DC	DISTANCE	COUNTY	MUN	DEPTH	GEO1	GEO2	CAPACITY
100660W	CARLSTADT-E. RUTHERFORD B.O.E	2603920	1	404931	740652	[redacted]	3.5	03	12	225	GTRB		125
2016P	ITT AVIONICS DIVISION	2601834	1	404930	740820	[redacted]	3.7	13	16	500	GTRB		150
	ITT AVIONICS DIVISION	2601835	2	404930	740820	[redacted]	3.7	13	16	450	GTRB		150
	ITT AVIONICS DIVISION	2601925	3	404930	740820	[redacted]	3.7	13	16	500	GTRB		150
	ITT AVIONICS DIVISION	2604692	4/SEALED	404912	740812	[redacted]	3.9	13	16	500	GTRB		200
2035P	ARCOLA COUNTRY CLUB	4600126	3	405533	740515	[redacted]	3.8	03	46	200	GTRB		160
	ARCOLA COUNTRY CLUB	2603872	4	405537	740509	[redacted]	3.9	03	46	208	GTRB		125
	ARCOLA COUNTRY CLUB	POND	1	405535	740430	U	4.1	03	46	5	GTRB		200
	ARCOLA COUNTRY CLUB	POND	2	405535	740430	U	4.1	03	46	15	GTRB		200
2049P	SIKA CORPORATION	2604036	1	404825	740638	[redacted]	4.7	03	32	302	GTRB		220
2055P	GANES CHEMICAL, INC.	4600080	2	405026	740557	[redacted]	2.5	03	05	490	GTRB		200
	GANES CHEMICAL, INC.	2600005	4	405024	740607	F	2.5	03	05	526	GTRB		80
	GANES CHEMICAL, INC.	2604277	5	405025	740557	F	2.5	03	05	430	GTRB		30
2057P	SPINNERIN YARN CO., INC.	4600177	0	405208	740309	F	3.3	03	59	404	GTRB		65
	SPINNERIN YARN CO., INC.	4600083	2	405210	740305	F	3.3	03	59	435	GTRB		0
	SPINNERIN YARN CO., INC.	2603018	3	405210	740309	F	3.3	03	59	400	GTRB		50
	SPINNERIN YARN CO., INC.	4600176	4	405208	740305	F	3.3	03	59	400	GTRB		140
	SPINNERIN YARN CO., INC.	2611599	5 PROPOSED	405210	740305	F	3.3	03	59		GTRB		
2066P	MILES LABORATORIES	2603833	2	405248	740624	M	1.4	31	02	300	GTRB		200
	MILES LABORATORIES	2604613	3	405247	740621	M	1.3	31	02	408	GTRB		200
2068P	RIDGEWOOD COUNTRY CLUB	4300032	1	405635	740458	U	5.0	03	46	306	GTRB		120
	RIDGEWOOD COUNTRY CLUB	4300033	2	405635	740458	U	5.0	03	46	275	GTRB		275
	RIDGEWOOD COUNTRY CLUB	2303832	3	405635	740458	S	5.0	03	46	500	GTRB		250
	RIDGEWOOD COUNTRY CLUB	POND		405635	740458	U	5.0	03	46	8	GTRB		500
2071P	UNIFIED DATA PRODUCTS, INC.	2301946	1	405634	740727	S	4.7	03	17	390	GTRB		60
2075P	EINSON, FREEMAN & DETROY CORP.	4300001	-14	405637	740831	S	5.0	03	17	400	GTRB		250
	EINSON, FREEMAN & DETROY CORP.	4300002	15	405638	740828	S	5.0	03	17	400	GTRB		275
2092P	GIVAUDAN CORPORATION	4600006	6	404936	740745	F	3.4	31	02	297	GTRB		235
	GIVAUDAN CORPORATION	4600007	7	404940	740745	F	3.3	31	02	250	GTRB		110
2093P	ORVAL KENT FOOD COMPANY, INC.	2604317	1	405045	740704	F	2.0	03	12	560	GTRB		150
	ORVAL KENT FOOD COMPANY, INC.	2604341	2	405045	740654	S	2.0	03	12	300	GTRB		150
	ORVAL KENT FOOD COMPANY, INC.	2604382	3	405035	740655	T	2.2	03	12	470	GTRB		430
2094P	D.A.K. MANUFACTURING CORP.	2600466	1	405404	740655	F	1.8	03	11		GTRB		
	D.A.K. MANUFACTURING CORP.	4600210	2	405404	740655	U	1.8	03	11		GTRB		
	D.A.K. MANUFACTURING CORP.	4600211	3	405404	740655	U	1.8	03	11		GTRB		
	D.A.K. MANUFACTURING CORP.	2605037	4	405353	740657	F	1.6	03	11	250	GTRB		60
2100P	MARCAL PAPER MILLS, INC.	4600008	1	405412	740752	F	2.2	03	11	308	GTRB		150
	MARCAL PAPER MILLS, INC.	4600009	2	405412	740752	F	2.2	03	11	330	GTRB		260
	MARCAL PAPER MILLS, INC.	4600010	3	405412	740752	F	2.2	03	11	335	GTRB		250
	MARCAL PAPER MILLS, INC.	4600011	4	405412	740752	F	2.2	03	11	282	GTRB		80
	MARCAL PAPER MILLS, INC.	4600012	5	405412	740752	F	2.2	03	11		GTRB		125
	MARCAL PAPER MILLS, INC.	4600013	6	405412	740752	F	2.2	03	11		GTRB		300
2172P	PARK 80-KIDDIE ASSOCIATES	2604234	1	405408	740630	S	1.9	03	57	400	GTRB		300
	PARK 80-KIDDIE ASSOCIATES	2604235	2	405410	740629	S	2.0	03	57	400	GTRB		300
	PARK 80-KIDDIE ASSOCIATES	2605301	3	405410	740629	S	2.0	03	57	300	GTRB		0
	PARK 80-KIDDIE ASSOCIATES	2604104	4	405412	740600	S	2.1	03	57	300	GTRB		
2211P	HENKEL PROCESS CHEMICALS, INC.	4600125	1	405000	740500	[redacted]	3.3	03	05	170	GOSD		600
2230P	HOFFMAN LAROCHE INC.	2406268	1	405047	740345	T	3.4	41	03	140	GO		700
2233P	HOFFMANN-LAROCHE INC.	4600155	20	405000	740919	F	3.6	13	16	402	GTRB		100
	HOFFMANN-LAROCHE INC.	4600156	32	405015	740927	F	3.4	31	02	650	GTRB		260
	HOFFMANN-LAROCHE INC.	4600157	33	405003	740915	F	3.5	31	02		GTRB		165
	HOFFMANN-LAROCHE INC.	4600158	37	404958	740907	F	3.5	31	02	720	GTRB		300
2246P	FARMLAND DAIRIES INC.	2604169	1	405115	740727	U	1.5	03	65	300	GTRB		200
	FARMLAND DAIRIES INC.	2304250	2	405115	740727	U	1.5	03	65	300	GTRB		185
2261P	FRITZCHE DODGE & OLCOTT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]		[redacted]

9

Tenneco

NUMBER	NAME	SOURCEID	LOCID	LAT	LON	LLAUC	DISTANCE	COUNTY	HUN	DEPTH	GEO1	GEO2	CAPACITY
2262P	UPPER MONTCLAIR COUNTRY CLUB	2601199	1	[redacted]	[redacted]		3.6	31	02	490	GTRB		90
	UPPER MONTCLAIR COUNTRY CLUB	2604390	2	[redacted]	[redacted]		3.7	13	02	335	GTRB		132
	UPPER MONTCLAIR COUNTRY CLUB	2604825	3	[redacted]	[redacted]	T	3.8	31	02	300	GTRB		60
	UPPER MONTCLAIR COUNTRY CLUB	POND	SW	[redacted]	[redacted]	T	3.8	13	02	12	GQSD		11000
2313P	FENCO OF LYNDHURST INC.	4600172	1	[redacted]	[redacted]		4.3	03	32	267	GTRB		110
	FENCO OF LYNDHURST INC.	4600173	2	[redacted]	[redacted]		4.3	03	32	313	GTRB		185
	FENCO OF LYNDHURST INC.	2601699	3	[redacted]	[redacted]	F	4.3	03	32	410	GTRB		150
	FENCO OF LYNDHURST INC.	2603604	4	[redacted]	[redacted]	F	4.4	03	32	352	GTRB		185
2370P	FISHER SCIENTIFIC CO. CHEM DIV	2605038	FW2	[redacted]	[redacted]		3.8	03	17	335	GTRB		60
2372P	YOO-HOO CHOCOLATE BEV. CORP.	2602067	1	[redacted]	[redacted]		4.1	03	05	303	GTRB		90
	YOO-HOO CHOCOLATE BEV. CORP.	2602933	2	[redacted]	[redacted]		4.1	03	05	393	GTRB		50
	YOO-HOO CHOCOLATE BEV. CORP.	2603053	3	[redacted]	[redacted]		4.1	03	05	378	GTRB		55
2373P	CHINAM, INC.	4300098	1	[redacted]	[redacted]	T	4.6	31	08	800	GTRB		70
	CHINAM, INC.	4300099	2	[redacted]	[redacted]	T	4.6	31	08	800	GTRB		203
	CHINAM, INC.	2300369	3	[redacted]	[redacted]	T	4.6	31	08	625	GTRB		119
	CHINAM, INC.	2302336	4	[redacted]	[redacted]	T	4.6	31	08	400	GTRB		188
2376P	PARAMUS GOLF AND COUNTRY CLUB	4300095	2	[redacted]	[redacted]	F	4.9	03	46	200	GTRB		200
	PARAMUS GOLF AND COUNTRY CLUB	STORAGE POND	1	[redacted]	[redacted]	F	4.9	03	46		GTRB		330
4001FS	J.L. PESCOTT CO.	PASSAIC	RIVER	405118	740635	T	1.4	31	07		SFPAS		
4004FS	DUNDEE WATER POWER & LAND CO.	DUNDEE LK.	G.S. PAPER	[redacted]	740742	T	1.0	03	21		SFPAS		
	DUNDEE WATER POWER & LAND CO.	DUNDEE CAN	WIPPANY CO	405208	740727	T	0.6	31	02		SP		
	DUNDEE WATER POWER & LAND CO.	DUNDEE CAN	CHELTON CO	405208	740702	T	0.4	31	02		SP		
	DUNDEE WATER POWER & LAND CO.	DUNDEE CAN	OKONITE CO	405143	740712	T	0.9	31	07		SP		
	DUNDEE WATER POWER & LAND CO.	DUNDEE LK.	MARCAL CO.	405405	740754	T	2.0	03	11		SFPAS		
	DUNDEE WATER POWER & LAND CO.	DUNDEE CAN	PASSAIC IN	405218	740702	T	0.3	31	02		SP		
	DUNDEE WATER POWER & LAND CO.	DUNDEE CAN	TUCK IND.	405136	740704	T	1.0	31	07		SP		
	DUNDEE WATER POWER & LAND CO.	DUNDEE CAN	PANTASOTE	405204	740704	T	0.5	31	02		SP		
4005FS	KALAMA CHEMICAL, INC.	PASSAIC RIVER		405206	740745	T	0.9	03	21		SFPAS		
4037FS	GREAT FALLS HYDROELECTRIC CO	PASSAIC RIVER		405455	741058		4.5	31	08		SFPAS		
4041FS	STEPAN CHEMICAL COMPANY	SADDLE RIVER		405356	740447		2.5	03	54		SFSAD		2000
5086	HACKENSACK WATER COMPANY	4600065	2	405221	740157		4.3	03	04	550	GTRB		180
	HACKENSACK WATER COMPANY	4600066	3	405248	740143		4.5	03	04	350	GTRB		175
	HACKENSACK WATER COMPANY	4600067	4	405242	740145		4.5	03	04	235	GTRB		
5087	HACKENSACK WATER COMPANY	2600914	1	405357	740216		4.4	03	23	168	GQSD		1550
	HACKENSACK WATER COMPANY	2601034	2	405355	740215		4.4	03	23	190	GQSD		1400
	HACKENSACK WATER COMPANY	2603017	ROCHELLE P	405458	740449		3.4	03	54	473	GTRB		200
5127	LODI BOROUGH	4600068	ARNOT ST.	405240	740618		1.4	03	31	300	GTRB		160
	LODI BOROUGH	4600069	4	405249	740502		1.6	03	31	307	GTRB		295
	LODI BOROUGH	4600070	5	405249	740502		1.6	03	31	300	GTRB		355
	LODI BOROUGH	4600071	7	405249	740502		1.6	03	31	332	GTRB		355
	LODI BOROUGH	4600072	LAWRENCE	405217	740420	U	2.2	03	31	373	GTRB		500
	LODI BOROUGH	4600073	COLUMBIA	405240	740410	U	2.4	03	31	409	GTRB		375
	LODI BOROUGH	2601037	TERRACE	405157	740538		1.0	03	31	607	GTRB		150
	LODI BOROUGH	2601010	GARFIELD	405218	740538		1.1	03	31	459	GTRB		150
	LODI BOROUGH	2603185	HOME PLACE	405439	740301		4.2	03	31	450	GTRB		175
	LODI BOROUGH	2603183	CORABELLE	405231	740435		2.0	03	31	470	GTRB		200
5198	WALLINGTON BOROUGH	2603933	DUL	405131	740619		1.2	03	65	400	GTRB		140
	WALLINGTON BOROUGH	2603027	LESTER ST	405125	740710		1.3	03	65	400	GTRB		130
	WALLINGTON BOROUGH	4600075	8	405125	740750		1.5	03	65	503	GTRB		80
	WALLINGTON BOROUGH	4600074	5	405125	740750		1.5	03	65	506	GTRB		150
5234	HAWTHORNE BOROUGH	4300067	10	405618	740918	T	4.9	31	04	300	GTRB		200
	HAWTHORNE BOROUGH	4600068	11	405618	740916	T	4.9	31	04	300	GTRB		400
	HAWTHORNE BOROUGH	4300069	12	405618	740918	T	4.9	31	04	300	GTRB		400
5232	GARFIELD WATER DEPARTMENT	2604016	1A	405256	740651		0.5	03	21	400	GTRB		300
	GARFIELD WATER DEPARTMENT	2604063	2	405312	740648	U	0.8	03	21	475	GTRB		150
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

NUMBER	NAME	SOURCEID	LOCID	LAT	LON	LLADC	DISTANCE	COUNTY	MUN	DEPTH	GEO1	GEO2	CAPACITY
	GARFIELD WATER DEPARTMENT	2604064	8C	405250	740742		0.8	03	21	405	GTRB		400
5317	FAIR LAWN BOROUGH	2600465	16	405540	740830		3.9	03	17	413	GTRB		140
	FAIR LAWN BOROUGH	2601197	19	405438	740818		2.8	03	17	400	GTRB		260
	FAIR LAWN BOROUGH	2600393	15	405535	740825	F	3.8	03	17	402	GTRB		500

Number of Observations: 115

GEOLOGY LEGEND:

GTRB = Brunswick Formation
SPPAS = Passaic River
GQSD = Stratified Dirt
SP = Unknown or Non-specific

Reference Number 10

RECORD OF TELEPHONE CONVERSATION

DATE 12/16/91

TO EPA / File
NAME/FILE NO.

FROM Judith Cusick

CLIENT/PROJECT EPA / SSI

SUBJECT Tenneco (aka Kalama Chemical)

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.82 U

DISCUSSION WITH

Bart Cerami, Water Technical Programs - Bureau of Water Allocation

Mr. Cerami faxed me

Well Identification information - (as follows)
County Info.

He also explained to me the identification processes/codes on well-search data sheets -

COMMENTS

Number"
1000 - followed by "D" is for dewatering permit, temporary diversion
9[illegible]0 - surface water division
0,000 follow W = capacity to pump 100,000 gpd but do not
0[illegible]0 foll. P - water allocation permit; large industrial user or some type of private user/non-public
0[illegible]0 water allocation permit - permit holder is usually public water supplier
letters followed by 4 #'s - agricultural certificates - farmer must register but aren't required a permit

Location ID - Location/Local ID
[illegible] owner named the well -

BY _____ NAME _____ TITLE _____ DEPT. NO.

CC:

[illegible]CC - Estimate of accuracy
long/lat

Ref. No. 10

T E L E C O P Y

from

WATER TECHNICAL PROGRAMS - BUREAU OF WATER ALLOCATION

FAX# (609) 633-1231

DATE: 12/16/91

TO: Judy Cusick

FROM: Bart Cerami

TELECOPIER NUMBER: (201) 460-0025

CONTACT NUMBER: (609) 292-2957

TOTAL NUMBER OF PAGES: 6 (Including Cover)

MUN:

ATLANTIC COUNTY (01)

01 - Absecon City
02 - Atlantic City
03 - Brigantine City
04 - Buena Boro
05 - Buena Vista Twp
06 - Corbin City
07 - Egg Harbor City
08 - Egg Harbor Twp
09 - Estell Manor City
10 - Folsom Boro
11 - Galloway Twp
12 - Hamilton Twp
13 - Hammonton Town
14 - Linwood City
15 - Longport Boro
16 - Margate City
17 - Mullica Twp
18 - Northfield City
19 - Pleasantville City
20 - Port Republic City
21 - Somers Point City
22 - Ventnor City
23 - Weymouth Twp

BERGEN COUNTY (03)

01 - Allendale Boro
02 - Alpine Boro
03 - Bergenfield Boro
04 - Bogota Boro
05 - Carlstadt Boro
06 - Cliffside Park Boro
07 - Closter Boro
08 - Cresskill Boro
09 - Demarest Boro
10 - Dumont Boro
12 - East Rutherford Boro
13 - Edgewater Boro
11 - Elmwood Park Boro
14 - Emerson Boro
15 - Englewood City
16 - Englewood Cliffs Boro
17 - Fair Lawn Boro
18 - Fairview Boro
19 - Fort Lee Boro
20 - Franklin Lakes Boro
21 - Garfield Boro
22 - Glen Rock Boro
23 - Hackensack City
24 - Harrington Park Boro
25 - Hasbrouck Heights Boro
26 - Haworth Boro
27 - Hillsdale Boro
28 - Hohokus Boro
29 - Leonia Boro
30 - Little Ferry Boro
31 - Lodi Boro
32 - Lyndhurst Twp
33 - Mahwah Twp
34 - Maywood Boro
35 - Midland Park Boro
36 - Montvale Boro
37 - Moonachie Boro
38 - New Milford Boro
39 - North Arlington Boro
40 - Northvale Boro
41 - Norwood Boro
42 - Oakland Boro
43 - Old Tappan Boro
44 - Oradell Boro
45 - Palisades Park Boro
46 - Paramus Boro
47 - Park Ridge Boro
48 - Ramsey Boro
49 - Ridgefield Boro
50 - Ridgefield Park Village
51 - Ridgewood Village
52 - River Edge Boro
53 - River Vale Twp
54 - Rochelle Park Twp
55 - Rockleigh Boro
56 - Rutherford Boro
57 - Saddle Brook Twp
58 - Saddle River Boro
59 - South Hackensack Twp
60 - Teaneck Twp
61 - Tenafly Boro
62 - Teterboro Boro
63 - Upper Saddle River Boro
64 - Waldwick Boro
65 - Wallington Boro
66 - Washington Twp
67 - Westwood Boro
68 - Wood-Ridge Boro
69 - Woodcliff Lake Boro
70 - Wyckoff Twp

BURLINGTON COUNTY (05)

01 - Bass River Twp
02 - Beverly City
03 - Bordentown City
04 - Bordentown Twp

07 - Hopewell Twp
09 - Maurice River Twp
11 - Shiloh Boro
13 - Upper Deerfield Twp
08 - Lawrence Twp
10 - Millville City
12 - Stow Creek Twp
14 - Vineland City

ESSEX COUNTY (13)

01 - Belleville Town
03 - Caldwell Boro
05 - East Orange City
07 - Fairfield Boro
09 - Irvington Town
11 - Maplewood Twp
13 - Montclair Town
15 - North Caldwell Boro
17 - Orange City
19 - South Orange Village
21 - West Caldwell Boro
02 - Bloomfield Town
04 - Cedar Grove Twp
06 - Essex Fells Boro
08 - Glen Ridge Boro
10 - Livingston Twp
12 - Millburn Twp
14 - Newark City
16 - Nutley Town
18 - Roseland Boro
20 - Verona Boro
22 - West Orange Town

GLOUCESTER COUNTY (15)

01 - Clayton Boro
03 - East Greenwich Twp
05 - Franklin Twp
07 - Greenwich Twp
09 - Logan Twp
11 - Monroe Twp
13 - Newfield Boro
15 - Pitman Boro
17 - Swedesboro Boro
19 - Wenonah Boro
21 - Westville Boro
23 - Woodbury Heights Boro
02 - Deptford Twp
04 - Elk Twp
06 - Glassboro Boro
08 - Harrison Twp
10 - Mantua Twp
12 - National Park Boro
14 - Paulsboro Boro
16 - South Harrison Twp
18 - Washington Twp
20 - West Deptford Twp
22 - Woodbury City
24 - Woolwich Twp

HUDSON COUNTY (17)

01 - Bayonne City
03 - Guttenberg Town
05 - Hoboken City
07 - Kearny Town
09 - Secaucus Twp
11 - Weehawken Twp
02 - East Newark Boro
04 - Harrison Town
06 - Jersey City
08 - North Bergen Twp
10 - Union City
12 - West New York Town

HUNTERDON COUNTY (19)

01 - Alexandria Twp
03 - Bloomsbury Boro
05 - Clinton Town
07 - Delaware Twp
09 - Flemington Boro
11 - Frenchtown Boro
13 - Hampton Boro
15 - Holland Twp
17 - Lambertville City
19 - Lebanon Twp
21 - Raritan Twp
23 - Stockton Boro
25 - Union Twp
02 - Bethlehem Twp
04 - Califon Boro
06 - Clinton Twp
08 - East Amwell Twp
10 - Franklin Twp
12 - Glen Gardner Boro
14 - High Bridge Boro
16 - Kingwood Twp
18 - Lebanon Boro
20 - Milford Boro
22 - Readington Twp
24 - Tewksbury Twp
26 - West Amwell Twp

MORRIS COUNTY (27)

01 - Boonton Town
02 - Boonton Twp
03 - Butler Boro
04 - Chatham Boro
05 - Chatham Twp
06 - Chester Boro
07 - Chester Twp
08 - Denville Twp
09 - Dover Town
10 - East Hanover Twp
11 - Florham Park Boro
12 - Hanover Twp
13 - Harding Twp
14 - Jefferson Twp
15 - Kinnelon Boro
16 - Lincoln Park Boro
17 - Madison Boro
18 - Mendham Boro
19 - Mendham Twp
20 - Mine Hill Twp
21 - Montville Twp
23 - Morris Plains Boro
22 - Morris Twp
24 - Morristown Town
26 - Mount Arlington Boro
27 - Mount Olive Twp
25 - Mountain Lakes Boro
28 - Netcong Boro
29 - Parsippany Troy-Hills Twp
30 - Passaic Twp
31 - Pequannock Twp
32 - Randolph Twp
33 - Riverdale Boro
34 - Rockaway Boro
35 - Rockaway Twp
36 - Roxbury Twp
37 - Victory Gardens Boro
38 - Washington Twp
39 - Wharton Boro

OCEAN COUNTY (29)

01 - Barnegat Light Boro
33 - Barnegat Twp
02 - Bay Head Boro
03 - Beach Haven Boro
04 - Beachwood Boro
05 - Berkeley Twp
06 - Brick Twp
07 - Dover Twp
08 - Eagleswood Twp
09 - Harvey Cedars Boro
10 - Island Heights Boro
11 - Jackson Twp
12 - Lacey Twp
13 - Lakehurst Boro
14 - Lakewood Twp
15 - Lavalette Boro
16 - Little Egg Harbor Twp
17 - Long Beach Twp
18 - Manchester Twp
19 - Mantaloking Boro
21 - Ocean Gate Boro
20 - Ocean Twp
22 - Pine Beach Boro
23 - Plumsted Twp
25 - Point Pleasant Beach Boro
24 - Point Pleasant Boro
26 - Seaside Heights Boro
27 - Seaside Park Boro
28 - Ship Bottom Boro
29 - South Toms River Boro
30 - Stafford Twp
31 - Surf City Boro
32 - Tuckerton Boro

PASSAIC COUNTY (31)

01 - Bloomingdale Boro
02 - Clifton City
03 - Haledon Boro
04 - Hawthorne Boro
05 - Little Falls Twp
06 - North Haledon Boro
07 - Passaic City
08 - Paterson City
09 - Pompton Lakes Boro
10 - Prospect Park Boro
11 - Ringwood Boro
12 - Totowa Boro
13 - Wanaque Boro
14 - Wayne Twp
15 - West Milford Twp
16 - West Paterson Boro

SALEM COUNTY (33)

01 - Alloway Twp
13 - Carney's Point Twp
03 - Elsinboro Twp

04 - Lower Alloways Creek Twp
06 - Oldmans Twp
08 - Pennsville Twp
10 - Pittsgrove Twp
12 - Salem City
15 - Woodstown Boro
05 - Mannington Twp
07 - Penns Grove Boro
09 - Pilesgrove Twp
11 - Quinton Twp
14 - Upper Pittsgrove Twp

SOMERSET COUNTY (35)

01 - Bedminster Twp
03 - Bernardsville Boro
05 - Branchburg Twp
07 - Far Hills Boro
09 - Green Brook Twp
11 - Manville Boro
13 - Montgomery Twp
15 - Peapack-Gladstone Boro
17 - Rocky Hill Boro
19 - South Bound Brook Boro
21 - Watchung Boro
02 - Bernards Twp
04 - Bound Brook Boro
06 - Bridgewater Twp
08 - Franklin Twp
10 - Hillsborough Twp
12 - Millstone Boro
14 - North Plainfield Boro
16 - Raritan Boro
18 - Somerville Boro
20 - Warren Twp

SUSSEX COUNTY (37)

01 - Andover Boro
03 - Branchville Boro
05 - Frankford Twp
07 - Fredon Twp
09 - Hamburg Boro
11 - Hardyston Twp
13 - Lafayette Twp
15 - Newton Town
17 - Sandyston Twp
19 - Stanhope Boro
21 - Sussex Boro
23 - Walpack Twp
02 - Andover Twp
04 - Byram Twp
06 - Franklin Boro
08 - Green Twp
10 - Hampton Twp
12 - Hopatcong Boro
14 - Montague Twp
16 - Ogdensburg Boro
18 - Sparta Twp
20 - Stillwater Twp
22 - Vernon Twp
24 - Wantage Twp

UNION COUNTY (39)

01 - Berkeley Heights Twp
03 - Cranford Twp
05 - Fanwood Boro
07 - Hillside Twp
09 - Linden City
11 - New Providence Boro
13 - Rahway City
15 - Roselle Park Boro
17 - Springfield Twp
19 - Union Twp
21 - Winfield Twp
02 - Clark Twp
04 - Elizabeth City
06 - Garwood Boro
08 - Kenilworth Boro
10 - Mountainside Boro
12 - Plainfield City
14 - Roselle Boro
16 - Scotch Plains Twp
18 - Summit City
20 - Westfield Town

WARREN COUNTY (41)

01 - Allamuchy Twp
03 - Belvidere Town
05 - Franklin Twp
07 - Greenwich Twp
09 - Hardwick Twp
11 - Hope Twp
02 - Alpha Boro
04 - Blairstown Twp
06 - Frelinghuysen Twp
08 - Hackettstown Town
10 - Harmony Twp
12 - Independence Twp

13 - Knowlton Twp
15 - Lopatcong Twp
17 - Oxford Twp
19 - Phillipsburg Town
21 - Washington Boro
23 - White Twp

14 - Liberty Twp
16 - Mansfield Twp.
18 - Pahequarry Twp
20 - Pohatcong Twp
22 - Washington Twp

Reference Number 11

11046/8-74

Ref. No. 11

RECORD OF TELEPHONE CONVERSATION

DATE Dec. 16, 1991

TO EPA SSI File
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/SSI Tenneco (aka Kalama Chemical)

SUBJECT Kalama Facility Information

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Hari Goel, Technical Superintendent (201) 779-8880
Kalama Chemical Inc., Facility

COMMENTS

Mr. Goel informed me that the present number of people working at the Kalama faulity is ≈ 85.

As for the number of people that occupy residence within 200 feet of the site, Mr. Goel explained that the facility is surrounded by residences on 3 sides - there is a school nearby (located on Hudson and Cambridge Street). This school is identified as #6 school on Palisade Avenue ~ population of students ~ 303.

As for the permit information for the Kalama permits, Mr. Goel explained that Kalama filed their application on time for NJDPES, but have not yet received notification of the approval. The POTW permit was issued on 5/27/91 and will expire on 5/27/96

He will fax to J. Cusick the air pollution certificates information because of the large amount (25-30) active stacks with different issue and expiration dates

BY Judy Cusick (NAME) Fac (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 12

11046/8-74

Ref. No. 12

RECORD OF TELEPHONE CONVERSATION

DATE 12/10/91

TO EPA SSI /Tenneco (aka Kalama Chemical Co.)
NAME/FILE NO.

FROM Judy Cusick

CLIENT/PROJECT EPA/ Tenneco (aka Kalama Chemical)

SUBJECT Water Resources /Water Supply

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Water Supply Planning - (609) 292-7219
Bob Kecskes - (609) 633-1179

Main Water Supply - City of Garfield - is reservoir driven - Hackensack Water Company supplies Garfield water. According to Mr. Kecskes, no formal well-head protection area has been established.

Mr. Kecskes explained that drinking water water intakes within 15 miles downstream did not occur because all the drinking water comes from different upstream locations (reservoirs, etc.) He did say that the surface water could be used for various industrial processes and that near Newark, the water becomes brackish.

COMMENTS

BY J. Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 13

11046/8-74

Ref. No. 13

RECORD OF TELEPHONE CONVERSATION

DATE 12/6/91

TO SSI File
NAME/FILE NO.

FROM Judy Cusick

CLIENT/PROJECT EPA / SSI

SUBJECT Garfield, N.J. Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mr. Michael Sfuerruzzo (201) 546-2200
Garfield, NJ
Water Department

COMMENTS

Mr. Sfuerruzzo informed that there were no longer any active wells in Garfield used for public supply. Seven (7) wells were closed due to elevated VOC; one well was closed because of high chromium. Mr. Sfuerruzzo estimated that this took place about 6-7 years ago.

Garfield is supplied water by the Passaic Valley and has a wellfield located in Elmwood Park.

Boswell Engineering (201-641-0770) performed the installation work for the now-inactive Garfield wells.

Mr. Sfuerruzzo informed that most of the nearby towns were fed by Jersey City, Hackensack, or Passaic Valley reservoirs. The Hackensack & Passaic Valley sources are located north/upstream of the site.

BY Judy Cusick (NAME) Engineer (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 14

Ref. No. 14

RECORD OF TELEPHONE CONVERSATION

DATE 12/16/91

TO EPA Project Files/SSI
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA ISSI Tenneco (aka Kalama Chem.)

SUBJECT Lodi Borough Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Sam Cannizzo
(201) Lodi Borough Water Dept.
365-4025

No wells in Lodi (formerly used for public supply) are active

COMMENTS

BY Judy Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 15

11046/8-74

Ref. No. 15

RECORD OF TELEPHONE CONVERSATION

DATE Dec. 16, 1991

TO EPA Files SSI / Tenneco (aka Kalama Chemical)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/SSI

SUBJECT Garfield Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mike Sfuerruzzo ; Water Dept. Garfield
(201) 546-2200

All garfield supply wells are inactive.

Garfield gets supply of water from Passaic Valley or the active wellfield (9 wells) in Elmwood.

COMMENTS

BY Judy Cusick NAME Eng TITLE 940 DEPT. NO.

CC:

Reference Number 16

RECORD OF TELEPHONE CONVERSATION

Ref. No. 1.

DATE 12/16/91

TO EPA SSI Tenneco (aka Kalama Chem)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/ SSI

SUBJECT Wallington Borough Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Ray Milne - Wallington Water Dept.
(201) 777-1726

All public supply Wallington Wells have been inactive since 1987

COMMENTS

BY J. Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 17

11046/8-74

Rel. No. 17

RECORD OF TELEPHONE CONVERSATION

DATE Dec. 10, 1991

TO EPA SSI / Tenneco (aka Kalama Chemical Co.)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/ Tenneco (aka Kalama Chemical Co.)

SUBJECT Surface Water Usage - Passaic River

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mr. Bruce Halgren (609) 292-9410
Administrative Marine Fisheries

1) Identify fisheries that exist 15 miles downstream of the site.

Mr. Halgren explained that no commercial fisheries or state fisheries exist within 15 miles downstream of the site.

2) Identify sensitive environments that exist within 15 miles of the point of surface water entry.

COMMENTS Mr. Halgren explain that the offices are currently stocking several areas with certain species and are making attempts to clean up the waterway. He listed the Meadowlands Area as a sensitive environment. He was sent a letter from J. Cusick on Dec. 10, 1991, which he requested, in order to further investigate the area of concern. Since the area is fresh, then salt water, he would need to speak to several representatives in the group.

BY J. Cusick (NAME) Eng (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 18

11046/8-74

Ref. No. 18

RECORD OF TELEPHONE CONVERSATION

DATE 12/16/91

TO EPA File / SSI Tenneco (aka Kalama Chem)
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA SSI / Tenneco (aka Kalama Chem.)

SUBJECT Hackensack Water Co. Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Don Hovem (201) 767-9300
Rochelle Park well is Active. It is for potable water directly to distribution system - The well has not been used in several years - it is only used during peaking (summer time) purpose.
The Hackensack System is supplied w/ surface water from the Oradell Reservoir (on the Hackensack River).
The are considering sealing the well

COMMENTS

BY J. Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 19

M E M O R A N D U M

State of New Jersey
Department of Environmental Protection

TO: Byron Sullivan

FROM: R. Jaggi

DATE: February 25, 1977

SUBJECT: Tenneco Chemical
River Road, Garfield

Date of Investigation - 2-17-77 3:00 p.m. - 3:45 p.m.

Purpose of Investigation - Complaint Evaluation

Persons Interviewed - Mr. & Mrs. Arthur Makowski
51 Commerce Street, Garfield

Investigation:

The Makowski's were interviewed and they stated that they have lived at the site for about two years. At times they have noticed odors in the area which they believe are emanating from the subject company. Mr. Makowski notices the odors mostly at 5:00 p.m. and later, when he returns from work. Mrs. Makowski notices odors throughout the day. They described odor(s) as being a winter green type.

The Makowski's were advised of the provisions of Subchapter 5 and the Bureau procedures with regard to complaints, verification, etc. Mr. Makowski said that he plans to again talk to his neighbors regarding the situation. He said the odor(s) will now be more noticeable with the coming of warmer weather.

An effects survey was conducted in the area of the subject plant. Unidentified odors were detected downwind of the plant along Hudson Street and Cambridge Avenue. Weather, mostly clear. Wind, from NW* @ 20 mph* (* - Variable). Distance to plant, 25 feet to 250 feet.

Conclusion

The complaint was not verified in that odors were not detected at the complainants home nor at a distance* from the subject plant which would be detected at the complainants home. However, odors were detected and possibly with particular wind and weather conditions, these odors would be detected at the complainants home.

* Approx. 750 Feet

Recommendation:

File report. Audit future complaints. Copy of report to Subchapter 8 file.

Addendum

Mr. Dege at the subject company was telephoned and advised of the complaint and that odors were detected downwind of the plant off Company property.

R. Jaggi

R. Jaggi

R10

State of New Jersey
Department of Environmental Protection

M E M O R A N D U M

TO: Byron Sullivan

FROM: Marvin Makler

DATE: January 20, 1977

SUBJECT: Odor Complaint Tenneco Chemicals
290 River Road, Garfield

Date of Investigation: January 12, 1977

Persons Interviewed: Joanne Kurr, Employee
Neighborhood Youth Center
11 Commerce Street, Garfield

Douglas E. Jacobsen, Production Supt.
Tenneco Chemicals

Investigation:

Ms. Kurr stated that upon arrival at work at the Neighborhood Youth Center at 9:00 a.m. of January 12, 1977, she detected a horrible odor coming from Tenneco. This odor, she said, lasted for approximately one hour. The Center is located approximately 400 feet directly east of Tenneco. The wind direction at the time of the interview was west at 10-15 mph.

Mr. Jacobsen indicated that the company had experienced some problems which caused an odor emission. He described it as follows:
A distillation process containing Benzoic Acid became contaminated with "Dowtherm A" after a leak had developed in the jacket of the still pot. The contaminated product was then transferred to a reaction vessel for boil down. As the product temperature rose, the "Dowtherm A" vaporized to atmosphere, causing the release of odors. At approximately 9:00 a.m., people called the company complaining of odors. At this point the boiling reactor was shut down and the odors subsided.

Conclusion:

Since no odors were detected in the vicinity of the Neighborhood Youth Center by the undersigned, it appears that the action taken by the company resolved the odor problem

Recommendation:

File report.

Marvin P. Makler

Marvin Makler, Pr. Environmental Technician

R11

Lee Marsh

VACLOW DOMBAL
CITY CLERK

City of Garfield
New Jersey
07026

CITY HALL
TELEPHONE (201) 475-7040

May 10, 1972

Air Pollution Control
25 Route 22
Springfield, New Jersey

Attention: William Hart, Senior Environmental Engineer

Dear Mr. Hart:

Confirming our telephone conversation of yesterday, please be advised that Monday night at the City Hall, a conference was held with the Mayor and City Council, Heyden Chemical Corporation and residents in the area of the plant.

The main contention was the noise, vibration, smog and vapor eminating from the new Benzaldehyde operation.

The neighbors present would like to have you speak to them personally concerning these problems. Please advise me when you will be available for a conference so that notices can be sent to them and the City Officials.

The Mayor and Council also request a written report of the inspection that was made at Heyden Chemical last fall or early this spring.

Please except our sincere thanks for your cooperation in this matter.

Very truly yours,

Vaclow Dombal
CITY CLERK

VD:etk

cc: Mayor Visotcky, Councilmen Mucha, Reno, Benanti
James Lusciandriello

Table 10. Concentrations of Inorganic Constituents in Sample from Monitoring Well MW-3.

Parameter	Concentration (mg/L)
Chlorides	763
Bicarbonate as CaCO3	160
Nitrate and Nitrite as N	0.18
Total Dissolved Solids (@ 180 degree celcius)	37,400
Sulfates	36,000
Calcium	4.50
Iron	2280
Magnesium	72.0
Manganese	5.98
Potassium	36.9
Sodium	4130

Notes:

The sample was collected on January 6, 1998 and was analyzed by General Testing Corporation of Hackensack, New Jersey.

gf29.wk1

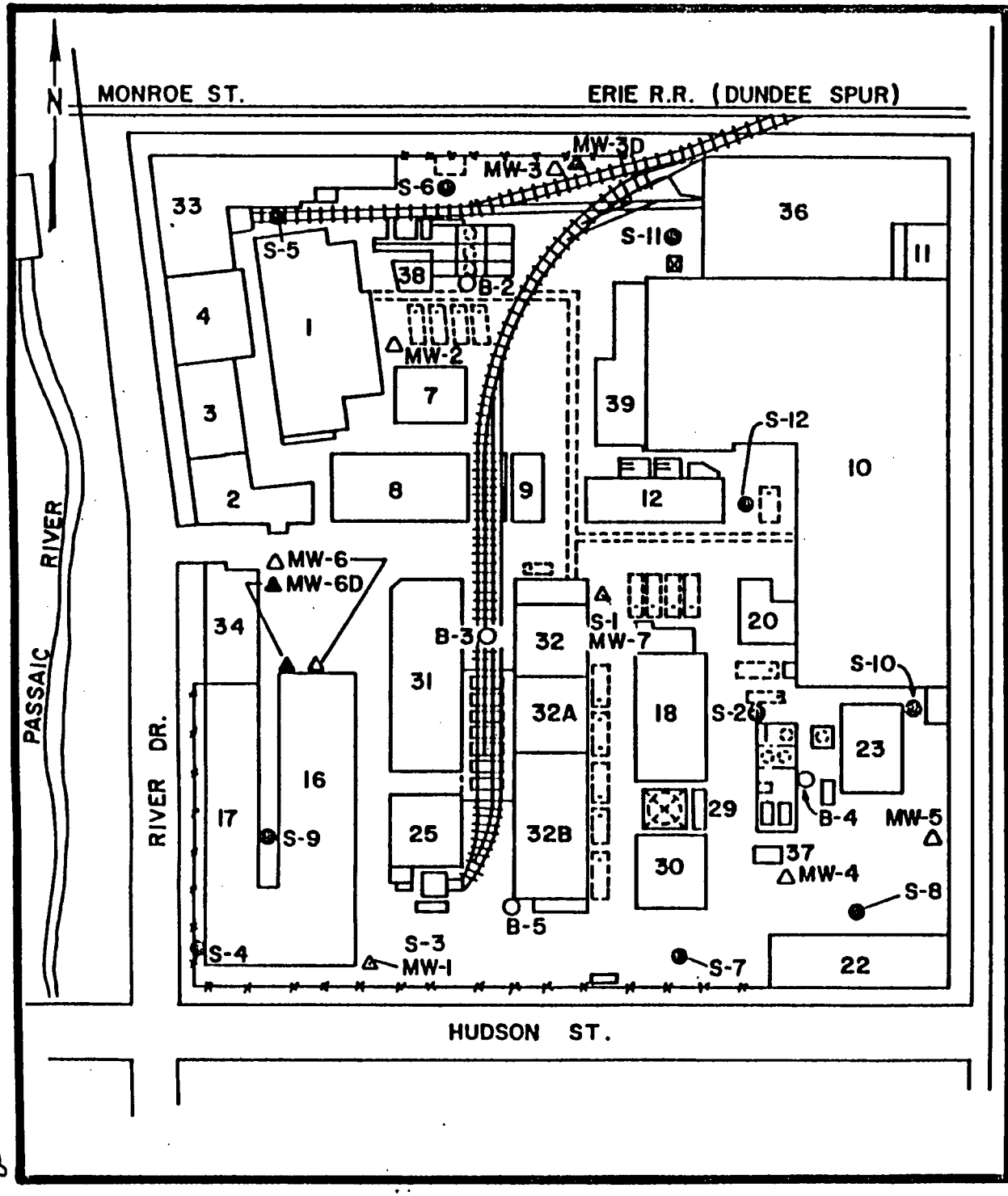
Table 11: Summary of Product Removal Data - Monitoring Well MW-7

	BEFORE PRODUCT REMOVAL					AFTER PRODUCT REMOVAL		
DATE	DEPTH TO PRODUCT (ft)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft)	AMT. PRODUCT REMOVED (gal)	AMT. WATER REMOVED (gal)	DEPTH TO PRODUCT (ft)	DEPTH TO WATER (ft)	PRODUCT THICKNESS (ft)
5/12/88	10.67	NA	>1.25	4	4	12.00	12.00	TRACE
5/23/88	10.67	4.25	0.58	0.4	4	11.50	11.50	TRACE
6/3/88	10.83	11.17	0.34	0.2	5	12.25	12.25	TRACE

NOTE:

NA - not able to measure

E25



EXPLANATION

OB-3	BORING FROM PREVIOUS INVESTIGATION
●S-11	SOIL BORING LOCATION
△MW-3	SHALLOW MONITORING WELL LOCATION
▲MW-3D	DEEP MONITORING WELL LOCATION
⬚	UNDERGROUND STORAGE TANK
—x—x—x—	FENCE
7	BUILDING WITH NUMBER
◬	COMBINED SOIL BORING AND MONITORING WELL LOCATION

SCALE 0 100 FT.

SUBJECT

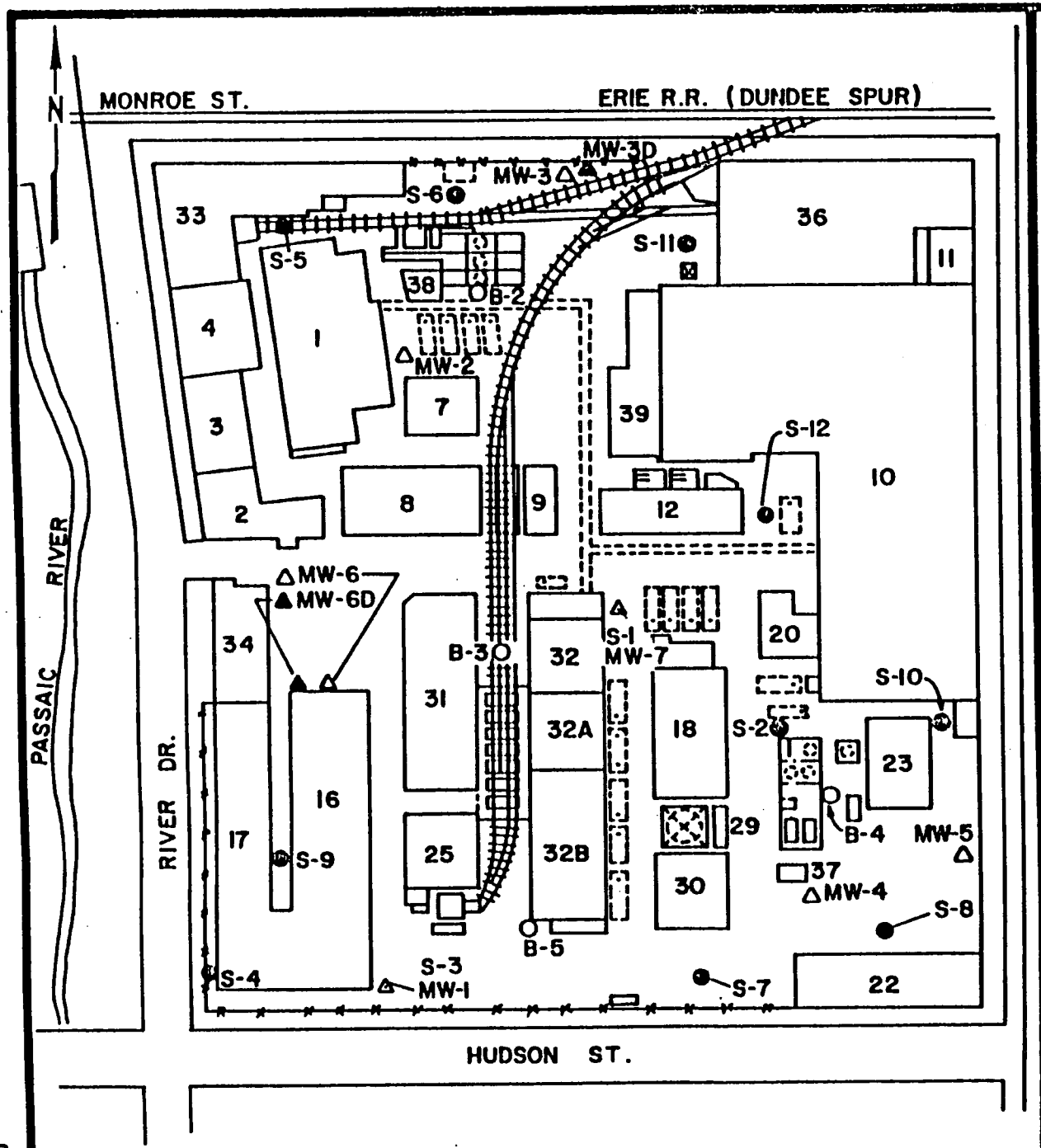
MONITORING WELL AND SOIL BORING LOCATION MAP

PREPARED FOR

KALAMA CHEMICAL, INC.

Geraghty & Miller, Inc.	COMPILED BY C.R.	SCALE SHOWN	FIGURE 1
	PREPARED BY R.M.M.		
	PROJECT MGR D.A.N.	DATE 7-21-87	

E29



EXPLANATION

OB-3	BORING FROM PREVIOUS INVESTIGATION
●S-11	SOIL BORING LOCATION
△MW-3	SHALLOW MONITORING WELL LOCATION
▲MW-3D	DEEP MONITORING WELL LOCATION
⬚	UNDERGROUND STORAGE TANK
✕ ✕ ✕ ✕ ✕	FENCE
7	BUILDING WITH NUMBER
△	COMBINED SOIL BORING AND MONITORING WELL LOCATION

SCALE 0 100 FT.

SUBJECT

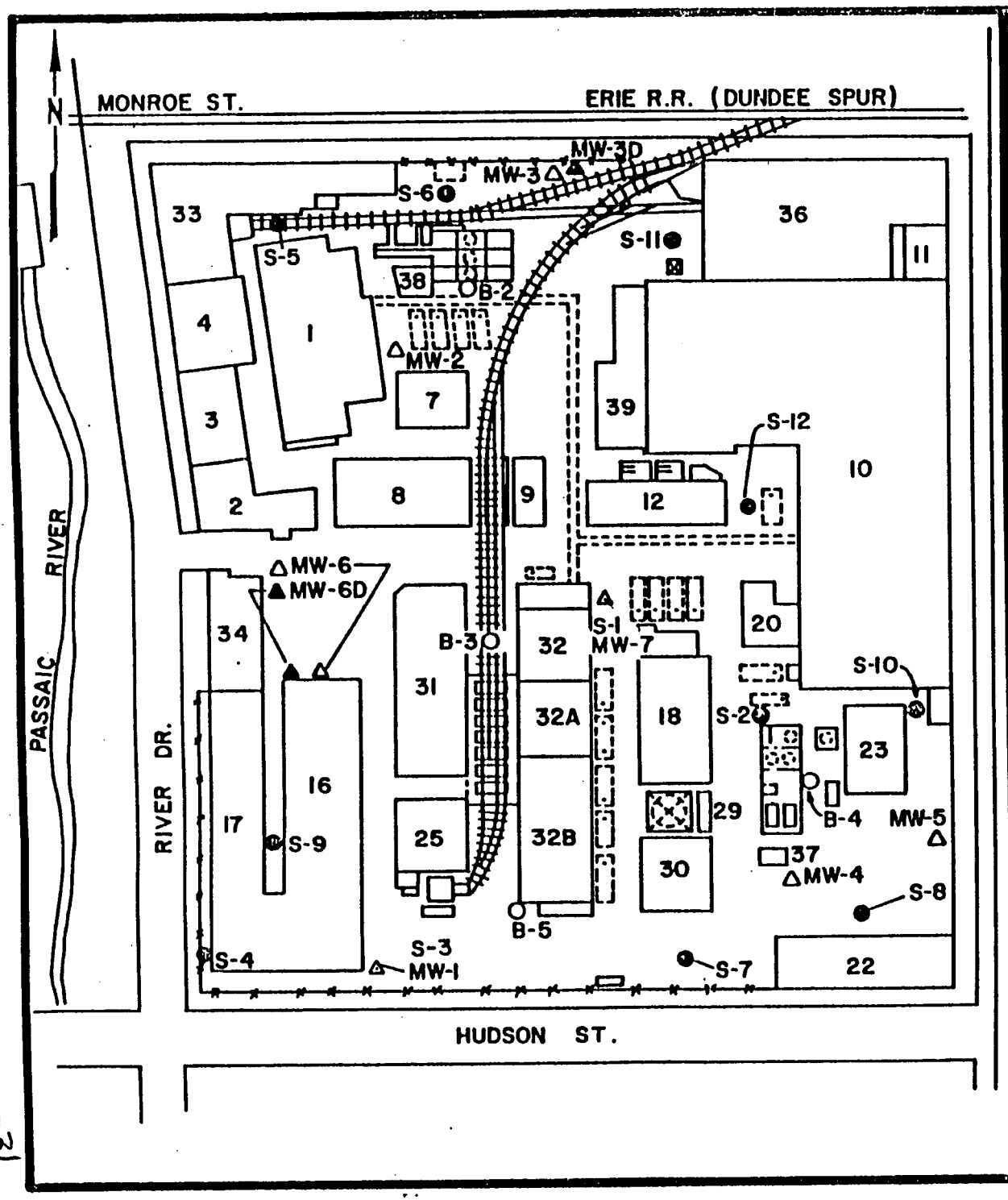
MONITORING WELL AND SOIL BORING LOCATION MAP

PREPARED FOR

KALAMA CHEMICAL, INC.

Geraghty & Miller, Inc.	COMPILED BY C.R.	SCALE SHOWN	FIGURE 1
	PREPARED BY R.M.M.	DATE 7-21-87	
	PROJECT MGR D.A.N.		

E3



EXPLANATION

OB-3	BORING FROM PREVIOUS INVESTIGATION
●S-11	SOIL BORING LOCATION
△MW-3	SHALLOW MONITORING WELL LOCATION
▲MW-3D	DEEP MONITORING WELL LOCATION
⬚	UNDERGROUND STORAGE TANK
—x—x—x—	FENCE
7	BUILDING WITH NUMBER
◬	COMBINED SOIL BORING AND MONITORING WELL LOCATION

SCALE 0 100 FT.

SUBJECT

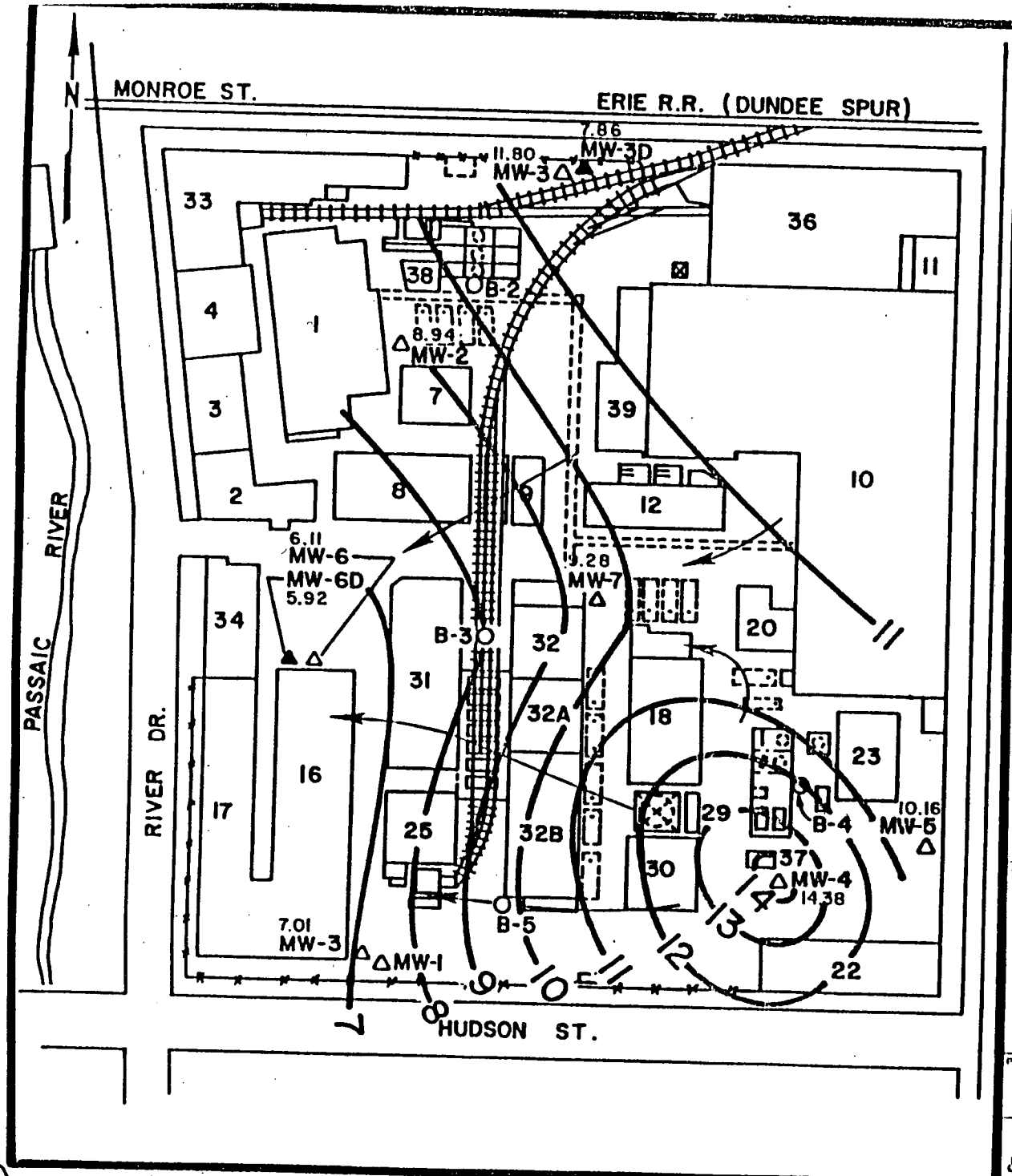
MONITORING WELL AND SOIL BORING LOCATION MAP

PREPARED FOR

KALAMA CHEMICAL, INC.

Geraghty & Miller, Inc.	COMPILED BY C.R.	SCALE SHOWN	FIGURE 1
	PREPARED BY R.M.M.	DATE 7-21-87	
	PROJECT MGR D.A.N.		

E31



EXPLANATION

OB-3	BORING FROM PREVIOUS INVESTIGATION
7.86	WATER-LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)
△MW-3	SHALLOW MONITORING WELL LOCATION
▲MW-3D	DEEP MONITORING WELL LOCATION
	UNDERGROUND STORAGE TANK
	FENCE
7	BUILDING WITH NUMBER
←	DIRECTION OF HORIZONTAL COMPONENT OF GROUND-WATER FLOW IN UPPERMOST SATURATED UNIT
8	LINE OF EQUAL WATER-LEVEL ELEVATION (FEET ABOVE MEAN SEA LEVEL)

SCALE 0 100 FT.

SUBJECT

WATER-LEVEL CONTOUR MAP MARCH 11, 1988

PREPARED FOR

KALAMA CHEMICAL, INC.

Geraghty & Miller, Inc.	COMPILED BY C.R.	SHOWN	2
	PREPARED BY R.M.M.		
	PROJECT MGR D.A.N.	7-21-87	

E-32

GERAGHTY & MILLER, INC.
Ground-Water Consultants

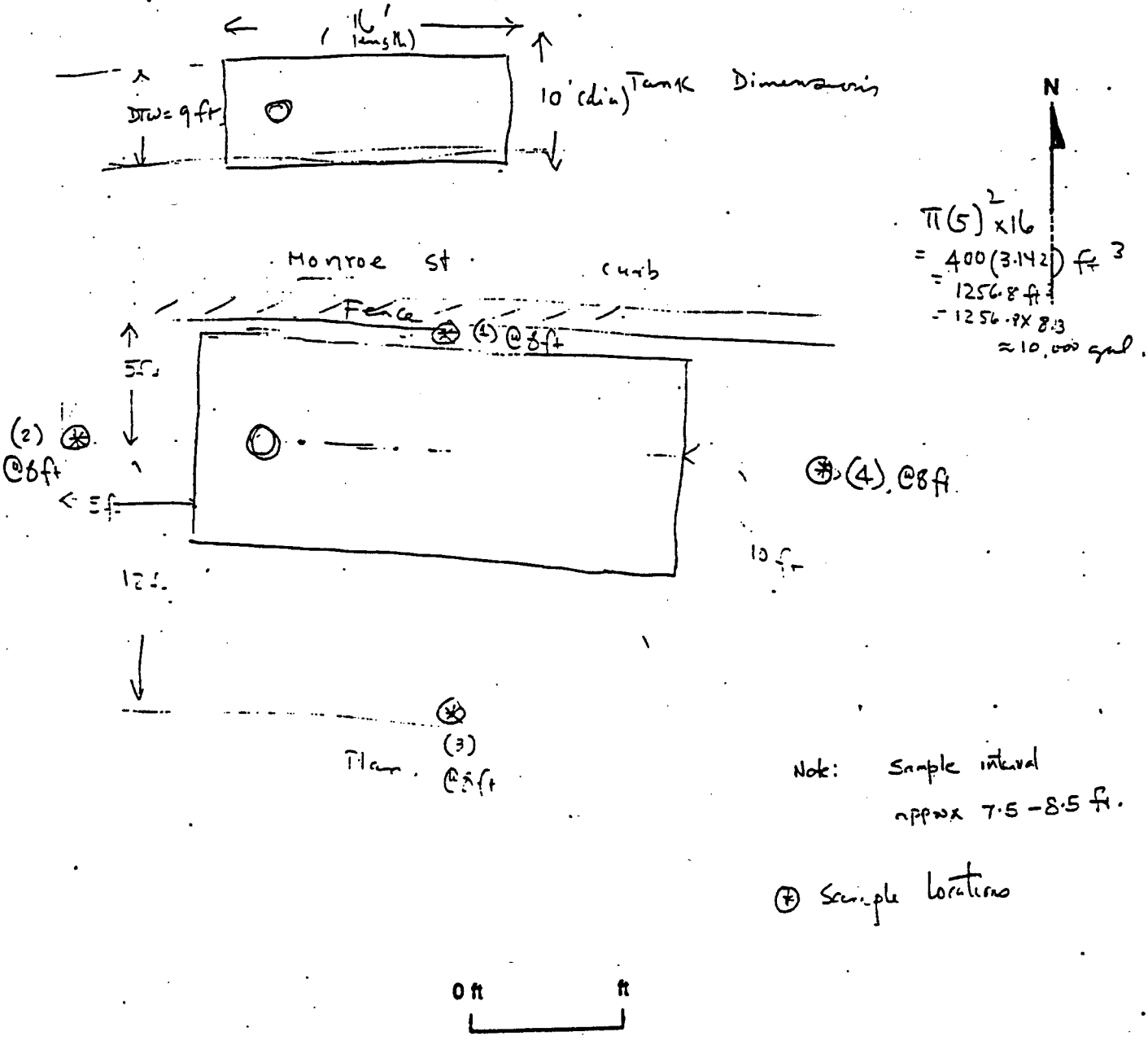
LOCATION SKETCH

Well(s) A-25 Project/No. J1080GF2 Page ____ of ____

Site Location Kalamazoo - Garfield

Observer C. Ray (9-22-87)

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)



APPENDIX B

APPENDIX C

E33

GERAGHTY & MILLER, INC.
Ground-Water Consultants

LOCATION SKETCH

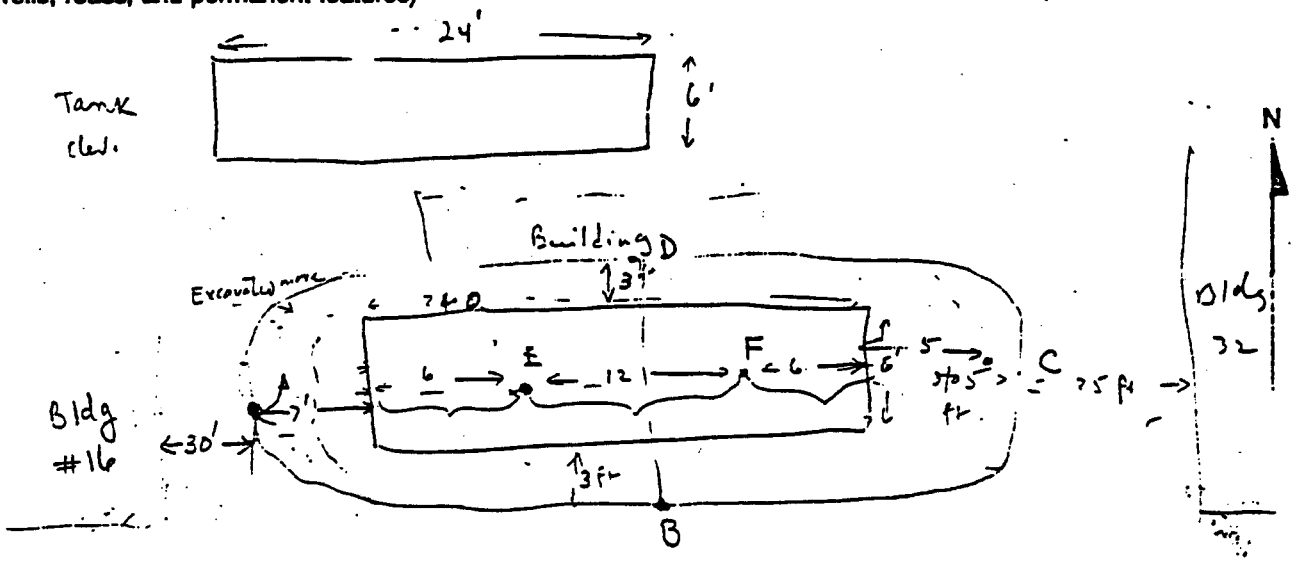
10/1/87

Well(s) Tank C-3 Project/No. J1080GF2 Page ____ of ____

Site Location Garfield

Observer C Ray

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)



Samples collected @ 7-7.5 ft depth interval.

3(A)

(F)

3(Fill) — composite } Took samples by a clean trowel at various locations of the piles and mixed in clean ziploc bags. Removed & filled the lab supplied jars.

3(Removed) — " }

material brought by contractor to fill the excavation.

• Sample location

0 ft ____ ft

E-34

GERAGHTY & MILLER, INC.
Ground-Water Consultants

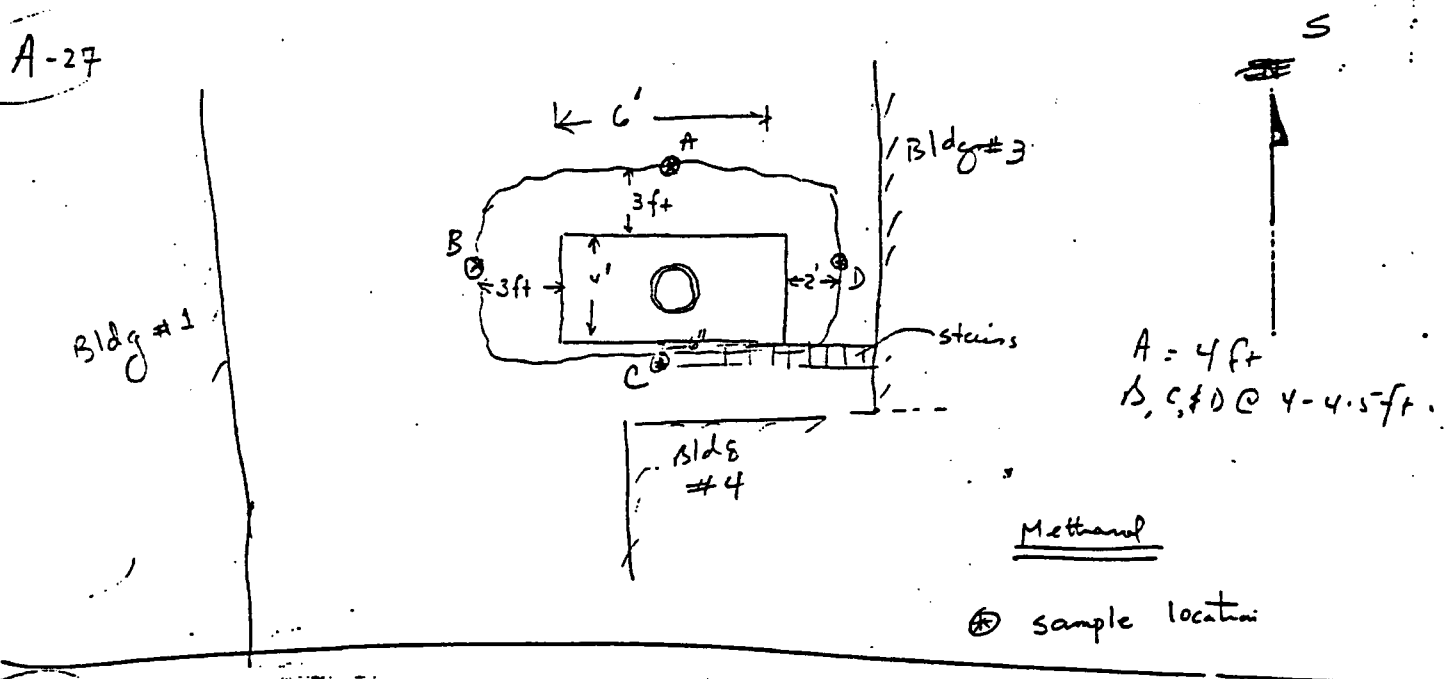
LOCATION SKETCH

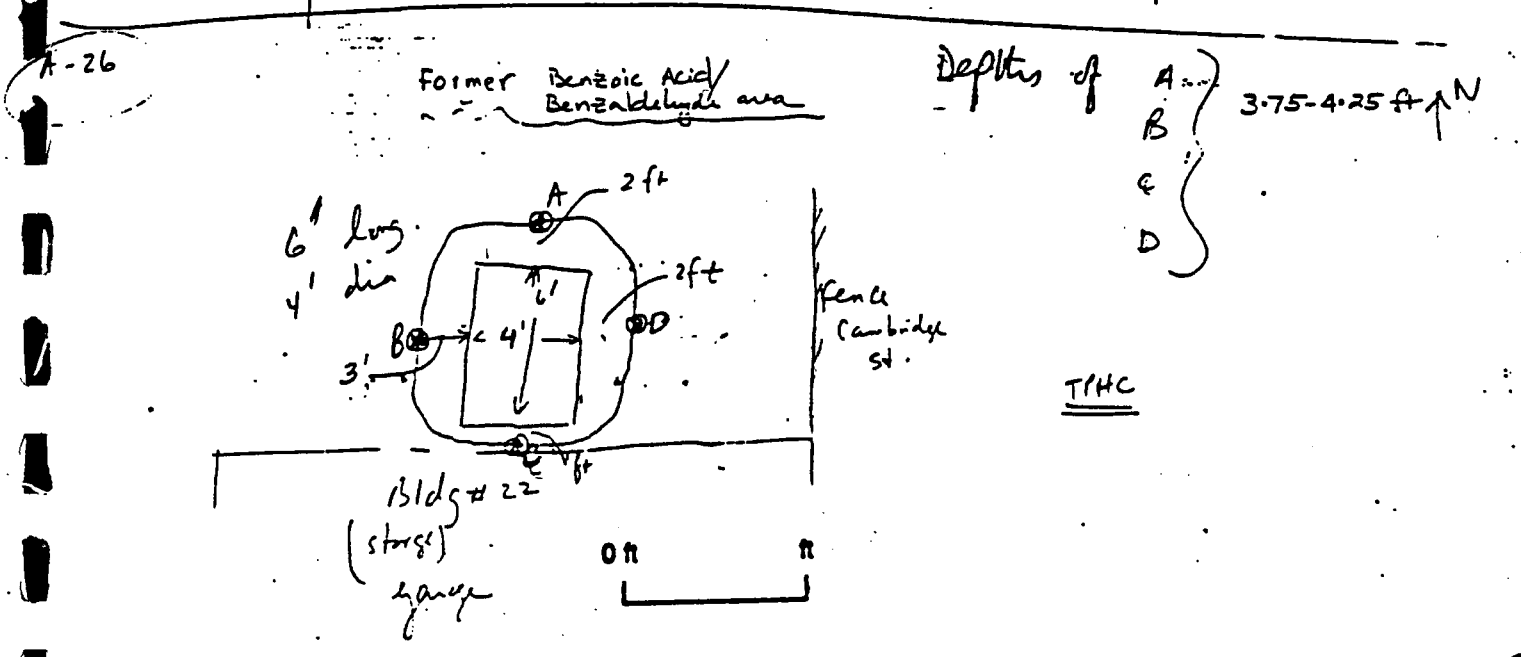
Well(s) Tank A-27/A-26 Project/No. J1080GF2 Page _____ of _____

Site Location Kalama

Observer C Ray (10-5-87)

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)





E35

GERAGHTY & MILLER, INC.
Ground-Water Consultants

LOCATION SKETCH

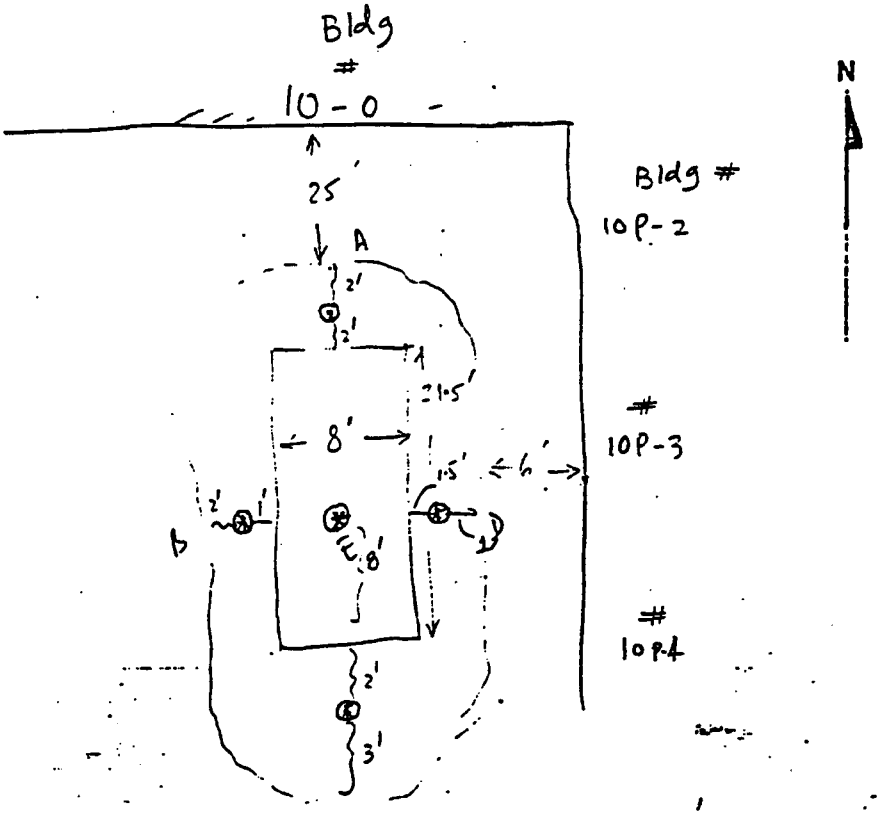
10-7-87

Well(s) A-4 Project/No. J 1080 GF 2 Page _____ of _____

Site Location Kalama (Garfield)

Observer C Ray

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)



Depths

A	9.5-10.5
B	9.5-10.5
C	9.5-10.5
D	9.5-10.5
E	10.5-11.0'

0 ft ft

⊛ Sample location

Depth to water @ 10.5' bgs

log - 0-0.5'. Asphalt paving

0.5-10.5'. Fill, m-c sand, gravel, cobbles, occasional black silt & clay layers; moist, brown color.

Tank was @ 2-3 ft below ground. Bottom ½ ft of tank was in contact with water.

E36

GERAGHTY & MILLER, INC.
Ground-Water Consultants

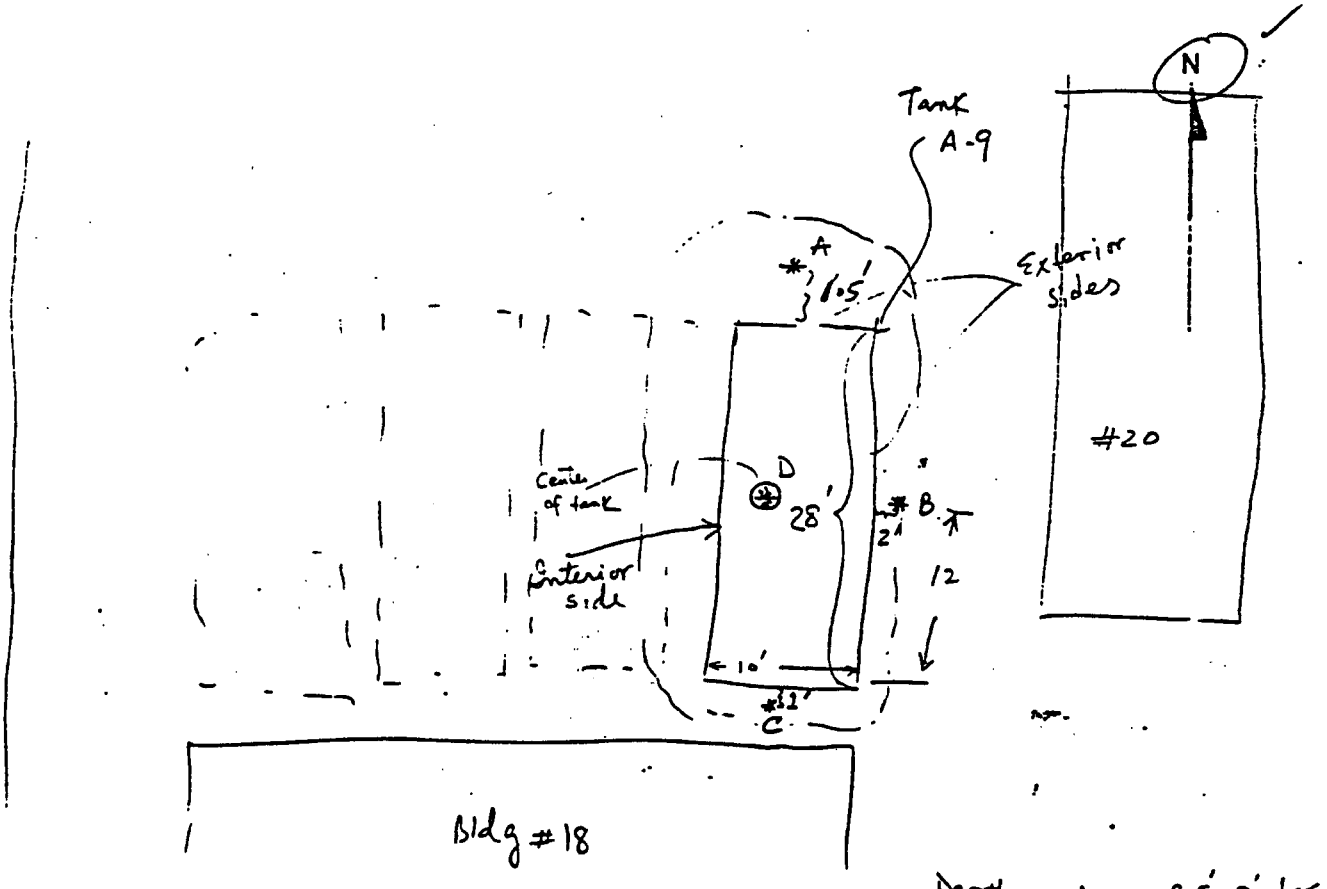
LOCATION SKETCH

Well(s) Tank A-9 Project/No. J10806F2 Page ____ of ____

Site Location KALAMA

Observer C Ray

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features) 10-14-87



Depths
A ~ 8.5'-9' bgs
B ~ 8.5-9.0 bgs
C. 8.5 to 9.0' bgs
D – 10.5-12 ft bgs saturated

Collected in 16-oz glass jars (these jars were used for TPHC samples)

0 ft ft

E37

GERAGHTY & MILLER, INC.
Ground-Water Consultants

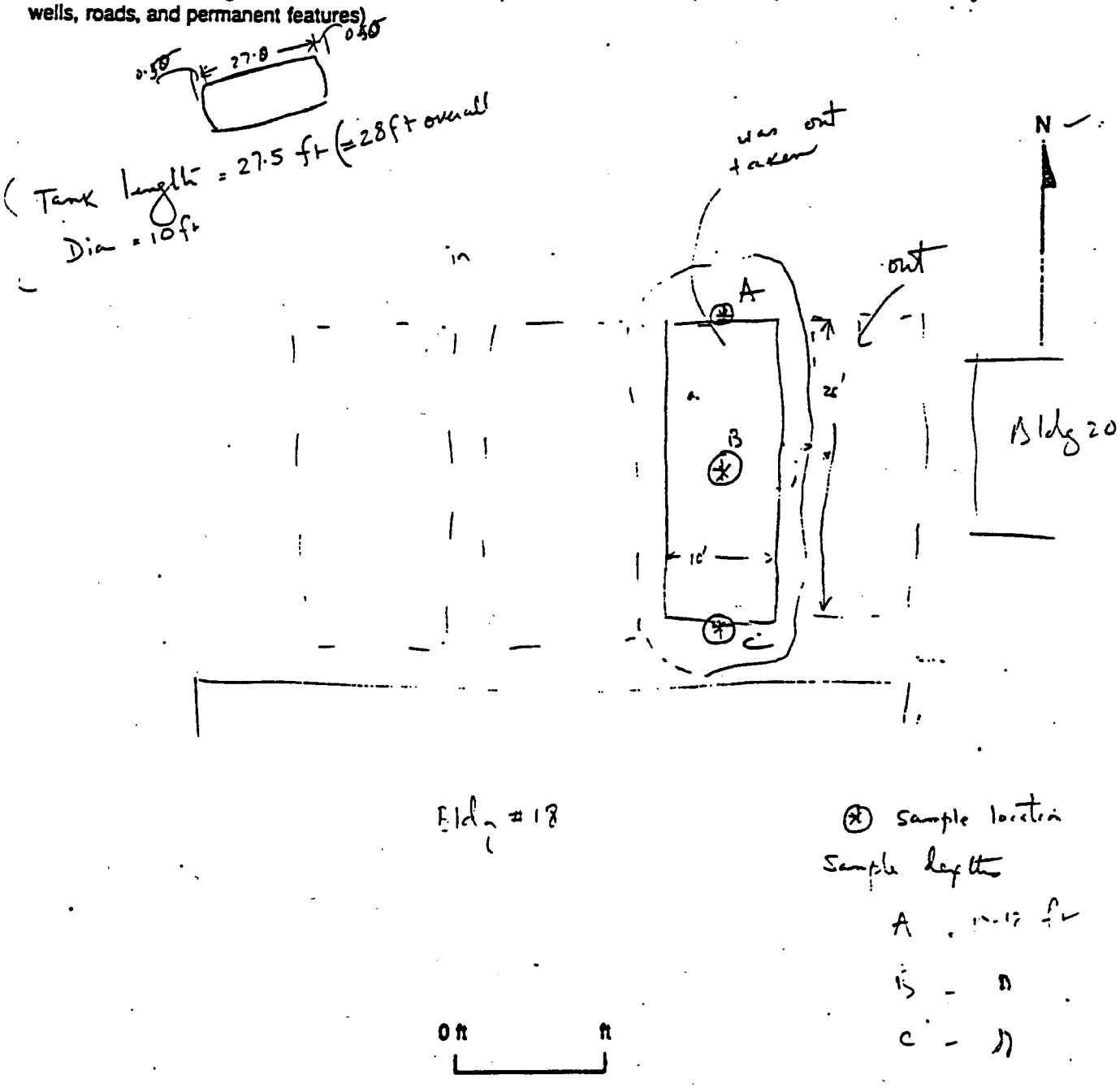
LOCATION SKETCH

Well(s) A-10 Tank Project/No. J1080GF2 Page ____ of ____

Site Location Kalama

Observer C Ray (10-20-87)

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)



E38

GERAGHTY & MILLER, INC.
Ground-Water Consultants

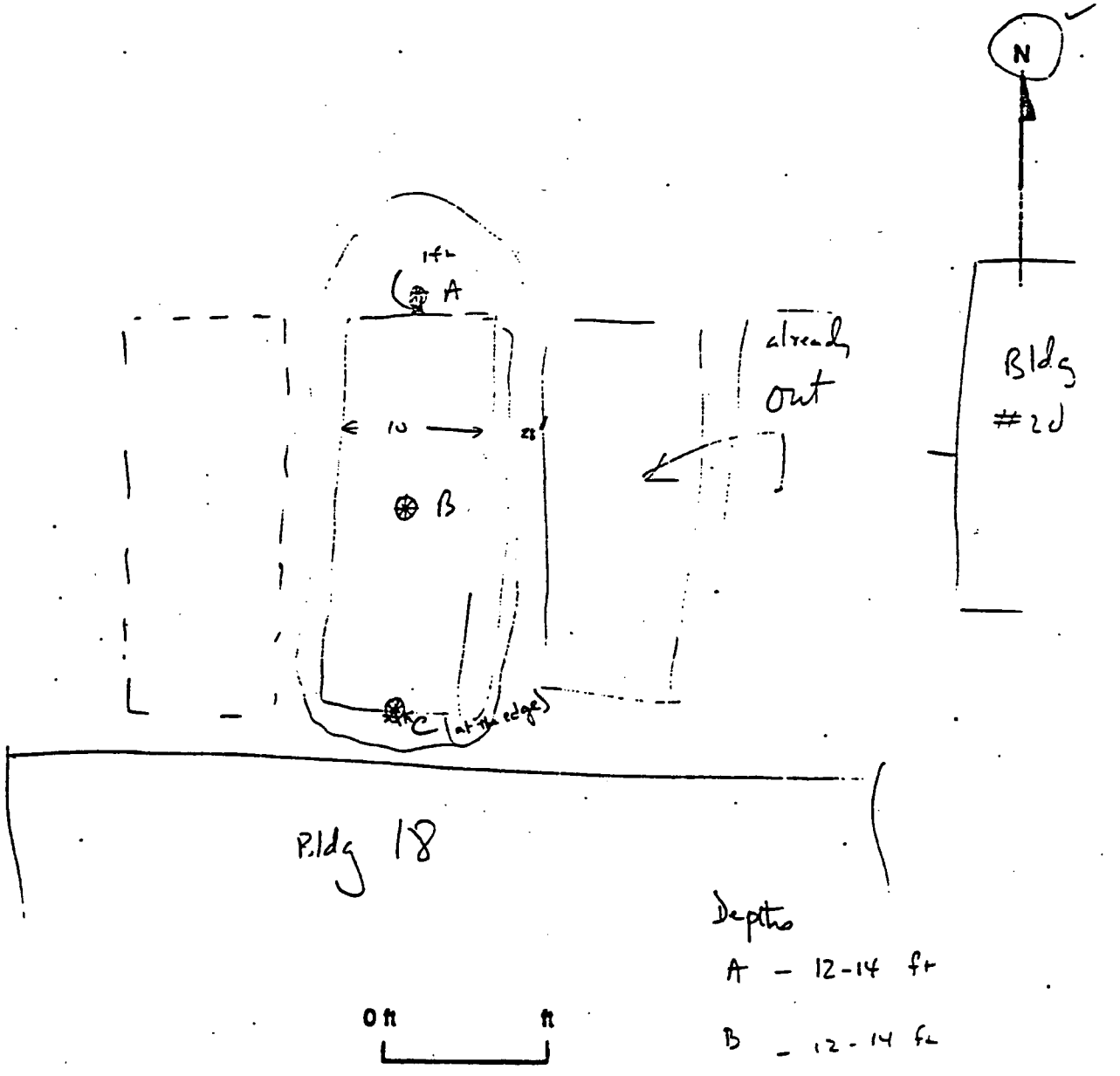
LOCATION SKETCH

Well(s) Tank A-11 Project/No. T1080GF2 Page ____ of ____

Site Location Kalama

Observer C Ray

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features) 10-22-87



Depths
A - 12-14 ft
B - 12-14 ft
C 12-14 ft
⊛ Sample location

E39

APPENDIX B

APPENDIX C

GERAGHTY & MILLER, INC.
Ground-Water Consultants

LOCATION SKETCH

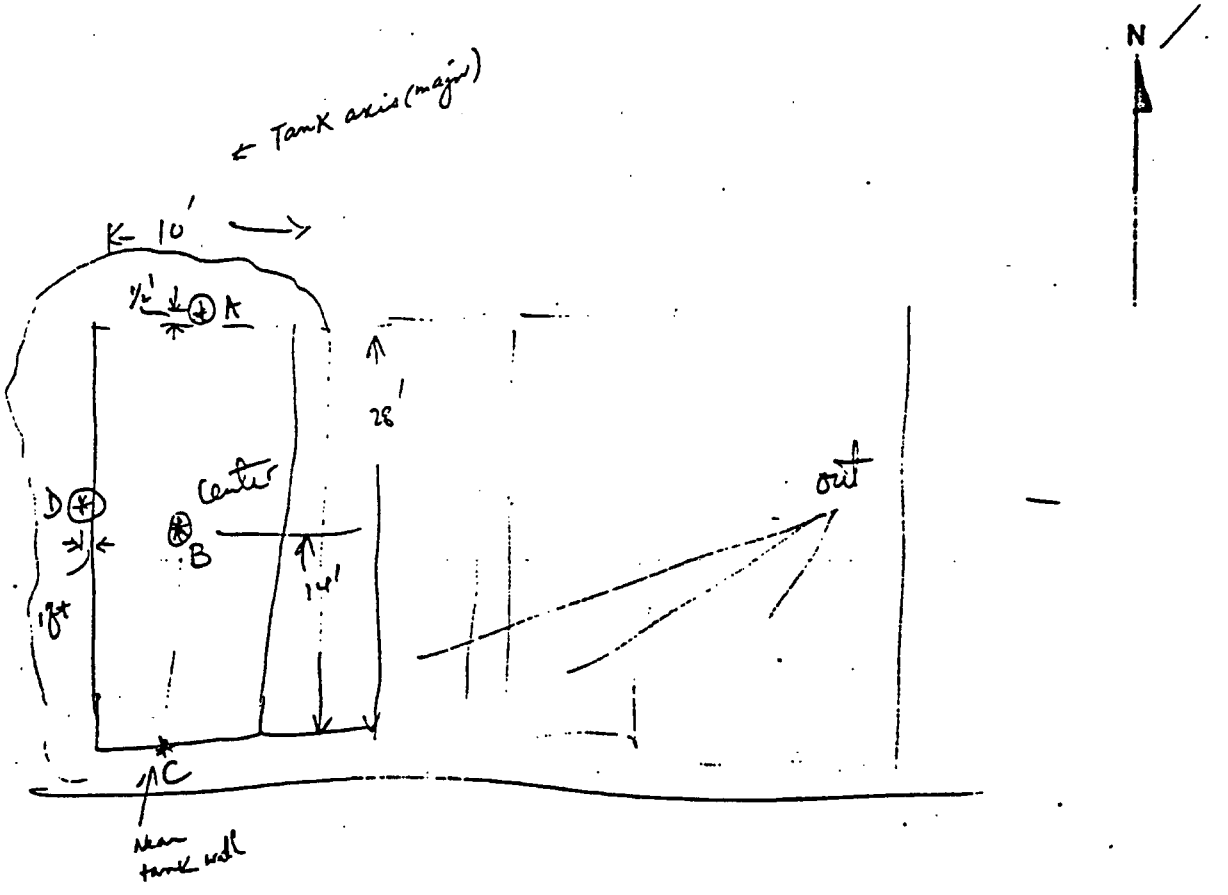
Well(s) A -12 Project/No. J 1080 GF Page ____ of ____

Site Location Kalama

Observer C. Ray

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)

10-26-87



Depths - A — 10.5 - 11.5 (ft).
B - 12.5 - 13.5 (ft)
C - 10.5 - 11.5 (ft)
D - 10.5 - 11.5 (ft)

0 ft ft

⊛ sampling locations

E40

GERAGHTY & MILLER, INC.
Ground-Water Consultants

LOCATION SKETCH

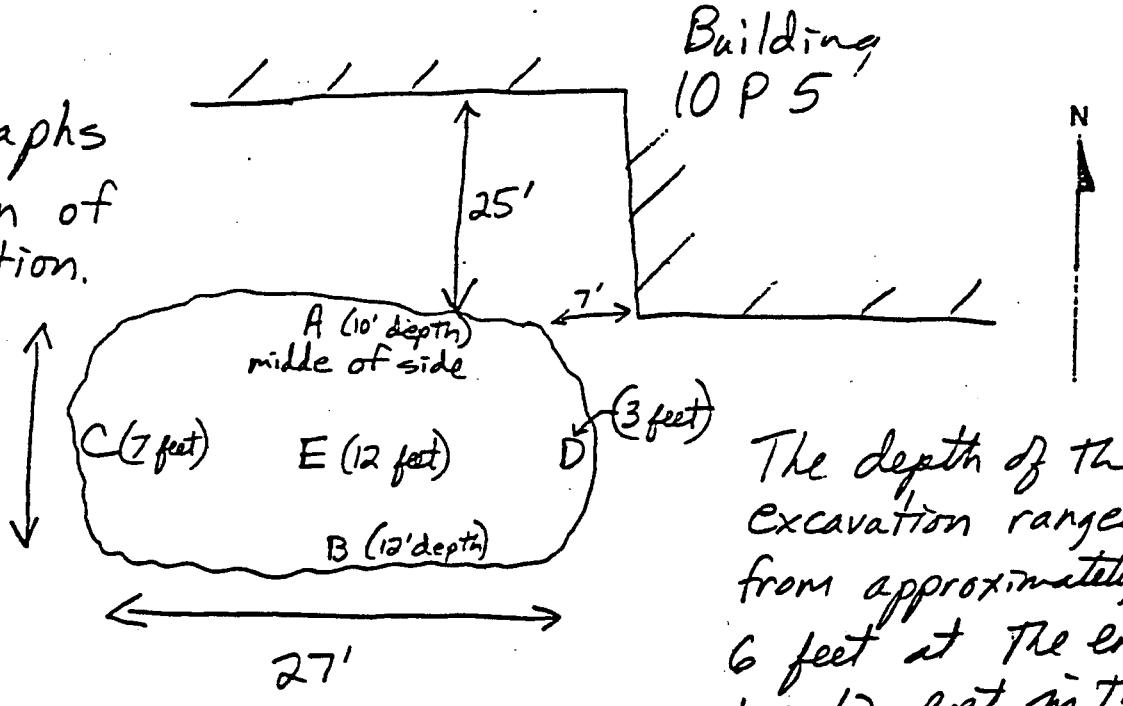
Well(s) _____ Project/No. Kalama / J1080 GF2 Page 1 of 1

Site Location Garfield

Observer Peter Miliozis

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)

3 photographs were taken of the excavation.



The depth of the excavation ranged from approximately 6 feet at the ends to 12 feet in the middle. Samples A, B, C, & D were collected in the middle of each of the respective walls (laterally speaking).

Tank C(2)

diameter 6 feet
heigth 24 feet

One photograph was taken of the removed tank.

0 ft ft

GERAGHTY & MILLER, INC.
Ground-Water Consultants

LOCATION SKETCH

11/23/87

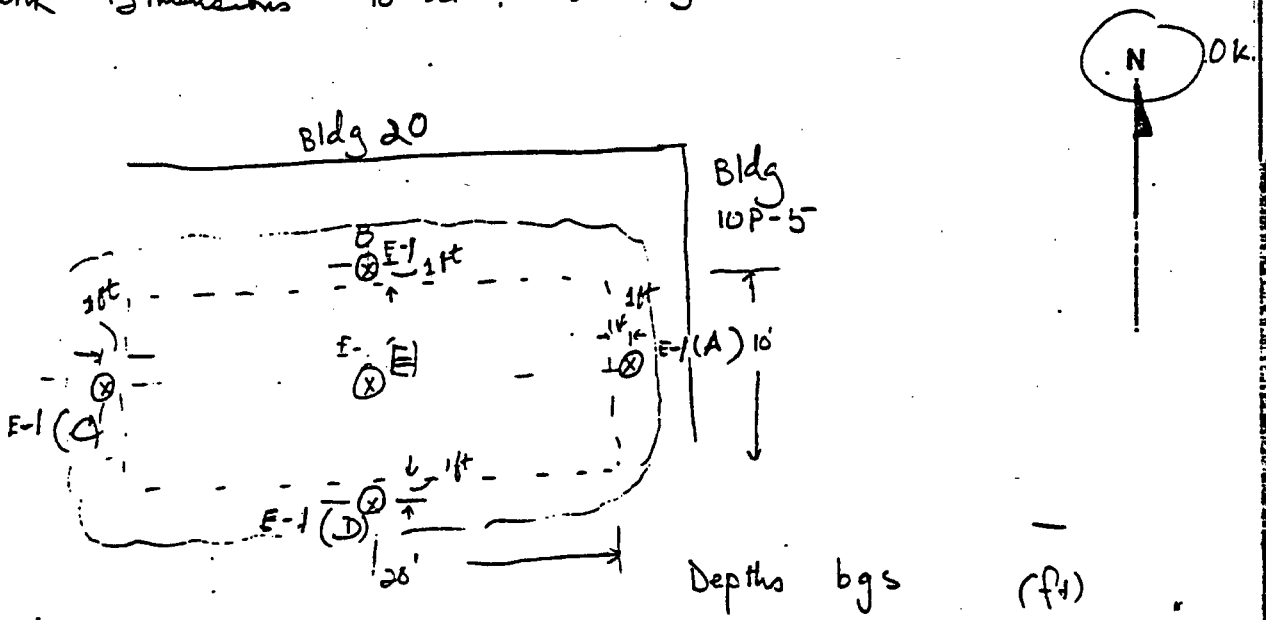
Well(s) Tank E-1 Project/No. J1080GF2 Page ____ of ____

Site Location Kalama

Observer C Ray

(Locate all wells, borings, etc. with reference to three permanent reference points; tape all distances; clearly label all wells, roads, and permanent features)

Tank Dimensions 10' dia. 28' long



Depths bgs	(ft)
E-1 (A)	8-10
(B)	"
(C)	"
(D)	"
(E)	"

⊗ sample location.

A+B - by trowel
C thigh & by ... bucket at location - from the center of bucket.

0 ft ft

APPENDIX B

APPENDIX C

E42

GENERALIZED GEOLOGIC LOGS OF MONITORING AND SOIL BORINGS
KALAMA CHEMICAL FACILITY

Wells/ Borings	Description	Depth (ft-ft)
MW-1	Asphalt mixed with gravel, stones and bricks.	0-2.5
	Sand, fine, with some silt and gravel pieces, yellowish-brown, cohesive, slightly moist.	2.5-6.5
	Sand, medium to coarse, with some gravel and stone fragments, gray-brown color, moist.	6.5-10.5
	Sand, coarse, with gravel and shale fragments, wet. Water at 11 feet.	10.5-12.5
	Sand, fine, with trace silt, red-brown. Becomes more silty at bottom.	12.5-22.0
MW-2	Concrete and gravel.	0-1.0
	Crushed stone and brick pieces.	1.0-3.0
	Sand, medium to coarse, with large gravel pieces, yellowish-brown color, slightly moist.	3.0-5.0
	Sand, fine to coarse, with crushed stones and shale fragments, gray to brown color, color changes to gray-black at 9.0 feet. Water at 9.0 feet.	5.0-11.5
	Silt, clay and very fine sand in intermittent layers, maximum thickness of individual layers 0.25 inch, gray color, very cohesive.	11.5-17.0
MW-3D	Fill: medium to coarse sand with silt, gravel, cinder pieces, and coal. Brown to black color, slightly moist.	0-2.0
	Sand, fine to coarse, with silt, gravel and shale fragments, slightly cohesive. Brownish-yellow color, wet at bottom.	2.0-7.0
	Coal. Black color, wet, sewery smell.	7.0-8.0
	Clay, compact, with trace of silt, gray-black color, very cohesive.	8.0-15.0
	Clay with some silt, gray color.	15.0-20.0
	Silt mixed with fine sand; intermittent layers of silt or fine sand.	20.0-36.0

E43

	Fragmented shale with some silt and fine sand, red-brown color.	38.0-42.0
MW-4	Concrete and large gravel. Water at 1.5 ft below ground surface.	0-1.0
	Sand, coarse, with gravel and trace silt. Brownish-red color.	1.0-8.0
	Silt and fine sand with some clay. Gray color.	8.0-11.0
	Sand, coarse, with gravel, shale fragments and some silt, gray to brown color.	11.0-17.0
MW-5	Asphalt, gravel, cobbles, and a layer of brick.	0-2.0
	Sand, medium to coarse, with some gravel, red brown, slightly moist.	2.0-6.0
	Sand, fine to coarse, with shale fragments, trace silt and some gravel, red-brown in color. Water at 8.0 feet below ground surface.	6.0-13.0
	Sand, fine to medium, with some silt, brownish red color.	13.0-21.0
MW-6D	Asphalt and gravel.	0-0.5
	Fill: Coarse sand with gravel and trace silt, gray to yellow-brown color, slightly moist.	0.5-4.5
	Sand, coarse, with gravel, brown, moist.	4.5-10.0
	Sand, fine to coarse, with some silt, intermittent layers of silt, clay, and medium sand, water at 11 ft.	10.0-28.0
	Sand, fine to medium, with some silt, clay, shale pieces.	28.0-30.0
	Crushed sandstone and shale fragments with some silt and fine sand, red color.	30.0-32.5
MW-7	Asphalt, stone, and gravel.	0-1.0
	Fill: coarse sand, gravel and some silt, brown color, moist.	1.0-5.0
	Sand, medium, with some silt, gray-black color.	5.0-8.0

	Clay and silt, gray-brown, moist.	9.0-10.0
	Sand, medium to coarse, gray-brown, wet with water.	10.0-11.0
	Sand, fine to medium, with some silt, gray color, with intermediate layers of silty black sand.	11.0-19.0
	Sand, fine, with silt, brownish-red.	19.0-22.0

Soil Borings

-1	Same as MW-7.	
-2	Asphalt, stone, and gravel.	0-2.0
	Sand, fine to coarse, with some gravel, trace silt, red brown to gray color. A layer of solvent/water at the bottom of the spoon (at 4 ft).	2.0-4.0
S-3	Same as MW-1.	
-4	Top soil, gravel, and stone fragments.	0-1.0
	Sand, fine to medium, gray brown to red brown in color, moist.	1.0-3.5
5	Asphalt and gravel.	0-0.5
	Coarse sand, gravel and shale pieces.	0.5-2.5
	Sand, medium to coarse, shale fragments, silt, cohesive, red-brown, moist.	2.5-6.5
	Sand, fine, with some silt, gray color, wet at bottom.	6.5-8.5
S-6	Asphalt and gravel.	0-1.0
	Sand, fine to medium, with some silt, cohesive, yellow-brown, moist.	1.0-5.0
	Sand, medium to coarse, with gravel and stone pieces, brown to black color, wet at bottom.	5.0-8.5
S-7	Asphalt and stones.	0-2.0
	Sand, medium to coarse, gravel, stones and brick pieces. Gray-brown color, solvent/water at 4 ft.	2.0-4.0

E45

S-8	Asphalt, stone and gravel.	0-2.5
	Sand, fine to medium with trace silt, red shale pieces, and stone.	2.5-4.5
	Sand, fine to medium, with crushed sandstone and shale, red-brown, moist. Wet at bottom of spoon (6.5-8.5 ft).	4.5-8.5
S-9	Concrete, gravel, and stones.	0-2.0
	Weathered shale, powder-like, brownish-red, moist.	2.0-3.5
S-10	Concrete and stones.	0-2.5
	Sand, medium to coarse, with some gravel, moist, wet at bottom.	2.5-4.5
S-11	Asphalt, stone and gravel.	0-1.0
	Sand, fine to medium, with some silt, cohesive, yellow-brown, moist.	1.0-3.0
	Sand, fine to coarse, with some silt and stone fragments, gray black. Water at 8.0 ft.	3.0-9.0
S-12	Asphalt and gravel.	0-1.5
	Sand, medium to coarse, with gravel and brick fragments, gray color. Water at 5.5 feet.	1.5-5.5

Reference Number 7

Ref. No. 7

JAN 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA
Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL 1) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	46	32	39	7	26	26	0	1	0	0.14	0.0	29.730	28	15.4	16.7	49	W	25	28			8	7
02	43	27	35	3	19	30	0		0	0.00	0.0	30.270	25	10.3	11.6	29	NW	16	25			0	0
03	50	29	40	8	22	25	0		0	0.00	0.0	30.260	21	6.3	6.9	15	SW	13	22			3	1
04	51	33	42	10	35	23	0	1	0	T	0.0	29.980	22	7.6	8.9	21	SW	17	21			10	8
05	49	36	43	11	28	22	0	1	0	0.00	0.0	30.070	31	6.5	9.8	29	NW	20	33			3	4
06	47	34	41	9	23	24	0		0	T	T	30.010	31	6.7	8.9	25	NW	17	29			6	5
07	44	26	35	3	23	30	0		0	0.00	0.0	30.070	22	8.3	9.9	24	SW	16	22			4	4
08	41	31	36	4	29	29	0	1 4 8	0	1.14	1.4	29.860	35	2.3	7.1	17	N	14	01			10	10
09	46	32	39	7	33	26	0		1	0.00	0.0	29.880	20	6.0	7.0	15	SW	13	22			8	6
10	47	39	43	12	35	22	0	1	1	0.03	0.0	29.600	25	9.8	11.5	33	W	23	27			9	10
11	46	37	42	11	29	23	0		0	0.00	0.0	29.585	22	7.7	9.9	25	W	15	18			10	8
12	43	31	37	6	21	28	0		0	T	T	29.450	26	13.9	15.2	48	W	29	26			9	7
13	35	25	30	-1	7	35	0		0	T	T	29.960	30	18.7	18.9	43	NW	28	30			2	3
14	37	22*	30*	-1	15	35	0		0	0.00	0.0	30.335	24	8.0	9.2	17	W	14	30			9	7
15	40	33	37	6	32	28	0	1 8	1	0.10	0.2	30.240	22	6.9	7.5	14	SW	13	21			10	10
16	57	32	45	14	37	20	0		0	0.00	0.0	30.260	22	6.1	6.6	15	SW	12	25			5	5
17	62	40	51	20	42	14	0	1 8	0	0.00	0.0	30.180	19	5.7	6.7	20	SW	15	21			2	4
18	66*	44	55*	24	46	10	0		0	T	0.0	29.910	25	10.2	12.6	30	NW	18	31			8	7
19	44	31	38	7	15	27	0		0	0.00	0.0	30.310	31	10.5	11.4	31	NW	20	32			10	6
20	36	30	33	2	27	32	0	1	0	0.46	0.8	30.140	15	1.3	3.8	14	S	12	18			10	10
21	38	31	35	4	33	30	0	1 4	0	0.30	T	29.770	02	4.6	7.0	20	NE	16	03			10	9
22	47	30	39	8	33	26	0	1 8	0	0.02	T	29.820	22	6.4	7.5	22	SW	15	22			10	9
23	46	34	40	9	28	25	0		0	0.00	0.0	30.040	24	6.1	9.1	20	NW	16	28			6	6
24	57	41	49	18	37	16	0		0	T	0.0	29.940	20	4.0	6.4	18	W	15	23			10	10
25	55	46	51	20	47	14	0	2	0	1.12	0.0	29.850	12	4.0	5.0	23	NW	12	31			10	10
26	58	36	47	16	38	18	0	1	0	0.20	0.0	29.730	27	11.2	13.4	29	W	20	27			10	9
27	46	30	38	7	24	27	0		0	0.00	0.0	30.240	23	8.0	9.9	24	NW	16	29			4	4
28	58	32	45	14	21	20	0		0	0.00	0.0	30.215	31	3.9	9.9	23	NW	17	35			9	7
29	44	35	40	9	30	25	0	1 8	0	1.07	0.0	29.980	05	10.6	11.5	24	E	18	03			10	10
30	46	37	42	11	31	23	0	1	0	0.14	0.0	29.820	31	12.1	14.0	44	W	25	29			8	8
31	53	31	42	11	30	23	0	8	0	0.00	0.0	30.240	36	0.1	4.5	12	SE	8	20			1	2
	SUM 1478	SUM 1027				TOTAL 756	TOTAL 0	NUMBER OF DAYS		TOTAL 4.72	TOTAL 2.4	29.990	26	5.1	9.6	FOR THE MONTH: 49	W	29	26	TOTAL	% FOR MONTH	SUM 224	SUM 206
	AVG. 47.7	AVG. 33.1	AVG. 40.4	DEP. 9.1	AVG 28.8	DEP. -25	DEP. 0	PRECIPITATION ≥ .01 INCH 11		DEP. 1.59						DATE: 1		DATE: 12		POSSIBLE		AVG. 7.2	AVG. 6.6

NUMBER OF DAYS				SEASON TO DATE		
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	
≥ 90°	≤ 32°	≤ 32°	≤ 0°	2752	0	
0	0	17	0	DEP. -73	DEP. 0	

SNOW, ICE PELLETS	
≥ 1.0 INCH	1
THUNDERSTORMS	0
HEAVY FOG	1
CLEAR 6	PARTLY CLOUDY 5 CLOUDY 20

GREATEST IN 24 HOURS AND DATES			
PRECIPITATION		SNOW, ICE PELLETS	
1.21	29-30	1.4	08

GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
1	10+

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

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Kenneth D. Wadlan
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NATIONAL CLIMATIC DATA CENTER

noaa
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

JAN 1990
NEWARK, NJ

FEB 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	54	32	43	12	34	22	0	1 8	0	0.00	0.0	30.160	21	7.5	7.9	22	S	15	22			8	6
02	53	39	46	15	42	19	0	1	0	0.06	0.0	29.930	01	2.3	7.5	17	N	14	01			10	10
03	40	31	36	5	30	29	0	1 6	0	0.10	0.0	30.210	04	10.4	11.6	18	E	15	03			10	10
04	40	34	37	6	35	28	0	1	0	0.29	T	29.800	04	9.4	11.6	20	N	15	02			10	10
05	38	22	30	-1	20	35	0		0	0.00	0.0	30.160	33	8.6	10.3	22	NW	16	33			3	4
06	57	30	44	13	27	21	0		0	0.00	0.0	30.100	26	5.0	9.9	24	W	18	29			4	4
07	55	39	47	16	36	18	0		0	T	0.0	30.020	01	2.7	6.8	14		12	32			7	6
08	57	33	45	13	34	20	0		0	0.00	0.0	30.150	18	4.2	5.3	14	S	12	19			0	0
09	63	40	52	20	43	13	0	8	0	T	0.0	29.890	21	7.5	8.6	25	SW	18	23			7	7
10	63	35	49	17	41	16	0	1 8	0	0.52	0.0	29.570	29	6.4	11.2	28	NW	21	31			10	8
11	49	31	40	8	18	25	0		0	0.00	0.0	29.850	26	8.9	9.7	22	W	15	31			3	4
12	47	32	40	8	22	25	0		0	0.01	0.1	30.020	34	7.2	9.2	21	NW	15	32			6	6
13	53	29	41	9	27	24	0		0	0.00	0.0	30.080	19	8.5	9.1	24	S	17	27			9	7
14	60	41	51	19	34	14	0		0	0.02	0.0	30.060	33	6.0	10.7	20	N	17	31			10	10
15	41	35	38	5	34	27	0	1	0	0.07	0.0	30.180	05	9.9	10.3	17	E	14	07			10	10
16	58	37	48	15	41	17	0	2	0	0.01	0.0	29.790	36	2.1	6.1	23	W	14	24			10	10
17	59	24	42	9	17	23	0		0	0.00	0.0	30.140	30	19.5	20.2	43	W	28	33			2	2
18	38	20	29	-4	15	36	0		0	0.00	0.0	30.530	19	3.5	9.0	18	SW	16	22			3	4
19	57	33	45	12	23	20	0		0	0.00	0.0	29.960	26	10.7	13.9	33	NW	22	30			9	6
20	38	27	33	-1	3	32	0		0	0.00	0.0	30.380	31	17.6	18.3	36	NW	29	32			0	0
21	50	23	37	3	13	28	0		0	0.00	0.0	30.520	22	9.3	10.1	25	SW	17	23			0	0
22	63	34	49	15	40	16	0	1 8	0	0.13	0.0	30.050	21	11.7	12.4	35	SW	25	27			10	8
23	66*	50	58*	24	54	7	0		0	0.22	0.0	29.510	22	11.6	13.6	35	W	18	23			10	10
24	50	31	41	6	28	24	0	1	0	0.15	1.3	29.600	01	7.8	10.5	32	NW	30	27		100	10	10
25	33	10	22	-13		43	0	1	0	0.13	1.4					49	NW	35	29			9	7
26	26	8*	17*	-18	0	48	0		0	0.00	0.0	30.800	31	6.7	10.1	26	NW	17	32			0	0
27	35	20	28	-7	17	37	0		0	T	T	30.480	21	10.9	11.8	25	SW	21	23			8	7
28	39	26	33	-3	14	32	0		0	0.00	0.0	30.330	30	12.0	13.8	24	NW	20	29			1	2

SUM	SUM				TOTAL	TOTAL	NUMBER OF DAYS	TOTAL	TOTAL	FOR THE MONTH:								TOTAL	% FOR MONTH	SUM	SUM
1382	842				689	0		1.71	2.8	30.050	29	4.4	11.1	49	NW	35	29			179	168
AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION	DEP.						DATE: 25		DATE: 25		POSSIBLE		AVG.	AVG.
49.4	30.2	39.8	7.0	26.8	-203	0	≥ .01 INCH.	-1.34												6.4	6.0

NUMBER OF DAYS				SEASON TO DATE				GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	SNOW, ICE PELLETS ≥ 1.0 INCH		PRECIPITATION		SNOW, ICE PELLETS		
≥ 90°	≤ 32°	≤ 32°	≤ 0°	349	0	THUNDERSTORMS		0.52	10	2.7	24-25	2 26-
0		16	0	-216	0	HEAVY FOG						
						CLEAR 9	PARTLY CLOUDY 4	CLOUDY 15				

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
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FEB 1990
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NAT'L WEA SER OFC.,NOAA
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01	42	22	32	-4	11	33	0		0	0.00	0.0	30.340	26	9.1	11.2	21	W	15	29			3	3
02	52	30	41	5	28	24	0	8	0	0.00	0.0	29.970	22	12.1	12.4	23	SW	18	21			7	6
03	54	39	47	10	33	18	0	1 8	0	0.00	0.0	29.770	32	2.2	7.2	21	NW	16	33			9	8
04	39	23	31	-6	6	34	0		0	0.00	0.0	30.100	33	13.3	14.1	28	NW	20	33			0	0
05	37	25	31	-6	16	34	0		0	T	T	30.420	05	5.4	7.5	14	N	10	01			9	8
06	35	22	29	-9	21	36	0	1 4	1	0.32	2.5	30.490	02	13.1	13.4	23	N	20	01			10	8
07	35	13*	24*	-14	2	41	0		2	0.00	0.0	30.780	36	7.4	8.9	21	N	20	01			0	0
08	49	22	36	-2	11	29	0		0	0.00	0.0	30.560	24	1.0	5.6	12	W	9	14			3	2
09	47	28	38	-1	24	27	0	8	0	0.01	0.0	30.200	21	5.0	5.9	13	SW	10	22			9	7
10	54	40	47	8	37	18	0	8	0	0.00	0.0	30.230	17	3.6	4.2	13	SE	10	14			10	10
11	68	44	56	17	47	9	0	1 8	0	0.04	0.0	30.160	21	5.2	5.8	12	SW	9	21			9	10
12	60	48	54	14	43	11	0	8	0	T	0.0	30.090	10	4.0	5.1	13	SE	9	11			6	8
13	86*	45	66	26	49	0	1	1 8	0	0.00	0.0	29.990	26	6.8	8.7	24	W	21	29			6	4
14	67	46	57	17	48	8	0	1 8	0	0.00	0.0	30.090	09	5.8	7.4	13	N	10	02			8	7
15	79	44	62	21	48	3	0	1 8	0	0.00	0.0	30.080	15	1.8	6.1	17	S	13	18			6	7
16	82	57	70*	29	59	0	5		0	0.00	0.0	30.000	20	9.9	10.8	29	SW	24	22			7	7
17	78	53	66	24	60	0	1	1 8	0	0.46	0.0	29.710	21	12.6	14.3	41	SW	26	21			10	10
18	60	47	54	12	35	11	0	1	0	0.34	0.0	29.860	26	10.8	12.7	35	W	23	24			6	6
19	54	40	47	5	32	18	0		0	0.02	0.0	30.180	12	5.9	7.9	20	SE	18	15			9	8
20	49	39	44	1	41	21	0	1 3	0	0.95	0.0	29.870	34	11.1	12.7	22	N	17	33			10	10
21	55	37	46	3	26	19	0		0	0.03	T	30.010	30	17.8	18.3	43	W	29	30			2	4
22	60	39	50	7	32	15	0		0	0.00	0.0	30.225	16	8.4	9.2	29	S	17	18			5	5
23	69	36	53	9	32	12	0		0	0.00	0.0	30.040	28	11.4	15.8	45	NW	26	28			5	5
24	36	33	35	-9	17	30	0		0	0.00	0.0	30.380	28	4.4	8.7	23	N	15	35			10	10
25	48	34	41	-3	25	24	0		0	0.00	0.0	30.260	23	7.3	8.1	21	SW	18	24			5	6
26	56	32	44	-1	26	21	0	8	0	0.00	0.0	30.180	28	11.6	15.2	38	W	26	28			2	1
27	44	26	35	-10	20	30	0		0	0.00	0.0	30.380	33	10.9	11.7	25	NW	20	33			0	0
28	53	28	41	-4	18	24	0		0	0.00	0.0	30.400	26	7.7	9.4	31	W	18	26			3	4
29	47	37	42	-4	21	23	0		0	0.05	0.0	30.520	10	6.9	10.4	18	E	16	16			9	9
30	40	36	38	-8	36	27	0	1	0	0.56	0.0	30.310	05	11.3	12.5	23	NE	17	07			10	10
31	48	37	43	-4	39	22	0	1 8	0	0.03	0.0	30.040	04	2.5	5.2	13	N	12	01			10	10
SUM	SUM					TOTAL	TOTAL	NUMBER OF DAYS	TOTAL	TOTAL		FOR THE MONTH:								TOTAL	% FOR MONTH	SUM	SUM
1683	1102					622	7		2.81	2.5	30.180	28	2.6	9.9	45	NW	29	33				200	193
AVG.	AVG.	AVG.	DEP.	AVG.		DEP.	DEP.	PRECIPITATION	DEP.						DATE:23		DATE:21		POSSIBLE			AVG.	AVG.
54.3	35.5	44.9	3.7	30.2		-116	7	≥ .01 INCH 11	-1.34													6.5	6.2

NUMBER OF DAYS				SEASON TO DATE TOTAL	SEASON TO DATE TOTAL
MAXIMUM TEMP.		MINIMUM TEMP.			
≥ 90°	≤ 32°	≤ 32°	≤ 0°	4113	7
0	0	11	0	DEP.	DEP.
				-332	7

SNOW, ICE PELLETS ≥ 1.0 INCH 1	GREATEST IN 24 HOURS AND DATES		GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
THUNDERSTORMS 1	PRECIPITATION	SNOW, ICE PELLETS	
HEAVY FOG 0	0.97	20-21+ 2.5	2 07-
CLEAR 8 PARTLY CLOUDY 8 CLOUDY 15			

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
\+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE

NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

Kenneth D. Wadell
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

MAR 1990
NEWARK, NJ

APR 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER (EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	46	42	44	-3	40	21	0	1	0	0.02	0.0	29.980	15	5.0	5.3	10	S	7	17			10	10
02	51	43	47	0	44	18	0	2	0	0.01	0.0	29.870	13	5.8	6.5	16	E	12	11			10	10
03	46	42	44	-4	42	21	0	1	0	1.05	0.0	29.540	02	10.7	13.2	24	N	17	03			10	10
04	48	40	44	-4	35	21	0		0	0.01	0.0	29.295	25	13.3	14.2	31	W	20	25			10	10
05	58	38	48	0	28	17	0		0	0.00	0.0	29.630	24	9.9	11.1	31	W	18	26			6	5
06	52	41	47	-2	29	18	0		0	0.10	0.0	29.900	28	8.3	8.9	30	W	20	30			10	10
07	48	32*	40*	-9	28	25	0	1	T	0.24	0.6	29.950	32	7.4	12.3	23	SW	18	35			7	7
08	51	34	43	-7	17	22	0		0	0.00	0.0	30.220	29	11.5	12.2	30	NW	21	30			5	3
09	64	34	49	-1	23	16	0		0	0.00	0.0	30.360	21	10.7	11.1	30	SW	18	20			1	2
10	70	47	59	9	45	6	0	1 8	0	0.07	0.0	29.940	20	13.4	13.9	31	S	23	20			10	10
11	64	40	52	1	38	13	0	1	0	0.24	0.0	29.660	29	13.7	17.7	41	SW	23	31			7	6
12	53	35	44	-7	19	21	0		0	T	T	30.080	29	8.8	10.4	26	W	21	26			7	4
13	53	33	43	-8	20	22	0		0	0.00	0.0	30.420	23	5.0	8.7	23	SW	16	25			0	0
14	54	37	46	-6	34	19	0	1	0	0.12	0.0	30.300	16	8.7	9.2	26	SE	18	14			6	6
15	64	48	56	4	49	9	0	1	0	1.14	0.0	29.920	19	5.5	7.2	14	S	12	16			9	8
16	69	49	59	7	38	6	0		0	0.00	0.0	29.940	24	5.0	8.5	30	SW	14	20			0	2
17	66	40	53	0	39	12	0		0	0.16	0.0	29.855	26	7.2	12.8	33	W	20	25			10	8
18	55	36	46	-7	18	19	0		0	0.00	0.0	30.330	32	13.4	13.8	32	NW	23	32			0	0
19	62	37	50	-3	25	15	0		0	0.00	0.0	30.580	18	8.0	9.2	22	S	15	20			2	2
20	69	43	56	2	42	9	0		0	T	0.0	30.360	20	12.7	12.9	26	SW	20	22			9	9
21	65	53	59	5	52	6	0	1 8	0	0.17	0.0	29.990	25	1.6	7.0	28	NE	21	03			10	9
22	74	49	62	8	42	3	0		0	0.00	0.0	30.010	34	3.7	7.3	17	NW	14	02			0	1
23	82	54	68	13	37	0	3		0	0.00	0.0	29.970	35	3.9	8.5	23	N	15	36			3	3
24	62	51	57	2	41	8	0		0	0.00	0.0	30.155	12	6.9	8.8	17	SE	14	13			8	7
25	68	50	59	4	48	6	0	1	0	0.10	0.0	30.030	16	4.6	6.6	16	S	13	22			8	7
26	72	52	62	6	50	3	0	8	0	0.00	0.0	29.910	13	4.5	5.6	14	SE	12	13			1	1
27	94*	50	72	16	51	0	7	1 8	0	0.00	0.0	29.910	20	6.1	7.3	23	SW	16	22			3	3
28	90	66	78*	22	55	0	13	8	0	0.00	0.0	29.890	15	5.1	6.0	16	S	10	14			1	3
29	73	51	62	5	49	3	0	1 8	0	0.30	0.0	30.080	06	11.7	12.0	20	NE	15	05			10	9
30	58	51	55	-2	52	10	0	1 8	0	0.25	0.0	30.000	03	7.7	8.1	16	NE	13	04			10	10
	SUM 1881	SUM 1318	—	—	—	TOTAL 369	TOTAL 23	NUMBER OF DAYS		TOTAL 3.98	TOTAL 0.6	30.000	FOR THE MONTH: 24	2.7	9.9	41	SW	23	32	TOTAL	% FOR MONTH	SUM 183	SUM 175
	AVG. 62.7	AVG. 43.9	AVG. 53.3	DEP. 1.2	AVG. 37.7	DEP. -18	DEP. 23	PRECIPITATION ≥ .01 INCH. 15		DEP. 0.41	—	—	—	—	—	DATE: 11		DATE: 18+		POSSIBLE		AVG. 6.1	AVG. 5.8

NUMBER OF DAYS				SEASON TO DATE TOTAL	TOTAL	SNOW, ICE PELLETS ≥ 1.0 INCH 0	GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.		4482	30	THUNDERSTORMS 0	PRECIPITATION	SNOW, ICE PELLETS		
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	HEAVY FOG 1	1.26	14-15	0.6	07
2	0	1	0	-350	30	CLEAR 10 PARTLY CLOUDY 6 CLOUDY 14				

1 1 0"

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
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APR 1990
NEWARK, NJ

MAY 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST MILE SPEED 18	FASTEST MILE DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	83	56	70*	13	52	[illegible]	5	1 8	[illegible]	0.00	0.0	29.830	29	7.4	10.0			[illegible]	[illegible]			8	9
02	68	56	62	4	29	[illegible]	0		[illegible]	0.00	0.0	30.080	32	12.2	12.5	25	NW	[illegible]	[illegible]			9	8
03	72	49	61	3	30	[illegible]	0		[illegible]	0.00	0.0	30.315	28	3.6	9.8	24	SW	[illegible]	[illegible]			8	6
04	59	50	55	-3	45	10	0	1 3	0	0.41	0.0	30.160	15	4.9	7.6	16	SE	12	[illegible]			10	10
05	73	49	61	2	50	4	0	1 3 8	0	0.38	0.0	29.580	33	4.8	9.9	28	SW	22	24			9	9
06	68	47	58	-1	40	7	0		0	0.02	0.0	29.730	31	2.8	9.5	20	SW	15	34			7	8
07	70	49	60	1	40	5	0		0	0.00	0.0	29.845	27	7.2	9.4	30	NW	[illegible]	[illegible]			7	6
08	72	53	63	3	48	[illegible]	0		0	0.00	0.0	29.990	11	4.6	7.3	22	SE	[illegible]	[illegible]			0	2
09	83*	54	69	9	52	[illegible]	4	1 8	0	0.00	0.0	29.950	21	6.3	9.2	23	SW	15	[illegible]			9	8
10	72	[illegible]	65	5	60	0	0	1 3	0	1.40	0.0	29.630	19	8.5	10.6	37	W	25	[illegible]			10	10
11	62	49	56	-5	36	9	0		0	0.00	0.0	29.820	27	5.1	17.4	45	SW	25	[illegible]			5	3
12	63	43*	53	-8	34	12	0		0	0.00	0.0	30.245	19	6.7	8.8	18	S	[illegible]	[illegible]			8	6
13	72	54	63	2	56	2	0	1 3	0	0.85	0.0	29.910	19	7.7	8.9	23	S	[illegible]	[illegible]			10	10
14	78	55	67	5	48	[illegible]	2		0	0.00	0.0	30.050	36	5.5	10.0	30	N	[illegible]	[illegible]			3	4
15	74	54	64	2	49	[illegible]	0		0	T	0.0	30.140	19	7.3	9.1	20	SW	15	[illegible]			7	6
16	64	59	62	0	59	3	0	1 3	0	1.34	0.0	29.940	13	3.6	6.2	18	W	[illegible]	[illegible]			10	10
17	66	59	63	0	60	2	0	1	0	0.02	0.0	29.690	07	3.5	6.3	31	NW	[illegible]	[illegible]			10	9
18	69	53	61	-2	44	4	0		0	T	0.0	29.750	26	12.7	13.3	43	W	[illegible]	[illegible]			5	3
19	75	51	63	0	41	2	0		0	0.00	0.0	29.870	28	7.7	11.8	28	W	[illegible]	[illegible]			6	5
20	67	53	60	-4	45	5	0		0	0.00	0.0	29.920	09	9.2	10.6	20	E	[illegible]	[illegible]			9	9
21	53	48	51*	-13	45	14	0	1	0	0.13	0.0	29.880	04	1.0	11.5	20	NE	14	[illegible]			10	10
22	65	47	56	-8	40	9	0		0	0.00	0.0	29.940	01	9.6	10.2	16	N	[illegible]	[illegible]			8	8
23	66	50	58	-7	42	7	0		0	T	0.0	29.910	03	3.9	7.6	16	NW	[illegible]	[illegible]			6	7
24	71	54	63	-2	44	2	0		0	T	0.0	29.990	35	2.7	6.1	18	N	[illegible]	[illegible]			8	7
25	78	51	65	0	45	0	0		0	0.00	0.0	30.070	20	5.2	7.7	21	S	15	[illegible]			4	5
26	63	56	60	-6	54	5	0	1 8	0	0.04	0.0	29.930	12	5.4	7.4	17	SE	[illegible]	[illegible]			10	10
27	75	55	65	-1	48	0	0		0	T	0.0	29.830	06	4.8	8.7	16	NE	[illegible]	[illegible]			4	4
28	74	55	65	-1	52	0	0		0	0.00	0.0	29.900	15	5.2	6.4	17	SE	[illegible]	[illegible]			9	6
29	62	53	58	-8	56	[illegible]	0	1	0	0.25	0.0	29.630	03	2.1	13.[illegible]	30	N	[illegible]	[illegible]			10	10
30	72	54	63	-4	42	2	0	1	0	0.02	0.0	29.725	32	4.[illegible]	15.4	33	W	[illegible]	[illegible]			[illegible]	[illegible]
31	78	49	64	-3	40	[illegible]	0		0	0.00	0.0	30.070	26	9.3	13.3	24	W	[illegible]	[illegible]			[illegible]	[illegible]
SUM	2167	SUM 1602				TOTAL [illegible]	TOTAL [illegible]	NUMBER OF DAYS		TOTAL [illegible]	TOTAL 0.0	29.910	FOR THE MONTH: 29	7.6	9.8	45	SW	[illegible]	[illegible]		% FOR MONTH	SUM [illegible]	SUM [illegible]
AVG. 69.9		AVG 52.3	AVG 61.1	DEP. -1.2	AVG 45.9	DEP. -15	DEP. -45	PRECIPITATION ≥ .01 INCH 12		DEP. [illegible]						DATE 11		[illegible]		POSSIBLE		AVG. [illegible]	AVG. [illegible]

NUMBER OF DAYS				SEASON TO DATE TOTAL	TOTAL
MAXIMUM TEMP.		MINIMUM TEMP.		4604	41
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP	DEP
0	[illegible]	0	0	-366	-15

SNOW, ICE PELLETS	
≥ 1.0 INCH	0
THUNDERSTORMS	5
HEAVY FOG	2
CLEAR 3	PARTLY CLOUDY 10

GREATEST IN 24 HOURS AND DATES		
PRECIPITATION		SNOW, ICE PELLETS
1.25	29-30	0.0

GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
0

CLOUDY 16

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

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MAY 1990
NEWARK, NJ

JUN 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	85	56	71	4	47	0	6		0	0.00	0.0	30.170	23	8.1	9.0	21	SW	17	23			2	2
02	87	64	76	8	60	0	11	8	0	0.00	0.0	30.090	21	11.6	11.8	25	SW	18	22			4	5
03	85	69	77	9	65	0	12	3	0	0.03	0.0	29.810	20	14.0	14.3	28	SW	20	19			9	9
04	77	54	66	-2	53	0	1	1	0	0.00	0.0	29.700	28	11.6	15.3	31	W	21	32			8	8
05	75	51*	63*	-6	38	2	0		0	0.00	0.0	29.960	29	8.5	10.5	28	W	20	29			3	3
06	82	55	69	0	52	0	4		0	0.00	0.0	29.950	21	11.6	12.1	28	W	18	20			5	5
07	87	66	77	8	58	0	12	1 3 8	0	0.29	0.0	29.900	29	7.1	10.9	24	NW	17	32			8	8
08	79	60	70	0	53	0	5	1	0	0.12	0.0	30.030	11	4.0	6.6	20	SE	13	14			10	9
09	83	64	74	4	67	0	9	1 3 8	0	0.35	0.0	29.840	24	7.2	8.2	20	W	15	23			10	10
10	85	65	75	5	59	0	10	3 8	0	0.36	0.0	29.770	30	9.3	10.6	35	NW	18	29			5	6
11	72	60	66	-4	53	0	1		0	T	0.0	29.870	34	12.9	14.4	29	NW	21	36			8	8
12	83	57	70	-1	44	0	5		0	0.00	0.0	30.090	01	6.9	10.8	25	N	16	03			2	2
13	83	57	70	-1	49	0	5		0	0.00	0.0	30.120	18	4.7	6.0	14	S	12	[illegible]			7	6
14	68	62	65	-6	57	0	0	1 8	0	0.37	0.0	29.970	17	4.0	5.4	12	W	8	[illegible]			10	10
15	80	62	71	-1	58	0	6	1	0	0.03	0.0	29.970	14	3.8	4.6	15	SE	10	15			4	4
16	83	61	72	0	61	0	7	2 8	0	0.00	0.0	30.070	13	3.4	5.0	13	SE	9	11			4	4
17	84	65	75	3	62	0	10		0	0.00	0.0	30.090	15	5.1	5.5	14	SE	10	15			5	3
18	85	66	76	4	65	0	11	1 3	0	1.14	0.0	29.850	19	5.9	8.6	23	N	20	36			8	7
19	84	65	75	2	65	0	10	1 3 8	0	0.40	0.0	29.690	23	4.8	7.7	37	SW	28	25			8	7
20	80	64	72	-1	60	0	7		0	0.00	0.0	29.790	31	4.6	6.9	16	NW	10	35			6	6
21	80	67	74	1	63	0	9	8	0	0.30	0.0	29.830	21	3.9	6.3	23	N	10	22			8	8
22	91	66	79	6	62	0	14	1 8	0	0.01	0.0	29.830	19	7.8	9.0	32	S	21	18			6	6
23	86	71	79	6	64	0	14	1 8	0	0.05	0.0	29.630	21	6.6	8.6	25	SW	18	25			7	7
24	82	67	75	1	57	0	10		0	0.00	0.0	29.710	24	10.7	11.1	23	W	18	22			4	4
25	80	63	72	-2	55	0	7		0	0.00	0.0	29.980	25	8.4	9.0	23	W	15	25			5	5
26	87	63	75	1	58	0	10		0	0.00	0.0	30.060	22	8.7	9.4	21	SW	15	19			4	4
27	92*	70	81	7	63	0	16	8	0	0.00	0.0	29.960	21	8.3	9.5	32	SW	16	23			6	7
28	90	72	81	6	63	0	16	8	0	0.11	0.0	30.000	26	5.0	6.9	37	W	18	25			6	6
29	90	73	82	7	65	0	17	8	0	0.10	0.0	29.895	17	2.9	7.9	30	NW	18	32			6	7
30	91	72	82*	7	65	0	17	3 8	0	0.02	0.0	29.770	29	6.9	10.0	41	N	20	36			5	6
SUM	SUM					TOTAL	TOTAL	NUMBER OF DAYS		TOTAL	TOTAL	FOR THE MONTH:								TOTAL	% FOR MONTH	SUM	SUM
2496	1907					2	222			3.68	0.0	29.910	23	4.4	9.1	41	N	28	25			183	182
AVG.	AVG.	AVG.	DEP.	AVG.		DEP.	DEP.	PRECIPITATION		DEP.						DATE:30		DATE:19		POSSIBLE		AVG.	AVG.
83.2	63.6	73.4	1.9	58.0		2	63	≥ .01 INCH 15		0.74												6.1	6.1

NUMBER OF DAYS				SEASON TO DATE					
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	SNOW, ICE PELLETS ≥ 1.0 INCH 0	GREATEST IN 24 HOURS AND DATES		GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	THUNDERSTORMS 7	PRECIPITATION	SNOW, ICE PELLETS	
5	0	0	0	-366	48	HEAVY FOG 1	1.42 18-19	0.0	0
						CLEAR 3 PARTLY CLOUDY [illegible] CLOUDY 10			

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

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Kenneth D. Wadell
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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

JUN 1990
NEWARK, NJ

JUL 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES (1 FOG, 2 HEAVY FOG, 3 THUNDERSTORM, 4 ICE PELLETS, 5 HAIL, 6 GLAZE, 7 DUSTSTORM, 8 SMOKE, HAZE, 9 BLOWING SNOW) 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN. SPEED 18	FASTEST 1-MIN. DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	83	66	75	0	64	0	10	3 8	0	1.20	0.0	29.720	03	4.2	7.0	46	N	31	35			9	8
02	79	67	73	-2	57	0	8		0	T	0.0	29.880	02	8.3	10.5	22	NE	16	33			8	6
03	88	64	76	0	59	0	11	1	0	0.00	0.0	29.960	24	11.0	11.6	24	W	16	24			7	6
04	97	71	84	8	65	0	15		0	0.00	0.0	29.790	23	16.6	16.7	32	SW	23	23			4	4
05	98*	78	88*	12	67	0	23	3 8	0	0.02	0.0	29.740	29	8.7	11.8	32	NW	17	28			8	7
06	83	70	77	1	56	0	12		0	0.00	0.0	29.930	03	7.7	9.7	18	N	15	36			5	6
07	83	64	74	-2	52	0	9		0	0.00	0.0	30.150	04	2.5	8.4	17	N	13	31			3	4
08	82	66	74	-2	59	0	9		0	0.00	0.0	30.200	17	8.3	9.0	22	SE	15	35			9	8
09	96	73	85	9	72	0	20	1 3 8	0	0.21	0.0	29.910	22	11.5	12.2	32	NW	23	29			9	9
10	89	73	81	4	62	0	16	8	0	0.00	0.0	29.920	29	8.0	9.7	21	W	14	25			7	7
11	78	66	72	-5	56	0	7		0	0.10	0.0	30.040	03	5.5	6.9	18	NE	13	22			9	9
12	69	59	64*	-13	60	1	0	1 3	0	0.65	0.0	30.010	04	9.1	9.7	21	NE	15	24			10	10
13	72	58*	65	-12	57	0	0	1	0	0.40	0.0	30.150	05	6.6	9.0	20	NE	13	24			10	10
14	74	65	70	-7	62	0	5	1	0	0.01	0.0	30.120	10	6.5	6.9	12	SE	9	14			10	10
15	90	70	80	3	72	0	15	2 3	0	0.41	0.0	29.965	14	5.9	7.1	20	SE	15	14			7	7
16	86	73	80	3	65	0	15	1 8	0	0.00	0.0	30.110	24	10.9	11.4	25	SW	16	25			7	7
17	90	70	80	3	63	0	15	8	0	0.00	0.0	30.220	23	9.2	9.3	22	SW	15	22			8	7
18	94	72	83	6	66	0	18	8	0	0.00	0.0	30.140	22	8.5	8.8	18	SW	16	23			1	1
19	94	74	84	7	67	0	19	8	0	0.00	0.0	30.060	25	8.1	8.7	18	W	13	25			6	4
20	94	74	84	7	68	0	19	8	0	0.00	0.0	29.930	23	10.3	11.0	28	SW	17	22			4	4
21	87	73	80	3	68	0	15	1 3 8	0	1.21	0.0	29.890	27	1.2	4.9	14	W	10	26			9	9
22	85	73	79	2	71	0	14	1 8	0	0.01	0.0	29.880	11	3.7	5.8	12	S	9	22			8	8
23	88	72	80	2	72	0	15	3 8	0	0.66	0.0	29.820	19	3.4	8.1	25	S	15	34			9	8
24	84	71	78	0	64	0	13		0	T	0.0	29.970	01	4.9	7.1	15	N	12	32			8	7
25	90	71	81	3	62	0	16		0	0.00	0.0	30.060	01	7.0	8.1	20	NW	14	34			2	2
26	89	73	81	3	66	0	16		0	0.00	0.0	30.180	05	4.1	8.0	17	NE	12	03			6	5
27	83	71	77	-1	68	0	12	8	0	T	0.0	30.190	05	6.8	8.7	17	NE	12	27			9	8
28	81	72	77	0	67	0	12		0	T	0.0	30.130	05	6.7	8.1	15	E	12	32			9	9
29	85	73	79	2	67	0	12	8	0	T	0.0	30.040	10	4.4	6.5	12	SE	9	33			7	7
30	84	71	78	1	65	0	13	6	0	0.00	0.0	29.920	10	2.6	5.2	13	N	9	33			7	6
31	88	68	78	1	66	0	13	3	0	0.10	0.0	29.800	29	4.9	7.6	23	NW	15	37			7	7
SUM	2663	SUM 2161				TOTAL 1	TOTAL 4[illegible]	NUMBER OF DAYS		TOTAL 4.98	TOTAL 0.0	29.990	26	6.9	8.6	46	N	31	35	TOTAL	% FOR MONTH	SUM 222	SUM 210
AVG. 85.9		AVG. 69.7	AVG. 77.8	DEP. 1.0	AVG. 64.0	DEP. 1	DEP. 3[illegible]	PRECIPITATION ≥ .01 INCH. 12		DEP. 1.13						DATE: 1		DATE: 1		POSSIBLE		AVG. 7.2	AVG. 6.8

NUMBER OF DAYS				SEASON TO DATE	
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL
≥ 90°	≤ 32°	≤ 32°	≤ 0°	1	706
9	0	0	0	DEP. 1	DEP. 65

SNOW, ICE PELLETS ≥ 1.0 INCH	0
THUNDERSTORMS	8
HEAVY FOG	1
CLEAR 3	PARTLY CLOUDY 12

GREATEST IN 24 HOURS AND DATES		
PRECIPITATION		SNOW, ICE PELLETS
1.22	21-22	0.0

GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
0

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
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JUL 1990
NEWARK, NJ

AUG 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

AUG 1990
NEWARK, NJ

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	85	65	75	-2	54	0	10		0	0.00	0.0	29.940	33	12.1	12.3	23	NW	18	34			1	2
02	89	64	77	0	53	0	12		0	0.00	0.0	30.050	31	4.9	6.6	20	NW	12	35			2	1
03	91	69	80	3	61	0	15		0	0.00	0.0	30.025	19	2.0	4.5	13	NE	7	22			2	2
04	93	73	83	6	63	0	18		0	0.00	0.0	30.010	16	4.3	7.9	20	SE	15	15			8	8
05	81	69	75	-2	69	0	10	8	0	0.25	0.0	30.030	17	8.8	9.1	20	S	15	19			10	10
06	86	69	78	1	72	0	13	1 3 8	0	2.82	0.0	29.930	17	6.6	7.8	22	S	15	17			10	10
07	86	72	79	2	69	0	14	1 3	0	0.33	0.0	29.970	31	3.5	9.0	29	S	16	16			10	9
08	86	70	78	1	62	0	13		0	0.00	0.0	30.110	02	4.3	7.1	17	N	13	02			8	7
09	85	71	78	1	63	0	13	8	0	0.01	0.0	30.130	03	6.8	9.6	18	SE	14	12			10	9
10	77	71	74	-3	69	0	9	1 8	0	1.69	0.0	30.050	03	4.7	6.3	16	N	10	20			10	10
11	88	69	79	3	70	0	14	3	0	0.46	0.0	29.980	04	2.5	5.9	17	N	10	34			9	9
12	91	71	81	5	67	0	16	1 8	0	0.00	0.0	30.060	14	2.3	5.6	16	SE	10	15			2	2
13	89	70	80	4	70	0	15	1 3 8	0	0.60	0.0	30.000	19	8.6	10.6	37	NW	30	30			4	5
14	86	68	77	1	62	0	12	1	0	T	0.0	30.000	30	7.3	8.9	22	NW	14	34			4	4
15	86	69	78	2	59	0	13		0	0.00	0.0	30.040	26	5.9	7.9	21	SW	14	24			1	2
16	90	69	80	4	63	0	15	8	0	0.00	0.0	30.040	23	5.0	6.7	20	SW	12	24			5	3
17	91	70	81	5	67	0	16	8	0	0.00	0.0	30.060	20	7.2	7.9	17	S	14	16			3	2
18	91	71	81	6	67	0	16	8	0	0.00	0.0	30.015	22	9.6	10.0	18	SW	14	22			2	3
19	84	60	72	-3	64	0	7	8	0	0.02	0.0	30.020	03	5.1	11.1	26	NE	21	01			10	9
20	69	60	65	-10	54	0	0		0	0.03	0.0	30.190	05	12.0	12.4	25	NE	16	05			10	10
21	69	58*	64*	-11	58	1	0	1	0	0.10	0.0	30.150	03	11.3	11.5	22	NE	16	05			10	10
22	76	66	71	-4	61	0	6		0	0.01	0.0	30.120	04	8.2	8.7	17	NE	13	05			10	10
23	70	66	68	-7	63	0	3	1	0	0.13	0.0	30.060	02	9.7	9.9	16	NE	13	01			10	10
24	73	67	70	-4	69	0	5	1	0	0.20	0.0	30.030	01	9.8	9.9	22	N	14	02			10	10
25	87	70	79	5	69	0	14	1	0	0.01	0.0	30.040	31	5.4	7.1	14	NW	9	32			8	8
26	92	71	82	8	67	0	17		0	0.00	0.0	30.010	36	1.9	5.3	16	NW	10	32			4	4
27	93*	73	83*	9	69	0	18	3 8	0	0.57	0.0	29.860	32	5.3	7.1	29	W	17	27			4	3
28	90	71	81	8	67	0	16	3	0	0.25	0.0	29.765	25	5.5	7.6	41	NW	32	34			6	6
29	88	68	78	5	65	0	13	3	0	0.23	0.0	29.710	26	6.4	9.9	30	N	21	35			7	8
30	86	66	76	3	56	0	11		0	0.00	0.0	29.920	02	3.2	8.3	18	N	14	02			1	1
31	86	65	76	3	59	0	11		0	0.00	0.0	30.120	31	1.6	5.8	15	NW	10	32			3	2
SUM		SUM				TOTAL	TOTAL			TOTAL	TOTAL											SUM	SUM
2634		2111					365			7.71	0.0	30.010	34	1.5	8.3	41	NW	32	34		% FOR MONTH	194	189
AVG.		AVG.	AVG.	DEP.	AVG.	DEP.	DEP.			DEP.										TOTAL POSSIBLE		AVG.	AVG.
85.0		68.1	76.6	1.1	63.8	1	39			3.41						DATE:28		DATE:28				6.3	6.1

FOR THE MONTH:

NUMBER OF DAYS				SEASON TO DATE		NUMBER OF DAYS		GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	SNOW, ICE PELLETS ≥ 1.0 INCH	0	PRECIPITATION	SNOW, ICE PELLETS		
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	THUNDERSTORMS	7	2.82	06	0.0	0
9	0	0	0	2	124	HEAVY FOG	0				
						PRECIPITATION ≥ .01 INCH	17	CLEAR 9	PARTLY CLOUDY 7	CLOUDY 15	

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE

NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

Kenneth D. Wadell
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

SEP 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES (1 FOG, 2 HEAVY FOG, 3 THUNDERSTORM, 4 ICE PELLETS, 5 HAIL, 6 GLAZE, 7 DUSTSTORM, 8 SMOKE, HAZE, 9 BLOWING SNOW) 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	87	65	76	3	59	0	11	8	0	0.00	0.0	30.140	25	3.4	5.6	16	NW	9	24			5	4
02	91*	68	80	8	65	0	15	3 8	0	0.34	0.0	29.980	25	5.8	7.7	26	NW	18	31			4	5
03	80	69	75	3	58	0	10		0	0.00	0.0	30.150	01	11.2	11.8	28	N	16	02			2	2
04	77	62	70	-2	55	0	5		0	0.00	0.0	30.320	07	3.0	7.5	14	NE	10	06			1	2
05	81	63	72	1	60	0	7		0	0.00	0.0	30.070	24	7.5	7.8	15	W	10	25			8	8
06	86	73	80	9	68	0	15	1 8	0	0.00	0.0	29.910	18	4.2	4.9	13	SE	9	19			8	7
07	89	71	80*	9	68	0	15	1 8	0	T	0.0	29.740	27	7.3	11.2	25	W	17	33			8	8
08	72	59	66	-5	46	0	1		0	0.00	0.0	30.140	04	6.6	9.8	24	N	20	02			1	1
09	70	56	63	-7	53	2	0		0	0.00	0.0	30.140	13	4.3	6.9	13	SE	9	15			8	7
10	83	65	74	4	62	0	9	1	0	0.04	0.0	30.010	30	1.9	5.4	14	NW	9	04			7	7
11	88	65	77	7	63	0	12		0	0.00	0.0	30.120	19	2.5	5.3	12	S	9	15			6	6
12	85	70	78	9	65	0	13	1	0	0.00	0.0	30.160	17	5.7	6.1	14	SE	10	13			9	9
13	84	71	78	9	67	0	13	1 8	0	T	0.0	30.125	17	2.4	5.7	12	SW	8	13			9	9
14	83	70	77	8	67	0	12	8	0	0.00	0.0	29.940	15	7.4	7.7	16	SE	14	13			6	7
15	81	63	72	3	59	0	7	3	0	0.19	0.0	29.600	26	8.2	11.0	26	W	15	28			6	6
16	72	56	64	-4	51	1	0		0	0.27	0.0	29.730	36	4.3	6.4	23	N	18	32			7	6
17	64	48	56	-12	40	9	0		0	0.25	0.0	30.030	32	11.5	12.5	30	NW	22	30			5	5
18	69	44*	57	-11	38	8	0		0	0.00	0.0	30.170	29	8.8	9.6	24	NW	16	31			1	1
19	68	50	59	-8	49	6	0	1	0	0.18	0.0	30.000	19	3.4	6.7	18	SW	13	22			9	8
20	73	57	65	-2	49	0	0	1	0	0.00	0.0	29.950	29	9.4	10.2	23	W	16	30			6	5
21	72	50	61	-6	46	4	0		0	0.00	0.0	30.080	19	1.3	5.9	13	S	9	17			4	4
22	65	59	62	-4	59	3	0	1	0	0.80	0.0	29.760	21	3.0	5.9	13	S	12	30			10	9
23	69	53	61	-5	48	4	0		0	0.00	0.0	29.680	27	10.5	11.2	29	W	18	28			2	1
24	65	47	56*	-9	42	9	0		0	0.00	0.0	29.920	25	8.8	9.6	25	W	15	29			5	3
25	74	47	61	-4	45	4	0		0	0.00	0.0	29.960	22	8.8	9.3	18	W	15	25			6	5
26	76	58	67	2	55	0	2	8	0	0.05	0.0	29.890	17	3.8	5.4	13	S	8	21			9	6
27	77	56	67	3	55	0	2	2 8	0	0.00	0.0	30.050	02	2.7	5.1	9	N	8	36			5	3
28	81	58	70	6	59	0	5	1 8	0	0.00	0.0	30.150	19	4.5	5.7	14	SW	10	17			2	1
29	81	58	70	6	61	0	5	1 8	0	0.00	0.0	30.110	21	7.1	7.6	17	SW	14	21			4	5
30	79	60	71	8	61	0	6	3 8	0	0.60	0.0	29.990	22	4.6	9.5	28	NW	17	31			9	9

	SUM	SUM				TOTAL	TOTAL	NUMBER OF DAYS	TOTAL	TOTAL	FOR THE MONTH:							TOTAL	% FOR MONTH	SUM	SUM
	2322	1793				50	165		2.72	0.0	30.000	25	2.5	7.8	30	NW	22	30		172	159
	AVG	AVG	AVG	DEP.	AVG	DEP	DEP	PRECIPITATION	DEP.						DATE:17		DATE:		POSSIBLE	AVG.	AVG.
	77.4	59.8	68.6	0.4	55.8	14	33	≥ .01 INCH 9	-0.94											5.7	5.3

NUMBER OF DAYS				SEASON TO DATE TOTAL	SEASON TO DATE TOTAL	SNOW, ICE PELLETS		GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.				≥ 1.0 INCH	0	PRECIPITATION	SNOW, ICE PELLETS		
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP	DEP	THUNDERSTORMS	3	0.80	22	0.0	0
1	0	0	0	.16	157	HEAVY FOG	1				
						CLEAR 6	PARTLY CLOUDY 14	CLOUDY 10			

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
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DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	70	53	62	-1	45	3	0		0	0.00	0.0	29.980	29	6.8	9.4	20	SW	16	29			4	3
02	71	54	63	1	42	2	0		0	0.00	0.0	30.005	29	9.4	12.1	32	W	21	29			2	3
03	73	48	61	-1	44	4	0		0	0.00	0.0	30.270	21	6.2	6.9	18	SW	12	24			1	3
04	78	58	68	6	60	0	3	1	0	0.07	0.0	29.970	21	10.0	12.1	30	S	20	22			10	9
05	77	53	65	4	49	0	0		0	0.00	0.0	29.970	24	12.3	12.6	31	W	16	26			1	2
06	88*	58	73	12	54	0	8		0	0.00	0.0	30.030	22	10.5	10.8	26	SW	17	22			3	2
07	85	58	72	12	58	0	7		0	0.00	0.0	30.100	22	8.0	8.2	22	SW	15	22			1	2
08	84	65	75	15	66	0	10	1 3 8	0	0.95	0.0	30.110	19	4.1	6.1	18	SW	12	21			10	10
09	87	69	78*	18	67	0	13	1 3	0	0.93	0.0	30.050	19	9.5	10.0	28	S	21	20			6	5
10	81	66	74	15	66	0	9	1	0	0.20	0.0	30.100	14	6.1	6.8	18	S	13	13			8	7
11	79	69	74	15	67	0	9	1	0	T	0.0	30.150	14	9.6	9.8	24	SE	15	14			9	7
12	79	67	73	14	68	0	8	1	0	0.11	0.0	30.050	10	4.2	5.3	15	SE	12	07			8	7
13	77	70	74	16	70	0	9	1 3	0	0.05	0.0	29.795	14	3.8	4.9	14	S	9	17			8	8
14	83	67	75	17	64	0	10	1	0	0.00	0.0	29.770	28	4.5	6.6	16	NW	12	32			4	5
15	78	58	68	11	50	0	3	1 8	0	0.00	0.0	29.870	28	8.4	10.8	31	W	21	28			1	1
16	71	52	62	5	36	3	0		0	0.00	0.0	30.190	30	8.1	8.9	24	W	16	27			1	0
17	76	50	63	6	49	2	0	8	0	0.00	0.0	30.240	19	6.5	8.3	24	S	17	18			7	6
18	78	51	65	9	60	0	0	3	0	0.89	0.0	29.820	19	13.0	14.8	53	SW	25	22			10	9
19	59	47	53	-3	32	12	0		0	0.00	0.0	29.900	27	14.9	15.7	40	NW	25	28			3	3
20	64	42	53	-3	33	12	0		0	0.00	0.0	30.280	28	1.9	6.5	17	N	13	35			4	3
21	68	44	56	1	46	9	0		0	0.00	0.0	30.270	17	2.7	5.8	18	SE	12	15			10	7
22	70	54	62	7	58	3	0	2 8	0	0.01	0.0	30.080	20	3.8	4.6	13	SW	9	23			10	9
23	67	62	65	10	62	0	0	1 3	0	1.90	0.0	29.810	09	4.4	8.3	20	SE	15	11			10	10
24	65	53	59	5	49	6	0		0	0.00	0.0	29.720	30	10.3	11.2	26	NW	18	31			2	4
25	63	48	56	2	40	9	0		0	0.00	0.0	29.805	02	9.8	10.0	21	N	14	01			6	5
26	52	40	46	-8	33	19	0		0	T	0.0	29.780	35	19.5	20.3	46	N	30	36			9	8
27	56	35*	46	-7	24	19	0		0	0.00	0.0	30.120	31	5.0	9.4	29	NW	16	32			0	1
28	57	41	49	-4	34	16	0		0	T	0.0	29.995	26	7.9	9.9	29	W	18	29			9	7
29	53	39	46*	-7	25	19	0		0	0.00	0.0	30.130	31	17.3	17.5	44	NW	28	30			3	3
30	61	36	49	-3	29	16	0		0	0.00	0.0	30.180	24	7.5	8.4	18	SW	13	23			0	0
31	64	47	56	4	36	9	0		0	0.00	0.0	30.180	01	3.3	6.3	20	N	15	01			5	3
	SUM 2214	SUM 1654				TOTAL 163	TOTAL 69	NUMBER OF DAYS		TOTAL 5.11	TOTAL 0.0	FOR THE MONTH: 30.020	25	3.5	9.6	53	SW	30	36	TOTAL	% FOR MONTH	SUM 165	SUM 152
	AVG. 71.4	AVG. 53.4	AVG. 62.4	DEP. 5.2	AVG. 48.9	DEP. -91	DEP. 77	PRECIPITATION ≥ .01 INCH. 9		DEP. 2.02						DATE:18		DATE: 26		POSSIBLE		AVG. 5.3	AVG. 4.9

NUMBER OF DAYS				SEASON TO DATE		SNOW, ICE PELLETS		GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	≥ 1.0 INCH	0	PRECIPITATION		SNOW, ICE PELLETS	
≥ 90°	≤ 32°	≤ 32°	≤ 0°	215	1325	THUNDERSTORMS	5	1.90	23	0.0	0
0	0	0	0	DEP. -75	DEP. 234	HEAVY FOG 1					
						CLEAR 12	PARTLY CLOUDY 7	CLOUDY 12			

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01	68	45	57	5	45	6	0	8	0	0.00	0.0	30.190	21	3.0	5.7	14	SW	13	24			6	5
02	78	50	64	13	48	1	0	-1 6	0	0.00	0.0	30.130	22	8.8	9.0	21	SW	16	23			8	7
03	79*	54	67*	16	48	0	2		0	0.00	0.0	30.070	22	7.8	8.3	21	SW	13	22			5	7
04	74	52	63	12	47	2	0	8	0	0.00	0.0	29.960	23	7.8	8.1	20	SW	14	24			10	9
05	68	51	60	10	51	5	0	1 8	0	T	0.0	29.850	08	6.9	9.9	24	E	17	09			6	6
06	63	45	54	4	39	11	0	1	0	0.03	0.0	29.760	28	15.7	16.6	49	W	32	27			1	3
07	56	39	48	-2	28	17	0		0	T	0.0	30.010	28	6.6	7.7	17	NW	15	[illegible]			9	7
08	50	37	44	-5	25	21	0		0	T	0.0	30.135	32	13.9	14.6	36	NW	22	32			3	2
09	51	32	42	-7	27	23	0		0	0.01	0.0	30.230	15	1.2	6.2	16	S	12	23			8	7
10	62	46	54	5	45	11	0	1	0	1.99	0.0	29.540	05	2.6	16.1	44	NW	29	34			10	9
11	51	41	46	-2	24	19	0		0	T	0.0	29.730	28	16.0	20.1	59	NW	29	30			2	5
12	48	36	42	-6	19	23	0		0	0.01	0.0	29.860	29	24.0	24.1	55	W	35	29			3	2
13	44	33	39	-9	17	26	0		0		T	30.030	30	19.4	19.6	44	NW	25	30			3	3
14	52	34	43	-4	20	22	0		0	0.00	0.0	30.330	29	12.4	13.4	38	NW	29	30			6	4
15	68	38	53	6	33	12	0		0	0.00	0.0	30.245	22	10.5	10.7	22	SW	15	22			2	1
16	73	47	60	14	41	5	0		0	0.00	0.0	30.000	20	9.6	9.7	22	SW	14	23			3	4
17	58	40	49	3	40	16	0	1 8	0	0.21	0.0	29.860	33	10.4	13.1	30	NW	22	33			10	10
18	44	33	39*	-7	21	26	0		0	0.00	0.0	30.050	35	16.6	16.8	32	N	22	36			0	0
19	51	29*	40	-5	20	25	0		0	0.00	0.0	29.960	32	11.9	12.3	26	NW	17	30			0	1
20	54	36	45	0	27	20	0		0	0.30	0.0	30.120	32	11.0	11.3	30	NW	18	32			2	4
21	56	39	48	3	29	17	0		0	0.00	0.0	30.225	34	5.4	6.6	18	NW	14	35			1	1
22	56	38	47	3	34	18	0		0	0.00	0.0	30.100	13	1.7	6.7	14	SE	9	18			9	8
23	51	47	49	5	47	16	0	1 3	0	0.40	0.0	29.670	24	3.0	5.2	20	SW	14	24			10	9
24	50	39	45	2	32	20	0	1 3	0	0.14	0.0	29.650	25	8.6	9.5	33	W	25	27			5	5
25	64	39	52	9	33	13	0		0	T	0.0	29.755	24	10.5	11.5	35	W	22	24			7	6
26	56	44	50	8	29	15	0		0	0.00	0.0	30.190	36	3.7	7.0	20	NW	14	27			4	4
27	63	41	52	10	43	13	0	8	0	T	0.0	30.200	06	3.0	5.6	14	NE	9	02			10	8
28	71	46	59	17	57	6	0	1 8	0	T	0.0	30.070	20	6.3	7.9	25	SW	17	24			6	6
29	70	37	54	13	37	11	0		0	0.14	0.0	30.070	31	2.3	4.6	31	NW	21	34			10	7
30	46	35	41	0	24	24	0		0	0.02	0.0	30.340	30	11.5	12.3	28	NW	21	30			2	2
SUM	SUM					TOTAL	TOTAL			TOTAL	TOTAL		FOR THE MONTH:							TOTAL	% FOR MONTH	SUM	SUM
1775	1223					446	2	NUMBER OF DAYS		2.62	T	30.0209	6.3	11.4	59	NW	35	[illegible]				161	152
AVG.	AVG.	AVG.	DEP	AVG		DEP.	DEP	PRECIPITATION		DEP							DATE:11	DATE: 12		POSSIBLE		AVG.	AVG.
59.2	40.8	50.0	3.5	34.3		-109	2	≥ .01 INCH.	8	-0.77												5.4	5.1

NUMBER OF DAYS				SEASON TO DATE		SNOW, ICE PELLETS		GREATEST IN 24 HOURS AND DATES			GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE
MAXIMUM TEMP.		MINIMUM TEMP.		TOTAL	TOTAL	≥ 1.0 INCH	0	PRECIPITATION	SNOW, ICE PELLETS		
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	THUNDERSTORMS	2	1.99	09-10	trace	13	0
0	0	2	0	661	1327	HEAVY FOG	0				
				-184	236	CLEAR 12	PARTLY CLOUDY 8	CLOUDY 10			

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
HEAVY FOG: VISIBILITY 1/4 MILE OR LESS.
BLANK ENTRIES DENOTE MISSING OR UNREPORTED DATA.

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I CERTIFY THAT THIS IS AN OFFICIAL PUBLICATION OF THE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, AND IS COMPILED FROM RECORDS ON FILE AT THE NATIONAL CLIMATIC DATA CENTER.

Kenneth D. Wadleen
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

NOV 1990
NEWARK, NJ

DEC 1990
NEWARK, NJ
NAT'L WEA SER OFC.,NOAA
BLDG. 51, RM 241

ISSN 0198-344X

LOCAL CLIMATOLOGICAL DATA

Monthly Summary

INTERNATIONAL AIRPORT

LATITUDE 40° 42'N LONGITUDE 74° 10'W ELEVATION (GROUND) 7 FEET TIME ZONE EASTERN 14734

DATE 1	TEMPERATURE °F MAXIMUM 2	MINIMUM 3	AVERAGE 4	DEPARTURE FROM NORMAL 5	AVERAGE DEW POINT 6	DEGREE DAYS BASE 65°F HEATING (SEASON BEGINS WITH JUL) 7A	COOLING (SEASON BEGINS WITH JAN) 7B	WEATHER TYPES 1 FOG 2 HEAVY FOG 3 THUNDERSTORM 4 ICE PELLETS 5 HAIL 6 GLAZE 7 DUSTSTORM 8 SMOKE, HAZE 9 BLOWING SNOW 8	SNOW ICE PELLETS OR ICE ON GROUND AT 0700 INCHES 9	PRECIPITATION WATER EQUIVALENT (INCHES) 10	SNOW, ICE PELLETS (INCHES) 11	AVERAGE STATION PRESSURE IN INCHES ELEV. 30 FEET ABOVE M.S.L. 12	WIND (M.P.H.) RESULTANT DIR. 13	RESULTANT SPEED 14	AVERAGE SPEED 15	PEAK GUST SPEED 16	PEAK GUST DIRECTION 17	FASTEST 1-MIN SPEED 18	FASTEST 1-MIN DIRECTION 19	SUNSHINE MINUTES 20	PERCENT OF TOTAL POSSIBLE 21	SKY COVER (TENTHS) SUNRISE TO SUNSET 22	MIDNIGHT TO MIDNIGHT 23
01	56	30	43	3	30	22	0		0	0.00	0.0	30.325	24	9.4	9.5	23	W	16	25			5	5
02	57	38	48	8	33	17	0		0	T	0.0	30.320	28	5.5	9.4	22	N	15	30			9	7
03	54	37	46	7	39	19	0	1	0	0.95	0.0	30.330	09	10.0	14.6	35	E	21	12			10	9
04	63	35	49	10	43	16	0	1	0	0.72	0.0	29.760	24	8.8	16.6	39	S	23	25			9	7
05	38	32	35	-4	22	30	0		0	T	T	29.925	28	16.8	17.7	49	W	28	31			8	6
06	49	30	40	2	25	25	0		0	0.00	0.0	29.990	26	10.4	10.9	23	W	16	25			7	7
07	48	33	41	3	32	24	0		0	0.00	0.0	30.120	29	2.2	5.3	12	NW	8	02			9	9
08	50	38	44	6	33	21	0		0	T	0.0	30.010	36	9.2	9.8	22	NW	16	33			9	7
09	50	34	42	5	32	23	0		0	0.00	0.0	30.000	28	8.8	11.2	28	NW	18	31			3	2
10	56	35	46	9	30	19	0		0	0.00	0.0	29.850	29	12.6	15.5	38	NW	26	32			6	5
11	40	30	35	-2	16	30	0		0	0.00	0.0	30.170	30	7.7	8.8	25	NW	20	32			9	7
12	52	32	42	6	31	23	0		0	0.00	0.0	30.070	23	1.9	4.6	14	SW	10	23			2	4
13	62	37	50	14	35	15	0	1	0	T	0.0	29.820	27	9.1	12.1	40	NW	25	30			8	5
14	41	30	36	0	18	29	0		0	0.00	0.0	30.400	31	6.8	9.6	39	NW	18	30			0	1
15	42	27	35	0	30	30	0	1 4	0	0.43	T	30.120	30	3.2	5.6	17	W	10	25			10	9
16	50	39	45	10	37	20	0	1 3	0	0.25	0.0	29.900	28	14.0	15.0	35	W	24	30			7	8
17	49	36	43	8	31	22	0		0	0.00	0.0	30.080	29	6.0	8.8	25	NW	18	31			8	7
18	55	39	47	12	46	18	0	1	0	0.39	0.0	29.620	19	3.6	7.4	18	S	13	31			10	10
19	53	39	46	12	34	19	0		0	T	0.0	30.000	31	10.4	12.1	29	NW	20	30			6	4
20	46	33	40	6	27	25	0		0	0.00	0.0	30.590	04	6.5	8.4	20	N	14	02			7	6
21	59	46	53	19	50	12	0	1	0	0.25	0.0	30.350	11	4.3	6.4	21	SE	10	01			10	10
22	62	57	60	26	59	5	0	1	0	0.01	0.0	30.080	22	9.1	9.3	21	SW	14	22			10	10
23	67*	58	63*	30	61	2	0	1	0	0.31	0.0	29.830	20	10.6	11.4	29	SW	17	23			10	10
24	64	30	47	14	34	18	0	1	0	0.45	0.0	29.750	28	12.0	16.3	46	NW	28	29			8	6
25	32	22	27	-6	7	38	0		0	0.00	0.0	30.330	29	8.2	10.1	29	NW	17	31			0	0
26	37	24	31	-2	13	34	0		0	0.00	0.0	30.460	28	8.7	9.8	22	W	14	29			10	6
27	29	21*	25*	-8	11	40	0	1	0	0.13	1.4	30.770	35	9.0	9.7	24	N	14	34			10	8
28	36	23	30	-3	29	35	0	1 4 6	8	1.13	6.2	30.500	03	9.4	10.1	21	NE	14	04			10	10
29	40	34	37	5	37	28	0	2	4	0.01	0.0	30.260	25	4.1	7.1	20	SW	13	21			10	10
30	58	38	48	16	46	17	0	2	2	0.05	0.0	29.860	22	7.2	7.6	24	SW	16	21			10	10
31	60	27	44	12	24	21	0		0	0.11	0.0	30.190	32	13.9	15.7	52	NW	28	31			3	4
	SUM	SUM				TOTAL	TOTAL			TOTAL	TOTAL	FOR THE MONTH:								TOTAL	% FOR MONTH	SUM	SUM
	1555	1064				697	0	NUMBER OF DAYS		5.19	7.6	30.120	28	5.2	10.5	52	NW	28	31			233	209
	AVG.	AVG.	AVG.	DEP.	AVG.	DEP.	DEP.	PRECIPITATION		DEP.						DATE:31		DATE: 31+		POSSIBLE		AVG.	AVG.
	50.2	34.3	42.3	6.8	32.1	-218	0	≥ .01 INCH 14		1.77												7.5	6.7

NUMBER OF DAYS				SEASON TO DATE TOTAL	SEASON TO DATE TOTAL						
MAXIMUM TEMP.		MINIMUM TEMP.		1358	1327	SNOW, ICE PELLETS ≥ 1.0 INCH 2					
						THUNDERSTORMS 1					
≥ 90°	≤ 32°	≤ 32°	≤ 0°	DEP.	DEP.	HEAVY FOG 2					
0	2	13	0	-402	236	CLEAR 5	PARTLY CLOUDY 6	CLOUDY 20			

GREATEST IN 24 HOURS AND DATES				GREATEST DEPTH ON GROUND OF SNOW, ICE PELLETS OR ICE AND DATE	
PRECIPITATION		SNOW, ICE PELLETS			
1.67	03-04	7.6	27-28	8	28

* EXTREME FOR THE MONTH - LAST OCCURRENCE IF MORE THAN ONE.
T TRACE AMOUNT.
+ ALSO ON EARLIER DATE(S).
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Kenneth D. Wadell
DIRECTOR
NATIONAL CLIMATIC DATA CENTER

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NATIONAL ENVIRONMENTAL SATELLITE, DATA AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER ASHEVILLE NORTH CAROLINA

DEC 1990
NEWARK, NJ

Reference Number 8

Reference Number 25

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 1/8/92

TO EPA /SSI File
NAME/FILE NO.

FROM Judy Cusick

CLIENT/PROJECT EPA/SSI Tenneco (aka Kalama Chemical)

SUBJECT NJDEPE - Identification of Sensitive Environments

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Bruce Halgren - Division of Marine Fisheries
(609) 292 - 9410
(609) 748 - 2020

COMMENTS

I Called On 1/6/92 to check on status of information which I had requested -

Mr. Halgren returned my telephone call today - The information is still being collected & developed; he did inform me that all "open water" is considered environmentally sensitive, according to the current legislation which he had looked over. The document & information will be sent to me as soon as it is finished.

BY Judy Cusick (NAME) Engineer (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 26

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 1/24/92

TO File
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA / SSI

SUBJECT Av. people per household / Tenneco, Garfield

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Noreen Best, Sr. Planner
Bergen Cty Dept
2.44/hshold of Planning &
Economic Development

Garfield, NJ.

COMMENTS

CC:

BY _____ NAME _____ TITLE _____ DEPT. NO.

Reference Number 27

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 1/27/92

TO EPA Files of J. Cusick
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT Tenneco (aka Kalama Chemical Co.) - EPA

SUBJECT Garfield, NJ, Department

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mr. Mike Sfuerruzzo (201) 546-2200
Garfield, NJ

Well Information

Well ID (Garfield #)	Location
1	Fire Co. #3 Willard Street & Cambridge St. (Located 75' east of Cambridge St.)
4;5;6	Midland Avenue & Krakow St.
14;1;2	Outwater Lane & exists in Columbus Park
8C	Deadend of Laurel Lane - Delphine Parkway

COMMENTS

Mr. Sfuerruzzo explained that the well located on Willard & Cambridge Street is the nearest to the site.

BY Judy Cusick (NAME) Engineer (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 28

RECORD OF TELEPHONE CONVERSATION

DATE 1/27/92

TO EPA files of J. Cusick
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/SSI

SUBJECT Tenneco Chemical Co.

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH

Don Hovem, Hackensack Water Co.

Responding to telefax sent on 1/25/92

The Rochelle Park Well - which is the Hackensack Water Company Well #12.

This well is not active at the present time. It has not been used in 5 years. It has a 142 ft. pump off, a water hardness 300-400 (which increases as it's pumped), the capacity was 200 gpm - which supplies 3,000 people (≈ 900 homes).

COMMENTS

The well was installed in the mid-60's (1965)

It has not been used for quite a while (5 yrs.) even as backup. The Hackensack Water Company has included this well as part of an ongoing study, they are considering not using it again.

BY Judy Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 29

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF
FISH, GAME AND WILDLIFE
ROBERT L. McDOWELL
DIRECTOR

PLEASE REPLY TO:
CN 400
TRENTON, NJ 08625-0400
FAX #: 1-609-984-1414

January 28, 1992

Judith A. Cusick
Ebasco Environmental
160 Chubb Avenue
Lyndhurst, NJ 07071

Dear Ms. Cusick:

Your request to identify any fisheries and sensitive environments on the lower Passaic River 15 miles downstream of Garfield, Bergen County was forwarded for my reply.

Because of chemical contamination the sale or consumption of all fish from the tidal Passaic River is prohibited, see Statewide Advisory on page 6 of the enclosed Fish and Wildlife Digest. Because of this prohibition there is no recreational or commercial fishery at this time. We have little recent data on fishery resources for this area. Enclosed is a list of fishes collected in 1972 and 73 for Public Service Electric and Gas Company's 316A Demonstration.

No environmentally sensitive areas have been identified by the Bureau of Marine Fisheries within the lower Passaic River.

If you have further questions in regard to this matter I may be reached at 609-748-2020.

Sincerely,

Bill Andrews

Bill Andrews
Principal Fisheries Biologist

cms

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well-known of the chemicals of contamination in fish and sediment winter flounder in saltwater.

2) or the DEP hotline (609) 292-7172.

How to Reduce Consumer Exposure to Fish Contaminated with Toxic Chemicals (PCBs, Dioxins, Chlordane, etc.)

Statewide Advisory and/or Prohibition:

Striped Bass - all sales prohibited.
American Eels - advised limited consumption (especially the Northeast region).

A. NEWARK BAY COMPLEX

Prohibited - Sale or consumption of all fish from the tidal Passaic River; sale or consumption of striped bass and blue crabs and sale of American eels from the entire complex.

Newark Bay Complex includes Newark Bay, Passaic River (up to Dundee Dam), Hackensack River (up to Oradell Dam), Arthur Kill and Kill van Kull and all tributaries.*

B. HUDSON RIVER (NJ waters)

Advised - very limited consumption of striped bass and limited consumption of white perch and white catfish, and bluefish.

Prohibited sale of American eels.

Hudson River includes the River up to the NJ-NY border, approximately four miles above Alpine, N.J., and Upper New York Bay.*

C. LOWER NEW YORK BAY

Lower New York Bay is not in New Jersey State waters. Fishermen in NY waters, including Lower New York Bay and the NY part of the Upper New York Bay and Hudson River are advised to adhere to New York State advisory guidelines, which are similar to New Jersey's.

D. RARITAN BAY COMPLEX

Advised - limited consumption of striped bass, large bluefish (6 lb. or 24"), white catfish, and white perch.

Raritan Bay Complex includes the NJ portion of Sandy Hook and Raritan Bays and the tidal portion of the Raritan River upstream to the Rt. 1 bridge and New Brunswick.*

E. COASTAL NJ

Advised - limited consumption of striped bass and large bluefish (6 lb. or 24").

Coastal New Jersey includes offshore state waters.*

F. CAMDEN AREA

Prohibited - sale and consumption of all fish.

Camden Area includes Strawbridge Lake, Pennsauken Creek (N and S Branches), Cooper River and its drainage, Cooper River Lake, Stewart Lake, and Newton Lake.*

* Detailed delineations of areas are for purposes of these guidelines only (Under NJAC 7:15-18A, etc.).

DEFINITIONS

Limited Consumption means any person should consume not more than one meal per week of such fish and persons of high risk such as pregnant women, nursing mothers, women of child bearing age and young children, should not eat any such fish taken from the designated regions.

Very Limited Consumption is the same as above except to further restrict consumption to no more than one meal per month.

PREPARATION AND COOKING RECOMMENDATIONS

By following the outlined advisories and prohibitions concerning fish and crabs it is possible to reduce exposure to contaminated fish. Further reduction may be obtained by following the preparation guidelines below.

Chemical Contaminants Collect in Fat Tissue

In fish, the fatty belly flaps, backstrap and lateral-line tissue (dark meat) is where most man-made contaminants concentrate. To reduce exposure, these should be removed before cooking.

After filleting, make a thin slice to remove red or dark lateral-line tissue. Also remove the portion of belly flaps below the base of the ribs. Use your fingers to separate the backstrap from the flesh on top of the fillet. When you steak or chunk fish, similar efforts should be made.

Cooking methods that allow the removal of fats from the fish will generally remove contaminants as well. These include broiling on an elevated rack, boiling in water, and canning fish without skins. In all cases do not use the liquid that contains the oils and fats as a food item. In addition, coatings which hold in oils or fats should be avoided.

BLUE CRABS

Chemical contaminants do not seem to accumulate in the meat of blue crabs. Most contaminants are absorbed and stored in the hepatopancreas, more commonly known as the tomalley, green gland or mustard. This should not be eaten and it is best to remove it before cooking so as not to contaminate the meat during the cooking process.

The hepatopancreas is the yellowish green portion of the digestive system under the gills and could be removed with the gills prior to cooking.

If the crab is cooked whole, be certain to discard the cooking water and don't use the water or mustard in any juices or sauces to be eaten.

This article draws from previously published information developed by the Division of Science and Research. For more detailed data on history, health effects, etc. write to Bruce Ruppel, CN 409, Trenton, NJ 08652

Reference Number 30

KALAMA CHEMICAL INC.
290 RIVER DRIVE
GARFIELD, N.J. 07026
PHONE 201-779-8880
TWX 710-989-7001

RECEIVED
DIVISION OF
WATER RESOURCES
ENFORCEMENT ELEMENT
JUN 15 2 23 PM '87

File

June 11, 1987

Ms. Maureen C. Coates
N. J. Department of Environmental Protection
Division of Water Resources
2 Babcock Place
West Orange, NJ 07052

RE: Compliance Evaluation Inspection
April 8, 1987

Dear Ms. Coates:

This letter is in response to Mr. Thomas Harrington's letter of May 13, 1987 regarding the deficiencies found at our Garfield facility during a compliance inspection on April 8, 1987. In conformance with his request, we have taken the following actions with regard to each of the points contained in his letter.

1. The methanol spill occurred on April 6, 1987. An exhaustive investigation was conducted into the spill and a report issued on April 22, 1987, a copy of which is attached herewith. As stated in the report the spill was not reported to the NJDEP and EPA since methanol is not considered to be a hazardous substance under the NJDEP regulations and our initial estimate of the spilled material was less than 5,000 lbs which is a reportable quantity under CERCLA regulations. Once an accurate estimate of the spilled amount was made, this information was intimated to Mr. Frank Bland of Garfield Board of Health and Mr. Alan Layton of NJDEP regional office in West Orange, NJ.

2. We have one portable pump which is specifically meant for handling spills. This pump has now been fixed and checked periodically to keep it in good working condition. The other pump, which is normally used for routine maintenance activities, has also been repaired.

As recommended in the spill investigation report, we have instituted several measures to correct the deficiencies. Specifically, we have taken the following steps to prevent recurrence of a similar incident.

(a) A written log is kept by the production department showing the amount of methanol on hand in the storage tank based on actual level reading of the tank and the usage.

(b) A procedure has been written for the bulk tank truck unloading of chemicals. Please find enclosed a copy of this procedure. This procedure is now being strictly followed by the production and shipping departments.

N' 267

(c) The SPCC plan is being updated and appropriate personnel involved in handling spills instructed to follow all state and federal regulations.

Please be assured we have taken certain specific steps and implemented a program which we feel will prevent such an incident from happening in the future.

If you need any additional information or have any questions, please contact me.

Very truly yours,

KALAMA CHEMICAL INC.

H. A. Goel
Technical Supt.

HAG:PB
Encl.

cc: Mr. Paul J. Molinary
Chief, Water Permits & Compliance
USEPA, Region II
26 Federal Plaza
New York, NY 10278

N2

KALAMA CHEMICAL INC.
290 RIVER DRIVE
GARFIELD, N.J. 07026

PHONE 201-779-8880
TWX 710-989-7001

RECEIVED
MAY 07 1986
DEPT. ENVIRONMENTAL PROTECTION
NEWARK OFFICE

April 30, 1986

Mr. Richard Perusse
N.J. Dept. of Environmental Protection
Division of Water Resources
2 Babcock Place
West Orange, NJ 07052

RE: Compliance Inspection - Kalama Chemical on 1/21/86
NJPDES No: NJ0000124

Dear Mr. Perusse:

This letter is in response to the letter of Mr. Thomas Harrington, Supervisor, Compliance Unit, on April 1, 1986 regarding the adverse findings at our Garfield facility during a compliance inspection on January 21, 1986.

We have instituted the following measures to correct the deficiencies noticed during the inspection:

1. Sulfuric Acid Hose Drippings: We are placing a bucket underneath the hose connection to catch any drips of Sulfuric Acid during the unloading operation from the tank truck to the storage tank. After the filling operation is complete, any residual amount of the acid in the hose is also drained into the bucket and disposed of properly.

2. Benzoic Acid Powder on the Ground: Small amount of Benzoic Acid noticed on the ground was the result of improper handling of the Molten Benzoic Acid fill line. The Molten acid solidifies immediately at ambient temperature. The shipping department, which handles loading operations, has been instructed to take precautions and follow the instructions below to prevent recurrence.

   a. After the tank truck is loaded, the fill line should be lifted slowly and the material drained back in the truck. Purge the fill line before unhooking it.

   b. If there is any inadvertent discharge of Molten Benzoic Acid on the ground, it should be swept up immediately and placed in a container for proper disposal.

   The above measures are in place and are being followed by the shipping department.

3. Benzoic Acid outside Bldg. 12: The material noticed outside Bldg. 12 was not Benzoic Acid. It was Soda Ash from a broken bag. The spilled Soda Ash was collected and the area cleaned.

M1

Please be assured we are taking all precautions to prevent incidents of non-compliance. We have recently embarked on a plan for improve house-keeping practices. We have a continuing policy of instructing our employees periodically on safe and proper handling and diposal of materials in the plant.

If you have any questions or need additional information, please contact me.

Very truly yours,

KALAMA CHEMICAL INC.

H. A. Goel
Technical Supt.

HAG:PB

M2

File

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
METRO BUREAU OF REGIONAL ENFORCEMENT
2 BABCOCK PLACE
WEST ORANGE, NEW JERSEY 07052

JOHN W. GASTON JR., P.E.
DIRECTOR

DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

April 1, 1986

Mr. Hari Goel, Technical Supervisor
Kalama Chemical
290 River Drive
Garfield, New Jersey 07026

Re: Compliance Evaluation Inspection
Kalama Chemicals
NJPDES No. NJ 0000124
Garfield/Bergen County

Dear Mr. Goel:

A Compliance Evaluation Inspection of your facility was conducted by a representative of this Division on January 21, 1986. A copy of the completed inspection report form is enclosed for your information.

Your facility received a rating of "Unacceptable" due to the following deficiencies:

1. The sulfuric storage tank filling operation has resulted in the discharge of sulfuric acid to the ground.

2. Benzoic acid powder was discharged to the ground at the truck loading rack and outside building 12.

Since these unpermitted discharges are contaminating the ground and surface waters of the State, Kalama Chemical is therefore directed to:

1. Immediately cease all unpermitted discharges to the surface and ground waters of the State.

2. Clean and properly dispose of all spilled and/or contaminated materials.

3. Implement an improved housekeeping plan to prevent future spillages and unpermitted discharges.

M3

4. Submit a written report to this office within thirty (30) days of the receipt of this Directive detailing the corrective action taken.

Both the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.) provide for substantial monetary and criminal penalties in cases of permit violations.

Please direct all correspondence and inquiries to Richard Perusse the Compliance Investigator responsible for this case, who can be reached at (201) 669-3900 or by letter through this Division.

Failure to fully comply with the above will result in the initiation of enforcement action by this Department and/or the United States Environmental Protection Agency. This shall in no way be construed, however, to indicate any exemption on your part from possible penalties for violations indicated by the Compliance Evaluation Inspection, as stated above.

Very truly yours,

Thomas B. Harrington
Supervisor Compliance
Monitoring Unit
Metro Bureau of
Regional Enforcement

A27:G19

cc: Mr. John Theese, H.O.
Dr. Richard A. Baker, USEPA
Mr. Paul Molinari, USEPA

bcc: Marianne Montgomery
Steven Madonna

M4

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
P.O. Box 2809 Trenton, N.J. 08625

DISCHARGE SURVEILLANCE REPORT

PERMIT #: NJ0000124 NO. OF DISCHARGES: 003 CLASS: MAJ/IND

DISCHARGER: Kalama Chemicals

OWNER: Kalama Chemicals

MUNIC: Garfield COUNTY: Bergen WATERSHED CODE: P

LOCATION: 290 River Drive

RECEIVING WATERS: Passaic River STREAM CLASS: FW-2

LIC. OPERATOR & PLANT CLASS: Mr. Jerold Mayer, Plant Manager

TRAINEE/ASST: Mr. Hari Goel, Tech. Super. OTHER INFO: 779-8880

MAJOR DEFICIENCIES NOTED:

1) Approximately 2-3 lbs of benzoic acid powder was spilled on the ground near the truck loading area.

2) Approximately 7-8 lbs of benzoic acid powder was spilled on the ground outside building 12.

3) The sulfuric storage tank filling operation has resulted in the discharge of sulfuric acid to the ground. The cement pad at the tank filler neck had disintegrated and a field test of the fluid on the ground revealed a pH<1.

OVERALL RATING: ☐ Acceptable ☐ Conditionally Acceptable ☐ Unacceptable

EVALUATOR: Richard Perusse TITLE: Environmental Compliance Investigator

INFORMATION FURNISHED BY: (name) Mr. Hari Goel

(title) Technical Supervisor (organization) Kalama Chemical

DATE OF INSPECTION: January 21, 1986

MJ

KALAMA CHEMICAL INC.
GARFIELD DIVISION

INTERNAL MEMORANDUM

TO: J. M. Mayer

DATE: April 22, 1987

FROM: H. A. Goel

COPY TO: J. L. Opgrande
W. H. Ostermiller
D. C. McNiel
A. Ramadan
E. H. Khan

SUBJECT: Methanol Spill from U/G Methanol Storage Tank in Pit 33

This report covers the investigation of the spill of methanol from the underground methanol storage tank on 4/6/87. The investigation was conducted by D. McNiel and H. Goel.

SUMMARY

On Monday, April 6, 1987 at about 10:00 a.m. methanol overflowed from the underground storage tank in Pit 33 when a T/T of methanol was being off-loaded into it. Approximately 1,000 gallons of methanol is estimated to be spilled within the diked area of the pit. Attempts to recover the spilled material failed and none was recovered. The spill was not reported to the N.J. Dept. of Environmental Protection (NJDEP) since it is not listed as a hazardous substance under the NJDEP regulations and it was not reported to EPA hot line since our initial estimate of the spilled material was less than 5,000 lbs which is a reportable quantity. On Wednesday, April 8, 1987 the Garfield Board of Health inspector visited the plant at the request of NJDEP regional office who had received an anonymous call on the spill. Details on the incidents were provided to the Garfield Board of Health and the NJDEP regional office.

INCIDENT CLASSIFICATION

Date and Time of Incident:	Monday, April 6, 1987 at approximately 10:00 a.m.
Name and Clock No. of Unloader:	Ed Yakich 31137
Department Involved:	Methyl Salicylate
Equipment Involved:	Underground Methanol Storage Tank in Pit 33
Operation Being Performed:	Off-Loading 6,902 gallons of Methanol from a T/T into the U/G Storage Tank
Mechanical Cause:	None

N3

INCIDENT CLASSIFICATION (Cont'd.)

Human Causes:	i) Level of U/G Storage Tank Not Measured or Measured Incorrectly Before Unloading T/T
	ii) Level of U/G Storage Tank Not Monitored During Loading Operation
Injuries:	None
Equipment Damage:	None
Material Lost:	Approximately 1,000 Gallons of Methanol

DETAILS OF INVESTIGATION

The spill investigation was conducted by:

Dave C. McNiel - Production Superintendent
Hari A. Goel - Technical Superintendent

On Monday morning, April 6, 1987 at 7:30 a.m. Malcolm Smith, Methyl Salicylate operator, gaged the level of the U/G methanol tank in Pit 33. He reported the tank contained 44 inches or 5,000 gallons of methanol. This tank holds a maximum of 15,208 gallons of methanol. Based on this information, Ed Yakich was given permission to off-load a truck containing 6,902 gallons of methanol.

Ed Yakich began off-loading the truck at about 9:30 a.m. He did not gage the storage tank before starting the transfer. Methanol is off-loaded via a transfer pump located approximately 100' away from the storage tank. No monitoring of level rise in the tank was done during the transfer operation. At about 10:00 a.m. Ed Yakich noticed methanol coming out of the vent on the methanol tank. At which time he shut down the pump and notified supervision. The vent pipe is 2" diameter and 10' above ground level. He reported a maximum of 50 gallons spilled due to his quick actions. The truck driver confirmed this and indicated that approximately 2,500 gallons remained in the truck. Ed Yakich and the truck driver both were standing near the pumping station during the unloading operation. The methanol remaining in the truck was put into the methyl parasept methanol tank which is located underground on the southeast side of Bldg. 32. Ed Yakich was instructed to gage this tank before and after the transfer of the remaining methanol. He gaged the tank prior to but not after the transfer was complete. The tank showed it contained 41.5 inches or 5,055 gallons of methanol before the transfer.

Shortly after the spill occurred the area was cordonned off and closed to non-essential personnel. The spill was contained within the diked area of the methanol pit. The pit was estimated to be 12 feet by 25 feet and 4 feet deep. The pit is located in the yard and is open to the atmosphere. We had heavy rains on Sunday night, April 5 and also in the morning before the spill occurred. The level of the liquid was measured at several locations in the pit and it ranged

N4

DETAILS OF INVESTIGATION (Cont'd.)

from 2 to 4 inches. The spill was estimated at approximately 700 gallons or 4,600 lbs. The Shift Foreman, George Burks, was asked to take a sample of the spilled material. A sample was received in the lab presumably of the spilled material (the sample bottle was without a label or a cap). The lab analysis showed the material to contain 1.2% water, the rest methanol. On Wednesday, April 8, 1987 the pit was more accurately measured and the dimensions are 15 feet by 32.3 feet. This gives the spill amount to be 906 gallons on the average to a maximum of 1209 gallons if the maximum depth of 4 inches in the pit is used in the calculation.

Since the material was contained, it was decided to recover the material and clean up the pit by pumping it into 55 gallons steel drums. We employed a standby portable pump which is specifically meant for such purposes. The pump failed. We attempted to recover the material with another pump but that too failed. The Maintenance Department worked on both pumps the entire day before the pumps were fixed and ready to be used. Unfortunately when the pumps were tried to recover the spill, most of methanol had evaporated to the atmosphere and none could be recovered.

ESTIMATE OF METHANOL SPILLED

Since the storage tank level in Pit 33 was in error and that's why the spill occurred in the first place, we tried to estimate the spill from production records. We used earlier and presumably correct level readings of both methanol storage tanks taken on March 27, 1987. Based on actual usage and bulk methanol received since then, it was estimated we lost 900-1000 gallons of methanol.

ENVIRONMENTAL REPORTING & RESPONSE

Methanol is not considered to be a hazardous substance under the NJDEP regulations but it is reportable to EPA under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) if the discharge is 5,000 lbs or more. Since the spill was contained in a diked area and we planned to recover most of it and the fact that it was estimated to be below the reportable quantity, it was not reported to the NJDEP or EPA. Attempts to recover the spilled material failed and none was recovered as noted earlier.

On Wednesday, April 8, 1987 at approximately 11:00 a.m., Mr. Frank Bland of Garfield Board of Health visited the plant. He was asked by the NJDEP regional office in West Orange, N.J. (Alan Layton - Air Pollution Control - 669-3948) to investigate the spill. Apparently an anonymous caller notified NJDEP on the spill. Details on the spill were given to Mr. Bland. He inspected the diked area where the spill had occurred. He said that he will turn in his report to the regional office and we will probably hear from the NJDEP water division. He advised us to call the regional NJDEP office on the spill. I called the regional office but Alan Layton was not available. After several tries, I finally was able to talk to him on Friday, April 10, 1987 at 3:20 p.m. I gave him the details of the spill and told

ENVIRONMENTAL REPORTING & RESPONSE (Cont'd.)

him that we lost approximately 1,000 gallons of methanol-water mixture from this incident. He said that he is waiting to receive a report from Frank Bland of Garfield Board of Health. He also said that we don't need to inform the NJDEP enforcement office in Trenton, N.J. at this point. He further stated that he will call us on Monday, April 13, 1987 after discussing this matter with his supervisor.

On Monday, April 13 and again the following morning, I tried to contact him on this matter but he was unavailable. He finally called me back on Tuesday, April 14, 1987 at about 11:15 a.m. and told me that since methanol is not a hazardous substance under N.J. air pollution regulations, he is going to refer this matter to the Water Division for their review and action. We have not heard from the Water Division so far.

CONCLUSIONS & RECOMMENDATIONS

From the information presented above, it is obvious that several procedural breakdowns occurred before, during and after the incident. The following conclusions are made:

1. The spill occurred because the storage tank was either not gaged or gaged incorrectly by the Methyl Salicylate operator before unloading the methanol truck. There was no cross-check available from production records to point out this error.

2. The unloader did not gage the storage tank before or during off-loading of methanol.

3. There is no written procedure on bulk loading/unloading operations in the plant which spells out checks to be made and functions of personnel involved before, during and after unloading operations are complete.

4. Even though the plant has a Spill Prevention Control & Countermeasure Plan (SPCC) to take care of such an incident, provisions of the plan were not adequately followed.

The following recommendations are made to prevent a recurrence:

1. A written log should be kept by the production department to show on a daily basis the amount of methanol which should be on hand based on methanol received and actual usage. This value should be confirmed with the level reading of the tank.

2. A procedure should be written and implemented for loading and unloading of all bulk materials in the plant. The procedure should include checks and cross-checks of tank levels, approval from the lab and production supervisio and responsibility of individuals involved before, during and after the loading/unloading operations are complete.

3. The SPCC Plan should be updated and applicable provisions followed to meet the state and federal regulations.

I believe that these recommendations will significantly reduce the recurrence of such an incident in the future.

H. A. Goel

HAG:PB

Jom

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
METRO BUREAU OF REGIONAL ENFORCEMENT
2 BABCOCK PLACE
WEST ORANGE, NEW JERSEY 07052

GEORGE G. McCANN, P.E.
DIRECTOR

DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

May 13, 1987

Mr. Hari Goel, Technical Superintendent
Kalama Chemical, Incorporated
290 River Drive
Garfield, NJ 07026

Re: Compliance Evaluation Inspection
Kalama Chemical, Incorporated
NJPDES No. NJ 0000124
Garfield/Bergen County

Dear Mr. Goel:

A Compliance Evaluation Inspection of your facility was conducted by representatives of this Division on April 8, 1987. A copy of the completed inspection report form is enclosed for your information.

Your facility received a rating of "UNACCEPTABLE" due to the following deficiencies:

1) On April 6, 1987, a spill of approximately 1000 gallons of methanol occurred at the Kalama Chemical facility.

   Oral and written notification, as required by Page 4, Part I, Paragraph 6 of NJPDES Permit No. NJ 0000124, were not received by this office.

2) The facility's two (2) portable pumps for spill containment are not being properly maintained (out of order) in violation of NJPDES permit (Page 2, Part I, Paragraph 4e).

N8

Since the deficiencies cited are presently, or could, in the future, adversely affect effluent quality, you are DIRECTED to institute measures to correct the deficiencies. A written report concerning specific details of remedial measures to be instituted, as well as an implementation timetable, must be submitted to this Department and USEPA, Permits Administration Branch, within thirty (30) calendar days of the date of this correspondence.

Both the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.) provide for substantial monetary and criminal penalties in cases of permit violations.

Please direct all correspondence and inquiries to Maureen C. Coates, the Environmental Specialist responsible for this case, who can be reached at (201) 669-3900 or by letter through this Division.

Failure to fully comply with the above will result in the initiation of enforcement action by this Department and/or the United States Environmental Protection Agency. This shall in no way be construed, however, to indicate any exemption on your part from possible penalties for violations indicated by the Compliance Evaluation Inspection, as stated above.

Very truly yours,

Thomas B. Harrington

Thomas B. Harrington
Supervisor, Compliance
Monitoring Unit
Metro Bureau of
Regional Enforcement

E10:G25

cc: Dr. Richard A. Baker, USEPA
Mr. Paul Molinari, USEPA
Mr. John L. Welch, H.O.

Enclosure

bcc: Mohammed Z. Hussani, Enforcement
Robert Candido, Criminal Justice

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

File

INVESTIGATION MEMORANDUM

Persons Conducting Investigation: Maureen Coates

Complaint No./NJPDES No. NJ0000124

Date of Investigation: APRIL 8, 1987

Routing: JB4

Location of Incident: Kalama Chemical
290 River Drive Garfield/Bergen

Purpose of Investigation: Spill of methanol

Persons Interviewed: Mr. Hari Goel (by phone)

Summary of Findings

In the process of filling an underground storage tank from a tanker truck - due to an improper guaging of the tank an overflow occurred. This tank is a four foot high concrete wall 13' x 25' surrounding the underground tank area. Approximately 8-10" of crushed stone covers the tank. Due to heavy rains prior to the spill there was a lot of water in the dyked area - it is estimated that approximately 1000 gallons of methanol and water were in the dyke.

A portable pump was brought to the area in an attempt to pump the methanol-water mixture to drums - however the pump was broken. A second pump brought to the scene was also broken. By the time a pump was available (a number of hours) the mixture had either evaporated or seeped thru the stones to the ground.

A/10

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
JOHN FITCH PLAZA, CN027, TRENTON, N.J. 08625

ORDER

TO: Kalama Chemicals, Inc.
Bob Kirshner, President
280 River Road
Garfield, New Jersey 07026

RE: N.J.A.C. 7:27-16.6(d)
Plant ID # Not listed
Violation Occurred on
Premises Known As:

280 River Road, Garfield City,
Lot 1, Block 50, Bergen County,
New Jersey

WHEREAS, the State Department of Environmental Protection has determined by investigation(s) made pursuant to the Provisions of the New Jersey Air Pollution Control Act that on December 14, 1982 you did violate Title 7, Chapter 27, Subchapter 16, Section 16.6(d), of the New Jersey Administrative Code.

The investigation(s) disclosed that you did cause, suffer, allow or permit VOS (toluene & water) to be emitted into the outdoor atmosphere from a leaking condenser/sight glass fitting connection.

NOW, THEREFORE, YOU ARE HEREBY ORDERED to cease violation(s) of said Subchapter on the premises owned, leased, operated or maintained by you on or before January 13, 1983.

DATED December 29, 1982

for Harold E. Christoff
Thomas A. Pluta, Assistant Director
Enforcement Branch

cc: Newark Field Office

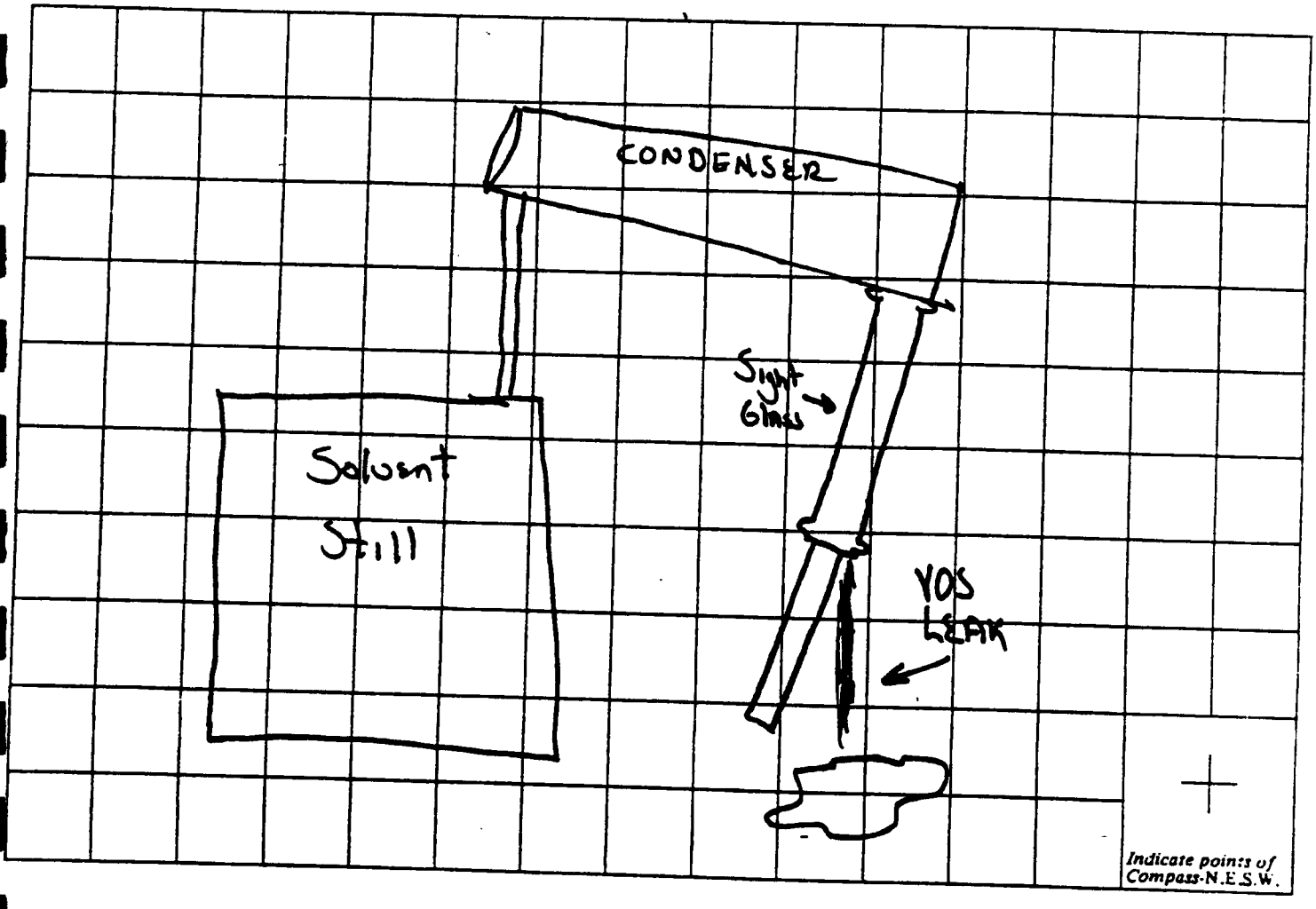
LOG # 20111

CERTIFIED MAIL

NATURE OF OPERATION *(Check one that applies)*

- ☐ a. Agriculture (Includes farming, fishing, forestry)
- ☐ b. Mining
- ☐ c. Construction
- ☐ d. Manufacturing (type)
- ☐ e. Transportation
- ☐ f. Wholesale and Retail Trade (Includes restaurants)
- ☐ g. Utilities
- ☐ h. Business and Personal Services (Includes Banks, Real Estate Co., Insurance Co., Hotels, Recreational Services i.e., Movies
- ☐ i. Salvage
- ☐ j. Refuse and Garbage Disposal
- ☐ k. Government (Includes Federal, State and Local)
- ☐ l. Other

DRAW DIAGRAM BELOW SHOWING LOCATION, STREETS AND DISTANCES OF VIOLATION WITH RESPECT TO STREETS AND/OR LANDMARKS.



~~Comments on Location~~ It was fixed in the past but they were afraid to tighten it too much in fear of cracking the glass

Statements about violation made by person interviewed _____

58

Reference Number 31

11046/5-74

RECORD OF TELEPHONE CONVERSATION

DATE 2/6/92

TO EPA File / Tenneco Screening Site Inspection
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA / Tenneco SSI

SUBJECT Tenneco Chemical Co/. Wallington Bureau Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mr. Bill Mastroberte
Wallington Water Dept.

Mr. Mastroberte estimated that 12,000 people were served by the 4 Wallington wells at the time that they were active.

COMMENTS

BY J. Cusick — NAME
Engineer — TITLE
940 — DEPT. NO.

CC:

Reference Number 32

RECORD OF TELEPHONE CONVERSATION

DATE 2/7/92

TO EPA / Screening Site Inspection file
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA / SSI ; Garfield, N.J. Tenneco Chemical Co.

SUBJECT Garfield Wells -

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mike Sfuerruzzo, Garfield Water Department

Mr. Sfuerruzzo estimated that the wells that were at one time operating served a population of (approximately) 10,000 people.

COMMENTS

BY _____ NAME _____ TITLE _____ DEPT. NO.

CC:

Reference Number 33

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 2/7/92

TO EPA/Screening Site Inspection
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/SSI Garfield, NJ; Tenneco Chemical Co.

SUBJECT Lodi Wells

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Sal Capizzi, Lodi Water Department

Mr. Capizzi estimated that the Lodi Wells (Arnot, 4, 5, 7, Lawrence St, Columbia, Terrace, Garfield, Horse Place, Carabelle) served an estimated population of 28,000 - 30,000 people, when active.

COMMENTS

BY _____ NAME _____ TITLE _____ DEPT. NO.

C:

Reference Number 25

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 1/8/92

TO EPA /SSI File
NAME/FILE NO.

FROM Judy Cusick

CLIENT/PROJECT EPA/SSI Tenneco (aka Kalama Chemical)

SUBJECT NJDEPE - Identification of Sensitive Environments

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Bruce Halgren - Division of Marine Fisheries
(609) 292 - 9410
(609) 748 - 2020

COMMENTS

I Called On 1/6/92 to check on status of information which I had requested -

Mr. Halgren returned my telephone call today - The information is still being collected & developed; he did inform me that all "open water" is considered environmentally sensitive, according to the current legislation which he had looked over. The document & information will be sent to me as soon as it is finished.

BY Judy Cusick (NAME) Engineer (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 26

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 1/24/92

TO File
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA / SSI

SUBJECT Av. people per household / Tenneco, Garfield

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Noreen Best, Sr. Planner
Bergen Cty Dept
2.44/hshold of Planning &
Economic Development

Garfield, NJ.

COMMENTS

CC:

BY _____ NAME _____ TITLE _____ DEPT. NO.

Reference Number 27

11046/8-74

RECORD OF TELEPHONE CONVERSATION

DATE 1/27/92

TO EPA Files of J. Cusick
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT Tenneco (aka Kalama Chemical Co.) - EPA

SUBJECT Garfield, NJ, Department

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH Mr. Mike Sfuerruzzo (201) 546-2200
Garfield, NJ

Well Information

Well ID (Garfield #)	Location
1	Fire Co. #3 Willard Street & Cambridge St. (Located 75' east of Cambridge St.)
4;5;6	Midland Avenue & Krakow St.
1A;1;2	Outwater Lane & exists in Columbus Park
8C	Deadend of Laurel Lane - Dolphine Parkway

COMMENTS

Mr. Sfuerruzzo explained that the well located on Willard & Cambridge Street is the nearest to the site.

BY Judy Cusick (NAME) Engineer (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 28

RECORD OF TELEPHONE CONVERSATION

DATE 1/27/92

TO EPA files of J. Cusick
NAME/FILE NO.

FROM J. Cusick

CLIENT/PROJECT EPA/SSI

SUBJECT Tenneco Chemical Co.

CHARGE: DEPT. NO. 940 CLIENT SYMBOL EPA OFS NO. 8310.820

DISCUSSION WITH

Don Hovem, Hackensack Water Co.

Responding to telefax sent on 1/25/92

The Rochelle Park Well - which is the Hackensack Water Company Well #12.

This well is not active at the present time. It has not been used in 5 years. It has a 142 ft. pump off, a water hardness 300-400 (which increases as it's pumped), the capacity was 200 gpm - which supplies 3,000 people (≈ 900 homes)

COMMENTS

The well was installed in the mid-60's (1965)

It has not been used for quite a while (5 yrs.) even as backup. The Hackensack Water Company has included this well as part of an ongoing study, they are considering not using it again.

BY Judy Cusick (NAME) Eng. (TITLE) 940 (DEPT. NO.)

CC:

Reference Number 29

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF
FISH, GAME AND WILDLIFE
ROBERT L. McDOWELL
DIRECTOR

PLEASE REPLY TO:
CN 400
TRENTON, NJ 08625-0400
FAX #: 1-609-984-1414

January 28, 1992

Judith A. Cusick
Ebasco Environmental
160 Chubb Avenue
Lyndhurst, NJ 07071

Dear Ms. Cusick:

Your request to identify any fisheries and sensitive environments on the lower Passaic River 15 miles downstream of Garfield, Bergen County was forwarded for my reply.

Because of chemical contamination the sale or consumption of all fish from the tidal Passaic River is prohibited, see Statewide Advisory on page 6 of the enclosed Fish and Wildlife Digest. Because of this prohibition there is no recreational or commercial fishery at this time. We have little recent data on fishery resources for this area. Enclosed is a list of fishes collected in 1972 and 73 for Public Service Electric and Gas Company's 316A Demonstration.

No environmentally sensitive areas have been identified by the Bureau of Marine Fisheries within the lower Passaic River.

If you have further questions in regard to this matter I may be reached at 609-748-2020.

Sincerely,

Bill Andrews

Bill Andrews
Principal Fisheries Biologist

cms

New Jersey is an Equal Opportunity Employer
Recycled Paper

Reference Number 30

KALAMA CHEMICAL INC.
290 RIVER DRIVE
GARFIELD, N.J. 07026
PHONE 201-779-8880
TWX 710-989-7001

RECEIVED
DIVISION OF
WATER RESOURCES
ENFORCEMENT ELEMENT
JUN 15 2 23 PM '87

File

June 11, 1987

Ms. Maureen C. Coates
N. J. Department of Environmental Protection
Division of Water Resources
2 Babcock Place
West Orange, NJ 07052

RE: Compliance Evaluation Inspection
April 8, 1987

Dear Ms. Coates:

This letter is in response to Mr. Thomas Harrington's letter of May 13, 1987 regarding the deficiencies found at our Garfield facility during a compliance inspection on April 8, 1987. In conformance with his request, we have taken the following actions with regard to each of the points contained in his letter.

1. The methanol spill occurred on April 6, 1987. An exhaustive investigation was conducted into the spill and a report issued on April 22, 1987, a copy of which is attached herewith. As stated in the report the spill was not reported to the NJDEP and EPA since methanol is not considered to be a hazardous substance under the NJDEP regulations and our initial estimate of the spilled material was less than 5,000 lbs which is a reportable quantity under CERCLA regulations. Once an accurate estimate of the spilled amount was made, this information was intimated to Mr. Frank Bland of Garfield Board of Health and Mr. Alan Layton of NJDEP regional office in West Orange, NJ.

2. We have one portable pump which is specifically meant for handling spills. This pump has now been fixed and checked periodically to keep it in good working condition. The other pump, which is normally used for routine maintenance activities, has also been repaired.

As recommended in the spill investigation report, we have instituted several measures to correct the deficiencies. Specifically, we have taken the following steps to prevent recurrence of a similar incident.

(a) A written log is kept by the production department showing the amount of methanol on hand in the storage tank based on actual level reading of the tank and the usage.

(b) A procedure has been written for the bulk tank truck unloading of chemicals. Please find enclosed a copy of this procedure. This procedure is now being strictly followed by the production and shipping departments.

N' 267

(c) The SPCC plan is being updated and appropriate personnel involved in handling spills instructed to follow all state and federal regulations.

Please be assured we have taken certain specific steps and implemented a program which we feel will prevent such an incident from happening in the future.

If you need any additional information or have any questions, please contact me.

Very truly yours,

KALAMA CHEMICAL INC.

H. A. Goel
Technical Supt.

HAG:PB
Encl.

cc: Mr. Paul J. Molinary
Chief, Water Permits & Compliance
USEPA, Region II
26 Federal Plaza
New York, NY 10278

N2

KALAMA CHEMICAL INC.
290 RIVER DRIVE
GARFIELD, N.J. 07026

PHONE 201-779-8880
TWX 710-989-7001

RECEIVED
MAY 07 1986
DEPT. ENVIRONMENTAL PROTECTION
NEWARK OFFICE

April 30, 1986

Mr. Richard Perusse
N.J. Dept. of Environmental Protection
Division of Water Resources
2 Babcock Place
West Orange, NJ 07052

RE: Compliance Inspection - Kalama Chemical on 1/21/86
NJPDES No: NJ0000124

Dear Mr. Perusse:

This letter is in response to the letter of Mr. Thomas Harrington, Supervisor, Compliance Unit, on April 1, 1986 regarding the adverse findings at our Garfield facility during a compliance inspection on January 21, 1986.

We have instituted the following measures to correct the deficiencies noticed during the inspection:

1. Sulfuric Acid Hose Drippings: We are placing a bucket underneath the hose connection to catch any drips of Sulfuric Acid during the unloading operation from the tank truck to the storage tank. After the filling operation is complete, any residual amount of the acid in the hose is also drained into the bucket and disposed of properly.

2. Benzoic Acid Powder on the Ground: Small amount of Benzoic Acid noticed on the ground was the result of improper handling of the Molten Benzoic Acid fill line. The Molten acid solidifies immediately at ambient temperature. The shipping department, which handles loading operations, has been instructed to take precautions and follow the instructions below to prevent recurrence.

   a. After the tank truck is loaded, the fill line should be lifted slowly and the material drained back in the truck. Purge the fill line before unhooking it.

   b. If there is any inadvertent discharge of Molten Benzoic Acid on the ground, it should be swept up immediately and placed in a container for proper disposal.

   The above measures are in place and are being followed by the shipping department.

3. Benzoic Acid outside Bldg. 12: The material noticed outside Bldg. 12 was not Benzoic Acid. It was Soda Ash from a broken bag. The spilled Soda Ash was collected and the area cleaned.

M1

Please be assured we are taking all precautions to prevent incidents of non-compliance. We have recently embarked on a plan for improve house-keeping practices. We have a continuing policy of instructing our employees periodically on safe and proper handling and diposal of materials in the plant.

If you have any questions or need additional information, please contact me.

Very truly yours,

KALAMA CHEMICAL INC.

H. A. Goel
Technical Supt.

HAG:PB

M2

File

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
METRO BUREAU OF REGIONAL ENFORCEMENT
2 BABCOCK PLACE
WEST ORANGE, NEW JERSEY 07052

JOHN W. GASTON JR., P.E.
DIRECTOR

DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

April 1, 1986

Mr. Hari Goel, Technical Supervisor
Kalama Chemical
290 River Drive
Garfield, New Jersey 07026

Re: Compliance Evaluation Inspection
Kalama Chemicals
NJPDES No. NJ 0000124
Garfield/Bergen County

Dear Mr. Goel:

A Compliance Evaluation Inspection of your facility was conducted by a representative of this Division on January 21, 1986. A copy of the completed inspection report form is enclosed for your information.

Your facility received a rating of "Unacceptable" due to the following deficiencies:

1. The sulfuric storage tank filling operation has resulted in the discharge of sulfuric acid to the ground.

2. Benzoic acid powder was discharged to the ground at the truck loading rack and outside building 12.

Since these unpermitted discharges are contaminating the ground and surface waters of the State, Kalama Chemical is therefore directed to:

1. Immediately cease all unpermitted discharges to the surface and ground waters of the State.

2. Clean and properly dispose of all spilled and/or contaminated materials.

3. Implement an improved housekeeping plan to prevent future spillages and unpermitted discharges.

M3

4. Submit a written report to this office within thirty (30) days of the receipt of this Directive detailing the corrective action taken.

Both the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-I et seq.) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.) provide for substantial monetary and criminal penalties in cases of permit violations.

Please direct all correspondence and inquiries to Richard Perusse the Compliance Investigator responsible for this case, who can be reached at (201) 669-3900 or by letter through this Division.

Failure to fully comply with the above will result in the initiation of enforcement action by this Department and/or the United States Environmental Protection Agency. This shall in no way be construed, however, to indicate any exemption on your part from possible penalties for violations indicated by the Compliance Evaluation Inspection, as stated above.

Very truly yours,

Thomas B. Harrington
Supervisor Compliance
Monitoring Unit
Metro Bureau of
Regional Enforcement

A27:G19

cc: Mr. John Theese, H.O.
Dr. Richard A. Baker, USEPA
Mr. Paul Molinari, USEPA

bcc: Marianne Montgomery
Steven Madonna

M4

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
P.O. Box 2809 Trenton, N.J. 08625

DISCHARGE SURVEILLANCE REPORT

PERMIT #: NJ0000124 NO. OF DISCHARGES: 003 CLASS: MAJ/IND

DISCHARGER: Kalama Chemicals

OWNER: Kalama Chemicals

MUNIC: Garfield COUNTY: Bergen WATERSHED CODE: P

LOCATION: 290 River Drive

RECEIVING WATERS: Passaic River STREAM CLASS: FW-2

LIC. OPERATOR & PLANT CLASS: Mr. Jerold Mayer, Plant Manager

TRAINEE/ASST: Mr. Hari Goel, Tech. Super. OTHER INFO: 779-8880

MAJOR DEFICIENCIES NOTED:

1) Approximately 2-3 lbs of benzoic acid powder was spilled on the ground near the truck loading area.

2) Approximately 7-8 lbs of benzoic acid powder was spilled on the ground outside building 12.

3) The sulfuric storage tank filling operation has resulted in the discharge of sulfuric acid to the ground. The cement pad at the tank filler neck had disintegrated and a field test of the fluid on the ground revealed a pH<1.

OVERALL RATING: ☐ Acceptable ☐ Conditionally Acceptable ☐ Unacceptable

EVALUATOR: Richard Perusse TITLE: Environmental Compliance Investigator

INFORMATION FURNISHED BY: (name) Mr. Hari Goel

(title) Technical Supervisor (organization) Kalama Chemical

DATE OF INSPECTION: January 21, 1986

MJ

KALAMA CHEMICAL INC.
GARFIELD DIVISION

INTERNAL MEMORANDUM

TO: J. M. Mayer

DATE: April 22, 1987

FROM: H. A. Goel

COPY TO: J. L. Opgrande
W. H. Ostermiller
D. C. McNiel
A. Ramadan
E. H. Khan

SUBJECT: Methanol Spill from U/G Methanol Storage Tank in Pit 33

This report covers the investigation of the spill of methanol from the underground methanol storage tank on 4/6/87. The investigation was conducted by D. McNiel and H. Goel.

SUMMARY

On Monday, April 6, 1987 at about 10:00 a.m. methanol overflowed from the underground storage tank in Pit 33 when a T/T of methanol was being off-loaded into it. Approximately 1,000 gallons of methanol is estimated to be spilled within the diked area of the pit. Attempts to recover the spilled material failed and none was recovered. The spill was not reported to the N.J. Dept. of Environmental Protection (NJDEP) since it is not listed as a hazardous substance under the NJDEP regulations and it was not reported to EPA hot line since our initial estimate of the spilled material was less than 5,000 lbs which is a reportable quantity. On Wednesday, April 8, 1987 the Garfield Board of Health inspector visited the plant at the request of NJDEP regional office who had received an anonymous call on the spill. Details on the incidents were provided to the Garfield Board of Health and the NJDEP regional office.

INCIDENT CLASSIFICATION

Date and Time of Incident:	Monday, April 6, 1987 at approximately 10:00 a.m.
Name and Clock No. of Unloader:	Ed Yakich 31137
Department Involved:	Methyl Salicylate
Equipment Involved:	Underground Methanol Storage Tank in Pit 33
Operation Being Performed:	Off-Loading 6,902 gallons of Methanol from a T/T into the U/G Storage Tank
Mechanical Cause:	None

N3

INCIDENT CLASSIFICATION (Cont'd.)

Human Causes:	i) Level of U/G Storage Tank Not Measured or Measured Incorrectly Before Unloading T/T
	ii) Level of U/G Storage Tank Not Monitored During Loading Operation
Injuries:	None
Equipment Damage:	None
Material Lost:	Approximately 1,000 Gallons of Methanol

DETAILS OF INVESTIGATION

The spill investigation was conducted by:

Dave C. McNiel - Production Superintendent
Hari A. Goel - Technical Superintendent

On Monday morning, April 6, 1987 at 7:30 a.m. Malcolm Smith, Methyl Salicylate operator, gaged the level of the U/G methanol tank in Pit 33. He reported the tank contained 44 inches or 5,000 gallons of methanol. This tank holds a maximum of 15,208 gallons of methanol. Based on this information, Ed Yakich was given permission to off-load a truck containing 6,902 gallons of methanol.

Ed Yakich began off-loading the truck at about 9:30 a.m. He did not gage the storage tank before starting the transfer. Methanol is off-loaded via a transfer pump located approximately 100' away from the storage tank. No monitoring of level rise in the tank was done during the transfer operation. At about 10:00 a.m. Ed Yakich noticed methanol coming out of the vent on the methanol tank. At which time he shut down the pump and notified supervision. The vent pipe is 2" diameter and 10' above ground level. He reported a maximum of 50 gallons spilled due to his quick actions. The truck driver confirmed this and indicated that approximately 2,500 gallons remained in the truck. Ed Yakich and the truck driver both were standing near the pumping station during the unloading operation. The methanol remaining in the truck was put into the methyl parasept methanol tank which is located underground on the southeast side of Bldg. 32. Ed Yakich was instructed to gage this tank before and after the transfer of the remaining methanol. He gaged the tank prior to but not after the transfer was complete. The tank showed it contained 41.5 inches or 5,055 gallons of methanol before the transfer.

Shortly after the spill occurred the area was cordonned off and closed to non-essential personnel. The spill was contained within the diked area of the methanol pit. The pit was estimated to be 12 feet by 25 feet and 4 feet deep. The pit is located in the yard and is open to the atmosphere. We had heavy rains on Sunday night, April 5 and also in the morning before the spill occurred. The level of the liquid was measured at several locations in the pit and it ranged

N4

DETAILS OF INVESTIGATION (Cont'd.)

from 2 to 4 inches. The spill was estimated at approximately 700 gallons or 4,600 lbs. The Shift Foreman, George Burks, was asked to take a sample of the spilled material. A sample was received in the lab presumably of the spilled material (the sample bottle was without a label or a cap). The lab analysis showed the material to contain 1.2% water, the rest methanol. On Wednesday, April 8, 1987 the pit was more accurately measured and the dimensions are 15 feet by 32.3 feet. This gives the spill amount to be 906 gallons on the average to a maximum of 1209 gallons if the maximum depth of 4 inches in the pit is used in the calculation.

Since the material was contained, it was decided to recover the material and clean up the pit by pumping it into 55 gallons steel drums. We employed a standby portable pump which is specifically meant for such purposes. The pump failed. We attempted to recover the material with another pump but that too failed. The Maintenance Department worked on both pumps the entire day before the pumps were fixed and ready to be used. Unfortunately when the pumps were tried to recover the spill, most of methanol had evaporated to the atmosphere and none could be recovered.

ESTIMATE OF METHANOL SPILLED

Since the storage tank level in Pit 33 was in error and that's why the spill occurred in the first place, we tried to estimate the spill from production records. We used earlier and presumably correct level readings of both methanol storage tanks taken on March 27, 1987. Based on actual usage and bulk methanol received since then, it was estimated we lost 900-1000 gallons of methanol.

ENVIRONMENTAL REPORTING & RESPONSE

Methanol is not considered to be a hazardous substance under the NJDEP regulations but it is reportable to EPA under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) if the discharge is 5,000 lbs or more. Since the spill was contained in a diked area and we planned to recover most of it and the fact that it was estimated to be below the reportable quantity, it was not reported to the NJDEP or EPA. Attempts to recover the spilled material failed and none was recovered as noted earlier.

On Wednesday, April 8, 1987 at approximately 11:00 a.m., Mr. Frank Bland of Garfield Board of Health visited the plant. He was asked by the NJDEP regional office in West Orange, N.J. (Alan Layton - Air Pollution Control - 669-3948) to investigate the spill. Apparently an anonymous caller notified NJDEP on the spill. Details on the spill were given to Mr. Bland. He inspected the diked area where the spill had occurred. He said that he will turn in his report to the regional office and we will probably hear from the NJDEP water division. He advised us to call the regional NJDEP office on the spill. I called the regional office but Alan Layton was not available. After several tries, I finally was able to talk to him on Friday, April 10, 1987 at 3:20 p.m. I gave him the details of the spill and told

ENVIRONMENTAL REPORTING & RESPONSE (Cont'd.)

him that we lost approximately 1,000 gallons of methanol-water mixture from this incident. He said that he is waiting to receive a report from Frank Bland of Garfield Board of Health. He also said that we don't need to inform the NJDEP enforcement office in Trenton, N.J. at this point. He further stated that he will call us on Monday, April 13, 1987 after discussing this matter with his supervisor.

On Monday, April 13 and again the following morning, I tried to contact him on this matter but he was unavailable. He finally called me back on Tuesday, April 14, 1987 at about 11:15 a.m. and told me that since methanol is not a hazardous substance under N.J. air pollution regulations, he is going to refer this matter to the Water Division for their review and action. We have not heard from the Water Division so far.

CONCLUSIONS & RECOMMENDATIONS

From the information presented above, it is obvious that several procedural breakdowns occurred before, during and after the incident. The following conclusions are made:

1. The spill occurred because the storage tank was either not gaged or gaged incorrectly by the Methyl Salicylate operator before unloading the methanol truck. There was no cross-check available from production records to point out this error.

2. The unloader did not gage the storage tank before or during off-loading of methanol.

3. There is no written procedure on bulk loading/unloading operations in the plant which spells out checks to be made and functions of personnel involved before, during and after unloading operations are complete.

4. Even though the plant has a Spill Prevention Control & Countermeasure Plan (SPCC) to take care of such an incident, provisions of the plan were not adequately followed.

The following recommendations are made to prevent a recurrence:

1. A written log should be kept by the production department to show on a daily basis the amount of methanol which should be on hand based on methanol received and actual usage. This value should be confirmed with the level reading of the tank.

2. A procedure should be written and implemented for loading and unloading of all bulk materials in the plant. The procedure should include checks and cross-checks of tank levels, approval from the lab and production supervisio and responsibility of individuals involved before, during and after the loading/unloading operations are complete.

3. The SPCC Plan should be updated and applicable provisions followed to meet the state and federal regulations.

I believe that these recommendations will significantly reduce the recurrence of such an incident in the future.

H. A. Goel

HAG:PB

Jom

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF WATER RESOURCES
METRO BUREAU OF REGIONAL ENFORCEMENT

2 BABCOCK PLACE
WEST ORANGE, NEW JERSEY 07052

GEORGE G. McCANN, P.E.
DIRECTOR

DIRK C. HOFMAN, P.E.
DEPUTY DIRECTOR

May 13, 1987

Mr. Hari Goel, Technical Superintendent
Kalama Chemical, Incorporated
290 River Drive
Garfield, NJ 07026

Re: Compliance Evaluation Inspection
Kalama Chemical, Incorporated
NJPDES No. NJ 0000124
Garfield/Bergen County

Dear Mr. Goel:

A Compliance Evaluation Inspection of your facility was conducted by representatives of this Division on April 8, 1987. A copy of the completed inspection report form is enclosed for your information.

Your facility received a rating of "UNACCEPTABLE" due to the following deficiencies:

1) On April 6, 1987, a spill of approximately 1000 gallons of methanol occurred at the Kalama Chemical facility.

   Oral and written notification, as required by Page 4, Part I, Paragraph 6 of NJPDES Permit No. NJ 0000124, were not received by this office.

2) The facility's two (2) portable pumps for spill containment are not being properly maintained (out of order) in violation of NJPDES permit (Page 2, Part I, Paragraph 4e).

N8

Since the deficiencies cited are presently, or could, in the future, adversely affect effluent quality, you are DIRECTED to institute measures to correct the deficiencies. A written report concerning specific details of remedial measures to be instituted, as well as an implementation timetable, must be submitted to this Department and USEPA, Permits Administration Branch, within thirty (30) calendar days of the date of this correspondence.

Both the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1 et seq.) and the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.) provide for substantial monetary and criminal penalties in cases of permit violations.

Please direct all correspondence and inquiries to Maureen C. Coates, the Environmental Specialist responsible for this case, who can be reached at (201) 669-3900 or by letter through this Division.

Failure to fully comply with the above will result in the initiation of enforcement action by this Department and/or the United States Environmental Protection Agency. This shall in no way be construed, however, to indicate any exemption on your part from possible penalties for violations indicated by the Compliance Evaluation Inspection, as stated above.

Very truly yours,

Thomas B. Harrington

Thomas B. Harrington
Supervisor, Compliance
Monitoring Unit
Metro Bureau of
Regional Enforcement

E10:G25

cc: Dr. Richard A. Baker, USEPA
Mr. Paul Molinari, USEPA
Mr. John L. Welch, H.O.

Enclosure

bcc: Mohammed Z. Hussani, Enforcement
Robert Candido, Criminal Justice

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES

File

INVESTIGATION MEMORANDUM

Persons Conducting Investigation: Maureen Coates

Complaint No./NJPDES No. NJ0000124

Date of Investigation: APRIL 8, 1987

Routing: JBH

Location of Incident: Kalama Chemical
290 River Drive Garfield/Bergen

Purpose of Investigation: Spill of methanol

Persons Interviewed: Mr. Hari Goel (by phone)

Summary of Findings

In the process of filling an underground storage tank from a tanker truck - due to an improper guaging of the tank an overflow occurred. This tank is a four foot high concrete wall 13' x 25' surrounding the underground tank area. Approximately 8-10" of crushed stone covers the tank. Due to heavy rains prior to the spill there was a lot of water in the dyked area - it is estimated that approximately 1000 gallons of methanol and water were in the dyke.

A portable pump was brought to the area in an attempt to pump the methanol-water mixture to drums - however the pump was broken. A second pump brought to the scene was also broken. By the time a pump was available (a number of hours) the mixture had either evaporated or seeped thru the stones to the ground.

A10

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
JOHN FITCH PLAZA, CN027, TRENTON, N.J. 08625

ORDER

TO: Kalama Chemicals, Inc.
Bob Kirshner, President
280 River Road
Garfield, New Jersey 07026

RE: N.J.A.C. 7:27-16.6(d)
Plant ID # Not listed
Violation Occurred on
Premises Known As:

280 River Road, Garfield City,
Lot 1, Block 50, Bergen County,
New Jersey

WHEREAS, the State Department of Environmental Protection has determined by investigation(s) made pursuant to the Provisions of the New Jersey Air Pollution Control Act that on December 14, 1982 you did violate Title 7, Chapter 27, Subchapter 16, Section 16.6(d), of the New Jersey Administrative Code.

The investigation(s) disclosed that you did cause, suffer, allow or permit VOS (toluene & water) to be emitted into the outdoor atmosphere from a leaking condenser/sight glass fitting connection.

NOW, THEREFORE, YOU ARE HEREBY ORDERED to cease violation(s) of said Subchapter on the premises owned, leased, operated or maintained by you on or before January 13, 1983.

DATED December 29, 1982

for Harold E. Christoff
Thomas A. Pluta, Assistant Director
Enforcement Branch

cc: Newark Field Office ✓

LOG # 20111

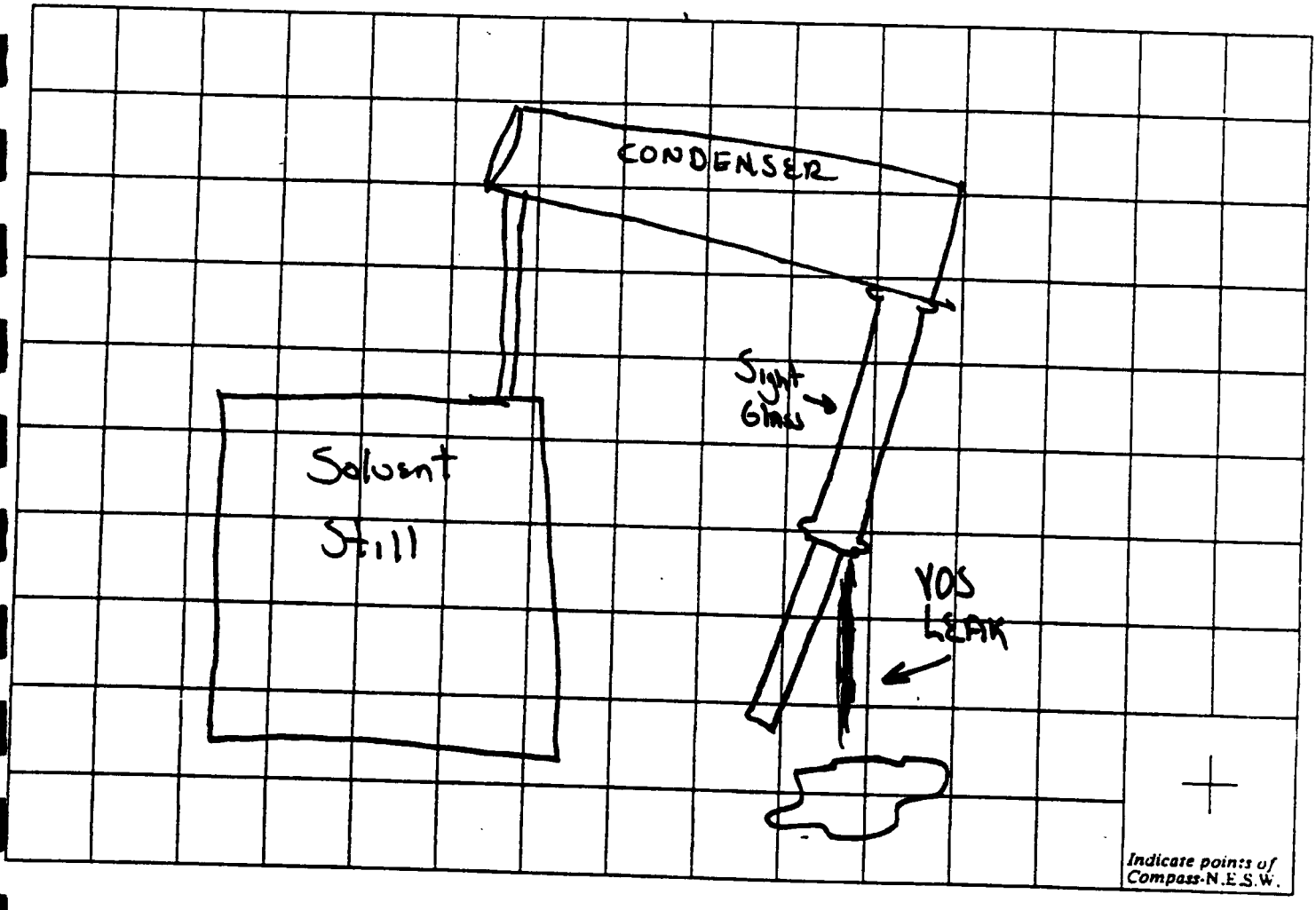
CERTIFIED MAIL

5-6

NATURE OF OPERATION *(Check one that applies)*

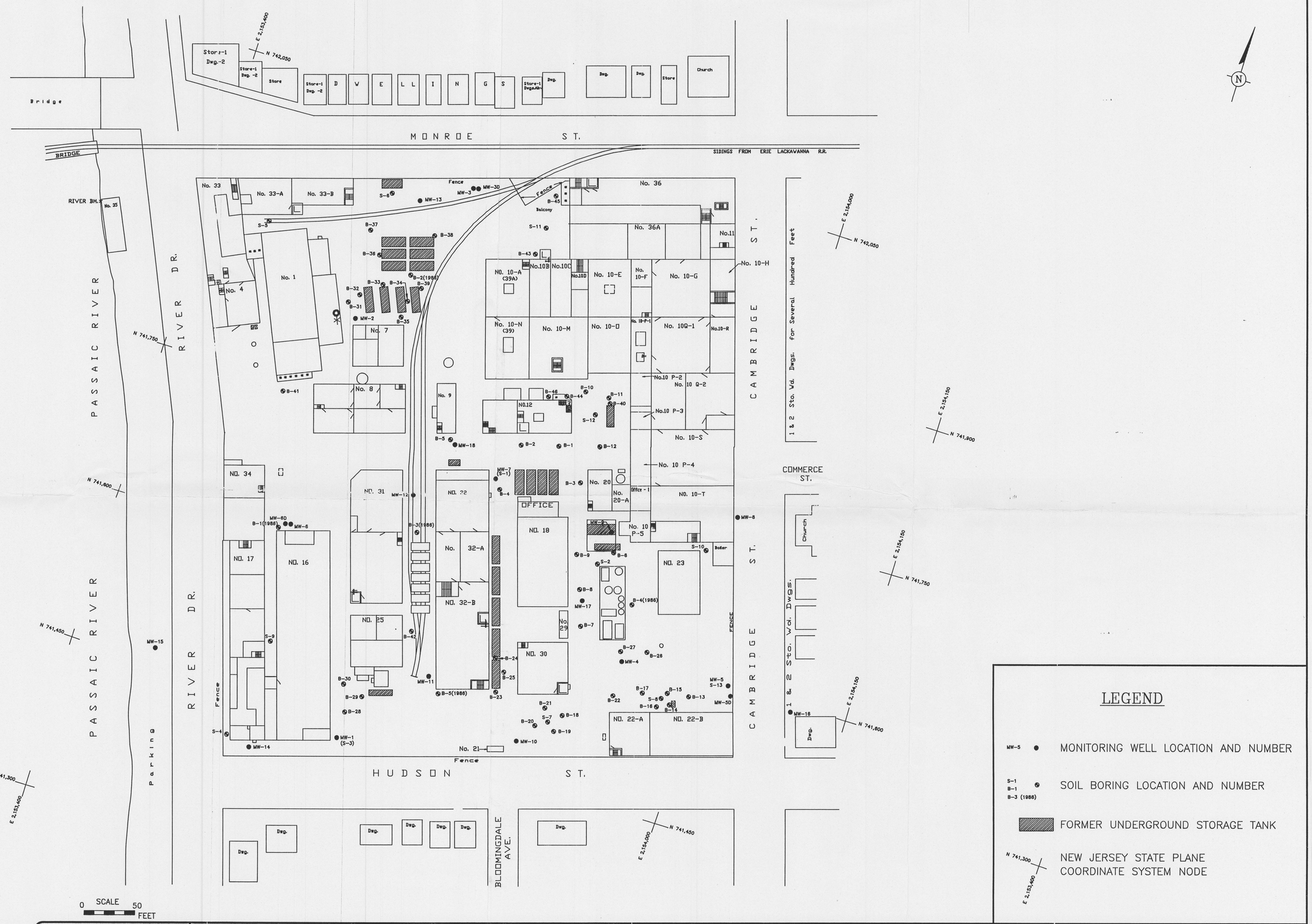
- ☐ a. Agriculture (Includes farming, fishing, forestry)
- ☐ b. Mining
- ☐ c. Construction
- ☐ d. Manufacturing (type)
- ☐ e. Transportation
- ☐ f. Wholesale and Retail Trade (Includes restaurants)
- ☐ g. Utilities
- ☐ h. Business and Personal Services (Includes Banks, Real Estate Co., Insurance Co., Hotels, Recreational Services i.e., Movies
- ☐ i. Salvage
- ☐ j. Refuse and Garbage Disposal
- ☐ k. Government (Includes Federal, State and Local)
- ☐ l. Other

DRAW DIAGRAM BELOW SHOWING LOCATION, STREETS AND DISTANCES OF VIOLATION WITH RESPECT TO STREETS AND/OR LANDMARKS.



~~Comments on Location~~ It was fixed in the past but they were afraid to tighten it too much in fear of cracking the glass

Statements about violation made by person interviewed _____



LEGEND

MW-5 ●	MONITORING WELL LOCATION AND NUMBER
S-1 B-1 B-3 (1986) ⊗	SOIL BORING LOCATION AND NUMBER
▨	FORMER UNDERGROUND STORAGE TANK
N 741,300 / E 2,153,400	NEW JERSEY STATE PLANE COORDINATE SYSTEM NODE

NOTES:

1) BASE MAP SOURCE: MAP ENTITLED "TENNECO INC., TENNECO CHEMICALS, ORGANIC AND POLYMERS DIVISION, GARFIELD, N.J.", DATED NOVEMBER 16, 1973.

2) MONITORING WELL LOCATIONS WERE SURVEYED BY THE GEOD CORPORATION OF NEWFOUNDLAND, NEW JERSEY.

3) SOIL BORING LOCATIONS WERE MAPPED (BY GERAGHTY & MILLER, INC.) WITH REFERENCE TO EXISTING FEATURES.

0 SCALE 50 FEET

GERAGHTY & MILLER, INC.
Environmental Services

DRAWING CONFIDENTIAL: THIS DRAWING AND ALL INFORMATION CONTAINED THEREON IS AND SHALL REMAIN THE PROPERTY OF GERAGHTY & MILLER, INC. AS AN INSTRUMENT OF PROFESSIONAL SERVICE. THIS INFORMATION SHALL NOT BE USED IN WHOLE OR IN PART WITHOUT THE FULL KNOWLEDGE AND PRIOR WRITTEN CONSENT OF GERAGHTY & MILLER, INC.

SCALE VERIFICATION
THIS BAR REPRESENTS ONE INCH ON THE ORIGINAL DRAWING:
USE TO VERIFY FIGURE REPRODUCTION SCALE

REV. NO.	DATE	DESCRIPTION	BY	APPR.

PROJECT NO.: NJ03602	FILE NO:
DRAWING: KAL-SITE	PLOT SIZE: 1"=50'
DRAFTED BY: M. NIXON	DATE: 13AUG1991
CHECKED BY: R. BURNS	DATE: –
APPROVED BY: C. MOTTA	DATE: –

SOIL BORING, MONITORING WELL, AND FORMER UNDERGROUND STORAGE TANK LOCATIONS

KALAMA CHEMICAL, INC.
GARFIELD, NEW JERSEY

FIGURE **3**