DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA750)
Migration of Contaminated Groundwater Under Control

Facility Name: AlliedSignal Incorporated
Facility Address: Columbia Road and Park Avenue, Morristown, NJ 07960
Facility EPA ID#: NJD048794986

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While final remedies remain the long-term objective of the RCRA Corrective Action program, the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993 (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determination status codes should remain in the RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

Honeywell International, Inc. (formerly known as AlliedSignal Inc.) occupied a 170-acre site located in Morris Township in Morristown, New Jersey. A merger between AlliedSignal Inc. and Honeywell Inc. occurred in January 2000. For convenience, the following discussion shall use the former facility name, for much of the discussion concerns past activities. The AlliedSignal site consisted of three areas: the

AlliedSignal Headquarters Main Site, the A.M. Best Site, and the Park Avenue Facility. AlliedSignal conducted research activities at the site from 1946 to 1999. Past research operations included, but were not limited to, research in polymers, metals, ceramics, electronic materials and devices, biosciences, and analytical sciences. Laboratory testing associated with AlliedSignal's research generated approximately 268,500 pounds of waste per year. The waste materials comprised solvents, poisons, flammable and reactive materials, acids, bases, and waste gases. Research activities at the A.M. Best Site were limited to metal alloys research. No research activities were conducted at the Park Avenue Facility. Waste management activities at AlliedSignal have resulted in releases of contaminants to soil, groundwater, and sediment. Fourteen SWMUs were identified at the Main Site in the Administrative Consent Order that AlliedSignal entered into with the New Jersey Department of Environmental Protection (NJDEP) on November 3, 1989. In addition, five areas of concern were identified in other facility documentation. The site is currently owned by Honeywell and similar research activities are conducted at the site. The land immediately surrounding the site is used for industrial, commercial, research, and residential purposes. An industrial area located northeast of the site includes the Morristown Municipal Airport, which is approximately ½ mile from the site. A large residential area is located north and west of the site and a smaller residential area is located southeast of the site. The Morris County Golf Club borders the site to the south-southwest.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   _X_ If yes - check here and continue with #2 below.

   ____ If no - re-evaluate existing data, or

   ____ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

Summary of Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs): A SWMU and AOC map has been provided as Attachment 1.

SWMU 1, Groundwater Pumping: This unit consists of two recovery wells (Well 2 and Well 10, see Attachment 1) that collect contaminated groundwater at the AlliedSignal site. In 1976, carbon tetrachloride was detected in the groundwater northeast of the Materials Research Center. The extraction of the contaminated groundwater began at well number 2 at a rate of 400 gallons per minute. In 1981, an additional well was installed (number 10) and the two wells are pumped at a combined rate of 400 gallons per minute, and discharged to the county storm sewer in accordance with New Jersey Pollutant Discharge Elimination System Permit No. NJ0031305. Well number 2 was shut down in March, 1993.

SWMU 2A/2B, Rear Ponds: This unit consists of two interconnected retention ponds present in the western corner of the site. Pond A is approximately 1.2 million gallons in capacity and Pond B is approximately 0.75 million gallons in capacity. The ponds currently receive storm water runoff and air conditioner condensate via an interconnected storm drainage system. From 1957 to 1981 the ponds received boiler and cooling tower blowdowns. These blowdowns contained a chromate-based water treatment chemical, a slimicide, and an amine-based water treatment chemical. The ponds were treated annually with an algaecide. No documented releases have occurred in these ponds. Sampling results have indicated there has been no impact to surface water or sediment above relevant screening criteria. The ponds are currently in operation.

SWMU 3, Nichols Complex Disposal Area: This disposal site was located near the existing Solvay building. Solid wastes and drums of materials from laboratories were deposited at this location. The wastes contained cyclohexane caustic washes. The period of operation is not known. Site operations began in 1946 and the on-site disposal of waste materials stopped in 1962. In 1969, during the construction of the Solvay building, the waste materials were removed and disposed of off site. Sampling conducted as part of the Remedial Investigation indicated that soil had been impacted by SVOCs above relevant screening criteria. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 4, AB Disposal Area: This disposal site was located near where the Administration building now stands. Only nonhazardous construction materials are believed to have been disposed of at this location. The period of operation is not known. No known or documented releases have been associated with this unit. Site operations began in 1946 and the on-site disposal of waste materials stopped in 1962.

SWMU 5, MRC Disposal Area: This disposal site is located near the Material Research Center. Only nonhazardous construction materials are believed to have been disposed of at this location. The period of operation is not known. Site operations began in 1946 and the on-site disposal of waste materials as stopped in 1962. No known or documented releases have been associated with this unit. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 6, CRC Neutralization Tank: From 1947 to 1962, this below-ground concrete neutralization tank was used to neutralize dilute laboratory wastewater from the CRC's closed drainage system. The tank contained limestone and may have treated wastes that contained hazardous constituents. The size of the tank and the quantity of the waste treated is unknown. Dieldrin is the only contaminant that has been detected in surface soil above relevant screening criteria. No known or documented releases have been associated with this unit. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 6A, CRC Leach Field: From 1947 to 1962, dilute chemical waste was discharged to a leach field behind the CRC/TPL buildings. The dilute laboratory wastewaters drained into the CRC Neutralization Tank prior to discharge to the CRC Leach Field. The wastewater contained pyridine and dichloroethane. The exact location and the quantity of wastewater discharged to the leach field is not known. No known or documented releases have been associated with this unit. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure. The potential exists for historical releases to groundwater from this unit. However, given the documented groundwater flow direction to the east, parallel to the southern property boundary, and the capture zone of Well 10, all historical contamination from this unit is contained within the site boundaries.

SWMU 7, MRC Neutralization Tank: From 1960 to 1962, this below-ground concrete neutralization tank was used to neutralize dilute laboratory wastewater from the MRC's closed drainage system. The tank contained limestone and treated wastes that contained pyridine and dichloroethane. The quantity of the waste treated is unknown. The tank was 4 feet by 8 feet and was removed in 1962. No known or documented releases have been associated with this unit. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 7A, MRC Leach Field: From 1960 to 1962, dilute chemical waste was discharged to a leach field east of the MRC building. The dilute laboratory wastewaters drained into the MRC Neutralization Tank prior to discharge to the MRC Leach Field. The types of materials discharged to the leach field are unknown although the wastewaters may have contained hazardous waste constituents. The exact location and the quantity of wastewater discharged to the leach field is not known. No known or documented releases have been associated with this unit. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure. The potential exists for historical releases to groundwater from this unit. However, SWMU 7A is directly upgradient of former extraction Well 2. This well was shut down in 1993 due to non-detectable level of contaminants. Therefore, no historical contamination from this unit is apparent.

SWMU 8, CRL Neutralization Tank: From 1953 to 1962, this below ground concrete neutralization tank was used to neutralize dilute laboratory wastewater from the Chemical Research Laboratories. The tank contained limestone and may have treated wastes that contained hazardous constituents. The quantity of the waste treated is unknown. This tank was 10 feet in diameter. No known or documented releases have been associated with this unit. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 8/9, Open Pipe Discharge From CRL/DEV: From 1953 to 1962, dilute laboratory wastewater from the CRL and DEV neutralization tanks was discharged from open pipes. The quantity of wastewater discharged at these location is not known and the pipes have been removed. Benzo[b]fluoranthene is the only contaminant that has been detected in surface soil in this area above relevant screening criteria. AlliedSignal has since installed a 3- to 4-inch thick sod cap over this unit and a portion of the Nichols Complex was constructed over this unit.

SWMU 9, DEV Neutralization Tank: From 1957 to 1962, this below-ground concrete neutralization tank was used to neutralize dilute laboratory wastewater from the Development Building. The tank contained limestone and may have treated wastes that contained hazardous constituents. The size of the tank is unknown. No known or documented releases have been associated with this unit. A 3- to 4-inch thick sod cap covers this unit and a portion of the Nichols Complex was constructed over this unit.

SWMU 10, Toxicology Underground Storage Tank: From 1979 to 1982, dilute wastewaters containing silica, toluene, hexane, hydrochloric acid, ethyl ether, ethanol, formalin, animal urine/feces, ammoniate zinc nitrate, NFE (nitrogen iron fertilizer containing ammonium nitrate, ferric ammonium citrate, and urea), and boron trifluoride were stored in the 3,000-gallon fiberglass underground storage tank located near the Toxicology Building. During the period of operation, 2000 to 3000 gallons of waste were handled in the tank. No known or documented releases have been associated with this unit. The tank was emptied and the waste was disposed of off site. The tank was removed in 1985 and no evidence of leaks was detected. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 11, CRL Underground Storage Tank: From 1979 to 1983, dilute wastewaters containing fish wastes, aldicarbe oxime, acid aldehydeoxime, solid waste extracts, chlorine and sodium hypochlorite were stored in the 1,000-gallon fiberglass underground storage tank located near the Aquatics Laboratory. During the period of operation less than 5,000 gallons of waste were handled in the tank. No known or documented releases have been associated with this unit. The tank was removed in 1985 and no evidence of leaks was detected. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 12, CRC Open Pipe Discharge: From 1947 to 1962, dilute laboratory wastewater from the CRC neutralization tank was discharge from an open pipe. The quantity of wastewater discharged at this location is not known and the pipe has been removed. Dieldrin is the only contaminant that has been detected in surface soil in this area above relevant screening criteria. AlliedSignal has since installed a 3- to 4-inch sod cover over the area to reduce the potential for direct human exposure.

SWMU 13, Permitted Waste Storage Facility: A permitted waste storage facility is located northwest of the Development building. The facility has operated since 1981. The quantity of waste stored at this location is not known and no releases have been reported.

SWMU 14, Be/Cu (A.M. Best) Proposed Discharge Location: This unit consists of an area at the A.M. Best site where, during a NJDEP field visit in 1980, a NJDEP representative observed what appeared to be a ponding of discharge from a beryllium/copper waste stream from the pilot plant. Based upon available documentation, the entire A.M. Best site received a No Further Action determination on December 27, 1994, from NJDEP and this portion of the site was removed from the Administrative Consent Order. This portion of the property has since been transferred.

AOC A, UST E-4: This unit was located in a paved parking lot near the PTL building and consisted of a 7,500-gallon UST which was used to store No. 2 fuel oil. During tank closure activities on August 24, 1994 contaminated soils were detected both visually and with field monitoring equipment. The UST was excavated, cleaned, and disposed with any contaminated soils also taken off site. Confirmatory sampling results were collected and the excavation was backfilled with clean fill. NJDEP approved a No Further Action Recommendation for this unit on June 14, 1995.

AOC B, UST E-7: This unit was located at the Park Avenue facility and consisted of a 10,000 gallon UST used to store No. 2 heating oil. During excavation of the tank, visual contamination was observed which indicated that overfill of the tank may have occurred. The tank was excavated, visually contaminated soil removed, and confirmatory samples collected. Once results were received the excavation was backfilled with clean soil. NJDEP approved the Remedial Investigations and Remedial Actions undertaken at this unit and extended a No Further Action Recommendation on November 14, 1996.

AOC C, UST E-8, E-9, E-10, and E-11: This unit was a tank system consisting of four tanks used to store gasoline near the Facilities and Services (F&S) building on site. During closure of these tanks in 1993, some visual signs of staining were observed. The tanks were excavated, contaminated soils removed, and confirmatory samples collected. Once results were received, the excavation was backfilled with clean soils. NJDEP approved the Remedial Investigations undertaken at this unit and extended a No Further Action Recommendation on February 17, 1994.

AOC D, UST E-2, E-3: This unit consisted of two USTs, one 20,000 gallon (E-2) and one 1,500 gallon (E-3), which were used to store No. 2 and No. 6 fuel oil, respectively. These tanks were located near the Administration building on site. During closure activities for these tanks in 1998, visual signs of contamination were observed. The tanks were excavated, contaminated soil removed, and confirmatory samples collected. Once results were received, the excavation was backfilled with clean soil. No further action was recommended for this area.

AOC E, A.M. Best Building Excavation: This area consisted of petroleum contaminated soils beneath a parking lot which were discovered during routine geotechnical work. The source of this contamination was unknown. Contaminated soil in the area was excavated and analyzed until the vertical and horizontal extent of the contamination was delineated. Contaminated soil was

disposed of off site and the excavation was backfilled with clean fill. No further action was recommended for this area.

All SWMUs/AOCs at the AlliedSignal site, with the exception of SWMUs 1, 2A, 2B, and 13, are no longer in operation and have either been designated as requiring no further action or have been taken out of operation and covered with a 3- to 4-inch sod layer. SWMUs 1, 2A, 2B, and 13, still exist at the site. SWMU 2A/2B is two storm water retention ponds that do not manage waste materials, and therefore do not require additional action at this time. SWMUs 1 and 13 managed hazardous wastes. However, they are currently operated in compliance with relevant permits and do not require any additional action at this time. SWMUs 6A and 7A contain leach fields that are no longer in operation. Any potential release to groundwater from these SWMUs would have been addressed by the extraction well system. The effectiveness of the extraction well system is further discussed in Question 3 of this CA750.

References:

(1) RCRA Preliminary Assessment, prepared by NJDEP - September 1987.
(2) Administrative Consent Order, prepared by NJDEP - November 1989.
(3) Remedial Investigation, prepared by Geraghty & Miller - October 1991.
(4) Site Assessment Report for UST Nos. E-8, E-9, E-10, E-11, prepared by Storch Engineers - October 6, 1993.
(5) Feasibility Study, prepared by Geraghty & Miller - January 1994.
(6) Letter from Bruce Venner, NJDEP to David Paley, AlliedSignal, re: Approval of Remedial Investigation and Closure of USTs E-8, E-9, E-10, E-11 - February 17, 1994.
(7) Remedial Investigation Report for UST E-4, prepared by Storch Engineers - December 1994.
(8) Letter form Pamela Lange, NJDEP, to Pamela Cissik, AlliedSignal, re: No Further Action decision for the A.M. Best Property and Removal of the A.M. Best property from the ACO - December 27, 1994.
(9) Letter from Pamela Lange, NJDEP, to David Paley, AlliedSignal, re: Approval of closure for UST E-4 - June 14, 1995.
(10) Letter from Robert Savarese, AlliedSignal, to Bureau of UST, NJDEP re: UST E-7 Tank Closure - July 17, 1995.
(11) Remedial Investigation Report for the A.M. Best Building, prepared by Storch Engineers - February 1996.
(12) Letter from Pamela Lange, NJDEP, to David Paley, AlliedSignal, re: Approval of Remedial Investigation/Remedial Actions for UST E-7 - November 14, 1996.
(13) Site Investigation Report for AlliedSignal Inc. Administration Building (UST E-2 and E-3), prepared by Storch Environmental - November 1998.
(14) RCRA Corrective Action Site Fact Sheet, prepared by USEPA - date unknown.

2. Is **groundwater** known or reasonably suspected to be "**contaminated**"[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

_X_ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

___ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Background

The first occurrence of volatile organic compounds (VOCs) in groundwater at the site was reported in Well 2 in December 1976. Carbon tetrachloride was detected at a concentration of 34 micrograms per liter (g/L) (Reference No. 1, Volume I). A 1976 investigation concluded that Well 2 should continue to be pumped to prevent VOCs from migrating off site.

In 1981, a second well (Well 10) was installed to reduce the pumping rate required from Well 2, and to ensure containment of VOCs within site boundaries and maximize the recovery of VOCs. Both Wells 2 and 10 were pumped continuously at a total rate of between 300 to 400 gallons per minute (gpm), and discharged to the county storm sewer in accordance with New Jersey Pollutant Discharge Elimination System (NJPDES) Permit No. NJ0031305. Well 2 was shut down on March 23, 1993 with NJDEP approval. Pumping at Well 10 continues. The NJDEP approval was based on two consecutive rounds of nondetectable levels of contaminants in Well 2. To date, the impacted groundwater has not required treatment in order to comply with the discharge permit (Reference No. 13).

During a hydrogeologic investigation conducted at the site in 1987, several VOCs were detected in groundwater samples collected from Well 16S, located adjacent to SWMU3. The detected compounds included bromoform, carbon tetrachloride, chlorobenzene, chloroform, 1,1-dichloroethane, 1,2-dichloroethane, 1,2-dichloroethene, tetrachloroethene, 1,1,1-trichloroethane, and trichioroethene. Since 1987, carbon tetrachloride and chloroform have consistently been detected in this well at concentrations of up to 990 ug/L and 170 ug/L, respectively (Reference No. 1, Volume I).

In accordance with the Administrative Consent Order that AlliedSignal and the NJDEP entered into on November 3, 1989, a Remedial Investigation (RI) was conducted. Additional monitoring wells were installed to help characterize groundwater quality at the site. The purpose of the wells was to evaluate water quality and to determine whether the perched zone in proximity to Well 16S was contributing VOCs

---

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

to the saturated zone. Based on the compounds detected in Well 16P (screened in the perched water zone), the perched zone did not appear to be contributing VOCs to the saturated zone (Reference No. 1, Volume I).

The highest concentrations of total VOCs reported in 1991 ranged from 1000 ug/L (Well 20S) to 1037 ug/L (Well 16S). The predominant VOCs detected in the terminal moraine deposit, in order of decreasing concentrations, include carbon tetrachloride, chloroform, trichloroethene, 1.1-dichloroethane, and 1,2-dichloroethane. The highest concentrations of total VOCs detected in the outwash deposit occurred in Well 10 at a level of 32 ug/L. The predominant VOCs detected in the outwash deposits, in order of decreasing concentrations, include carbon tetrachloride, trichloroethene, and toluene. VOCs were not detected in wells completed in the bedrock.

The concentrations of total semivolatile organic compounds (SVOC) detected in groundwater samples from wells screened in the terminal moraine ranged from not detected to 24 ug/L (Well 16P). The compounds consisted of bis(2-ethylhexyl)phthalate, di-n-octylphthalate, and di-n-butylphthalate. The concentrations of total SVOCs detected in groundwater samples from wells screened in the outwash deposits ranged from not detected to 92 ug/L (Well 19D). The compounds consisted of dimethylphthalate, diethylphthalate, n-nitrosodiphenylamin, 1,2-diphenylhydrazine, phenanthrene, anthracene, di-n-butylphthalate, fluoranthene, pyrene, butylbenzylphthalate, benz[a]nthracene, chrysene, bis (2-ethylhexyl) phthalate, di-n-octylphthalate, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, indeno[1,2,3-cd]pyrene, and dibenz[a,h,i]anthracene. SVOCs were not detected in bedrock wells (see Attachment 3).

The concentrations of metals reported in groundwater samples from wells screened in the terminal moraine and outwash deposits are below the N.J. Groundwater Quality Standards with the exception of total chromium. The concentrations of total chromium ranged from nondetectable to 1750 ug/L (Well 17S).

Attachment 3 depicts the location of the wells and summarizes the 1991 sampling results for total VOCs, SVOCs, and metals. Table 1 identifies the maximum concentrations in groundwater identified during the June and July 1991 groundwater sampling event:

Table 1
Maximum Contaminant Concentrations from June and July 1991 Sampling Event

Constituent	Well	Maximum Concentration (ppb)	Groundwater Quality Standards (N.J.A.C. 7:9-6) (ppb)
Carbon Tetrachloride	16S	810.00	0.4
Chloroform	20S	150.00	6
Toluene	20S	94.00	1,000
Xylenes	18D	0.96	40
Tetrachloroethene	16P	6.00	0.4
Trichloroethene	20S	100.00	1

1,2-Dichloroethane	20S	60.00	0.3

References:

(1) Remedial Investigation Conducted at the AlliedSignal Inc. Facility, Morris Township, New Jersey, Prepared by Geraghty & Miller, Inc.– October 1991.
(2) Feasibility Study AlliedSignal Inc. Site, Morris Township, New Jersey, Prepared by Geraghty & Miller, Inc.–January 1994.
(3) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: Honeywell Inc. Morris Township Center Site (formerly known as AlliedSignal)–December 16, 1999.
(4) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–April 16, 1999.
(5) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–October 22, 1998.
(6) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–April 6, 1998.
(7) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–October 15, 1997.
(8) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–October 23, 1995.
(9) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–April 24, 1995.
(10) Letter from David A. Paley, Manager, to Carol Graubart, Division of Hazardous Waste Management, Re: AlliedSignal Inc. Morris Township Center Site–November 11, 1994.
(11) Letter from David A. Paley, Manager, to Gerald M. Hahn, Bureau of Federal Case Management, Re: AlliedSignal Morris Township Center Site, Well 2 Shutdown Monitoring Program–January 14, 1994.
(12) Letter from David A. Paley, Manager, to Gerald M. Hahn, Bureau of Federal Case Management, Re: AlliedSignal Morris Township Center Site, Well 2 Shutdown Monitoring Program–March 4, 1994.
(13) Letter from Gerald M. Hahn, Bureau of Federal Case Management, to David A. Paley, Manager, Re: AlliedSignal Inc., Morris Township, Morris County, Well #2 Shutdown monitoring program–March 16, 1994.
(14) Supplemental Remedial Investigation Work Plan for SWMU 3, prepared by Geraghty & Miller, Inc.–December 1992.

3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination)?

X If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[2].

___ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

___ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Hydrogeology

The AlliedSignal facility rests on glacial deposits. The predominant glacial unit at the AlliedSignal site is the terminal moraine deposit. The terminal moraine is a till deposit that resulted from the recession of the most recent ice age (Wisconsin). The terminal moraine varies in thickness from approximately 160 feet to 200 feet and is responsible for the topographic relief at the site. The deposits consist of poorly sorted boulders, gravel, sand, silt and clay material. Groundwater occurs in the terminal moraine; however, the transmissivity of the unit is generally low (1,500 gallons per day per foot) due to the poorly sorted nature of the deposits. In contrast, the stratified outwash deposits underlying the terminal moraine, consisting of well-sorted, fine to medium grain sand, typically have transmissivity values of 100,000 gallons per day per foot. At several areas of the site, two distinct outwash deposits were identified and deposits were separated by a low-permeability silty-clay layer. These deposits comprise the Buried Valley Aquifer System, a highly developed groundwater reservoir for Morris County.

The aquifer, designated a sole source aquifer by the USEPA, is capable of sustaining yields of more than 200 gallons per minute and groundwater occurs under artesian conditions in many places, including the AlliedSignal site. The overall horizontal component of groundwater flow in both the terminal moraine and the outwash deposits is in an easterly direction across the site and parallel to the property line that separates the AlliedSignal site and the Morris County Golf Club. The vertical component of groundwater flow between the terminal moraine and the outwash deposits varies across the site depending upon surface water infiltration or localized groundwater pumping. The groundwater flow velocity in the

---

[2] "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

terminal moraine was determined to be 18 feet per year. The depth to bedrock ranges from 220 to 300 feet below ground surface at the AlliedSignal site.

Numerous wells are in place to assess groundwater contamination at the site. These wells include background wells, off-site downgradient wells, on-site production/extraction wells, and on-site monitoring wells. The details pertaining to the construction of these wells are listed in Attachment 4.

VOCs have been detected in both the terminal moraine and outwash deposits at levels above the NJ Groundwater Classification Criteria for Class II-A, potable groundwater and groundwater restrictions are in place to prevent on-site personnel from using affected groundwater for potable purposes. The highest groundwater concentrations of VOCs were detected in the terminal moraine deposits in Well 16S and similar concentrations of VOCs were detected in Well 20S. The predominant VOCs detected include carbon tetrachloride, chloroform, trichloroethene, 1,1-dichloroethane, and 1,2-dichloroethane. These wells are located upgradient of extraction Well 10. Given the documented direction of groundwater flow, parallel to the southern site boundary, the contamination from theses wells has been contained within the site boundaries. The groundwater contamination at the facility is a result of multiple isolated releases. The predominant VOCs detected in the outwash deposits, in order of decreasing concentrations, include carbon tetrachloride, trichloroethene, and toluene. VOCs were not detected in wells completed in the bedrock (Reference No. 1, Vol. I).

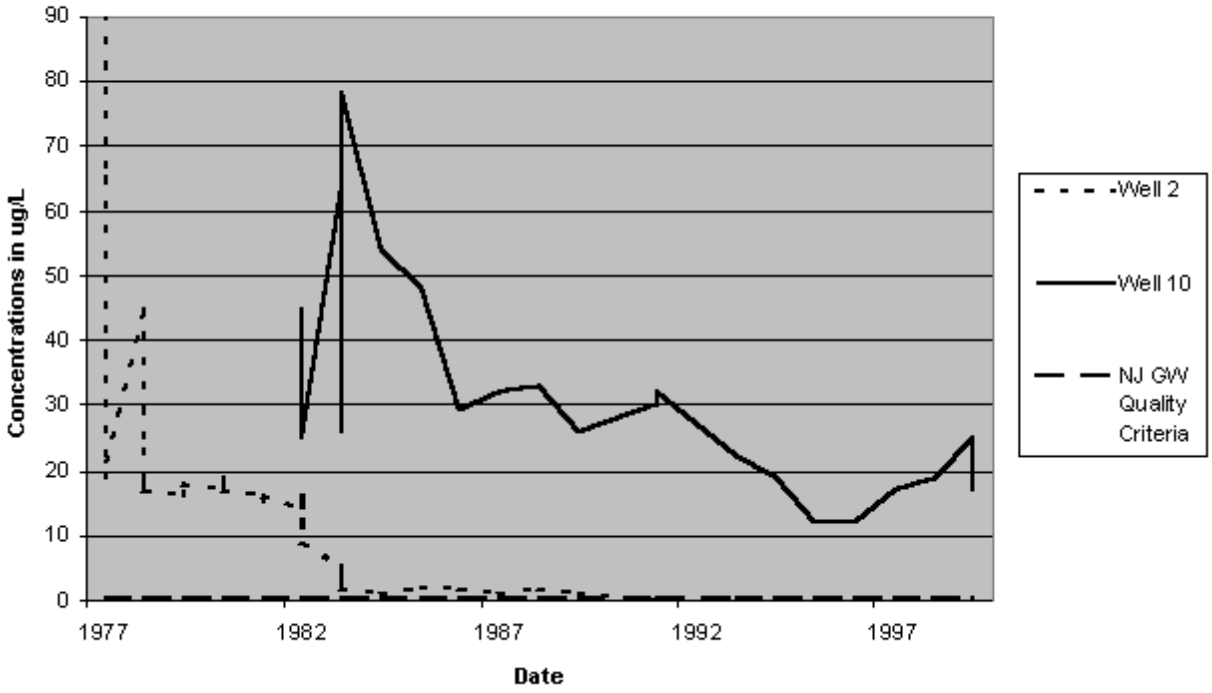
The concentrations of metals reported in groundwater samples from wells screened in the terminal moraine and outwash deposits are below the N.J. Groundwater Quality Standards with the exception of total chromium. The concentrations of total chromium ranged from nondetectable to 466 ug/L (Well 17S). Is should be noted that chromium was not detected in filtered samples (for dissolved concentrations). Therefore, it appears that the chromium is sorbed to the suspended particles in the samples. Groundwater at the site has not been analyzed for metals since the 1991 RI.

As part of the 1991 Remedial Investigation multiple groundwater analysis were conducted. Slug test results indicate that the terminal moraine has an estimated hydraulic conductivity that ranges from .02 to 31 gallons per day per square foot. Based on the average hydraulic conductivity of 8.47 gpd/ft^2, a hydraulic gradient of 0.016 ft/ft, and an effective porosity of 35 percent, groundwater travels at an approximate rate of 0.05 ft/day in the terminal moraine. The predominant VOCs detected in the terminal moraine deposit, in order of decreasing concentrations, include carbon tetrachloride, chloroform, trichloroethene, 1,1-dichloroethane, and 1,2-dichloroethane. The potential for compounds to migrate within this deposit is limited due to the poor transmissive properties of the terminal moraine and due to the retardation coefficients of the compounds.

Water levels measured in wells at the site indicate that the horizontal direction of groundwater flow in the terminal moraine and the outwash deposit is eastward and parallel to the boundary between AlliedSignal and the Morris County Golf Club (Reference No. 1, Vol. I) (see Attachment 2). Water levels measured in wells screened in the terminal moraine and outwash deposits indicate that the vertical component of groundwater flow between the two deposits is upward from the outwash deposit to the terminal moraine in many areas across the site. This vertical flow occurs because groundwater in the outwash deposit is under confined or semi-confined conditions. This vertical flow varies across the site due to surface water infiltration and localized groundwater pumping. Generally, however, the vertical component of groundwater flow plays an insignificant role in contaminant migration at the site because of the general upward flow and the capture zone of Well 10.

Routine groundwater monitoring has been conducted since 1976. Contaminated groundwater from Well 2 was recovered from 1976 to 1993. In 1981, a second well (Well 10) was installed to reduce the pumping rate required from Well 2, and to ensure containment of VOCs within site boundaries and maximize the recovery of VOCs. Both Wells 2 and 10 were pumped continuously at a total rate of between 300 to 400 gallons per minute (gpm), and discharged to the county storm sewer in accordance with New Jersey Pollutant Discharge Elimination System (NJPDES) Permit No. NJOO31305. From 1980 to 1984, the carbon tetrachloride concentrations in Well 2 decreased as a result of pumping Well 10. Carbon

Figure 1
Carbon Tetrachloride Concentrations in Wells 2 and 10



tetrachloride concentrations in Well 10 initially rose to 90 ug/L, then declined to about 25.38 ug/L, which is the current level. Well 2 was shut down on March 23, 1993 with NJDEP approval and pumping at Well 10 continues. The NJDEP approval was based on two consecutive rounds of nondetectable levels of contaminants in Well 2. Figure 1 shows the declining concentrations of carbon tetrachloride in Wells 2 and 10. To date, the impacted groundwater has not required treatment in order to comply with the discharge permit (Reference No. 4).

A capture zone analysis was conducted as part of the 1991 Remedial Investigation in order to determine the effective radius of Wells 2 and 10. According to the results of the analysis, the capture zone of Wells 2 and 10 extended approximately 315 ft downgradient of Well 2. Based on the results of the capture zone analysis and the easterly direction of groundwater flow, the VOCs detected in the terminal moraine and outwash deposits were being contained within the site boundaries. The capture zone generated by the pumping of Well 10 alone extended approximately 280 ft downgradient of Well 10 (see Attachment 2).

This capture zone was sufficient to contain VOCs in the southeastern portion of the site within site boundaries. This conclusion is supported by the absence of VOCs above New Jersey Groundwater Quality Standards in Well 18D, which is downgradient from Well 10. Attachment 5, a data table of the September 26, 1994 to the May 30, 2000 groundwater sampling events, provides a summary of historical and current groundwater concentrations at the AlliedSignal site.

Based on the results of the capture zone analysis of Wells 2 and 10 AlliedSignal demonstrated that Well 10 provides hydraulic control of the on-site contaminated groundwater. NJDEP reviewed analytical data concerning Well 2 and granted AlliedSignal approval to shut down the recovery well in 1993. Additionally, sampling results from the semi-annual groundwater monitoring show stability in contaminant levels in the monitoring wells that are part of the semi-annual groundwater monitoring program. Based on the effective groundwater extraction system and the annual groundwater sampling it appears that the migration of contaminated groundwater has stabilized. Therefore, it appears, based upon the current information available, that the current monitoring and extraction program in place is sufficient to control the migration of contaminant to off-site locations. It also appears that contaminant levels in groundwater have been stabilized.

References:

(1) Remedial Investigation Conducted at the AlliedSignal Inc. Facility, Morris Township, New Jersey, Prepared by Geraghty & Miller, Inc.–October 1991.

(2) Letter from David A. Paley, Manager, to Gerald M. Hahn, Bureau of Federal Case Management, Re: AlliedSignal Morris Township Center Site, Well 2 Shutdown Monitoring Program–January 14, 1994.

(3) Letter from David A. Paley, Manager, to Gerald M. Hahn, Bureau of Federal Case Management, Re: AlliedSignal Morris Township Center Site, Well 2 Shutdown Monitoring Program–March 4, 1994.

(4) Letter from Gerald M. Hahn, Bureau of Federal Case Management, to David A. Paley, Manager, Re: AlliedSignal Inc., Morris Township, Morris County, Well #2 Shutdown monitoring program–March 16, 1994.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

___ If yes - continue after identifying potentially affected surface water bodies.

_X_ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination"does not enter surface water bodies.

___ If unknown - skip to #8 and enter "IN" status code.

Surface Water:

Surface water bodies in the vicinity of the AlliedSignal site include Black Brook, approximately 1 mile to the east, and Black Meadow Swamp, approximately 1 mile to the southeast. Based on the average depth to groundwater at the facility (> 40 feet) and the location of these surface water bodies, contaminated groundwater does not enter surface water bodies. This assumption is based on AlliedSignal's compliance with NJPDES Permit No. NJ0031305. The NJPDES Permit gives AlliedSignal permission to discharge extracted groundwater, non-contact cooling water, cooling tower and boiler blowdown, and storm water runoff to Black Brook in accordance with effluent conditions and monitoring requirements set forth in the permit.

References:

(1) Remedial Investigation Conducted at the AlliedSignal Inc. Facility, Morris Township, New Jersey, Prepared by Geraghty & Miller, Inc.–October 1991.
(2) Feasibility Study AlliedSignal Inc. Site, Morris Township, New Jersey, Prepared by Geraghty & Miller, Inc.–January 1994.
(3) Letter from Robert Savarese, Supervisor, to Carol Graubart, Bureau of Federal Case Management, Re: Renewal of NJPDES Permit No. NJ0031305–June 21, 1994.

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or ecosystems at these concentrations)?

___ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[3] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgement/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or ecosystem.

___ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[3] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

___ If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

This question is not applicable. See response to question #4.

[3] As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or ecosystems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

___ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site=s surface water, sediments, and ecosystems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment[5], appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialist, including an ecologist) adequately protective of receiving surface water, sediments, and ecosystems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

___ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or ecosystem.

___ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

This question is not applicable. See response to question #4.

---

[4] Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface waterbodies.

[5] The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

_X_ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

___ If no - enter "NO" status code in #8.

___ If unknown - enter "IN" status code in #8.

Rationale:

In a letter dated March 16, 1994, NJDEP stated that AlliedSignal shall maintain the operation of recovery Well 10 indefinitely or until the affected groundwater achieves acceptable standards in accordance with current statutes and regulations. AlliedSignal will continue groundwater sampling and analysis of the existing monitoring and recovery system at a frequency of every six months unless NJDEP determines that alteration is necessary. The current groundwater monitoring program includes the sampling of wells 9R, 10, 12, 18D, and 17S.

AlliedSignal should continue semi-annual monitoring and include potentiometric surface maps in the groundwater monitoring reports. The potentiometric surface maps should be prepared using water level data from all wells and the operational status of productions wells an irrigation wells should be included in the reports.

References:

(1) Letter from Gerald M. Hahn, Bureau of Federal Case Management, to David A. Paley, Manager, Re: AlliedSignal Inc., Morris Township, Morris County, Well #2 Shutdown monitoring program–March 16, 1994.

8. Check the appropriate RCRIS status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

_X_ YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the AlliedSignal Inc. Facility, EPA ID #NJD048794986, located at Columbia Road and Park Avenue in Morris Township, Morris County, New Jersey. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

___ NO - Unacceptable migration of contaminated groundwater is observed or expected.

___ IN - More information is needed to make a determination.

Completed by: __original signed by_____ Date: 09/25/00

Keith Zielenski
Geologist
Booz Allen & Hamilton

__original signed by_____ Date: 09/21/00

Patricia Shanley
Geologist
Booz Allen & Hamilton

Reviewed by: __original signed by_____ Date: 09/25/00

Greg Starkebaum, P.E.
Civil Engineer
Booz Allen & Hamilton

__original signed by_____ Date: 09/27/00

Clifford Ng, RPM
RCRA Programs Branch
EPA Region 2

__original signed by_____ Date: 09/27/00

Barry Tornick, Section Chief
RCRA Programs Branch
EPA Region 2

Approved by: __original signed by_____ Date: 09/28/00

Raymond Basso, Chief
RCRA Programs Branch
EPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at the USEPA Region 2, RCRA Records Center, located at 290 Broadway, 15th Floor, New York, New York, and the New Jersey Department of Environmental Protection Office located at 401 East State Street, Records Center, 6th Floor, Trenton, New Jersey.

Contact telephone and e-mail numbers: Clifford Ng, EPA RPM
(212) 637-4113
ng.clifford@epa.gov

Attachments

The following attachments have been provided to support this EI determination.

Attachment 1 - SWMU/AOC Map (taken from the Administrative Consent Order, November 2, 1989).

Attachment 2 - Location of Existing Wells, Well 10 Capture Zone, Groundwater Flow Direction, and Areas of Soil Contamination.

Attachment 3 - Contaminant Concentration Map 1991

Attachment 4 - Well Construction Details

Attachment 5 - Summary of Media Impacts Table

Attachment 6 - May 30, 2000 Semi-Annual Groundwater Monitoring Results

Attachments truncated, see facility file (MSS, 06/17/02)