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

Facility Name: ATOFINA Chemicals (formerly Pennwalt Corporation)
Facility Address: 100 South Street, Holmdel, NJ 07733
Facility EPA ID#: NJD052788528

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 EIs 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 objectives of the RCRA Corrective Action program, the EIs 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

The ATOFINA Chemicals (ATOFINA) site, formerly known as the Pennwalt Corporation site, is located on approximately 117 acres in east central New Jersey. The site was used as a produce farm until 1950 when Bendix Corporation developed the land for manufacturing semiconductors. In 1971, the property was transferred to the S.S. White Division of the Pennwalt Corporation for use in manufacturing dental equipment, instruments, and supplies. Manufacturing operations ceased in 1983, and the facility was decommissioned in 1985. In 1990, Pennwalt Corporation became Elf Atochem North America. Elf Atochem North America subsequently became ATOFINA Chemicals in June 2000. The main plant and outbuildings, which occupy most of the central portion of the site, remain vacant to date. The northern and southern portions of the site are currently being used for agricultural purposes, and the western end of the property is used by the township for athletic events. Adjacent land use is primarily undeveloped or residential. The site is bordered to the south and southwest by Willow Brook; flow in the brook is to the southeast toward the Swimming River Reservoir. A natural freshwater pond, called East (Fire) Pond, is located on site along the property line east-northeast of the Main Building Area.

Resource Conservation and Recovery Act (RCRA) units at the site are limited to two underground waste solvent tanks and two hazardous waste container storage areas. Although not used for storage of petroleum products, and therefore not typically considered RCRA underground storage tanks (USTs), the two waste solvent tanks are designated as UST-1 and UST-2. The hazardous waste units were operated under interim status until they were taken out of service in 1987 and 1988. The New Jersey Department of Environmental Protection (NJDEP) approved formal RCRA closure for these units on December 19, 1989.

Environmental investigation of the ATOFINA site was initiated in 1986 under the NJDEP Environmental Cleanup and Responsibility Act (ECRA). Between 1986 and 1990, remedial activities were implemented at various areas of environmental concern (AECs). Approximately 2,000 cubic yards of soil were excavated and removed from the site due to contamination by chlorinated solvents, primarily trichloroethene (TCE). A number of subsequent investigation efforts have been implemented at the ATOFINA site to evaluate groundwater and soil beneath two specific AECs (UST-2 and Firing Range areas), which are the only two remaining concerns at this site. Because groundwater contamination remains above the New Jersey Ground Water Quality Criteria (NJ GWQC), groundwater Classification Exception Areas (CEAs) and Well Restriction Areas (WRAs) are currently being finalized for all appropriate portions of the site and downgradient areas. Aggressive remedial strategies to remediate groundwater at the site are planned for Summer 2002.

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 Historical Operations and AECs: Twenty-seven AECs were identified at the site during various investigation activities. Nineteen of these AECs were subsequently closed due to completed remedial action and/or further investigation efforts indicating that no further actions were required. The available documentation indicates that NJDEP approved no further action determinations for these AECs (Refs. 3, 6, 7, 8, 9, and 10). A small amount of additional soil investigation and remediation were required by NJDEP at six AECs (Ref. 3), but the available documentation does not provide additional details regarding investigation, remedial action, and closure at these AECs. However, considering that these AECs have not been included in recent NJDEP correspondence or NJDEP-approved investigation and remedial activities, these six AECs are assumed to have been addressed and subsequently closed. Hence, there are only two remaining AECs at the site: the UST-2 Area and the Firing Range Area. Refer to Figure 1-2 of the April 2002 Groundwater Monitoring Report for a map showing the AEC locations at the ATOFINA site (Ref. 13).

UST-2 Area: This AEC addresses the former location of a 7,500-gallon concrete solvent waste tank in the west central portion of the site. While in use, the tank received chlorinated solvents and wastewater from sinks and floor drains in the southwestern portion of the Main Building. The tank was removed from the site in accordance with RCRA requirements in August 1987. NJDEP approved the closure in December 1989.

Groundwater monitoring in the UST-2 Area has been ongoing since 1987. Dissolved volatile organic compounds (VOCs) in groundwater have long been attributed to historic discharges from UST-2. However, while attempting to define the upgradient plume edge in 1999, ATOFINA discovered even greater VOC concentrations upgradient of the former tank excavation area and beneath the Main Building, indicating the presence of another previously unidentified contamination source area. Soil samples collected later in 1999 indicate very localized contaminated areas beneath the southwestern corner of the Main

Building and at the base of the former tank excavation, where residual tetrachloroethene (PCE) concentrations exceed New Jersey Impact to Groundwater Soil Cleanup Criteria (NJ IGWSCC). VOCs were not reported in soil beneath other areas of the Main Building (e.g., the former plating area, laboratory area, or hallway sump area). Construction records from 1970 indicate that an area of contaminated soil may have been present near the rear wall of the original building (approximately 30 feet north of the current front wall), and that the impacted soil may have been removed as part of the grading and building expansion effort (Ref. 11). Soil in the suspected former source area will be further evaluated when and if the Main Building is demolished for redevelopment of the property. Groundwater samples collected in 1999 show PCE present at the highest concentration in the well installed inside the southwestern corner of the building (MW-103), and TCE present at the highest concentration in the well installed near the center of the building at the former plating and laboratory area (MW-104).

Firing Range Area: This AEC, historically used by local police for target practice and currently used for farming, is located approximately 1,500 feet southeast of the Main Building. Based on an NJDEP-approved Cleanup Plan, approximately 1,500 cubic yards of impacted soil were removed from the Firing Range Area in 1989. The excavation extended to a depth of 15 to 20 feet below ground surface (bgs), where groundwater was first encountered. To stabilize the steep slope and control erosion, approximately 130 linear feet of steel shoring was installed along the southern edge of the AEC. The shoring was advanced to a depth of approximately 30 feet, and was keyed into the underlying clay unit at 25 feet bgs (Ref. 11). Two large-scale groundwater pumping and off-site disposal events were also conducted immediately following the excavation. NJDEP approved the completed soil and groundwater remedial actions in a compliance letter dated October 5, 1990. Although soil is no longer a concern at the Firing Range Area, dissolved VOCs in groundwater continue to be reported above the NJ GWQC. ATOFINA contends that the combination of steel and clay effectively eliminates horizontal or vertical groundwater flow away from the Firing Range Area (Ref. 7).

Groundwater: The groundwater of primary concern at the ATOFINA site is found in two water-bearing zones of the Navesink Formation. A shallow water table aquifer is encountered beneath the site in silty sand, sandy silt, and clay strata at approximately 15 feet bgs. A deeper aquifer is first encountered in similar strata at approximately 30 to 35 feet bgs. The two units are separated by an aquiclude of clay and silt. Groundwater flow direction in the shallow water table aquifer varies across the site. In the Firing Range Area, shallow groundwater flows southeast toward the steel shoring installed as part of a previous remedial action, Willow Brook, and wetlands areas. In the UST-2 Area, flow is southwestward toward Willow Brook. Beneath the Main Building, shallow groundwater flows south, southeast, and southwest. Horizontal flow velocity has been reported at approximately 20 to 40 feet per year in the shallow

water table aquifer (Refs. 4, 5). Groundwater movement in the deeper Navesink aquifer is to the south beneath the entire site. VOCs have been detected above NJ GWQC at both AECs in both the shallow and deep Navesink aquifer. The Magothy Formation, at a depth of over 350 feet bgs, is also present beneath the site and serves as the principal aquifer for groundwater supply in this area. Considering that the estimated vertical extent of groundwater contamination is 65 feet bgs (Ref. 13), the Magothy Formation is not expected to be impacted by VOCs at this time.

A downward vertical gradient has been observed beneath most of the site, reported at 0.46 in the UST-2 Area and 1.40 in the Firing Range Area (Ref. 2). Nevertheless, sentinel wells closest to Willow Brook in the Firing Range Area, including deeper well FRSW-3, exhibit upward flow and artesian conditions (Ref. 4). ATOFINA contends that both shallow and deeper groundwater in the Navesink aquifer discharge completely into Willow Brook (Ref. 5), with the surface water body thereby acting as a barrier to lateral contaminant migration in groundwater.

References:

1. Letter from Kenneth Hart, NJDEP, to Sam Balamoun, Atochem North America. Re: Cleanup Plan (Full Compliance). Dated October 5, 1990.

2. Hydrogeologic Investigation and Public Health and Environmental Assessment. Prepared by Groundwater Technology and Environmental Liability Management. Dated January 1991.

3. Letter from Dawn Pompeo, NJDEP, to Peter Sacripanti, Sherman and Sterling. Re: Pennwalt Corporation (Negative Declaration and Additional Sampling Requirements). Dated March 5, 1991.

4. Revised Natural Remediation Compliance Work Plan for the Former S.S. White Facility, Holmdel, New Jersey. Prepared by Groundwater Technology. Dated April 23, 1993.

5. Progress Report of Remedial Investigation at the Elf Atochem North America Facility. Prepared by Groundwater Technology. Dated December 1994.

6. Letter from Stephen Maybury, NJDEP, to Gary Shelby, Elf-Atochem North America Inc. Re: Progress Report of Remedial Investigation and Site Investigation Report. Dated September 19, 1995.

7. Letter from Stephen Maybury, NJDEP, to Gary Shelby, Elf-Atochem North America Inc. Re: Underground Storage Tank (UGST) Closure Plan Approval Application for Closure. Dated Jan 16, 1996.

8. Letter from Stephen Maybury, NJDEP, to Gary Shelby, Elf-Atochem North America Inc. Re: Site Assessment Report and Results of Analysis of Soil Samples for Trivalent and Hexavalent Chromium. Dated August 8, 1996.

9. Remedial Investigation Report and Remedial Action Workplan for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by SECOR International. Dated December 13, 1996.

10. Letter from Stephen Maybury, NJDEP, to Gary Shelby, Elf-Atochem North America Inc. Re: Remedial Investigation Report/Remedial Action Workplan. Dated May 21, 1997.

11. Remedial Investigation Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Sovereign Consulting. Dated February 17, 2000.

12. Remedial Action Workplan for the Firing Range Area. Prepared by Jacques Whitford Company, Inc. Dated March 2001.

13. Ground Water Monitoring Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

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:

As stated previously, VOCs have been detected above NJ GWQC in groundwater beneath both of the remaining AECs. The nature of groundwater contamination in each area is described in the paragraphs below. Although some investigation and hydrogeological concerns were identified during development of this EI determination, NJDEP has determined that all appropriate horizontal and vertical plume delineation efforts have been completed for the UST-2 Area and the Firing Range Area (Refs. 11, 12), and has directed ATOFINA to move forward with remedial action. Nevertheless, to ensure the validity of this determination, all additional groundwater data generated during planned remedial activities and subsequent groundwater monitoring should be evaluated to ensure consistency with the current understanding of the nature and extent of contamination across the site.

UST-2 Area Organic Groundwater Impacts

Groundwater monitoring in the UST-2 Area was initiated in 1987. The most recent area-wide sampling event occurred in May 2000, but a few additional samples were collected from the UST-2 Area in February 2002. Refer to Figure 3-2 of the April 2002 Groundwater Monitoring Report for a monitoring well location map covering the UST-2 Area (Ref. 13). A list of wells in the UST-2 Area is provided in Attachment 2 to this CA750.

PCE, TCE, and related organic contamination have been detected above NJ GWQC in groundwater beneath the UST-2 Area, and approximately 50 feet upgradient of the former tank area beneath the Main Building (Ref. 2). Maximum contaminant concentrations observed in groundwater during the May 2000 sampling event are shown in Table 1 below (Ref. 7).

Table 1. Maximum Groundwater Contaminant Concentrations in UST-2 Area (May 2000)

Constituent	NJ GWQC	Well	Maximum Concentration (µg/L)
1,1-Dichloroethene (DCE)	2	MW-106	9.2
PCE	1	MW-103	1,200
TCE	1	MW-104	398

Temporary and permanent wells have been installed in the former tank excavation area to the south of the Main Building and inside the building (through the floor) in specific former process areas which may have contributed to groundwater contamination. The highest PCE concentration ever detected in groundwater in the UST-2 and Main Building Area (4,230 µg/L) was observed in April 1999 at temporary well SB-15, located along an interior floor drain and process waste line at the southwestern corner of the Main

Building (Ref. 3). The second highest PCE concentration (2,020 µg/L) was also reported in April 1999 at sample location SB-12, downgradient of SB-15, in the former vicinity of UST-2 (Ref. 3). Groundwater samples collected in 2000 (Ref. 7) also showed PCE present at the highest concentration in the well installed inside the southwestern corner of the building (MW-103), and TCE present at the highest concentration in the well installed near the center of the building at the former plating and laboratory area (MW-104). As stated previously, soil in the suspected former source area will be further evaluated when and if the Main Building is demolished for redevelopment of the property; at that time, it may also be appropriate to conduct additional sampling to determine the upgradient extent of groundwater contamination.

While the highest levels of contamination have been observed in the shallow portion of the Navesink aquifer, a localized area within the deeper portion of the aquifer has also been impacted. In May 1999, deep well MW-14 contained PCE above its NJ GWQC at a concentration of 2.5 µg/L (Ref. 4). In May 2000, newly installed deep well MW-107 (screened between 50 and 55 feet bgs) reported PCE and TCE concentrations of 1.5 and 4.6 µg/L, respectively (Ref. 7). In February 2002, well MW-107 showed PCE and TCE concentrations of 15 and 3.3 µg/L, respectively (Ref. 13). Other wells screened across the deeper Navesink aquifer in the UST-2 Area, including downgradient deep well MW-16, do not appear to be impacted at this time. According to a letter from the facility dated May 8, 2002 (Ref. 4), deep well MW-16 has a history of compliance with NJ GWQC.

In order to gauge the vertical extent of groundwater contamination, samples were collected from the shallow/deep nested well pair at MW-103 and MW-107 in February 2002. The comparative results are shown in Table 2 below (Ref. 13).

Table 2. Groundwater Contaminant Concentrations at Wells

MW-103 and MW-107 (February 2000)

Constituent	NJ GWQC	Concentration in Shallow Well MW-103 (µg/L)	Concentration in Deep Well MW-107 (µg/L)
Vinyl Chloride	5	11	ND
1,1-Dichloroethene	2	4.3	ND
PCE	1	840	15
TCE	1	190	3.3

Based on these results and the assumption that concentrations decrease linearly with depth, ATOFINA has estimated that COC concentrations drop below the applicable NJ GWQCs within one foot of the bottom of well MW-107. However, to be conservative, the maximum depth of groundwater impacts above NJ GWQC is assumed to be 65 feet bgs (Ref. 13).

UST-2 Area Inorganic Groundwater Impacts

Lead, mercury, nickel, and selenium were detected in groundwater samples collected from temporary wells advanced within the main plant building at the UST-2 Area in October 1999. ATOFINA attributed the elevated metals concentrations to high turbidity in the samples. To confirm this assessment and verify that actual metals concentrations in the area were below applicable NJ GWQC, nearby monitoring well MW-104 was sampled for total and dissolved metals in February 2002. Low-flow sampling techniques were used to minimize sample turbidity. Results presented in the Groundwater Monitoring Report from April 2002 (Ref. 13) indicated no exceedances of the Class II-A NJ GWQC for metals. During a meeting between NJDEP and facility representatives, it was agreed that if the results of this resampling effort were below NJ GWQC or naturally occurring background levels, metals in groundwater would no longer be considered an issue for the ATOFINA site (Ref. 12). Consequently, lead, mercury, nickel, and selenium have been eliminated as constituents of concern for groundwater (Ref. 13).

Firing Range Area Organic Groundwater Impacts

Since source removal was completed in 1989, 21 groundwater monitoring events have been conducted in the Firing Range Area. PCE, TCE, and related VOCs have long been reported in shallow groundwater beneath this area. The most recent area-wide sampling event occurred in August 1999. Refer to Figure 3- of the April 2002 Groundwater Monitoring Report for a monitoring well location map covering the Firing Range Area (Ref. 13). A list of wells in the Firing Range Area is provided in Attachment 2 to this CA750.

Maximum contaminant concentrations observed in groundwater during this sampling event are shown in Table 3 below. As indicated by these results, the area of greatest impact in shallow groundwater is located at well FRMW-E in the center of the Firing Range Area, just north and upgradient of the steel shoring (also shown in Figure 1-3 to Ref. 13). Nearby well FRMW-D is also situated within the suspected contamination source area.

Table 3. Maximum Groundwater Contaminant Concentrations in Firing Range Area (August 1999)

Constituent	NJ GWQC	Well	Maximum Concentration (µg/L)
cis-1,2-Dichloroethene	70	FRMW-E	122
PCE	1	FRMW-E	32.1
TCE	1	FRMW-E	389
Vinyl Chloride	5	FRSW-2	5.1

Deep well FRMW-H was installed in the Firing Range source area to assess the possibility of vertical contaminant migration. Three sampling rounds conducted in 1996 showed VOC concentrations in deeper Navesink groundwater in this area to be below NJ GWQC. Well FRMW-H is no longer being monitored because of the lack of earlier detections and because hydrogeological investigation results show that the underlying clay layer, with "negligible" permeability, significantly restricts vertical contaminant migration (Ref. 1). Historic monitoring of deep wells FRMW-1, FRSW-3, and FRSW-5 (located outside of the main source area at the Firing Range) further confirms that the deeper water-bearing unit has not been impacted. Although NJDEP previously requested advancement of at least one additional deep well upgradient of the steel shoring in this area (Ref. 5), the regulators appear to have abandoned this requirement and now consider vertical contaminant delineation to be complete in the Firing Range Area (Ref. 12).

References:

1. Remedial Investigation Report and Remedial Action Workplan for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by SECOR International. Dated December 13, 1996.

2. Letter from Gary Shelby, Elf Atochem North America, to Sharon Simmons Bruder, NJDEP. Re: Remedial Investigation Report and Response to NJDEP Correspondence. Dated August 9, 1999.

3. Remedial Investigation Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Sovereign Consulting. Dated February 17, 2000.

4. Letter from Gary Shelby, Elf Atochem North America, to Sharon Simmons Bruder, NJDEP. Re: Response to E-Mail from NJDEP Dated April 26, 2000. Dated May 8, 2000.

5. Letter from John Graham, NJDEP, to Gary Shelby, ATOFINA Chemicals. Re: Remedial Action Progress Report dated June 2, 1999. Dated August 28, 2000.

6. Remedial Action Workplan for the Firing Range Area. Prepared by Jacques Whitford Company, Inc. Dated March 2001.

7. Letter from John Roberts, Jacques Whitford Company, Inc., to Gary Shelby, ATOFINA Chemicals. Re: Vertical Delineation Well MW-107. Dated May 31, 2001.

8. Letter from John Roberts, Jacques Whitford Company, Inc., to Gary Shelby, ATOFINA Chemicals. Re: UST-2 Area Delineation Wells Installation/Supplemental Sampling. Dated November 8, 2001.

9. Letter from John Graham, NJDEP, to Gary Shelby, Elf Atochem North America. Re: Remedial Action Workplan Dated March 2001. Dated November 19, 2001.

10. Baseline Ecological Evaluation for the Former S.S. White Facility, Holmdel, New Jersey. Prepared by AMEC Earth & Environmental, Inc. Dated January 2002.

11. Letter from John Graham, NJDEP, to Gary Shelby, Elf-Atochem North America Inc. Re: Delineation Well Installation and Supplemental Sampling dated November 8, 2001. Dated January 31, 2002.

12. Letter from Gary Shelby, Elf-Atochem North America Inc, to Sharon Bruder, NJDEP. Re: Summary of February 6, 2002 Meeting and Proposed Schedule of Future Action. Dated February 21, 2002.

13. Ground Water Monitoring Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

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:

NJDEP has determined that groundwater impacts at the ATOFINA site have been fully delineated both horizontally and vertically (Refs. 10, 12), and appropriate fringe and sentinel wells have been identified for monitoring ongoing contaminant migration. A list

of these monitoring wells is provided in Attachment 2 to this CA750. As the investigation efforts draw to a close, ATOFINA is planning for active remediation of groundwater impacts at both the UST-2 Area and Firing Range Area (Ref. 10). Based on an assessment of current data, hydrogeological considerations, NJDEP approvals, EPA direction, interim remedies already in place, proposed follow-on treatment activities, and institutional controls being developed, groundwater contamination appears to be controlled at this time. However, it is recommended that the response to this question be periodically re-evaluated as site conditions change and new data become available.

Contaminant Stabilization in the UST-2 Area

Contaminant concentrations in groundwater at the UST-2 Area do not appear to have consistently or significantly declined since the onset of monitoring in 1987. Instead, wide variations and even some increases have been observed. For example, monitoring events from 1998 indicated PCE concentrations in well MW-2 ranged between 48 and 1,560 µg/L. PCE concentrations in well MW-8 show a steady increase from non-detect in September 1987 to approximately 200 µg/L in February 1999. These variations may be related to a possible continuing source area beneath the Main Building. In addition, NJDEP has determined that VOC concentrations in the UST-2 Area fluctuate conversely with groundwater levels. Specifically, observed concentrations are significantly greater during periods of low water table (e.g., August and November) than during periods of high water table (e.g., February and May). For instance, PCE was reported in well MW-2 at 52 µg/L in April 1999 and at 1,220 µg/L in August 1999 (Ref. 5). For this reason, water table plume maps presented in the Remedial Investigation Report (Figures 5 and 6) depicting results from August 1999 are believed to represent the then-highest contamination levels (Ref. 5).

Despite fluctuating concentrations in the suspected source area, sentinel wells downgradient of the impact areas and closest to Willow Brook have not shown contaminants above NJ GWQC (Refs. 5, 8). Shallow well MW-9 has been clean during each of the last 14 sampling rounds (occurring sporadically between March 1988 and August 1999). Shallow well MW-S was first installed and sampled in November 1995, and has shown non-detect results for all VOCs in all ten of the subsequent sampling rounds (up through August 1999). Recently installed shallow well MW-202 also showed no evidence of VOC contamination when it was sampled in August 2001 (no subsequent samples have been collected). These findings show that, at present, groundwater contamination originating in the UST-2 Area remains fully within the site boundaries.

Future Treatment and Institutional Controls for the UST-2 Area

To address groundwater contamination in the source area, ATOFINA has developed (but not yet submitted) an Interim Remedial Action Selection Report for the UST-2 Area. The preferred remedy for groundwater in the UST-2 Area involves installation of a reactive treatment wall and testing/use of potassium permanganate as the reactant (Ref. 13). A pilot study of this treatment technology is currently scheduled for July 2002, after which a full scale remedial program using this technology may be implemented for the

area. A formal groundwater monitoring program is scheduled to begin in November 2002.

To minimize contact with impacted groundwater until concentrations have dropped below applicable NJ GWQC, ATOFINA submitted an application for establishment of a CEA and WRA over the UST-2 Area (Ref. 15). As proposed, the CEA will extend vertically through the unconsolidated water-bearing zone to a depth of 65 feet bgs, and horizontally from the former source areas beneath and to the west of the main plant building to just beyond downgradient wells MW-9, MW-18, and MW-201. Refer to Exhibit B of the UST-2 Area CEA Application (Ref. 15) for a map showing the affected area. The duration of the CEA is undetermined. NJDEP has encouraged ATOFINA to move forward with implementation of these institutional controls, and the draft is expected to be approved in the near future (Ref. 13).

Contaminant Stabilization in the Firing Range Area

Contamination trends in the Firing Range Area exhibit classic chlorinated solvent degradation patterns (i.e., decreases in parent compound concentrations and increases in decomposition product concentrations). The simultaneous presence of low TCE and vinyl chloride concentrations suggest that the natural breakdown process is in progress at ATOFINA (Ref. 1). In addition to natural attenuation processes, several interim remedial actions have been implemented to date in an attempt to control contaminant migration and reduce COC concentrations in the Firing Range Area. In 1989, approximately 1,500 cubic yards of contaminated soil was removed from the site. Immediately following the excavation, two large-scale groundwater pumping and off-site disposal events were conducted. These efforts were specifically geared toward removing the contaminant source and the most significantly impacted groundwater.

To stabilize the steep slope and control erosion, approximately 130 linear feet of steel shoring was installed along the southern edge of the AEC. The shoring was advanced to a depth of approximately 30 feet, and was keyed into the underlying clay unit at 25 feet bgs (Ref. 7). ATOFINA contends that the combination of steel and clay effectively eliminates horizontal or vertical groundwater flow away from the Firing Range Area (Ref. 2). Although horizontal contaminant migration in the Firing Range Area does appear to be limited by the steel shoring, there is a possibility that VOCs could move eastward along the shoring and, upon reaching the lateral end of the shoring, could eventually migrate downgradient away from the Firing Range Area (Ref. 4). ATOFINA contends that dispersion of VOCs along the ends of the sheet pile is adequately controlled by natural attenuation processes, citing decreases in VOC concentrations in wells FRMW-G and FRP-7 and the absence of contamination in wells FRSW-5 and FRSW-6 in May 1998 to support their contention (Ref. 3).

In 1996, ATOFINA conducted an in-situ oxidation pilot study in the Firing Range Area using Fenton's Reagent as the oxidizer. The pilot test performed in August 1996 resulted in localized VOC mass reductions as shown in Table 4 below (Ref. 7), but only well FRMW-G indicated contaminant reductions by an order of magnitude or greater.

Table 4. Detected Concentrations of VOCs in Groundwater Before and After August 1996 In-Situ Oxidation Pilot Test

Well	FRMW-D		FRMW-E		FRMW-F		FRMW-G	
Sample Date	7/7/96	10/11/96	7/7/96	10/11/96	7/7/96	10/11/96	7/7/96	10/11/96
Total VOCs (µg/L)	342	227	1,911	1,064	379	103	493	4

Overall VOC concentrations in source area wells FRMW-D and FRMW-E have decreased by a total of 97 percent from the highest detected concentrations as a combined result of all implemented remedial actions, pilot tests, and natural attenuation processes to date (Ref. 5).

In addition to monitoring decreasing contaminant concentrations in source area wells, ATOFINA routinely sampled sentinel wells FRSW-1 and FRSW-4 downgradient of the impact areas and closest to Willow Brook. These wells have not been impacted by VOC contaminants above NJ GWQC (Refs. 5, 7). Well FRSW-4 is situated approximately 150 feet directly downgradient and on the opposite side of the steel shoring from the source area at well FRMW-E. Since its installation in 1994, this well has shown non-detect results for all VOCs during eight rounds of sampling (through August 1999), with the exception of one low hit of methylene chloride that was attributed to laboratory contamination. Well FRSW-1 is situated further downgradient of the Firing Range Area and less than 50 feet from Willow Brook. Between November 1994 and August 1999, eight rounds of samples were collected from the well. None of the Firing Range COCs was ever reported, although several hits of methylene chloride and toluene were reported below their applicable NJ GWQC; these results are most likely associated with laboratory contamination, but may need to be further evaluated if they continue to be reported in the well. With the sentinel wells reporting routinely clean samples (in terms of the site-specific COCs), groundwater contamination originating in the Firing Range Area appears to remain fully within the site boundaries.

Future Treatment and Institutional Controls for the Firing Range Area

To further address groundwater contamination in the source area of the Firing Range, ATOFINA submitted plans to expand the in-situ oxidation pilot study (Ref. 7). A monitored natural attenuation program will be implemented after the in-situ treatment efforts are completed. Due to some concerns over the effectiveness of the pilot study and potential negative impacts on the environment resulting from the injections of Fenton's reagent, NJDEP and ATOFINA are currently considering alternative oxidizers (Refs. 6, 13), and a revised Remedial Action Workplan will be submitted to NJDEP for review. As discussed in a meeting with NJDEP, ATOFINA may change the reactant to potassium permanganate (Ref. 13). Pilot studies using this reactant are scheduled to begin in the Firing Range Area in July 2002, after which a full scale remedial program may be

implemented for the area. A formal groundwater monitoring program is scheduled to begin in November 2002.

To minimize contact with impacted groundwater until concentrations have dropped below applicable NJ GWQC, ATOFINA has submitted an application for establishment of a CEA and WRA over the Firing Range Area (Ref. 14). As proposed, the CEA will extend vertically through the Navesink Formation to a depth of 25 feet bgs (just above the aquiclude), and horizontally from the former source areas north of the steel sheet piling to downgradient areas just beyond wells FRSW-2, FRSW-3, FRSW-5, and FRSW-6. Refer to Exhibit B of the Firing Range Area CEA Application (Ref. 14) for a map showing the affected area. The duration of the CEA is undetermined. NJDEP has encouraged ATOFINA to move forward with implementation of these institutional controls, and the draft is expected to be approved in the near future (Ref. 13).

References:

1. Progress Report of Remedial Investigation at the Elf Atochem North America Facility. Prepared by Groundwater Technology. Dated December 1994.

2. Remedial Investigation Report and Remedial Action Workplan for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by SECOR International. Dated December 13, 1996.

3. Letter from Gary Shelby, Elf Atochem North America, to Sharon Bruder, NJDEP. Re: Remedial Action Progress Report. Dated July 27, 1998.

4. Letter from Gary Shelby, Elf Atochem North America, to Sharon Simmons Bruder, NJDEP. Re: Remedial Action Progress Report. Dated November 3, 1998.

5. Remedial Investigation Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Sovereign Consulting. Dated February 17, 2000.

6. Letter from John Graham, NJDEP, to Gary Shelby, ATOFINA Chemicals. Re: Remedial Action Progress Report dated June 2, 1999. Dated August 28, 2000.

7. Remedial Action Workplan for the Firing Range Area. Prepared by Jacques Whitford Company, Inc. Dated March 2001.

8. Letter from John Roberts, Jacques Whitford Company, Inc., to Gary Shelby, ATOFINA Chemicals. Re: UST-2 Area Delineation Wells Installation/Supplemental Sampling. Dated November 8, 2001.

9. Letter from John Graham, NJDEP, to Gary Shelby, Elf Atochem North America. Re: Remedial Action Workplan Dated March 2001. Dated November 19, 2001.

10. Letter from Gary Shelby, Elf Atochem North America, to Sharon Bruder, NJDEP. Re: Delineation Well Installation and Supplemental Sampling. Dated November 26, 2001.

11. Baseline Ecological Evaluation for the Former S.S. White Facility, Holmdel, New Jersey. Prepared by AMEC Earth & Environmental, Inc. Dated January 2002.

12. Letter from John Graham, NJDEP, to Gary Shelby, Elf-Atochem North America Inc. Re: Delineation Well Installation and Supplemental Sampling dated November 8, 2001. Dated January 31, 2002.

13. Letter from Gary Shelby, Elf-Atochem North America Inc, to Sharon Bruder, NJDEP. Re: Summary of February 6, 2002 Meeting and Proposed Schedule of Future Action. Dated February 21, 2002.

14. Classification Exception Area Application for the Firing Range Area of the Former S.S. White Facility, Holmdel, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

15. Classification Exception Area Application for the UST-2 Area of the Former S.S. White Facility, Holmdel, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

16. Ground Water Monitoring Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

17. Letter from John Graham, NJDEP, to Gary Shelby, Elf Atochem North America, Inc. Re: Baseline Ecological Evaluation. Dated April 11, 2002.

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.

Rationale:

Groundwater beneath the ATOFINA site flows southward and southwestward toward Willow Brook. Because Willow Brook is considered a "gaining" stream in the area of the ATOFINA site, the potential exists for impacted groundwater from the Firing Range and UST-2 Areas to discharge to surface water. This determination is supported by upward trending groundwater contour lines near the brook and in surrounding wetlands areas, along with artesian flow conditions in wells closest to Willow Brook. According to the NJDEP-approved Baseline Ecological Evaluation (BEE) (Ref. 1), groundwater in the Navesink aquifer discharges to the surface water body rather than flowing beneath it. For this reason, Willow Brook would be expected to serve as a hydraulic barrier to lateral contaminant migration should any groundwater contamination reach that point before dropping below applicable NJ GWQC.

Sentinel wells installed between known impact areas and Willow Brook have shown no contamination above applicable screening levels, making the discussion of surface water discharge fairly moot at this time. (Wells specifically designated as sentinel wells for the ATOFINA site include MW-S, MW-9, and MW-202 in the UST-2 Area and FRSW-1 and FRSW-4 in the Firing Range Area). Because the sentinel wells have not yet been impacted, groundwater currently being discharged from the site into Willow Brook is not considered contaminated. Furthermore, surface water samples collected from Willow Brook in 1990 indicated no evidence of contamination by organic compounds or petroleum hydrocarbons. Ongoing monitoring will be conducted, as discussed in the response to Question 7, to ensure that any changing environmental conditions are appropriately addressed.

References:

1. Baseline Ecological Evaluation for the Former S.S. White Facility, Holmdel, New Jersey. Prepared by AMEC Earth & Environmental, Inc. Dated January 2002.

2. Ground Water Monitoring Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

3. Letter from John Graham, NJDEP, to Gary Shelby, Elf Atochem North America, Inc. Re: Baseline Ecological Evaluation. Dated April 11, 2002.

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:

Question not applicable. See response to Question #4.

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:

Question not applicable. See response to Question #4.

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:

As stated previously, although somewhat sporadic, there is a long history of groundwater monitoring at the two remaining ATOFINA AECs. In a letter to the facility dated November 19, 2001, NJDEP outlined minimum requirements for continued monitoring of groundwater quality beneath the ATOFINA site (Ref. 1). Groundwater beneath the UST-2 Area would be sampled on a semi-annual basis until appropriate remedial actions are selected and/or implemented. Depending on the remedy selected, quarterly groundwater monitoring may resume at some point in the future. Groundwater beneath the Firing Range Area would continue to be sampled on a quarterly basis. NJDEP has requested that, at minimum, the wells in Table 5 below should be included in the ongoing monitoring program. These wells cover both shallow and deep portions of the Navesink aquifer, as indicated in Attachment 2 to this CA750 determination.

Table 5. Wells in UST-2 and Firing Range Areas

UST-2 Area Wells	Firing Range Area Wells
MW-C, MW-2, MW-7, MW-8, MW-16, MW-18, MW-101, MW-103, MW-104, MW-105, MW-106, MW-107, MW-108, MW-109	FRMW-2, FRMW-D, FRMW-E, FRMW-F, FRMW-G, FRP-4, FRP-7, FRSW-1, FRSW-2

Because metals were eliminated as constituents of concern for the ATOFINA site based on the most recent round of sampling at MW-104 (Ref. 3), the samples from the wells listed above will only need to be analyzed for VOCs (VO+10 compounds).

During a subsequent meeting between NJDEP and facility representatives, it was agreed that the groundwater monitoring program will begin in November 2002 (Ref. 2, Attachment 1). ATOFINA is in the process of developing detailed plans for meeting NJDEP's stated groundwater monitoring requirements. A specific proposal will be issued as part of the revised Firing Range Remedial Action Workplan or the planned interim action in the UST-2 Area (Ref. 2). In addition, monitoring conducted in association with the groundwater remediation efforts scheduled to begin in July 2002 may also provide further information on current environmental conditions at the site and should be evaluated for consistency with current information.

References:

1. Letter from John Graham, NJDEP, to Gary Shelby, Elf Atochem. Re: Remedial Action Workplan dated March 2001. Dated November 19, 2001.

2. Letter from Gary Shelby, Elf Atochem, to Sharon Bruder, NJDEP. Re: Summary of February 6, 2002 Meeting and Proposed Schedule of Future Action. Dated February 21, 2002.

3. Ground Water Monitoring Report for the Former S.S. White Facility, Holmdel, Monmouth County, New Jersey. Prepared by Jacques Whitford Company, Inc. Dated April 2002.

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 ATOFINA Chemicals (formerly Pennwalt) site, EPA ID #NJD052788528, located at 100 South Street, Holmdel, 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 if 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: _____ Date:_____
Michele Benchouk
Engineering Consultant
Booz Allen Hamilton

Reviewed by: _____ Date: _____
Connie Crossley
Consultant
Booz Allen Hamilton

Also reviewed by: _____ Date: _____
Clifford Ng, RPM
RCRA Programs Branch
EPA Region 2

_____ Date: _____
Barry Tornick, Section Chief
RCRA Programs Branch
EPA Region 2

Approved by: Original signed by: Date: 9/30/2002
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:

USEPA Region 2
RCRA Records Center
290 Broadway, 15th Floor
New York, New York

and

NJDEP Office
Records Center, 6th Floor
401 East State Street,
Trenton, New Jersey

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

Attachments

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

* Attachment 1 - Summary of Media Impacts Table
* Attachment 2 - List of ATOFINA Monitoring Wells

Attachment 1 - Summary of Media Impacts Table
ATOFINA Chemicals, 100 South Street, Holmdel, NJ 07733

AEC	GW	Air (indoors)	Surface soil	Surface water	Sediment	Subsurface soil	Air (outdoors)	Corrective Action Measure	Key contaminants
UST-2 Area	Yes	No	No	No	No	Yes	No	* NFA for soil until building is demolished * CEA/WRA * In-situ groundwater remediation using potassium permanganate is planned for Summer 2002.	PCE (Soil and GW), 1, 1-DCE, cis-1,2-DCE, TCE, vinyl chloride
Firing Range Area	Yes	No	No	No	No	No	No	* Sheet piling installed * CEA/WRA * In-situ groundwater remediation using potassium permanganate is planned for Summer 2002.	cis-1,2-DCE, PCE, TCE, vinyl chloride

Attachment 2 -List of Monitoring Wells

ATOFINA Chemicals, 100 South Street, Holmdel, NJ 07733

UST-2 Area Monitoring Wells

Well	Approximate Location	Date Installed	Depth	Screen Interval (ft bgs)	Notes
MW-1	upgradient	7/15/87	shallow	5-20	Apparently no longer being sampled
MW-2	downgradient	7/14/87	shallow	7-22	Impacted; PCE above NJ GWQC; co-located with deep well MW-14
MW-3	cross-gradient	7/14/87	shallow	7-22	Apparently no longer being sampled
MW-4	upgradient	7/13/87	shallow	5-20	Apparently no longer being sampled
MW-5	upgradient	8/19/87	shallow	5-20	Apparently no longer being sampled
MW-6	far upgradient	8/19/87	shallow	5-20	Apparently no longer being sampled

MW-7	upgradient or source area	8/20/87	shallow	2-18	Only PCE detected in 2000; below NJ GWQC
MW-8	downgradient	8/21/87	shallow	8-23	Impacted; downgradient of well MW-2; PCE and TCE above NJ GWQC
MW-9	sentinel	8/20/87	shallow	10-25	Clean; downgradient of well MW-101
MW-10	downgradient	2/17/88	shallow	8-23	Clean; co-located with deep well MW-16
MW-11	downgradient	2/17/88	shallow	8-23	Clean
MW-12	cross-gradient	2/17/88	shallow	5-20	Apparently no longer being sampled
MW-13	cross-gradient	2/16/88	shallow	5-20	Apparently no longer being sampled
MW-14	downgradient	2/18/88	deep	29-34	Impacted; immediately downgradient of MW-107
MW-15	cross-gradient	2/18/88	deep	37-42	Apparently no longer being sampled
MW-16	downgradient	2/15/88	deep	36-41	Clean; downgradient of observed deep well impacts
MW-17	cross-gradient	2/11/88	deep	39-44	Apparently no longer being sampled No longer being sampled
MW-18	downgradient	10/28/92	shallow	10-25	Impacted; several COCs above NJ GWQC
MW-101	downgradient	unknown	shallow	unknown	Impacted; downgradient of well MW-8; PCE above NJ GWQC
MW-102	upgradient	unknown	shallow	unknown	Apparently no longer being sampled
MW-103	source area	7/19/99	shallow	5-20	Impacted; center of suspected source area; several COCs above NJ GWQC
MW-104	source area	7/20/99	shallow	5-20	Impacted; within suspected source area; several COCs above NJ GWQC
MW-105	downgradient	7/21/99	shallow	5-20	Impacted previously with TCE above NJ GWQC; clean in 2000
MW-106	source area	7/23/99	shallow	5-20	Impacted; within suspected source area; several COCs above NJ GWQC
MW-107	source area	5/4/00	deep	50-55	Impacted; immediately below suspected former source area; PCE and TCE above NJ GWQC
MW-108	upgradient	5/8/00	shallow	10-20	Clean in 2000
MW-109	cross-gradient	5/5/00	shallow	10-20	All detections below NJ GWQC
MW-201	fringe	8/9/01	shallow	9-19	Impacted; TCE slightly above NJ GWQC
MW-202	sentinel	8/9/01	shallow	2-12	Clean; close to Willow Brook
MW-A	cross-gradient	1/18/90	shallow	5-20	Apparently no longer being sampled
MW-B	cross-gradient	1/18/90	shallow	5-20	Apparently no longer being sampled
MW-C	downgradient	1/18/90	shallow	3-18	Impacted; TCE above NJ GWQC
MW-S	sentinel	unknown	shallow	unknown	Clean; close to Willow Brook

Firing Range Area Monitoring Wells

Well	Approximate Location	Date Installed	Depth	Screen Interval (ft bgs)	Notes
FRMW-1	upgradient	4/13/88	deep	25-30	Apparently no longer being sampled
FRMW-2	upgradient	4/13/88	shallow	10-20	Apparently no longer being sampled
FRMW-D	source area	1/17/90	shallow	10-25	Impacted; within source area; several COCs above NJ GWQC
FRMW-E	source area	1/17/90	shallow	10-25	Impacted; center of source area; several COCs above NJ GWQC
FRMW-F	source area	1/17/90	shallow	10-25	Impacted; within source area; several COCs above NJ GWQC
FRMW-G	source area	1/17/90	shallow	10-25	Impacted; within source area; several COCs above NJ GWQC
FRMW-H	source area	6/19/96	deep	32-42	No exceedances of NJ GWQC; center of source area beneath aquiclude
FRP-3	east of shoring	8/15/88	shallow	15-25	Impacted; TCE and PCE above NJ GWQC; suggests COCs may move laterally along shoring
FRP-4	west of shoring	8/11/88	shallow	13-23	Impacted; TCE above NJ GWQC; suggests COCs may move laterally along shoring
FRP-5	west of shoring	8/15/88	shallow	14-24	Clean; further west of well FRP-4
FRP-6	west of shoring	8/15/88	shallow	14-24	Clean; further west of well FRP-5
FRP-7	east of shoring	11/8/94	shallow	10-30	Impacted; TCE and PCE above NJ GWQC; suggests COCs may move laterally along shoring
FRP-8	west of source	11/7/94	shallow	5-25	Dry; no longer being sampled
FRSW-1	sentinel	10/28/92	shallow	1.3-6.3	Clean with the exception of probable lab contaminants; close to Willow Brook
FRSW-2	behind shoring	10/28/92	shallow	0.5-5	Impacted; several COCs above NJ GWQC
FRSW-3	behind shoring	12/21/92	deep	15-25	Clean; located adjacent to impacted well FRSW-2
FRSW-4	sentinel	11/7/94	shallow	0-5	Clean; approximately 150 feet downgradient of source area and 150 feet upgradient of Willow Brook
FRSW-5	behind shoring	6/19/96	deep	15-25	Clean; downgradient of well FRP-7
FRSW-6	behind shoring	6/19/96	shallow	5-6	All detections below NJ GWQC; downgradient of well FRP-7
P-1	east of source	10/25/95	shallow	13-28	Apparently no longer being sampled
P-2	source area	10/25/95	shallow	13-28	Apparently no longer being sampled
P-3	source area	10/25/95	shallow	13-28	Apparently no longer being sampled

[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).

[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.

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

[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 water bodies.

[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.