DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

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

Facility Name: EPEC Polymers, Inc. (formerly Tenneco Polymers, Inc.)
Facility Address: 71 River Road, Flemington Borough, New Jersey
Facility EPA ID #: NJD001890300

BACKGROUND

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 ground water 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 Determinations status codes should remain in 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).

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?

   Yes 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.

Facility Information

El Paso Energy Corporation [EPEC] Polymers, Inc. (formerly known as Tenneco Polymers Inc.) is located in Flemington, New Jersey. The irregular-shaped 24-acre site bordered by the River Road and the South Branch Raritan River to the northeast, a railroad terminal owned by a former industrial facility to the northwest, and the Bushkill Creek to the south, is situated at the confluence of the South Branch Raritan River and Bushkill Creek. The operations at the facility began in 1957 with the production of polyvinyl chloride (PVC) resin by Cary Chemicals. In 1965, Tenneco Polymers Inc. purchased Cary Chemicals and continued the production of PVC resin through November 1985, when manufacturing operations ceased and only research and development activities (R&D) were conducted. R&D ceased at the site in May 1986. Cessation of operations triggered the New Jersey Environmental Cleanup Responsibility Act (ECRA, now ISRA) and a facility investigation was performed to identify areas of environmental concern associated with all past operations at the site. The investigation identified 26 areas of concern (AOCs) requiring additional investigation and/or remediation.

In 1989, the Environmental Protection Agency (EPA) and the NJDEP conducted a RCRA Facility Assessment, which identified fifteen Solid Waste Management Units (SWMUs) and AOCs, all of which had been previously identified during ECRA activities. Seven of the identified SWMUs required further investigation. EPA and NJDEP issued a RCRA Post-closure Permit for the facility which included corrective action.

Investigation has determined that as the result of past activities at the site, the groundwater beneath the facility is contaminated with volatile organic compounds (VOCs), specifically vinyl chloride, trichloroethylene (TCE), methylene chloride, and trans-1,2 dichloroethylene. Tenneco was required to develop and install a groundwater remediation system that would both treat contaminated groundwater, and prevent the migration of contaminated groundwater from the site. The groundwater recovery system was put into service in 1987. In 1997, the recovery system was expanded to remediate additional areas. The system currently consists of six recovery wells installed into the bedrock. Water is extracted at a combined rate of 40 gallons per minute (gpm) and is treated by two 1,500 pound granular activated carbon (GAC) units. Treated water is subsequently discharged to the Raritan Township Municipal Utilities Authority (RTMUA). Recent sampling results indicate that the levels of methylene chloride and tran-1,2, dichloroethylene are only detected at levels below the NJDEP Groundwater Quality Standards (GWQS), and the concentration levels of the other two constituents of concern (COCs) TCE and vinyl chloride, although declined, continue to be very high in some of shallow wells. For example, level of TCE in groundwater at shallow well FM-1 sampled in October 2007 was 2720 ppb, while levels at deep wells were generally much lower ranging from 0.37 ug/l (TP-1) to 50 ug/l (TP-28), which is still above the NJDEP Groundwater Quality Standard of 1.0 ug/l.

See Site Location Map (Figure 1) and Site Plan (Figure 2) in the Remedial Action Progress Report, Former EPEC Polymers, Inc. Facility, River Road, Flemington, Hunterdon County, New Jersey, ISRA Case No. 86315 (Prepared by Sovereign Consulting Inc.). See the groundwater contour maps for trichloroethylene and vinyl chloride in Quarterly Monitor Well Data, December 2007, EPEC Polymers, Inc., River Road, Flemington, New Jersey, NJPDES-DGW NJ0001660, Doremus Engineering Environmental Consultants. Following is a summary of AOCs and SWMUs at the site.

AOC 1, PVC Resin Fill Area: This area was used for disposal of PVC resin from 1959 to 1973. Samples collected from this area were analyzed for VOCs, base neutral compounds (BNs), and metals. Elevated concentrations of barium (Ba) were encountered starting at a depth of 12 feet below ground surface. However, the concentrations detected were well below the Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) of 47,000 parts per million (ppm). On February 26, 1993 NJDEP approved No Further Action (NFA) for AOC 1 provided the remaining soil contamination was incorporated into a deed restriction notice. On August 4, 1994, Tenneco/EPEC filed the deed notice (Declaration of Environmental Restriction) for the PVC Resin landfill with Raritan Township.

AOC 2 Former Settling Pond: Off-spec PVC was disposed of in this area. Disposal of material ceased in 1983, at which time all pond material and underlying native soils were excavated to the top of bedrock and disposed off-site. Post-excavation soil samples were collected and analyzed for VOCs. No compounds were detected at concentrations exceeding their respective Impact to Groundwater Soil Cleanup Criteria (IGWSCC). In its letter of February 26, 1993, the NJDEP approved No Further Action for this AOC.

AOC 3 Effluent Drainage Ditch: Storm water and discharges from the process waste catch basin (AOC 20) were diverted into this ditch. Soil samples were collected from borings installed adjacent to this area to determine the nature and extent of any impact from the discharges. Soil samples were analyzed for VOCs, BNs and metals. Lead was detected at concentrations in excess of the Residential Direct Contact Soil Cleanup Criteria (RDCSCC). In December 1992 approximately 20 cubic yards of soil were excavated from the drainage ditch. Post excavation sampling showed lead concentrations were below the RDCSCC and the NJDEP approved NFA for this AOC in its letter of June 12, 1995.

AOC 4 Incinerator: The former incinerator (used to destroy vinyl chloride vapors) was located on a concrete pad in the south central portion of the facility. Sodium hydroxide (NaOH) was reportedly used to treat process cooling water associated with the operation of the incinerator. In May 1992, four soil samples were collected from borings on all four sides of the concrete pad. Each sample was collected from the top six inches of soil and analyzed for pH, with values ranging from 5.6 to 7.4. This range is considered to be within normal range for mineral soils. The borings were subsequently advanced to 2.5 feet below grade and the soils were screened for VOCs using a photo-ionization detector (PID). Since no PID readings were above background, no soil samples were collected. The NJDEP approved NFA for this AOC in it's letter dated February 26, 1993.

AOC 5 Spill Control Facility: The Spill Control Facility was located adjacent to the wastewater settling basin in the south-central portion of the site. This area consisted of the spill control pad and the spill collection tank. This AOC was originally investigated in September 1986. A soil boring was drilled through the center of the former waste collection tank and analyzed for VOCs, BNs, and metals. TCE was detected at 13.0 ppm which exceeded the NJDEP's ECRA Action Levels. In October 1987 soil was excavated to bedrock and spread out on a concrete slab, then aerated several times during the next three months. Approximately 450 cubic yards were treated in this manner. The soil was returned to the excavation in January 1988 and post-remediation samples were collected to determine if treatment had been effective. Soil sampling results indicated TCE was below the ECRA Action Levels in all samples except one. Soil from this hot spot" was removed and backfilled with clean fill. In May 1992, additional confirmation sampling was conducted at the request of NJDEP. Samples were analyzed for VOCs, and results indicated no exceedances of ECRA Action Levels. Based upon soil sampling results, the NJDEP approved No Further Action for this AOC in its letter dated February 26, 1993.

AOC 6 Drainage Ditch: The drainage ditch is located in the south-central portion of the site. A total of six samples were collected from soil borings to characterize this AOC. Samples were analyzed for VOCs, BNs, and metals. Soil sampling results indicated no exceedance of ECRA Action Levels. No Further Action was approved by NJDEP in its letter of February 26, 1993.

AOC 7 Reactor Building Septic Leach Field: The former septic leach field is located in the northwest corner of the site. Soil samples collected from this area were analyzed for VOCs, BNs, Total Petroleum Hydrocarbons (TPH) and metals. No analytes were detected at concentrations exceeding ECRA Action Levels, and No Further Action was approved in NJDEP's letter dated February 26, 1993.

AOC 8 Unlabeled Drum Storage Pad: The former drum storage shed was located in the south-central portion of the facility. Three soil borings were installed in this area, and soil samples were analyzed for VOCs, BNs, TPH, and metals. No analytes were detected at concentrations exceeding ECRA Action Levels. No Further Action for this AOC in its letter dated February 26, 1993.

AOC 9 Drum Rack: The former drum rack was located in the eastern portion of the facility. Three soil borings were installed in this area, and soil samples were analyzed for VOCs, BNs, TPH, metals, and pH. No analytes were detected at concentrations exceeding ECRA Action Levels and pH results were within normal range. The NJDEP approved No Further Action for this AOC in its letter dated February 26, 1993.

AOC 10 Drum Storage Pad: This AOC is located in the central portion of the facility. Three soil borings were installed in this area, and soil samples were analyzed for VOCs, BNs, and metals. No analytes were detected at concentrations exceeding ECRA Action Levels and the NJDEP approved No Further Action for this AOC in its letter dated February 26, 1993.

AOC 11 Former 2,000 gallon Diesel Fuel Underground Storage Tank (UST): A 2,000 gallon diesel fuel UST was formerly located along the northern property line near the railroad tracks. The UST was removed in 1986. Visual inspection revealed no evidence of corrosion and no staining or odors were observed in the excavation. Eight soil samples collected from four soil borings were analyzed for VOCs, BNs, TPH, and metals. No VOCs were detected and concentrations of BNs and metals were all below their respective ECRA Action Levels. The NJDEP approved No Further Action in its letter dated February 26, 1993.

AOC 12 Transformers: An electrical control building and three electrical transformers were located in the central portion of the facility. A total of sixteen soil samples were collected between 1986 and 1998 to characterize this AOC. In October 1997 removal of the electrical transformers and the electrical control building was initiated. Soil sampling was conducted and results indicated elevated concentrations of polychlorinated biphenyls (PCBs) in several samples surrounding Transformer 1 and 3. In May 1998 the PCB contaminated soils were excavated to a depth of two feet below surface grade. All post-excavation samples were below the NJDEP's RDCSCC of 0.49 ppm. The NJDEP approved No Further Action for this AOC in its letter dated October 26, 1998.

AOC 13 Stream Sediments: The site is bordered immediately to the west and south by Bushkill Creek. The creek flows south along the western property line and then to the east along the southern property line towards the South Branch Raritan River. At the direction of NJDEP, Tenneco collected four sediment samples from Bushkill Creek. The sediment samples were collected near the northwest corner of the site to represent sediment quality upstream; at a pipeline outfall (AOC 24) that discharged wastewater and non-contact cooling water under a NJPDES permit; at the discharge point of a drainage ditch (AOC 6); and at a location considered downstream from the site (where the River Road Bridge crosses the creek). Each sample was collected from the top six inches of sediment in the creek and analyzed for VOCs, BNs, barium, cadmium and lead.

The analytical results indicated that concentrations of metals and VOCs were below the applicable NJDEP action levels in all four sediment samples. However, the two upstream samples contained several

polycyclic aromatic hydrocarbons (PAHs) that exceeded either the NJDEP RDCSCC or NRDCSCC. In a letter dated February 26, 1993 the NJDEP approved NFA for this AOC for the following reasons: 1) the reported concentrations of PAHs do not pose a significant ecological concern to the stream; 2) the compounds detected were reportedly not used at the site and were most likely originating from an asphalt recycling plant upstream of the Tenneco facility and 3), the two upstream samples contained elevated levels of PAHs while the downstream samples did not, indicating the contamination had not migrated downstream.

AOC 14 Former Storage Warehouse Waste Collection UST: The former waste collection UST was located on the east side of the storage warehouse in the eastern portion of the facility. This UST was removed in February 1986. Visual inspection of the tank and excavation did not reveal evidence of a discharge and no odors were noted. Six post-excavation soil samples were collected and analyzed for VOCs, BNs, and metals. No contamination was detected above NJDEP action levels. No Further Action was approved by the NJDEP in its letter dated February 26, 1993.

AOC 15 Former R&D Center Waste Collection UST: This former waste collection UST was located at the southeast corner of the R&D building in the eastern portion of the facility. The UST was removed in February 1986. Visual inspection of the tank did not reveal evidence of corrosion. No stained soil or odors were observed in the excavation. Five post-excavation soil samples were collected and analyzed for VOCs, BNs and metals. No contamination was detected above NJDEP ECRA Action Levels and NJDEP approved No Further Action in its letter dated February 26, 1993.

AOC 16 Former Septic Systems: Three septic fields serviced the R&D center, the Office Building, Storage Warehouse, and the Office Laboratory. The septic fields for the R&D Center and the Office/Warehouse were located in the northeast corner of the site. The Office Laboratory septic system was located in the north-central portion of the facility. All three systems were removed from service when the facility connected to the public sanitary sewer system in 1971. Soil samples were collected from each of these areas and analyzed for VOCs, BNs, and metals. No NJDEP ECRA Action Levels were exceeded, and the NJDEP approved No Further Action for all three former septic fields in its letter dated February 26, 1993.

AOC 17, Former 30,000 Gallon No. 6 Fuel Oil UST: A 30,000 gallon No. 6 fuel oil UST was formerly located in the central portion of the facility. The UST was removed in February 1986. Visual inspection of the tank did not reveal evidence of corrosion. No stained soil or odors were observed in the excavation. Five post-excavation soil samples were collected and analyzed for VOCs, BNs and metals. No contamination was detected above NJDEP ECRA Action Levels and NJDEP approved No Further Action in its letter dated February 26, 1993.

AOC 18 Former 1,000 Gallon No. 2 Fuel Oil UST: The former 1,000 gallon No. 2 fuel oil UST was located on the east side of the small office building in the northeast portion of the facility. Soil samples were collected adjacent to the UST in April 1992. Samples were analyzed for TPH, which was detected at a maximum concentration of 677 ppm. Since TPH concentrations did not exceed the NJDEP action level of 1,000 ppm, no additional VOC analyses were required and NJDEP approved a proposal of No Further Action in its letter dated February 26, 1993.

As part of its property acquisition agreement, Flemington Industrial Park required that the 1,000 gallon UST be removed by Tenneco. Remaining product in the UST was removed, and the tank was excavated in October 1997. Visual inspection of the tank revealed evidence of corrosion and perforation in several areas. Soils samples collected from the excavation indicated contamination present in the surrounding soils, which were subsequently removed. Following post excavation sampling the area was backfilled with clean overburden and clean fill. The NJDEP approved NFA for this AOC in their letter dated February 20, 1998.

AOC 19 Railroad PVC Loading Area: The railroad loading area is located along the northern property line. This area was used to unload vinyl chloride monomer (VCM) from pressurized tank cars and to load PVC resin. Fourteen soil samples were collected from this area and analyzed for VOCs, BNs, and metals. Sampling results indicated soils had been impacted, but at concentrations below NJDEP soil cleanup criteria. Based upon these results, NJDEP approved the proposal for No Further Action in its letter dated April 10, 1995.

AOC 20 Process Waste Catch Basin System: The catch basin and piping in this area are located on the north side of the property and discharge into the effluent drainage ditch (AOC 3). The catch basin received process discharge water from the centrifuges used in the manufacturing process. The catch basin was visually inspected and it was determined that soil samples should be collected to characterize this AOC. Three samples were collected and analyzed. Sampling results indicated no exceedances of applicable NJDEP action levels. NJDEP approved the proposal for No Further Action in its letter dated February 26, 1993.

AOC 21 Stressed Vegetation South of the R&D Center: During a site inspection, NJDEP noted three areas of stressed vegetation to the south of the R&D Center. In May and June 1992, eight soil samples were collected and analyzed for VOCs, TPH, barium, cadmium and lead. No analytes were detected at concentrations exceeding their respective cleanup criterion. Based upon these results, NJDEP approved the proposal for No Further Action in its letter dated February 26, 1993.

AOC 22 Drainage Ditch through Spill Control Area: After reviewing an aerial photograph from 1963, NJDEP identified a drainage ditch that ran through the spill control facility. In May 1992 two soil samples were collected and analyzed for VOCs, pH, barium, cadmium and lead. No analytes were detected at concentrations exceeding their respective cleanup criterion. NJDEP approved the proposal for No Further Action in its letter dated February 26, 1993.

AOC 23 Diked Area at Production/Reactor Building: This area is comprised of a diked area near the southwest corner of the former Production/Reactor Building on the west side of the facility. The NJDEP directed that one soil boring be located within two feet of the south side of the dike due to the presence of a discharge pipe originating in an unknown area. In May 1992, three soil samples were collected from the soil boring and analyzed for VOCs, TPH, barium, cadmium and lead. No compounds were detected at concentrations exceeding their respective soil cleanup criterion. NJDEP approved the proposal for No Further Action in its letter dated February 26, 1993.

AOC 24 Discharge Pipeline: This AOC is comprised of a six-inch diameter clay pipe that formerly discharged process wastewater and non-contact cooling water from the vinyl chloride monomer tanks (AOC 26) to Bushkill Creek under the terms of a NJPDES permit. In April 1992, nine soil samples were collected along the length of the discharge pipe and analyzed for VOCs, BNs, TPH, barium, cadmium and lead. No analytes were detected at concentrations exceeding their respective soil cleanup criterion. NJDEP approved the proposal for No Further Action in its letter dated February 26, 1993.

AOC 25 Clarifier Building and Boiler House Swale: This AOC consists of a swale approximately 140 feet long that runs parallel to the south side of the Boiler House in the central portion of the facility. During a site inspection in May 1991, the NJDEP identified stained sediments within the swale. In September 1992, accumulated sediment was removed and disposed of off site. The asphalt liner forming the base of the swale was visually inspected and several small cracks were observed. NJDEP required that soil samples be collected from below the invert of the swale. The samples were analyzed for TPH, barium, cadmium and lead. Results indicated no exceedances of soil cleanup criteria and a proposal for No Further Action was approved by NJDEP in its letter dated July 27, 1994.

AOC 26 Former Vinyl Chloride Monomer Tanks: This AOC includes four vinyl chloride monomer (VCM) USTs in the north central portion of the facility. These USTs were excavated in February 1986 after PVC production ceased at the facility. At the time of tank removal activities, the USTs were visually

inspected and no evidence of corrosion or perforation was observed. Additionally, no stained soil or odors were evident in the excavations. Post-excavation soil samples were collected and analyzed for VOCs, BNs, and metals. In addition, a bedrock monitoring well was installed at this AOC (TP-28) to determine if groundwater had been impacted by any historical releases from the VCM tanks. Based on soil sampling and groundwater sampling results, the NJDEP approved the proposal for No Further Action in its letter dated July 27, 1994.

References:

(1) RCRA Facility Investigation Report, September, 1992
(2) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit, issued by NJDEP – 3/30/1992
(3) New Jersey Pollutant Discharge Elimination System (NJPDES) major modification 1/30/1999
(4) Remedial Action Progress Report prepared by Sovereign Consulting Inc.- 12/28/07

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?

Yes 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 and Reference(s):

During past PVC manufacturing related activities at the site, approximately 240,000 gallons per day of industrial wastewater was discharged to a series of three unlined settling lagoons and two unlined sludge drying beds. Underlying the facility is the Triassic-aged Brunswick Formation. This red, argillaceous shale formation is inter-bedded with greenish shale, siltstone, and red, fine-grained sandstone. The intense fractures in the upper 300 feet of this formation provide storage for groundwater. Groundwater depth at the former Tenneco site typically ranges from 10 to 30 feet below ground surface, however, depth to groundwater at the pumping wells are greater due to the draw-down effect. Investigation has determined that as a result of past manufacturing activities at the site, the groundwater beneath the facility is contaminated with volatile organic compounds (VOCs), specifically, trichloroethylene (TCE), vinyl chloride, methylene chloride, and trans-1,2 dichloroethylene were identified as the four constituents of concern (COC) found in the groundwater contamination. The detected levels of TCE found in 1996 at well TP-8 were as high as 4200 ppb, which is 4200 times higher than the current NJDEP Groundwater Quality Standard of 1.0 ug/l. The levels of vinyl chloride found in 1986 at the well cluster TP-13, TP-14 and TP-15 ranged from 3000 to 6000 ppb. The current NJDEP Groundwater Quality Standard for vinyl chloride is 1.0 ppb.

The historical levels of each contaminant in groundwater at different monitoring points are contained in Appendix C and D of the Remedial Action Progress Report prepared by Sovereign Consulting Inc.- Dec 28, 2007. Reference (4)

References

(1) New Jersey Pollutant Discharge Elimination System (NJPDES) RCRA Post-Closure Renewal Permit, prepared by NJDEP – 10/29/1991
(2) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit, issued by NJDEP – 3/30/1992
(3) New Jersey Pollutant Discharge Elimination System (NJPDES) major modification 1/30/1999
(4) Remedial Action Progress Report prepared by Sovereign Consulting Inc.- 12/28/07

Footnotes:

[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).

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)?

Yes — 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 and Reference(s):

As the result of past PVC manufacturing related activities at the site, groundwater beneath the facility is contaminated with volatile organic compounds, specifically TCE, vinyl chloride, methylene chloride, and trans-1,2- dichloroethylene. When this contamination was discovered in 1985, NJDEP required that Tenneco develop and install a groundwater remediation system which would both treat the contaminated groundwater, and prevent the migration of contaminated groundwater from the site.

Prior to the operation of the groundwater recovery/remediation system, the water table at the site was relatively flat, and the overall direction of the natural groundwater flow was generally toward the northeast (to the South Branch Raritan River.) However, the operation of the groundwater recovery system, which started in 1987 then expanded in 1997 and upgraded in 2004, has significantly changed the natural flow patterns of groundwater at the site. Under the influence of the groundwater recovery system, the groundwater, instead of flowing naturally in a northeastern direction, has been flowing toward several pumping points located within the site. Groundwater extraction from the six recovery wells, at a combined pumping rate of 40 gallons per minute (20 million gallons per year) has created three large capture zones or cones of depression within the groundwater around wells TP-8, TP-13, TP-14, TP-15, TP-22, and TP-24. A smaller capture zone also exists around TP-22.

The recovered groundwater is treated by two 1500-pound granular activated carbon (GAC) units before it is discharged to the Raritan Township Municipal Utilities Authority (RTMUA) Public Owned Treatment Works (POTW) under New Jersey Pollutant Discharge Elimination System (NJDES)-Significant Indirect user (SIU) Permit No. NJ0081850. Chemical oxidation injections have been used for the past eight years to enhance degradation of the TCE and vinyl chloride in the bedrock water-bearing zones. In addition to the above-mentioned general pump-and-treat system, for the groundwater extracted specifically from shallow wells (FM-3, FM-1, IW1, and MW-2) around TP-8 area, vapor extraction (Dual Phase Vacuum Extraction –DPVE installed in 2004) is also conducted.

Under the influence of the cone of depression created by the continuous operation of the groundwater recovery system, sampling data support the conclusion that the groundwater plume is contained within the boundary of the former Tenneco site, as described below:

Declining trend of contaminants concentration

Groundwater contamination at the former Tenneco site appears to have stabilized both in terms of the overall contaminant concentration level and areal extent. As the recovery system continues to operate, the

concentrations of each constituent has been steadily declining since 1987. The historical data contained in the Remedial Action Progress Report - 12/28/07 (ref 4) indicates a clear decreasing trend for all constituents. For example, the levels of methylene chloride and tran-1,2, dichloroethylene are no longer detected at levels above the NJDEP Groundwater Quality Standards (GWQS), and the levels of TCE and vinyl chloride indicate a general downward or stable trend at almost all monitoring wells. At well TP-08, the TCE levels were 4200 ppb in 1996, 550 ppb in 1998, 300 ppb in 2004, 50 ppb in 2006, and below 40 ppb in 2007. At well FM-3, the concentration level of TCE has dropped dramatically from 20,000 ppb in 1995 to 200 ppb in October 2007.

On-site groundwater recovery system prevents plume migration

A review of groundwater quality data collected as part of the quarterly monitoring program indicates that the recovery system is effectively controlling the migration of contaminated groundwater at the former Tenneco site. The table below presents the concentration levels of TCE detected at monitoring wells located on or near the Tenneco boundary between January 2004 and October 2007. Concentration levels of TCE have been consistently detected at levels below 10 ppb throughout the recent four-year monitoring period. Vinyl chloride was not included in the table, as it has been mostly undetected or detected rarely at levels above 10 ppb at any of these perimeter monitoring wells.

Well:	**TP-27**	**TP-24**	**TP-23**	**TP-20**	**TP-19**	**TP-16**	**TP-29**	**TP-12**	**TP-13**	**TP-14**	**TP-1**	**TP4**
04 Jan	ND	3.8	1.1	-	0.52	ND	5.0	1.90	4.7	2.8	ND	ND
Apr	0.32	3.7	0.53	0.28	0.79	ND	ND	10.3	4.4	2.6	ND	ND
Jul	ND	3.8	0.65	-	0.46	ND	5.4	8.5	4.2	2.3	ND	ND
Oct	0.34	4.3	1.0	0.35	0.28	ND	5.4	2.5	4.6	2.6	0.24	ND
05 Jan	0.34	3.4	0.84	-	0.63	ND	5.4	0.74	4.1	2.2	ND	ND
Apr	0.31	3.2	0.48	0.33	0.89	ND	4.6	6.6	4.1	2.7	ND	ND
Jul	0.52	4.2	0.89	-	0.96	ND	5.6	0.30	-	0.7	0.34	ND
Oct	0.16	4.2	0.52	0.48	0.85	ND	4.2	4.7	3.6	3.2	0.22	ND
06 Jan	0.38	3.8	0.53	-	1.10	ND	5.1	7.9	10.0	3.4	ND	--
Apr	ND	3.6	0.44	ND	1.00	ND	4.0	4.0	8.9	2.9	ND	--
July	0.34	3.6	0.80	-	0.92	ND	4.5	2.4	7.0	2.9	0.25	--
Oct	ND	3.5	0.71	0.29	0.64	ND	4.1	3.6	2.0	2.9	ND	--
07 Jan	ND	3.0	ND	-	0.80	ND	3.4	8.3	5.3	2.4	ND	--
Apr	0.31	2.8	0.62	0.34	0.78	ND	3.6	3.0	5.5	2.3	ND	--
Jul	ND	3.6	0.63	-	0.94	ND	3.9	2.5	5.1	2.6	ND	--
Oct	0.35	3.3	0.84	0.32	0.56	ND	4.4	2.5	7.4	1.6	0.37	--

The irregular-shaped Tenneco site is primarily surrounded by three entities, Bushkill Creek to the southeast, South Branch Raritan River to the north, and the former site of Tredegar Film to the northwest. We have sufficient sampling data to support the conclusion that the contaminated groundwater, under the influence of the on-site groundwater recovery/remediation system, is currently stabilized and contained within the boundary of the former site of Tenneco.

Bushkill Creek side- It is evident from the above table that contaminant concentration levels at wells TP-27, TP-24, TP-23, TP-20, TP19, and TP16 located along Bushkill Creek on the southeast side of the Tenneco site are mostly below the GWQS of 1 ppb, with the exception of TP24 which only slightly exceeds the groundwater standard. To confirm the above findings, Bushkill Creek was also sampled. As provided in the Supplemental Ecological Evaluation Report, dated June 5, 2007 (Ref 6), no COCs were detected in either benthic sediment or surface water at levels above laboratory method detection limits with the exception of TCE in one surface water sample SWSED-1, which was detected at an estimated concentration of only 0.37 ppb, below the applicable NJ Surface Water Quality Criteria (SWQC).

South Branch Raritan River side- No contaminants have ever been detected at levels above the NJDEP's GWQS at the sentinel wells TP-4 and TP-1 located close to the northeast boundary of the site, near the South Branch Raritan River. The detected levels of TCE at TP-14 between 2004 and 2007 have been between 0.7 and 3.4 ppb, which is just slightly above the applicable standard of 1 ppb.

Former Tredegar Film side- There are four monitoring wells (TP-29, TP-12, TP-13 and TP-14) located along the boundary Tenneco shared with the former Tredegar Film facility. As noted in the above table, the detected concentrations of TCE are generally less than 10 ppb for the past 4 years which provides evidence that the onsite portion of the original plume has stabilized and is contained within the Tenneco property.

With regard to the portion of original plume which may have potentially migrated onto the Tredegar property before the operation of the Tenneco on-site groundwater recovery system implemented in 1987, there is sufficient groundwater data obtained from both Tredegar and Tenneco sampling programs to conclude that either the contamination never migrated from Tenneco to Tredegar or that the cone of depression created by the Tenneco's on-site recovery system pulled back any contamination (page 4 of reference (4)).

Specifically, from the review of the Remedial Investigation Report/ Remedial Action Workplan, Former Tredegar Film Products Facility – July 2002 (ref 5), no significant levels of TCE and vinyl are found anywhere on the Tredegar site as noted below:

1.

TCE	**MW-1**	**MW-2**	**MW-3**	**MW-4**	**MW-5**	**MW-6**
10/96	N/D	36	ND	ND	-	-
07/97	6.2	8.5	ND	ND	-	-
07/98	6.9	5.2	ND	2.6	ND	ND
07/99	6.6	6.6	0.8	3.2	0.3	0.3
11/00	7.8	6.6	0.7	4.1	0.4	0.4
10/01	3.4	6.6	0.7	4.1	0.4	0.4
04/02	7.6	12	3.4	3.9	0.3	0.3
Vinyl Chloride						
10/96	N/D	ND	ND	ND	-	-
07/97	ND	ND	ND	ND	-	-
07/98	ND	ND	ND	ND	ND	ND
07/99	2.2	2.2	0.5	0.9	0.5	0.5
11/00	3.2	1.3	0.6	1.3	0.6	0.6
10/01	0.2	1.7	0.5	0.5	0.2	0.2
04/02	5.1	8.2	0.2	5.3	0.2	0.2

Note: MW-6 is the closest groundwater monitoring well to the Tenneco site

2. TCE and vinyl chloride were chosen as the target compounds for Tredegar's groundwater investigation, because these COC were determined to be related to Tredegar's historical manufacturing operations.

3. Groundwater investigation performed by Tredegar revealed a consistent pattern of concentration levels of less than 10 ppb for both TCE and vinyl chloride, and frequently below the 1 ppb NJDEP GWQS. As a result of these low levels of TCE and vinyl chloride, and other constituents, Tredegar was given the NFA (no further action) determination by NJDEP in 2004.

4. At monitoring well MW-6, the closest well to the Tenneco property, no TCE or vinyl chloride (the same COCs for Tenneco groundwater monitoring program) has ever been detected at levels above the 1 ppb groundwater standard.

5. Since the natural flow of groundwater in the western section of the Tenneco was found to the northeast toward the South Branch Raritan River, instead of northwestern direction toward Tredegar site, the deep Tenneco groundwater plume is unlikely to have migrated onto the Tredegar site.

6. All four of Tenneco's perimeter monitoring wells (TP-14, TP-13, TP-12, and TP-29) located along the boundary line between Tenneco and Tredegar indicate a consistent pattern of concentrations of less than 10 ppb of TCE for the past eight years, and sometimes at levels below the 1 ppb of NJDEP GWQS.

In summary, the groundwater sampling data obtained from both Tredegar and Tenneco sampling program support the position that Tenneco plume did not impact the Tredegar site.

Reference

(1) New Jersey Pollutant Discharge Elimination System (NJPDES) RCRA Post-Closure Renewal Permit, prepared by NJDEP – 10/29/1991
(2) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit, issued by NJDEP – 3/30/1992
(3) New Jersey Pollutant Discharge Elimination System (NJPDES) major modification 1/30/1999
(4) Remedial Action Progress Report prepared by Sovereign Consulting Inc.- 12/28/07
(5) Remedial Investigation Report/ Remedial Action Workplan, Former Tredegar Film Products Facility –
(6) Supplemental Ecological Evaluation Report, dated June 5, 2007 July 2002

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[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.

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

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

No If no - **skip to question #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.

Rationales and References:

There are two surface water bodies adjacent to the former Tenneco site, the Bushkill Creek to the southeast and the South Branch Raritan River situated to the northeast.

Bushkill Creek - The contaminant concentration levels at wells TP-27, TP-24, TP-23, TP-20, TP19, and TP16 located along Bushkill Creek to the southeast of the Tenneco site are mostly below the GWQS of 1 ppb, with the exception of TP-24 which only slightly exceeds the groundwater standard. To confirm the above findings, Bushkill Creek was also sampled. As provided in the Supplemental Ecological Evaluation Report, dated June 5, 2007 (Ref 6), no COCs were detected in either benthic sediment or surface water at levels above laboratory method detection limits with the exception of TCE in one surface water sample SWSED-1, which was detected at an estimated concentration of only 0.37 ppb, below the applicable NJ Surface Water Quality Criteria (SWQC).

South Branch Raritan River - No contaminants have ever been detected at levels above the NJDEP's GWQS at the sentinel wells TP-4 and TP-1 located close to the northern boundary of the site, near the South Branch Raritan River. The detected levels of TCE at TP-14 between 2004 and 2007 have been between 0.7 and 3.4 ppb, which is just slightly above the applicable standard of 1 ppb.

In addition to the above sampling data which indicate insignificant levels of contaminants at all boundary wells, the groundwater elevation map indicates that migration is away from the Raritan River and the Bushkill Creek since the groundwater is under the influence of the onsite recovery system.

References:

(1) New Jersey Pollutant Discharge Elimination System (NJPDES) RCRA Post-Closure Renewal Permit, prepared by NJDEP – 10/29/1991
(2) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit, issued by NJDEP – 3/30/1992
(3) New Jersey Pollutant Discharge Elimination System (NJPDES) major modification 1/30/1999
(4) Remedial Action Progress Report prepared by Sovereign Consulting Inc.- Dec 28, 2008
(5) Supplemental Ecological Evaluation Report, dated June 5, 2007
(6) Remedial Investigation Report/ Remedial Action Workplan, Former Tredegar Film Products Facility – July 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 eco-systems 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 <u>key</u> 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 eco-system.

_____ 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 <u>each</u> 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.

<u>Rationale and Reference(s):</u>

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 eco-systems 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 eco-systems), 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 specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, 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 eco-systems.

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

Rationale and Reference(s):

_____
_____
_____
_____
_____
_____
_____
_____
_____

[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.

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 and Reference(s):

The NJPDES-DGW permit (New Jersey Pollutant Discharge System-Discharge to Groundwater Permit, originally issued in 1987, was subsequently renewed and modified in 1992, 1997, 1999, and 2004). The permit requires on-going implementation of the groundwater remediation and groundwater monitoring program at the former Tenneco facility. Special Condition Part IV, Items 5 of the NJPDES-DGW permit broadly defines corrective action as being completed only when ALL monitoring wells yield groundwater samples with concentrations of site-specific COCs (i.e., trichlorotheylene (TCE), vinyl chloride, methylene chloride, and trans-1,2-dichloroethylene) below their respective groundwater quality standards (which are 1 ppb, 1 ppb, 3 ppb and 10 ppb, respectively) for three consecutive years. The groundwater monitoring program currently involves collection of samples on a quarterly basis from 37 monitoring wells, including:

Deep wells:	TP-1, TP-8, TP-12, TP-13, TP-14, TP-15, TP-16, TP-18, TP-19, TP-20, TP-22, TP-23, TP-24, TP-25, TP-26, TP-27, TP-28, and TP-29.
Shallow wells	FM-1, FM-2, FM-3, FM-4, FW-1, MW-1,MW-2, MW-3, MW-4, MW-7,,MW-12, MW-13, MW-14, MW-15, MW-16, MW-17, MW-18, SB-28, SB-29

NJDEP further requires that the facility must demonstrate a statistically valid decreasing trend in contaminant concentrations in all impacted monitoring wells in order to discontinue groundwater sampling. The required statistical analysis must be based on results of at least eight consecutive quarterly sampling rounds at all wells after meeting groundwater quality standards. To date, at the major groundwater capture zone of TP-8, as well as five other wells, both TCE and vinyl chloride are still being detected at concentrations significantly higher than their respective GWQS, despite a marked decrease in concentration levels over the years in some of the wells. Accordingly, the current groundwater monitoring program will continue for an unspecific length of time until the goals of the groundwater remediation, as specified in the Permit, are achieved.

References:

(1) New Jersey Pollutant Discharge Elimination System (NJPDES) RCRA Post-Closure Renewal Permit, prepared by NJDEP 10/29/1991
(2) New Jersey Pollutant Discharge Elimination System (NJPDES) Permit, issued by NJDEP – 3/30/1992
(3) New Jersey Pollutant Discharge Elimination System (NJPDES) major modification 1/30/1999
(4) Remedial Action Progress Report prepared by Sovereign Consulting Inc.- 12/28/07

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 EPEC Polymers Inc (formerly Tenneco Polymers, Inc.), EPA ID # NJD001890300, located at 71 River Road, Flemington Borough, 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 _____ Date _____
Sin-Kie Tjho, Project Manager
RCRA Programs Branch
Region 2

Supervisor _____ Date _____
Barry Tornick, Chief
New Jersey Section
RCRA Programs Branch
EPA Region 2

Approved by: Original signed by: Date: February 15, 1995
Adolph Everett, Chief
RCRA Programs Branch
EPA Region 2

Locations where References may be found:

U.S. Environmental Protection Agency - Region 2
RCRA File Room
290 Broadway - 15th Floor
New York, New York 10007

New Jersey Department of Environmental Protection
401 East State Street, Records Center, 6th Floor,
Trenton, New Jersey.

Contact telephone number and e-mail address

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