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# EPA Superfund
# Record of Decision:

**NORTH PENN - AREA 12**
**EPA ID: PAD057152365**
**OU 01**
**WORCESTER, PA**
**09/30/1997**

<IMG SRC 970880>

NORTH PENN AREA 12 SUPERFUND SITE
RECORD OF DECISION

PART I - DECLARATION

I. SITE NAME AND LOCATION

North Penn Area 12 Superfund Site
Worcester Township, Montgomery County, Pennsylvania

II. STATEMENT OF BASIS AND PURPOSE

This Record of Decision ("ROD") presents the final remedial action selected for the North Penn Area 12 Superfund Site ("Site"), located in Worcester Township, Montgomery County, Pennsylvania. This remedial action was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 ("CERCLA"), 42 U.S.C. ºº 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and the National Oil and Hazardous Substances Pollution Contingency Plan ("NCP"), 40 C.F.R. Part 300. This decision document explains the factual and legal basis for selecting the remedial action and is based on the Administrative Record for this Site. An index of documents for the Administrative Record is included in Appendix A of the ROD.

The Pennsylvania Department of Environmental Protection ("PADEP") has commented on the selected remedy and the State's comments have been incorporated to the extent possible.

III. ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of CERCLA, 42 U.S.C. º 9606, that actual or threatened releases of hazardous substances from this Site, as discussed in Section IV (Risk Assessment) of this ROD, if not addressed by implementing the remedial action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

IV. DESCRIPTION OF THE SELECTED REMEDY

The Environmental Protection Agency ("EPA"), in consultation with PADEP, has selected the following remedial action for the North Penn Area 12 Superfund Site. This remedy addresses alternative drinking water and contaminated groundwater at the Site and includes the following components:

ò A groundwater extraction and treatment system utilizing either an air stripper with vapor phase carbon or a liquid phase carbon adsorption unit. The treated groundwater will be reinjected into the ground by injection wells, an infiltration bank, or spray irrigation, if it can be demonstrated that such reinjection can be accomplished without adversely impacting the ability of the pumping system to contain the existing contamination from migrating from the former Transicoil property portion of the Site. A pre-design study will be completed to provide this demonstration. If the study shows that reinjection is not feasible, then the treated water will be discharged to a tributary to Stoney Creek.

ò A study will be conducted during the pre-design, design, or implementation of the extraction system to determine what, if any, remedial measure(s) (including natural attenuation or modification of the extraction system) may be needed or is technically practicable to reduce site related contaminants to MCL concentrations in contaminated groundwater which lies beyond the influence of the selected pump and treat extraction system within a reasonable time frame.

- The public water supply will be extended to provide drinking water to residents whose wells have been adversely affected or could potentially be adversely affected by groundwater contamination from the Site.

- Long term groundwater monitoring to evaluate the performance of the groundwater extraction and treatment system and to ensure that all affected and potentially affected residents are provided public water.

- Institutional controls that will prohibit the use of groundwater on the former Transicoil property, and restrict the use of Site-related contaminated groundwater as a drinking water supply source.

## V. STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. The remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy does employ treatment as a principal element.

Because this remedy will result in hazardous substances remaining on-site above health-based levels, a review will be conducted within five years after initiation of the remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

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NORTH PENN AREA 12 SUPERFUND SITE
WORCESTER TOWNSHIP, MONTGOMERY COUNTY, PENNSYLVANIA

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DECISION SUMMARY

## I. SITE NAME, LOCATION AND DESCRIPTION

The North Penn Area 12 Site includes the former Transicoil facility, which occupies approximately 25 acres on Trooper Road in Worcester Township, Montgomery County, Pennsylvania (Figure 1). The former Transicoil facility had been used for industrial and manufacturing activities from approximately 1952 to 1991. Activities included the manufacturing of electric motors for use by the aerospace industry. As part of the manufacturing operations, trichloroethene (TCE), 1,1,1-trichloroethane (1,1,1-TCA) and possibly other solvents were used to degrease parts and equipment, and were allegedly disposed of on the facility property.

Adjacent to the former Transicoil facility is the former Control facility for a Nike Missile Battery installation (PH- 191) that had been operated by the U.S. Army (Figure 2). The former Nike Control facility property was used by the Army from 1954 to 1968 and was located on approximately 12 acres of land. Both TCE and 1,1,1-TCA allegedly were used and disposed of at the former Nike Control facility between 1954 and 1968. In 1975, about 9 acres of the property were donated to Worcester Township and is now maintained as a park known as Nike Park. The remaining portion of the property was assigned to the Commonwealth of Pennsylvania, and is currently operated by Montgomery County as a rehabilitation center for the handicapped known as the Center Point Training Center.

## II. SITE HISTORY

Sampling of soil and groundwater at the Transicoil facility in 1979, carried out by the Pennsylvania Department of Environmental Protection (PADEP) (then the Pennsylvania Department of Environmental Resources), indicated the presence of TCE and 1,1,1-TCA in groundwater below both the Transicoil property and several surrounding properties' wells. Investigation of contamination at the Transicoil facility and in the surrounding area has been conducted on several occasions since that time. An investigation in 1980 included: sampling near a buried waste solvent tank; sampling of the contents of the waste solvent tank; sampling from underground septic system distribution boxes; and soil sampling in the septic system drain field area. Groundwater in two monitoring wells was also monitored for one year.

In January 1987, the Transicoil property was proposed for inclusion on the National Priorities List. A soil-gas survey was completed on the Transicoil facility in 1988. A consent agreement between EPA and two potentially responsible parties (PRPs), Transicoil, Inc. and Eagle-Picher Industries, Inc. ("Transicoil/Eagle-Picher") was executed in 1989 and led to the initiation of an Remedial Investigation/Feasibility Study (RI/FS) at the Site. The RI/FS work plan was submitted to EPA Region III on May 18, 1990. EPA subsequently approved the work plan and the field work was started.

A soil-gas survey conducted by Transicoil/Eagle-Picher in 1990 as part of the RI/FS indicated elevated levels of volatile organic compounds (VOCs) near Building No. 2 and the drum storage areas. Levels of TCE and 1,1,1-TCA were very low, although significant concentrations of vinyl chloride, a TCE degradation product, was detected. A hydrogeologic study was conducted in July and August 1988, and indicated the presence of TCE contaminated groundwater plume that seemed to be moving from east to west and was centered beneath the Transicoil property. Twelve monitoring wells were installed on and near the Transicoil property between 1988 and 1990. Residential wells near the former Transicoil facility were sampled in 1990 and again in 1991. During the residential well sampling, 13 home wells were found to contain TCE above the safe drinking water Maximum Contaminant Level (MCL) of 5 parts per billion (ppb). Transicoil/Eagle-Picher agreed, under an amendment to the approved RI/FS work plan, to install and maintain carbon filtration systems on those home wells that exceeded the 5 ppb MCL for TCE.

All ongoing RI/FS activities were halted on January 7, 1991, when Transicoil/Eagle-Picher filed for relief under Chapter 11 of the bankruptcy code. At the time of the bankruptcy filing, the RI/FS field investigation activities were in progress and no draft or final documents or reports had been prepared. In accordance with the consent agreement, EPA Region III assumed responsibility for funding, management, and completion of all remaining RI/FS activities. The tasks to be completed included air monitoring, soil sampling, surface water and sediment sampling, residential well sampling, monitoring well installation, groundwater sampling, geophysical logging, packer testing, pump testing, water level monitoring, wetlands assessment, and preparation of all associated reports and documents.

As a result of residential well sampling conducted in 1995 by EPA, additional residential wells were found to be contaminated with TCE above the 5 ppb MCL for TCE. EPA subsequently issued an order to four PRPs that required the installation and maintenance of carbon filtration systems on residential wells found to be contaminated with TCE above the MCL. Periodic sampling of over 100 residential wells near the Site was also required to ensure that TCE levels in residential water supplies would be maintained at safe levels. Fourteen additional home wells have been provided carbon filters in accordance with the 1995 order.

## III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

There have been a number of community relation activities carried out during EPA's involvement at the Site. A fact sheet was published by EPA in November 1990 that informed the public that a consent order was entered into with Transicoil/Eagle-Picher for the implementation of a remedial investigation and feasibility study.

In February 1991, EPA held a public meeting to address how Transicoil/Eagle-Picher's declaration of bankruptcy would affect cleanup activities at the site. In December 1991, EPA issued another fact sheet that provided an update of the site status and informed the community that the remedial investigation/feasibility study started by Transicoil/Eagle-Picher would be completed by EPA following the declaration of bankruptcy by Transicoil/Eagle-Picher.

A Community Relation Plan was finalized for the site on August 3, 1995. The plan highlighted issues, concerns, and interests of the community located near the site which were raised during interviews.

On August 22, 1995, EPA issue a fact sheet that informed residents that EPA had issued a unilateral administrative order that required the responsible parties for the site to install carbon filters on residential wells that were found to contain TCE above the safe drinking water standard of 5 ppb, and to conduct periodic sampling of residential wells that could potentially be impacted by contamination from the site.

Pursuant to CERCLA º 113(k)(2)(B)(I)-(v), the RI/FS reports and the Proposed Plan for the North Penn Area 12 Superfund Site were released to the public for comment on July 15, 1997. These documents were made available to the public in the Administrative Record located at the EPA Docket Room in EPA's Philadelphia office, and the Lansdale Public Library, Lansdale, PA. The notice of the availability of these documents was published in the Montgomery

Observer on July 23, 1997 and the Philadelphia Inquirer Montgomery - Neighbors Section on July 28, 1997.

A public comment period on the documents was opened from July 15, 1997 to August 15, 1997. A timely request for a 30-day extension to the public comment was made on August 12, 1997. As a result, the closing of the public comment period was extended until September 15, 1997. In addition, a public meeting was held on August 6, 1997 during which EPA answered questions about conditions at the Site and received verbal comments on the proposed remedial alternatives.

## IV. SCOPE AND ROLE OF THE RESPONSE ACTION

The selected remedy described in this Record of Decision will comprehensively address the threats posed by the release of hazardous substances at the site. The principal threats posed by the site are due to VOC contamination in the groundwater.

The concentration of contaminants in the groundwater at the site are above Maximum Contaminant Levels ("MCLs") which are enforceable, health-based drinking water standards established under the Safe Drinking Water Act ("SDWA"), 42 U.S.C. ºº 300f to 300j - 26.

The primary objectives of the response action specified for the site are: to prevent exposure or potential exposure to groundwater that contains contaminants of concern at the site at concentrations above the MCLs, which are the cleanup goals for the site; and to use remedial technologies to reduce concentrations of site contaminants of concern to levels that are below the MCLs. The ROD proposes to accomplish these goals by 1) addressing contaminated site groundwater and 2) providing a potable alternative source of drinking water to affected and potentially affected residents.

## V. SUMMARY OF SITE CHARACTERISTICS AND EXTENT OF CONTAMINATION

### A. SITE CHARACTERISTICS

#### 1. Topography

The North Penn site is in the Triassic Lowland Section of the Piedmont Physiographic Province. The topography of the area is gently rolling, with low-lying ridges and hills. The site is approximately 480 feet (ft) above mean sea level (msl), along the crest of a broad northeast-southwest trending ridge. Surface elevations vary from about 200 ft above msl to about 600 ft above msl.

#### 2. Surface Hydrology

Information on the surface-water hydrology in the vicinity of the site comes from the United States Geological Survey (USGS) topographic map (Lansdale, Pennsylvania, 7-1/2 minute quadrangle map). Montgomery County is on the drainage divide between the Delaware River and the Schuylkill River. Perkiomen Creek, the largest tributary of the Schuylkill River, drains the northern half of the county. Tributaries of the Delaware River drain the southern part of the county.

The site is along the crest of a broad northeast-southwest trending ridge which acts as a local drainage divide. The northern part of the site is drained by several unnamed tributaries of Zacharias Creek. Zacharias Creek then drains into Skippack Creek, which then discharges into Perkiomen Creek; Perkiomen Creek then discharges into the Schuylkill River, which ultimately discharges into the Delaware River. The southern part of the site is drained by unnamed tributaries of Stony Creek. Along several of the creeks are stock ponds used by area farmers to supply water during the drier months.

Surface water is also fed by springs in the area. Several springs were identified during field work southeast of the site across Trooper Road. The spring water feeds some unnamed tributaries of Stony Creek and provides water for stock ponds and a spring house. The groundwater provides an unknown amount of baseflow for local streams.

3. Soil and Sediment

Three main soil groups are found at the site: the Lansdale Loam, the Lansdale Silt Loam, and the Readington Silt Loam.

The Lansdale Loam has a brown, loamy surface layer in which as much as 35 percent of the soil material consists of pebbles and fragments of sandstone (SCS, 1967). The depth to bedrock ranges from 3 to 12 ft. This soil has been severely eroded, causing it to have a much thinner profile than the Lansdale Silt Loams. The soil is moderately permeable, has a high available moisture capacity, has a medium amount of surface runoff, and has a moderate to severe hazard of erosion (SCS, 1967).

The Lansdale Silt Loam has an 8 to 10-inch surface layer and a 24 to 40-inch subsoil. This soil generally forms over sandstone bedrock. Bedrock is generally 5 to 10 ft below ground surface (bgs). The soil has moderate permeability in the subsoil and moderate to rapid permeability in the subsoil.

The Readington Silt Loam is described as deep, moderately developed well-drained silt loams that form on nearly level surfaces. The surface layer varies from 2 to 24 inches and is described as a friable, dark-brown silt loam. The depth to bedrock is generally about 4 ft, but the depth ranges from 3 to 5 ft (SCS, 1967). The permeability is moderately rapid in the surface layer, and moderately slow in the subsoil. The soil is associated with a high water table.

Sediment samples were collected as part of a wetlands study conducted during the remedial investigation. The sediments are recent fluvial and alluvial material.

4. Regional Geology

The rocks underlying the area around the site are typically composed of the Triassic deposits of the Newark Basin (Longwill and Wood, 1965; Newport, 1971). .

The site lies within the outcrop belt of the Lockatong and Brunswick formations. The youngest bedrock unit is the Brunswick Formation. This formation consists of thin, discontinuous beds of reddish-brown shale interbedded with mudstone and siltstone. Principal mineralogical constituents are feldspar, illite, chloride, quartz, and calcite. The total thickness of the Brunswick near the site is on the order of 9,000 ft (Newport, 1971).

The Brunswick is underlain by the Lockatong Formation, but the two formations interfinger in the vicinity of the site (USGS, June 1995). The Lockatong consists of massive beds of medium and dark gray argillite (a very dense shale and mudstone) interbedded with thin beds of gray-to-black shale and siltstone. Some dolomite, feldspar, clay, and quartz are present. The Lockatong is more resistant to erosion and forms a low ridge when outcropping at the surface. The maximum thickness of the Lockatong in the vicinity of the site is about 2,000 ft (Newport, 1971).

The Stockton Formation underlies the Lockatong and consists of interbedded layers of sandstone and shale. The formation is typically divided into three members. The lower member is characterized by red-to-gray medium- to coarse-grained arkosic sandstone (a sandstone containing appreciable feldspars) and conglomerate. Numerous lenses of silty and sandy red shale are interbedded with the sandstone. The middle member consists of brown, red, and gray fine- to medium-grained arkosic sandstone with thick beds of red shale and siltstone. The sandstones of this member are more well-sorted than the sandstones of the lower member. The upper member is comprised of very fine-grained arkose and siltstone with an extremely hard and resistant layer of red and gray shale at the top. The total thickness of the Stockton in the vicinity of the site is about 6,000 ft (Newport, 1971).

Diabase dikes and sills occur in the subsurface and are exposed at the surface in some parts of Montgomery County. These features are composed of very dense fine-grained black diabase, containing primarily augite and labradorite. The dikes vary from 5 ft to 100 ft in thickness, and the sills may exceed 1,000 ft in thickness at some locations (Newport, 1971).

The sedimentary formations typically dip to the northwest and the north at an average angle of about 20 degrees and strike approximately northeast-southwest (Newport, 1971). Several broad anticlines and synclines have been identified.

Most of the rocks in the vicinity of the Site are cut by a well-developed system of nearly vertical joints. Three distinct joint sets have been identified in the Brunswick (JACA, 1987). One set strikes north-northeast while the other sets are reportedly less well-developed and strike northwest and east-northeast. All three joint sets are nearly vertical in dip. The average distance between joints is about 6 inches. These joint sets are common in the Brunswick but are narrower and more widely spaced in the Lockatong. Where the Brunswick and Lockatong are interfingered, the rocks are characterized by a greater number of fractures. Joints in all formations generally are partly filled with either quartz or calcite cement.

5. Site Geology

Most of the study area is underlain by Lockatong rocks. Rocks that were earlier classified as Brunswick Formation occurring on and near the site interbedded with Lockatong were reclassified by Lyttle and Epstein (1987) as a reddish-brown sandy siltstone member of the Lockatong. The presence of the Lockatong contributes to the high topography at the site. According to the USGS, the beds of the Lockatong Formation strike N64!E and dip at 15! N26!W in the vicinity of the site (USGS, 1995). Borehole video in onsite wells, along with the drilling logs for the wells, identified alternating red and gray siltstone. Longwill and Wood (1965) reported that more fracturing commonly occurs in interbedding of the Brunswick and Lockatong formations than in the two units individually.

Fracture traces provided some evidence of the extent and orientation of fractures.

Fractures are common throughout the area. Bionetics (1989) reviewed aerial photographs of the site and detected two major sets of fractures with orientations northwest/southeast (N 105 to 305W) and east-northeast/west-southwest (N605to 805E). A fracture trace analysis by ERM in 1989 covered an area approximately 1.2 miles by

0.8 miles around the site. Seven fracture traces were located in this site analysis. The fractures are mainly oriented to the north-northwest.

Geophysical logging and downhole video surveying performed by the USGS in nine wells provided information on the type, depth, and extent of fractures at the site. Caliper logs were also run in the boreholes to locate fracture zones. Geophysical logging was also conducted on several wells by ERM. Fractures were confirmed in most wells logged by USGS using a downhole video camera.

For wells with depths greater than about 100 ft, fractures were encountered by caliper logging most commonly within 100 ft of the ground surface. This is well-demonstrated in wells MW-1, MW-3, MW-9, T-3, T-5, T-6, and the Training Center well. Well MW-12 is cased to a depth of 117 ft bgs and therefore provides no information fractures above this depth. However, neighboring well MW-11 shows fractures occurring within 100 feet below ground surface (bgs). Wells MW-2 and MW-6 through MW-8 are too shallow to provide support for the assertion but at least demonstrate the presence of fractures in the upper 100 ft of the subsurface. The scarcity of fractures below a depth of about 100 ft bgs may be due to the tendency of fractures to close up at greater depths because of lithostatic pressure.

Wells MW-3, T-6, MW-7, and T-3 are along the direction of dip. MW-11 and MW-12 are approximately along strike from MW-3 and have been projected into the plane of the cross section from the southwest. The location of fractures observed in each of the wells, along with their orientation (horizontal or vertical), where this is known.

Bedrock formations and bedding planes dip to the northwest. Fractures may occur at any depth, and may be open or may be plugged with calcite deposits. Most of the fractures observed in boreholes on and near the site were in the upper 100 ft bgs. Fractures may be oriented in any direction, but at this site were observed frequently to be vertical. Some fractures were oriented approximately horizontally and may represent bedding plane openings.

Some bedding plane partings may be really extensive. In other areas, bedding planes may be discontinuous. Fractures that may represent bedding plane partings extend down the bedrock dip between wells T-6, MW-3, and the projection of wells MW-11 and MW-12 into the cross section. Some or all of these bedding plane partings may be open continuously. On the other hand, fractures encountered in well T-3 that may represent bedding plane partings do not appear to extend to well T-6. This demonstrates the discontinuous nature of the bedding plane partings. These bedding plane partings do not intersect well MW-7 because it is too shallow.

The USGS (1995) observed spikes in natural gamma logs at depth in some wells. These spikes likely represent thin zones of clay-rich material that appear to serve as marker horizons in the deeper wells. The marker horizons are discussed at greater length in the USGS report on geophysical borehole logging. These horizons were used to calculate the strike and dip of bedding planes discussed above.

## 6. Hydrogeology/Groundwater

The geology of the study area fits the anisotropic, heterogeneous system described above. In an anisotropic, heterogeneous system, preferential flow paths make determining groundwater occurrence and flow direction more complex. In the case of fractured bedrock, the primary porosity of the rock is very low, and most groundwater is found in the secondary porosity caused by fractures and bedding plane partings. Flow direction is determined by the combination of hydraulic gradient direction and the orientation of fractures and bedding planes, and groundwater flow direction cannot be assumed to be perpendicular to the contours of hydraulic head.

Groundwater associated with the Site is found primarily in fractures and bedding plane openings because the primary porosity of shale and Siltstone is extremely low. Bedding planes strike at N645E and dip at N265W in the vicinity of the study area (USGS, 1995). Fracture traces identified by ERM (1990) and Bionetics (1989) show fracture orientations northwest/southeast, approximately along the dip of bedding planes, and also east-northeast/west-southwest, approximately along strike. Much of the groundwater below the North Penn Area 12 site is expected to be found in secondary porosity with these orientations.

Groundwater in the Lockatong Formation may be under confined, unconfined, or under perched conditions. Groundwater in the upper part of the aquifer generally is under unconfined (water-table) conditions. Groundwater in the deeper part of the aquifer is probably confined, resulting in local artesian conditions.

The direction of flow in the study area is determined both by the direction of hydraulic gradient, the orientation of the fractures and bedding planes described above, and the relationship of recharge and discharge areas.

The site is a groundwater-recharge area, located at the top of a ridge where the topography slopes downward to the northwest and southeast. The ridge acts as a groundwater divide. During sampling for the packer testing, it was discovered that water in the upper part of the aquifer was colder and more oxygenated than water obtained from deeper in the aquifer, suggesting that water in the upper part of the aquifer had greater or more recent contact or exchange with the atmosphere than that in the lower zone (USGS, 1995). This observation supports the designation of the site as a groundwater-recharge area.

Water levels have been measured in onsite monitoring wells on several occasions. The following sources of water-level data were consulted:

- ERM (May 1990; data collected in August 1988)
- CH2M HILL (data collected in March and June 1995)
- USGS (1995; data collected continuously beginning in late May 1995)

A piezometric-surface map based on water levels measured in August 1988 by ERM (May 1990) showed the gradient of hydraulic head sloping to the north to northwest. This map indicates the potential for groundwater beneath the site generally to flow in this direction, parallel to the bedrock dip and down topographic slope. The 1988 water-level measurements also indicated an area of high hydraulic head near the septic system drainfield, which created groundwater gradients radially west, north, and northeast from the drainfield. The cone of depression created by the Center Point Training Center production well is clearly indicated.

Water-level data from March and June 1995 (CH2M HILL. 1995; USGS, 1995) confirmed that the hydraulic-head gradient slopes toward the north and northwest, so that the direction of groundwater flow potentially is approximately in these directions. The area of high hydraulic head detected in 1988 near the septic system drainfield is not evident at this time. It is likely that the hydraulic-head gradient on the southeast side of the ridge slopes toward the east to southeast, contributing to a component of groundwater flow away from the groundwater divide in these directions. The Center Point Training Center production well northeast of the site modifies the natural hydraulic gradient by inducing groundwater in the eastern part of the site to flow north and northeast rather than northwest. Some groundwater is drawn into the Training Center well itself.

Based on the observed water-level data, groundwater beneath the site primarily flows toward the northwest. Flow in this direction is due primarily to the disposition of area topography, fracture orientation, and the dip of bedding planes. Additionally, most of the residential wells in the area are located north and west of the site; pumping from these residential wells is expected to increase the local hydraulic gradient and enhance groundwater flow northwest from the study area. Because of the anisotropic nature of fractured bedrock, flow will not occur consistently perpendicular to the contours of hydraulic head. The actual flow direction at any given point may vary widely depending on the orientation of fractures present at that point. However, the net effect of the factors described above is to drive flow generally toward the northwest.

The USGS developed a map of water levels measured in several wells within one-half mile of the site. This map shows the potential for groundwater to flow generally to the north and northwest in the vicinity of the site. Groundwater also flows to the southeast, northeast, and southwest in a radial fashion away from the site.

Discharge points for the groundwater moving to the north and northwest include residential wells and possibly springs and groundwater discharge along two unnamed tributaries of Zacharias Creek to the east and northwest. Discharge points for groundwater on the southeast side of the groundwater divide include residential wells and several springs that feed an unnamed tributary of Stony Creek. The tributary itself may have a groundwater baseflow component.

## B. NATURE AND EXTENT OF CONTAMINATION

### 1. Air

Volatilization of VOCs to the atmosphere is not a significant risk at the Site due to the relatively low levels of contamination in the soil. Air monitoring surveys conducted in 1995 found no detections of VOCs attributable to contamination from the Site. Wind erosion and future construction activities have the potential of transporting soil contamination. Contaminants that tend to bind to the soil (e.g., metals) can be released to the air with wind blown dust. However, no Site-related metal contamination was identified. Risk associated with wind erosion and dust from construction is considered to be comparable to that from other uncontaminated locations near the Site.

Two air monitoring surveys were conducted as part of the RI field activities in 1995. The monitoring was conducted with portable hand held volatile organic compound detection devices. No significant levels of volatile organic contamination were identified during either of the monitoring events.

### 2. Soil Contamination

Soil and soil gas samples were collected between 1988 and 1994. Soil gas samples collected in 1990 showed evidence of VOC contamination, particularly vinyl chloride. The maximum vinyl chloride concentration was 325 ppb and the maximum TCE concentration was 14 ppb.  The highest readings were found in samples taken southeast of the parking lot and in the septic drain field.

Soil samples collected one month later, however, showed very little VOC contamination. Soil Samples were collected from 18 locations where soil gas was found to have elevated soil gas levels of VOCs.  Vinyl chloride was detected in only one sample at 3 Ig/kg in the septic drain field.

Soil sampling conducted by EPA in 1994 also showed very low concentrations of VOCs. PCE was found in two samples, one on he Nike property at 1.9 Ig/kg and one in the septic drain field on the Transicoil property at 1.6 Ig/kg.  Comparisons of soil VOC levels with levels that could pose a risk to human health did not show any VOCs of potential concern in the soil.  Therefore, no soil remediation is required.

Soil samples collected in 1994 also showed levels of inorganic compounds (arsenic, beryllium, and manganese) in excess of levels that could pose a potential human health risk.  Additional off-site soil samples were collected in December, 1995, from five locations in the vicinity of the Site to better establish background levels of arsenic, beryllium, and manganese.  Comparison of levels of these contaminants measured at the source area with levels measured at background locations and with levels general found in the eastern United States documented in literature indicates that the inorganic contaminants are not Site-related.  Also, there is no evidence of releases of inorganic contamination from the operations at the Site.  Therefore, the presence of arsenic, beryllium, and manganese observed in soil are considered to be naturally occurring and are not considered to be a result of activities at the Site.  Therefore, no remediation for inorganic contaminants in soil will be required.

3. Surface Water

Five surface water samples were collected in March 1995 from ponds, a spring, and in creeks near the Site at both upstream and downstream locations and in nearby, but separate, watersheds.  The locations were selected to represent areas that could potentially be affected by the Site (within the Site surface water drainage area) and areas not affected by the Site.  No VOCs or semi-volatile organic compounds (SVOCs) were detected in any surface water samples.  Very low levels of the pesticides 4,4-dichlorodiphenyldichloroethane (4,4-DDD) at 0.0044 Ig/L and 4,4-dichlorodiphenyltrichloroethane (4,4-DDT) at 0.0043 Ig/L were detected in one surface water sample.  These pesticides are not associated with Site contaminants and are more likely a result of local agricultural activities.  Inorganic compounds were also found at concentrations well below published standards.

4. Surface Water Sediment

Sediment samples were collected in March 1995 from the same five locations sampled for surface water.  Inorganic contaminants (arsenic, beryllium, and lead) were detected in sediment samples but, with the exception of lead, were below the lowest toxicological screening levels for sediments.  Lead is not considered to be Site-related and no clear path exists for surface water drainage from the Site to the area where the highest lead levels were found.

5. On-Site Groundwater

The monitoring wells were sampled by the PRP in August 1988 and by EPA in March

1995. Groundwater samples were collected from production and monitoring wells (MWs) installed on the Transicoil property, the former Nike property, and adjacent properties. Both TCE and tetrachloroethene (PCE) were found at levels exceeding drinking water standards in some samples. In addition, 1,1,1-TCA, 1,1-dichloroethene (1,1-DCE), Freon-113, and arsenic were detected. The highest levels of contamination in 1995 were found in MW-3 and MW-1 (TCE at 88 ppb, PCE at 3 ppb; and TCE at 380 ppb, PCE at 25 ppb, respectively); both are located northwest and downgradient of the septic drain field which is one of the suspected sources of the contamination at the site. Wells in the southeastern part of the Site had very low levels of contamination.

Historical data show fluctuations in the level of TCE in Site groundwater, ranging from 75 ppb (in 1979) to 2 ppb (in 1995) in production monitoring well T-3. Levels over time appear generally to be decreasing in both production monitoring wells T-3 and T-5.Samples from MW-1 through MW-5 also show a decrease in TCE concentration between 1988 and 1995. Although these data indicate that high concentrations near the source on the Transicoil property are dissipating, the most recent data from T-6, indicate that this well has a concentration of TCE which is higher now than it has been at any point in the past (100 ppb in 1995 compared to 33 ppb in 1988). The concentration of 1,1,1-TCA decreased between 1988 and 1995 in all wells sampled.

6. Groundwater in Residential Wells

Several residential wells surrounding the Transicoil property are contaminated with TCE, 1,1,1-TCA, Freon-113, and other chlorinated organic compounds. The contaminated wells are primarily located to the west, northwest, and northeast of the Transicoil property, although five wells to the southwest and southeast of the property also showed low levels of contamination. Most of the contaminated residential wells are located northwest of the Transicoil property, in Blocks Number 15 and 17 on either side of Valley Forge Road (see Figure 3). Two adjacent wells (Lots 17-46 and 17-52, located approximately 1,500 feet west-northwest of the Transicoil property were found to have TCE concentrations of 200 ppb and 180 ppb, respectively in January 1995. These two wells (Lots 17-46 and 17-52) were found to have TCE concentrations of 130 ppb and 120 ppb, respectively in November 1995. One residential well located further west of the Transicoil property site (Lot 15-10) was found to have 40 ppb of TCE. In addition, TCElevels in excess of MCLs also were found north of the Transicoil property in Block 14A, with concentrations in adjacent lots along Heebner Road ranging from 8 to 24 ppb.

Residential wells also had detectable levels of Freon-113 (for which no published standard is available) and of 1,1,1-TCA. Levels of 1,1,1-TCA were well below MCL for drinking water in all residential wells sampled. The pattern of contamination for Freon-113 and 1,1,1-TCA generally paralleled that of TCE, although concentrations of these compounds were significantly lower than those of TCE. Chloroform was detected in some residential wells containing other contaminants. Estimated chloroform levels, which generally were below quantitative detection limits, were slightly higher than the level that poses a potential risk to human health (0.15 ppb).

Contaminant levels in residential wells varied over time. Two wells (17-46 and 17-52), which were found to be the most contaminated during the 1995 sampling event, had levels twice as high in 1990. Some wells with lower contaminant levels experienced slight increases, while others experienced slight decreases. The data indicated that high levels of contamination at the Site may be gradually decreasing and moving down gradient.

No residential wells have been tested for inorganics. However, the North Penn Water Authority (NPWA) regularly tests area supply wells for a variety of compounds, including inorganics. Levels of arsenic in two NPWA monitoring wells (NP-34, approximately 7,000 feet north-northeast of the Transicoil property, and NP-33, approximately 4.5 miles north) were similar to levels detected onsite. NPWA monitoring wells showed arsenic at 2 to 5 ppb, which is below the MCL for arsenic which is 50 ppb.

## VI. SUMMARY OF SITE RISKS

### A. Human Health Risk Evaluation

#### 1. Selection of Chemicals of Concern

A selection process was used to reduce the field of detected chemicals to those considered to be the most important to the human health evaluation. Identification of the chemicals of potential concern (COPCs) was based on methods described in Risk Assessment Guidance for Superfund (USEPA, 1989a, 1991b), Guidance for Data Usability in Risk Assessment (USEPA, 1992), and Selecting Exposure Routes and Contaminants of Concern by Risk-Based Screening (USEPA, 1993b). The criteria for the selection of COPCs were as follows:

- Contaminant concentrations exceeding risk-based concentrations (RBCs) (in accordance with Region III guidance, USEPA, 1991b, 1993b, 1994b); for soils, saturation concentrations were calculated for organic constituents and used as the screening value if the RBC value was greater than the saturation concentration (USEPA, 1991b). (The RBCs are based on a target hazard index of 0.1 and target cancer risk of 1 X 10 -6.)

- Maximum concentrations of inorganic constituents exceeding background concentrations.

- Human nutrient concentrations exceeding the National Research Council's (NRC) Recommended Dietary Allowances (RDAs), Estimated Safe and Adequate Dietary Intakes, or Estimated Minimum Requirements for Healthy Persons (NAS, 1989).

A total of 59 chemicals, which included VOCs, semivolatiles, pesticides, and metals were detected in environmental media during sampling activities of the Remedial Investigation. The complete listing of COPCs for the Site is presented in Table 1-1 of the Feasibility Study Report. The major chemicals of concern for the site were determined to include:

ò Trichloroethene
ò 1,1-dichloroethene
ò 1,2-dichloroethene (total)
ò 1,2-dichloroethene (cis)
ò Tetrachloroethene
ò Chloroform

#### 2. Exposure Assessment

The objective of the exposure assessment is to estimate the amount of each COPC at a site that is actually taken into the body (i.e. the intake level or dose). There are three primary routes through which individuals may be exposed to site related contaminants including ingestion, inhalation, and contact with the skin. The group of individuals for which exposure was evaluated at the Site includes current and future residents, and current and future workers.

The potential receptors at the site were selected on the basis of the site setting, the nature and extent of contamination, plausible exposure pathways, and EPA guidance. Potential receptors for North Penn Area 12 are future site residents, future construction workers, and current and future onsite workers (occupational exposures).

Exposure to contamination at the site may occur at any location or to any contaminated medium that is accessible to potential receptors. Currently, the only accessible medium at the site is surface soil. Other media, including subsurface soil and groundwater, on the site currently are not accessible. The major routes of contaminant intake include incidental ingestion of, dermal contact with, and inhalation of surface soil fugitive dust; in surface and subsurface soil; and in groundwater.

Exposure to chemicals in surface soil was evaluated for the occupational worker on the site. Because onsite workers currently do not work outdoors, inhalation of fugitive dust is not considered a complete exposure pathway. Dermal contact with surface soil is considered a minor contributor to overall risk for the current worker, and was not evaluated quantitatively. The hypothetical future residential land use scenario also was evaluated for exposure to surface soil, including exposures to surface soil via incidental ingestion and dermal contact for a child and an adult. The site is vegetated, therefore dust inhalation is not considered a complete pathway.

Exposure to chemicals in subsurface soil was evaluated for the hypothetical future construction worker involved in short-term excavation activities. The exposure pathways evaluated are incidental ingestion, dermal contact, and inhalation of fugitive dust.

Exposure to chemicals in the groundwater was evaluated for potential future exposure for children and adults. The evaluation used data from onsite monitoring well samples. Residential wells where contaminant levels exceeded MCLs have been provided with groundwater treatment systems to reduce the exposure to site contaminants. Therefore, current exposure to groundwater was not considered a complete pathway (the contaminant levels will be less than MCLs after treatment) and was evaluated qualitatively. Future exposure to groundwater was quantitatively evaluated for residential exposure for children and adults. The exposure routes evaluated are ingestion, dermal contact while bathing (child), and inhalation of volatiles while showering (adult).

3. Toxicity Assessment

The toxicity assessment characterizes the inherent toxicity of a compound and helps to identify the potential health hazard associated with exposure to each of the chemicals of concern. Toxicological values, reference doses (RfDs) for non-carcinogenic chemicals and the non-carcinogenic effects of carcinogens, and cancer slope factors (CSFs) for known, suspected, and possible human carcinogens, derived by USEPA were used in the Risk Assessment.

RfDs have been developed by EPA for indicating the potential for adverse health effects from exposure chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

CSFs have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogoic chemicals. CSFs, which are expressed in units of (mg/kg-day) -1, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level.

The term "upper-bound" reflects the conservative estimate of the risks calculated from the CSF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal to human extrapolation and uncertainty factors have been applied.

4. Risk Characterization

The noncancer hazard indices (HIs) and cancer risks, and major sources of the risks are discussed below for exposure of potential receptors to surface soil, subsurface soil, and groundwater. Data from samples collected onsite were used in risk calculations. Table 1 presents the risk estimates for each medium and receptor and their relative contribution to the risks at the site. Risk calculations for exposure to the various media are presented in Appendix O of the RI report.

a. Surface Soil, Exposure Scenario

Risk estimates were calculated for the residential receptor potentially exposed to surface soil via incidental ingestion and dermal contact. The onsite worker and future trespasser were not evaluated because no constituents were selected in the COPC screening process. The future construction worker was evaluated for a combined surface and subsurface soil exposure scenario and is discussed in paragraph b, below.

The HIs for the ingestion and dermal exposure scenarios for future residents were below the USEPA recommended level of 1. Aluminum, the only CoPC identified in surface soil, is not considered a carcinogen and, therefore, the exposure estimates for carcinogens were not evaluated for the future resident.

b. Combined Surface and Subsurface Soil, Exposure Scenario

Risk estimates were calculated for the construction worker exposed to subsurface soil via incidental ingestion, dermal contact, and inhalation of dust during excavation activities. The VOC inhalation scenario was eliminated during the COPC screening process because no VOCs were selected as COPCs.

All noncancer hazards and carcinogenic risks were below or within EPA threshold levels for all exposure scenarios. The cumulative hazard was also below the EPA recommended level of 1. The cumulative cancer risk was 6.3E-06 which is within the EPA target risk range.

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c. Groundwater, Exposure Scenario

Reasonable Maximum Exposure Scenario

The noncancer HIs for all exposure scenarios were above the recommended level of 1. All of the cancer risks except ingestion of groundwater were within EPA's target risk range of 10 -4 to 10 -6. Table 2 below presents a summary of human health risks from exposure to groundwater.

Table 2
Human Health Risks

| Group of Individuals | Cancer Risk (Additional cancer cases for every 10,000 people) | Hazard Index Child | Hazard Index Adult |
|---|---|---|---|
| Future on-site adult residents who inhale contaminants during showering | .66 | --- | 3.5 |
| Future on-site residents who consume groundwater from the Site for 30 years | 2.6 | 5.6 | 2.4 |
| Future on-site child touching contaminated groundwater | .19 | 2.2 | NA |
| Total Calculated Risk for Above Exposures | 3.4 | 7.8 | 5.9 |

Children. The cumulative hazard index for ingestion of groundwater by children is 5.6 and for dermal contact while bathing is 2.2, which are above the threshold level of 1. TCE contributes approximately 71 percent of this hazard. The cancer risk from dermal contact during bathing is within the EPA target risk range.

Adults. The cumulative hazard indices for inhalation during showering and ingestion are 3.5 and 2.4, respectively, which are greater than the EPA threshold level. TCE contributes 93 percent of the inhalation hazard and 70 percent of the ingestion hazard. The cumulative risk from inhalation during showering is 6.6 x 10 -5, which is within the EPA target-risk range of 10 -4 to 10 -6. The age-adjusted cancer risk from ingestion is 2.6 x 10 -4, which is above the EPA target risk range. Arsenic contributes 44 percent of this risk, 1,1-DCE contributes 24 percent; and, TCE contribute approximately 24 percent of the total risk. Arsenic, however, has been determined to not be site related because it was found in soil at levels comparable to background samples collected in the vicinity of the site.

Central Tendency Scenario

The noncancer hazard index values for all exposure scenarios were above the recommended level of 1. All of the cancer risk estimates were within EPA's target risk range of 10 -4 to 10 -6

Children. The cumulative HI for children for ingestion of and dermal contact with groundwater are 2.4 and 1.7, respectively. TCE contributes approximately 71 percent of the ingestion hazard and 93 percent of the dermal hazard. The cancer risk due to dermal contact while bathing was 1.4 x 10 -5, which is within the EPA-recommended risk range.

Adults. The cumulative HI for ingestion is 1.7 and for inhalation during showering is 1.9. TCE contributes 93 percent of the inhalation hazard and 70 percent of the ingestion hazard. The inhalation cancer risk while showering is 1.4 x 10 -5, which is within the recommended risk range. The age-adjusted ingestion cancer risk is 8.3 x 10 -5, which is within the EPA target-risk range.

In summary, the principal source of risk at the site is from exposure to groundwater. Risks from exposure to soil are below or within EPA recommended levels. The main contaminants contributing to the noncancer hazard from groundwater are TCE and arsenic. The main cancer risk contaminants are TCE, arsenic, 1,1-DCE, and PCE. Arsenic, however, has not been determined to be site-related because it was found in soil at levels comparable to levels in background samples collected in the vicinity of the site and also comparable to levels normally expected to be found in soils of the Eastern United States. Arsenic in groundwater is considered to be a result of the background concentrations in soil. Other inorganics selected as COPCs for groundwater (aluminum and mercury) presented negligible risk at observed concentrations. Inorganics, therefore, are not considered COPCs for the site. Site-related COPCs are the following organic compounds: chloroform, 1,1-DCE, 1,2-DCE(total), 1,2-DCE(cis), PCE, and TCE.

## B. Environmental Risk

### 1. Site Characterization

Potentially sensitive receptors to onsite soil-gas and soil contamination and offsite surface water and sediment contamination include wetlands, threatened and endangered species, and other flora and fauna on and near the site.

No threatened or endangered species were identified on or near the site. During the work conducted under the 1990 RI, requests for information on threatened and endangered species near the site were sent to the regulatory authorities who have jurisdiction over matters affecting such species and species habitat. No threatened or endangered species habitats were identified on or near the site by those agencies. As part of the 1995 RI/FS work, CH2M HILL recontacted each agency, requesting updated information as to the status of threatened and endangered species near the site. No threatened or endangered species habitats have been identified on or near the site. Copies of letters sent to regulatory authorities, and responses received to date, are in Appendix N of the RI Report.

On the basis of nondetection of site contaminants in surface water and sediment samples, wetlands identified to the south of the site do not appear affected by site groundwater contaminants. Streams, springs, wetlands, and the aquatic species they contain, may be at some risk due to non-site-related contaminants.

Burrowing animals, animals that ingest soil, and vegetation are potentially at risk from soil-gas contamination.

### 2. Environmental Assessment

The objectives of the environmental assessment were to:

- Locate and characterize wetlands that might be affected by site contamination or remediation of the site

- Identify potential threatened or endangered species and their habitat within the area potentially affected by the site

- Discuss qualitatively the effect of the site contamination and potential remedial measures on the ecology

3. Risk Characterization

a. Soil Contamination

Few VOCs were detected in soil. PCE was detected in seven samples. Four of the detections indicate that PCE was not found at levels substantially above the level found in associated blanks. TCE was detected in one sample at a level below the practical quantification limit. None of the VOC detections was above interim draft Region III screening levels set by the biological technical assistance group (BTAG) (BTAG, 1995).

Soil-gas data are used to screen for "hot spots" of soil and groundwater contamination. In general, the highest concentrations of soil-gas contaminants were found southeast of the parking area. High concentrations of vinyl chloride and TCE also were detected in soil gas collected from the septic drainfield area.

Soil was sampled in several of the locations where soil gas was collected, including several where soil gas was found to have elevated levels of VOCs. Only vinyl chloride was detected and in only one soil sample, at 3 Ig/kg. High levels of soil-gas contamination did not correspond to locations where VOCs were detected in soils.

Selected soil samples also were analyzed on and off the site for pesticides and SVOCs. Low levels of several pesticides were detected in samples collected both on and off the site. The detections are consistent with the rural surroundings because pesticides likely have been used in farming this area. Low levels of SVOCs also were detected in several samples. SVOC contamination also may result from pesticide or herbicide use. Several SVOCs and pesticides have USEPA contract-required detection limits that are higher than the Region III BTAG interim draft screening levels, published January 1995.

In all soils tested for inorganics, beryllium was found at levels higher than the proposed action level of 0.2 mg/kg (Federal Register, July 27, 1990). The metal was detected at similar levels throughout the area investigated, both in onsite samples and in background samples. Beryllium was detected as high as 1.7 mg/kg in soils. The observed range of concentrations in the eastern United States is <1 to 7 mg/kg, with an estimated arithmetic mean of 0.85 mg/kg (Shacklette and Boerngen, 1984). No clear source of the beryllium was identified. There is no indication that beryllium was used or disposed of at the Transicoil site. Therefore, the beryllium detected in soils is not believed to be site-related.

Lead concentrations in soil were similar throughout the site, except for one location on the Nike Park site. That sample was collected at 0.6 feet bgs and contained 94.4 mg/kg of lead, in contrast to values ranging from 11.2 to 29.2 mg/kg in all other samples collected from the Nike and Transicoil sites. The observed range of lead concentrations in the eastern United States is <10 to 300 mg/kg, with a mean of 17 mg/kg (Shacklette and Boerngen, 1984). Because the contract-required detection limit for lead (0.6 mg/kg) is greater than the Region III BTAG screening level for lead in soil (0.0125 mg/kg), the assumption is that all samples exceed the BTAG screening criteria. Several other inorganics have contract-required detection limits set above BTAG screening criteria. The inorganics are antimony, beryllium, chromium, cobalt, copper, mercury, nickel, selenium, silver, and thallium. However, no information exists that suggests th;6 metals were used or disposed of at the Transicoil site. Therefore, any possible detection of metal is not believed to be site-related.

Arsenic was detected at concentrations one order of magnitude lower than the proposed federal action level of 80 mg/kg in nearly all soil samples tested, Two soil samples collected in the area of the septic drainfield had arsenic concentrations slightly above the 5 mg/kg Region III BTAG screening level. Concentrations were similar throughout the site, and no clear pattern to arsenic levels was apparent. Arsenic is present in soils of the eastern United States at concentrations ranging from <0.1 to 73 mg/kg, with an estimated arithmetic mean of 7.4 mg/kg (Shacklette and Boerngen, 1984). Arsenic is not believed to be a site related contaminant.

b. Surface Water Contamination

Surface water and sediment samples were collected from ponds, a spring, and creeks near the site. Surface water and sediment sampling location SW-5 is a background location, on a tributary whose drainage basin does not include the site. No VOCs or SVOCs were detected in surface water. Several metals have contract-required detection limits set above BTAG screening criteria. The metals are cadmium, chromium, cyanide, lead, mercury, and silver. Several metals were detected at low levels in surface water and sediment samples collected downslope of the site. Figure 4 presents analytical results for dissolved arsenic and manganese found in surface water samples.

Dissolved arsenic was detected in all but one surface water sample, but the levels detected were not significantly higher than those found in associated blank samples. No total arsenic was detected in surface water. The ambient water quality criterion (AWQC) for chronic exposure to total arsenic in surface water is 874 Ig/L. The chronic AWQC value for arsenic in filtered samples is 190 Ig/L. As discussed above, arsenic is not considered a site-related contaminant.

The surface water quality criterion for manganese published by the Commonwealth of Pennsylvania is 1.0 mg/L. No surface water samples collected exceeded this standard. The highest manganese level detected in surface water at the site was 182 Ig/L, in a sample collected from location SW-3, at the edge of a pond on the Hitchens farm site. A similarly high level was recorded at the outlet of a pond that does not appear to drain from the site (location SW-2). The other three samples tested had concentrations of manganese one order of magnitude lower than SW-2 and SW-3.

A comparison of metals in surface water shows that the background sample (SW-5) had concentrations similar to the other samples for nearly all constituents. As noted above, manganese was found at higher concentrations in SW-2 and SW-3 than in SW-5. The total lead concentration in SW-1 was higher than that in SW-5; however, no dissolved lead was present in either sample. Dissolved metals are presumed to have the greatest potential to interact with aquatic organisms, however, metals are not considered to site-related.

Surface water sample SW-3 contained very low levels of 4,4'-DDD and 4,4'-DDT. Several of the pesticide contract detection levels are above the Region III BTAG interim draft screening levels. Pesticides are not considered to be site-related contaminants.

c. Sediment Contamination

Figure 5 shows analytical results for arsenic, beryllium, and lead in sediment samples. Levels of arsenic and beryllium in sediment samples were slightly higher than those found in soil samples. No clear areal pattern of contamination is evident. Only low values of pesticides, SVOCs, and VOCs were detected. Several of the pesticide and inorganic detection limits are above the Region III BTAG screening levels. The conservative assumption for compounds with detection limits above guidance levels is that all samples exceeded the guidance criteria.

Toxicological screening levels are available for selecting contaminants that require further study of their effects on sediment-associated biota. Concentrations are reported as effects range-low (ER-L), corresponding to the lower 10th percentile of concentrations exhibiting adverse effects, and effects range-median (ER-M), corresponding to the 50th percentile of concentrations.

Sediment contamination detected near the Transicoil site was compared to available guidance levels for inorganics in sediment. The maximum concentration detected was below the ER-L for all compounds except lead, where all but one sample exceeded the ER-L concentration of 35 mg/kg. The highest concentration measured was 53.6 mg/kg, at location SD-1 in the spring southeast of the Transicoil site. No clear areal pattern to lead levels in sediment was evident. There is no clear path for surface water drainage from the site to the area with the highest lead levels. The background sample concentration measured 41.1 mg/kg. Lead concentrations are probably within background range. As discussed above, lead is not believed to be a site-related contaminant.

d. Groundwater Contamination

The majority of the contamination on and off the site was detected in groundwater. The main groundwater contaminants are TCE, 1,1,1-TCA, 1,1-DCE, Freon-113, and arsenic. The highest TCE concentration detected in groundwater on the site is 380 Ig/L.

The site is on the top of a northeast trending ridge. Depth to groundwater on the top of the ridge is approximately 60 feet. The majority of groundwater and groundwater contamination is migrating off the site to the north and northwest. Intermittent streams and ponds that may have a component of groundwater flow exist approximately 4000 feet northwest of the site. Some of the groundwater from the southeast section of the site, which is on the southeast slope of the ridge, appears to be migrating to the south. Groundwater-fed springs, wetlands, and streams occur south of the site. Many of the springs, wetlands, and streams occur even during extended drought conditions, suggesting that they are supplied largely by groundwater. Some springs flow from outcropping bedrock. Results of sampling indicate that very little groundwater contamination is migrating to the south and east of the site. A few residential wells located directly adjacent to the site have low concentrations of TCE, but TCE has not been detected in any other residential wells south and east of the site.

No discernible decrease in flow or water level was seen in the springs, wetlands, and streams south of the site during the aquifer-response testing. Longer-duration pumping, such as may be necessary with a hypothetical pump-and-treat remediation scenario, may affect water levels in these springs, streams, and wetlands.

Residential well sampling north and northwest of the site suggests that the contaminated groundwater has migrated farther north than originally anticipated. The intermittent streams and ponds located approximately 4000 feet northwest of the site were originally believed to be beyond the furthest extent of the groundwater contamination.

These contaminants are not expected to pose a hazad to the environment at the surface-water locations because concentrations of contaminants detected in the sampled residential wells generally decline as the distance from the site increases (which causes concentrations in residential wells sampled nearest the surface-water bodies to be low); because of the distance from the North Penn Area 12 site to the surface-water locations; and because the majority of the groundwater contaminants are volatile.

e. Air Contamination

Air monitoring surveys of the site, conducted during the RI field investigation, suggest that site-related volatile contaminants do not appear to be migrating by air in detectable quantities.

## VII. DESCRIPTION OF REMEDIAL ALTERNATIVES

A number of remedial action alternatives have been considered which would address groundwater contamination at the Site and provide alternative residential drinking water supplies. These alternatives are based on those presented in the Feasibility Study.

### A. Groundwater Remedial Alternatives:

#### 1. Alternative GW-1: No Action

Capital Cost: $0
Annual Operation & Maintenance (O&M) Cost: $0
Total Present Worth: $0

The no action alternative is required by the National Contingency Plan (NCP) and it serves as a baseline alternative. All other alternatives are judged against the no action alternative. Under this alternative, no controls or remedial technologies would be implemented.

#### 2. Alternative GW-2: Groundwater Extraction at Source, Air Stripping or Carbon Treatment, and Surface Water Discharge

Capital Cost: $378,000
Annual O&M Cost: $29,000
Total Present Worth: $830,000 1

This alternative requires installing extraction wells on the former Transicoil property. Extraction wells are the most frequently used method for collecting groundwater. Seven new extraction wells would be installed. Three existing monitoring wells would also be converted into extraction wells for a total of 10 wells in the extraction system. The water table is approximately 65 feet below ground surface (bgs). The majority of fractures in the bedrock are generally within the upper 100 feet of bedrock. The wells would be installed to a depth of 80 to 100 feet bgs. Extraction well modeling was conducted as part of the Remedial Investigation activities and the results were used to determine well locations and pumping rates. The model indicates that the contaminated groundwater could be pumped at a total flow rate of 35 gallons per minute (gpm). Figure 6 shows approximate locations of the proposed extraction and monitoring wells. The exact number, location, and depth of the wells would have to be determined during the remedial design.

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1 The present worth for all alternatives is calculated using a five percent interest rate over 30 years. For Alternatives GW-2 through GW-5, costs have been calculated assuming an average cost for the two treatment options.

The extracted groundwater would be treated using air stripping or carbon adsorption. These treatment options are considered comparable with respect to cost, implementability, and effectiveness. This alternative, therefore, does not specify which treatment option would be selected; selection would be a part of the remedial design effort.

Air Stripping. The air stripping system would use a packed tower or series of baffles and forced airflow to provide an interface between contaminated groundwater and air. VOCs in the groundwater are transferred to the air. Vapor-phase carbon would then be used to remove the VOCs from the of-gas from the air stripping unit.

Carbon Adsorption. Carbon effectively removes chlorinated organic compounds. The contaminants accumulate on the carbon and eventually, the carbon has to be replaced. When the carbon is replaced, the spent carbon is regenerated offsite. Regeneration is a process that incinerates the contaminants off of the carbon to open up the surface of the carbon and allow the carbon to be reused. The carbon would be regenerated offsite, destroying the adsorbed contaminants.

The system would discharge the treated water to surface water. The treated water would be piped to a culvert on Trooper Road, south of the Transicoil property, where the flow eventually goes to an unnamed tributary of Stony Creek and then to Stony Creek approximately five miles southeast of the property.

A preliminary evaluation was conducted to determine if a metal precipitation treatment system would be required to prevent fouling of a volatile organic treatment system and to ensure compliance with any discharge limit for metal constituents. It was concluded that a metal treatment system would not be required. This determination was based on the review of existing inorganic sampling data for wells on the Transicoil property.

Groundwater contamination beyond the Transicoil property would be managed by relying on natural attenuation. Many of the impacted properties have low levels of TCE present in their supply well. The residents' direct use of water is being addressed under the components for drinking water alternatives. The natural attenuation relies on degradation, volatilization, adsorption, and dilution which reduce contaminant concentration levels. The concentration levels would eventually attain their MCLs. Natural attenuation would be monitored by sampling residential wells on a regular basis to evaluate the extent of and concentrations in the groundwater plume.

In addition, the alternative includes administrative restrictions and groundwater monitoring. Administrative restrictions would require the regulation of the installation of any new supply wells in and around the Site to assure that no further exposure to contaminated groundwater occurs. A deed restriction would also be imposed on the Transicoil property that would prohibit the installation and use of supply wells on the property, and the pumping of groundwater under the property that could adversely affect the containment affects of the extraction system.

Groundwater monitoring would continue at the Site. Several additional monitoring wells would be installed, as indicated on Figure 6. Monitoring would monitor the extent and concentration of the groundwater plume, and evaluate the affects of the extraction and treatment system in removing the existing groundwater contamination. The influent and effluent of the treatment system would be monitored routinely to ensure the effectiveness of the system and that groundwater cleanup/treatment levels are being met.

3. Alternative GW-3: Groundwater Extraction at Source, Air Stripping or Carbon Treatment, and Discharge, Additional Groundwater Extraction to Reduce Contaminant Migration

| | |
|---|---|
| Capital Cost: | $1,797,000 |
| Annual O&M Cost: | $63,000 |
| Total Present Worth: | $2,760,000 |

This alternative adds additional groundwater extraction to Alternative GW-2 to remediate groundwater that already has migrated off of the Transicoil property and would not be captured by extraction wells proposed in Alternative GW-2. This alternative acts to reduce the risks associated with residential wells that are contaminated.

Preliminary groundwater modeling and extraction system configuration indicates that one line of extraction wells arcing around the Site would be required to contain the plume. The wells would arc around the Site from the West to the North at a distance of approximately 5,000 feet from the Transicoil property. An estimated 115 wells spaced approximately 75 feet apart would be installed. Figure 7 shows the approximate location of the line of extraction wells. The wells would be located downgradient from the Transicoil property and residential wells where TCE has been detected. The flow rate from each well would be two to three gpm for a total flow rate of roughly 300 gpm. Recent residential well data indicate the presence of contamination beyond the modeled capture zone in the Crest Terrace Area. The final well alignment would be selected using additional hydrogeologic and contaminant level data to ensure the appropriate capture zone. The total number of wells and extraction flow rate would be comparable to the modeled values. Alternate well locations could be developed during remedial design that would be able to produce equivalent results to the configuration specified.

Due to the positioning of the wells and combining effluent of wells prior to discharge, the extracted groundwater would not require treatment because average concentrations are anticipated to meet surface water standards. The water would be discharged directly to surface water. This discharge would be monitored periodically to ensure that all discharge requirements are met. The extraction, treatment, and discharge system components on the Transicoil property would remain the same as Alternative GW-2.

Administrative restrictions would regulate installation of any new supply wells in and around the Site to assure that no further exposure to contaminated groundwater occurs. A deed restriction would also be imposed on the Transicoil property that would prohibit the installation and use of supply wells on the property and the pumping of groundwater under the property that could adversely affect the containment affects of the extraction system.

Groundwater monitoring would continue at the Site. Several additional monitoring wells would be installed, as indicated on Figure 6. Monitoring would measure the extent and concentration of the groundwater plume, and evaluate the affects of the extraction and treatment system in removing the existing groundwater contamination. The influent and effluent of the system would be monitored routinely to ensure the effectiveness of the treatment system and that cleanup/treatment levels are being met.

4. Alternative GW-4: Groundwater Extraction at Source, Air Stripping or Carbon Treatment, and Reinjection

| | |
|---|---|
| Capital Cost: | $489,000 |
| Annual O&M Cost: | $35,000 |
| Total Present Worth: | $1,040,000 |

This alternative is similar to GW-2, except that the disposal option for the treated groundwater is reinjection. Ten extraction wells (see GW-2) would discharge water to the air stripping carbon
treatment system. The effluent would be reinjected downgradient of the extraction wells. Reinjection would be performed using injection wells, an infiltration bank, or spray irrigation. Reinjection would be performed at a location that would avoid enhancing contaminant migration or short-circuiting the extraction system. The injection well locations would be developed during a pre-remedial design study. As with Alternative 2, groundwater monitoring would be required and natural attenuation would be relied upon to address contamination beyond the Transicoil property.

Administrative restrictions would regulate installation of any new supply wells in and around the Site to assure that no further exposure to contaminated groundwater occurs. A deed restriction would also be imposed on the Transicoil property that would prohibit the installation and use of supply wells on the property and the pumping of groundwater under the property that could adversely affect the containment affects of the extraction system.

Groundwater monitoring would continue at the Site. Several additional monitoring wells would be installed, as indicated on Figure 6. Monitoring would measure the extent and concentration of the groundwater plume, and evaluate the affects of the extraction and treatment system in removing the existing groundwater contamination. The influent and effluent of the system would be monitored routinely to ensure the effectiveness of the treatment system and that treatment levels are being met.

5. Alternative GW-5: Groundwater Extraction at Source, Air Stripping or Carbon Treatment, and Reuse as Water Supply

| | |
|---|---|
| Capital Cost: | $774,000 |
| Annual O&M Cost: | $43,000 |
| Total Present Worth: | $1,440,000 |

This alternative is similar to Alternative GW-2, except that the treated water would be reused as a water supply for the local residents by feeding it into the NPWA supply system. This alternative would be combined with drinking water Alternative DW-2, connecting residents to the NPWA supply system.

Ten extraction wells (see Alternative GW-2) would be used to provide extracted water to an air stripping or carbon adsorption system. The water would be treated to meet all local, county, state, and federal drinking water quality requirements. In addition to the filtration and carbon treatment components of Alternative GW-2, inorganic chemical removal (manganese, iron), and disinfection have to be included in the system. The treatment system would be housed in a permanent building. The system also would have fail-safe controls and other emergency provisions to ensure that untreated water does not enter the NPWA system.

Groundwater contamination beyond the Transicoil property would be managed by relying on natural attenuation. Natural attenuation relies on degradation, volatilization, adsorption, and dilution which reduce contaminant concentration levels.

In addition, the alternative includes administrative restrictions and groundwater monitoring. Administrative restrictions would regulate installation of any new supply wells in and around the Site to assure that no further exposure to contaminated groundwater occurs. A deed restriction would also be imposed on the Transicoil property that would prohibit the installation and use of supply wells on the property and the pumping of groundwater under the property that could adversely affect the containment affects of the extraction system.

Groundwater monitoring would continue at the Site. Several additional monitoring wells would be installed, as indicated on Figure 6. Monitoring would measure the extent and concentration of the groundwater plume, and evaluate the affects of the extraction and treatment system in removing the existing groundwater contamination. The influent and effluent of the system would be monitored routinely to ensure the effectiveness of the treatment system and that treatment levels are being met.

6. Alternative GW-6: Groundwater Extraction at Source, UV/Oxidation, and Discharge

| | |
|---|---|
| Capital Cost: | $444,000 |
| Annual O&M Cost: | $44,000 |
| Total Present Worth: | $1,130,000 |

This alternative utilizes 10 extraction wells (see Alternative GW-2) to pump contaminated water on the Transicoil property to the treatment system. The treatment system for this alternative is chemical oxidation, also known as UV/oxidation. UV/oxidation is a destructive technology with no air emissions and generates minimal waste requiring offsite disposal.

UV/oxidation uses ultraviolet light in conjunction with standard oxidants such as hydrogen peroxide and ozone to greatly increase treatment performance over that obtained with either hydrogen peroxide or ozone alone. A treatability study may have to be performed to optimize operating conditions for the system.

Groundwater contamination beyond the Transicoil property would be managed by natural attenuation. Many of the residential wells have low levels of TCE. The residents' direct use of water is being addressed under the components for drinking water. Natural attenuation relies on degradation, volatilization, adsorption, and/or dilution which reduce contaminant concentration levels.

In addition, the alternative includes administrative restrictions and groundwater monitoring. Administrative restrictions would regulate installation of any new supply wells in and around the Site to assure that no further exposure to contaminated groundwater occurs. A deed restrictions would also be imposed on the Transicoil property that would prohibit the installation and use of supply wells on the property and the pumping of groundwater under the property that could adversely affect the containment affects of the extraction system.

Groundwater monitoring would continue at the Site. Several additional monitoring wells would be installed, as indicated on Figure 6. Monitoring would measure the extent and concentration of the groundwater plume, and evaluate the affects of the extraction and treatment system in removing the existing groundwater contamination. The influent and effluent of the system would be monitored routinely to ensure the effectiveness of the treatment system and that treatment levels are being met.

7. Alternative GW-7: Groundwater Extraction at Source, Metal-Enhanced Abiotic Degradation, and Discharge

| | |
|---|---|
| Capital Cost: | $1,380,000 |
| Annual O&M Cost: | $51,000 |
| Total Present Worth: | $2,160,000 |

This alternative utilizes 10 extraction wells (see Alternative GW-2) to pump contaminated water on the Transicoil property to the treatment system. The treatment system for this alternative is metal-enhanced abiotic degradation. Metal-enhanced abiotic degradation is an innovative technology designed to treat halogenated VOCs in water. The technology has been evaluated under EPA's SITE program.

The process uses a reactive granular iron medium that causes breakdown of VOCs to simple hydrocarbons (such as methane and ethane) and halogen salts as byproducts. The influent would require filtering to remove suspended solids that may inhibit flow through the medium.

The benefits to the process are the destruction of contaminants, no air emissions, no media transfer of contaminants, low energy consumption, and low O&M costs. Disadvantages of the technology are the amount of iron required for the reaction, formation of precipitates onto the iron media, and that full-scale aboveground systems have not yet been implemented (only pilot-scale systems have been implemented).

Treatability testing of the technology would be performed to measure the degradation rate of the groundwater contaminants and the rate of precipitates forming on the iron media. The results of the testing would be incorporated into a remedial design.

The remaining portions of the alternative are consistent with Alternative GW-2. The system discharge would be piped to a culvert on Trooper Road. The treatment unit would require a building, shed, or other structure for shelter from the weather. Groundwater contamination beyond the Transicoil property would be managed by relying on natural attenuation. The residents' direct use of water is being addressed under the components for drinking water. In addition, the alternative includes administrative restrictions and groundwater monitoring. Administrative restrictions would regulate installation of any new supply wells in and around the Site to assure that no further exposure to contaminated groundwater occurs. A deed restrictions would also be imposed on the Transicoil property that would prohibit the installation and use of supply wells on the property, and the pumping of groundwater under the property that could adversely affect the containment affects of the extraction system.

Groundwater monitoring would continue at the Site. Several additional monitoring wells would be installed, as indicated on Figure 6. Monitoring would measure the extent and concentration of the groundwater plume, and evaluate the affects of the extraction and treatment system in removing the existing groundwater contamination. The influent and effluent of the system would be monitored routinely to ensure the effectiveness of the treatment system and that treatment levels are being met.

8. Alternative GW-8: Natural Attenuation, Institutional Controls, Groundwater, Monitoring

| | |
|---|---|
| Capital Cost: | $88,000 |
| Annual O&M Cost: | $16,400 |
| Total Present Worth: | $350,000 |

This alternative would rely only on natural attenuation to decrease contaminant levels; no active remediation efforts would be employed. Institutional control actions such as local ordinances and deed restrictions would be used to prevent access to and use of contaminated groundwater. Groundwater monitoring would be used to track the migration and attenuation of the contaminant plume and identify locations where access to groundwater would be limited.

Natural attenuation relies on naturally occurring processes such as dilution, volatilization, adsorption, and/or biodegradation to reduce contaminant levels. Dilution, volatilization, and adsorption occur in some degree at all sites, but typically are not adequate in themselves in achieving remedial goals throughout the plume. Assuming site-specific conditions are supportive of biodegradation, the biodegradation component, in conjunction with the other naturally occurring processes, can effectively reduce concentrations.

The biodegradation process for TCE can occur as a result of reductive dehalogenation and aerobic cometabolism. Conditions at the Transicoil property are not believed to be supportive of biodegradation because of the lack of other organic material needed for the microorganisms to perform the biological degradation. Natural attenuation at the Transicoil property would rely primarily on less effective processes such as dilution, volatilization, and adsorption. Long-term monitoring would be required in any event to document the progress of the plume.

B. Alternate Drinking Water Alternatives

1. Alternative DW-1: No Action

| | |
|---|---|
| Capital Cost: | $0 |
| Annual O&M Cost: | $0 |
| Total Present Worth: | $0 |

Under this alternative no further effort or resources would be expended to provide residents within the vicinity of the North Penn Area 12 Site with an uncontaminated drinking water supply. The existing drinking water sampling program would be discontinued. The current program of providing operation and maintenance of the carbon systems currently installed would be discontinued, and would become the responsibility of the residents. Current and future residents would have unlimited access to contaminated drinking water. Drinking water treatment and/or connection to an alternative drinking water supply would be at the individual owners' discretion and expense. Because contaminated media would be left on Site, a review of Site 6 conditions would be required every five years, as specified in the NCP. Alternative DW-1 serves as the baseline against which the effectiveness of other alternatives are judged, and is required under the NCP.

2. Alternative DW-2: Connect Residents to Public Water Supply

| | |
|---|---|
| Capital Cost: | $2,340,000 |
| Annual O&M Cost: | $0 2 |
| Total Present Worth: | $2,340,000. |

Alternative DW-2 involves expanding the existing NPWA public water distribution system and supplying public water to the homes and businesses that have been affected and potentially may be affected. New water mains would be installed in the affected areas, and all residents along the pipeline route would be offered the option of being connected to the public water system at no cost. Existing private wells would be abandoned unless the owner requests continued use of the well for non-consumption purposes, and the current program of operating and maintaining carbon systems already installed would be discontinued.

Abandonment of existing residential wells would have unknown, although probably minimal, effects on the hydraulic gradient. Although such effects cannot be quantified at this time, they are not anticipated to adversely effect a groundwater remedial alternative. Services offered to residents at no charge would include installing the water main, installing a lateral between the main and the home, installing a water meter, connecting residences to the water main, installing required plumbing from the water main to the plumbing system of the house, and abandoning existing private wells. A public water supplier, such as the NPWA, then would bill residents for water usage. Public water connections under this remedy would not be offered to lots that are not yet developed.

The affected area currently is served by one NPWA 16-inch diameter main on Valley Forge Road. NPWA's ownership of this main terminates at the intersection of Valley Forge Road and Township Line Road. The Pennsylvania-American Water Company (PAWCO) owns this main south of Township Line Road. The expansion of the system would tie into the Valley Forge Road NPWA main to provide water to areas where sampling and analysis indicates groundwater contamination have affected or could affect residential drinking water supplies. Affected and potentially affected residences along the extension route would be offered the option of being connected to the public water supply. At this time public water is expected to be offered to approximately 120 locations. This plan could be expanded if updated residential groundwater sampling data indicates that the site-related groundwater contamination has migrated beyond its current extent.

The design of the public water supply extension and the construction could be performed directly by the NPWA or by outside contractors. After the system is completed, it is anticipated that it will be turned over to a public water supplier, such as the NPWA, to operate and maintain.

2 The water line would be turned over to a private water supplier, such as the NPWA, for O&M. Therefore, this alternative will not include an O&M cost.

Figure 8 illustrates the current water supply system and proposed extension.

In addition to providing a connection to the public water supply system, Alternative DW-2 would require other components to reduce potential use of and exposure to contaminated groundwater. Institutional controls, such as local ordinances or deed restrictions that regulate the installation of new wells, would have to be implemented. A groundwater monitoring program still would be required to monitor the migration of groundwater contamination and confirm that all affected and potentially affected residences are provided with clean water. It is assumed that the monitoring component would be accomplished as part of the selected groundwater alternative, and therefore is not included in Alternative DW-2.

3. Alternative DW-3: Carbon Adsorption at Residence Wellhead

| | |
|---|---|
| Capital Cost: | $227,000 |
| Annual O&M Cost: | $62,000 |
| Total Present Worth: | $1,180,000 |

Alternative DW-3 involves continuing the current residential well monitoring program and providing carbon treatment systems to residents whose wells are contaminated at or above the TCE MCL of 5 ppb. This alternative is currently being performed by the PRPs under the Response Action Plan dated October 1995. Residences are categorized into three "Tiers" based on the results of samples taken from their wells:

Tier I - Residences with TCE concentrations at or above the MCL. Carbon treatment systems are required and have been provided to these residences. Drinking water samples are collected before, in, and after the carbon systems are installed. A total of 27 carbon systems has been (or will soon be) installed for Tier I residences. Fourteen systems are maintained by Schlumberger Limited, Inc. and 13 systems are maintained by Eagle Picher, Inc.

Tier II - Residences with TCE concentrations below the Analytical Detection Limit. Drinking water samples are collected and analyzed annually. These home wells have been sampled and TCE was not detected. Approximately 100 residences are currently sampled under the Tier II sampling program. If TCE is detected in the future, their classification would be changed to either Tier I or Tier III.

Tier III - Residences with TCE concentrations above the analytical detection limit and below the MCL. Drinking water samples are collected and analyzed semi-annually. If TCE is found to be at or above the MCL, carbon systems are offered to the residences. Approximately 30 residences are currently sampled under the Tier III sampling program.

The carbon systems consist of two vessels (primary and secondary) containing activated carbon, which are connected in series, onto which VOCs adsorbed. The current systems are anticipated to last three years before requiring replacement depending the level of water use and the concentration of the contaminants.

This alternative includes continuation of the existing Tier I and Tier II sampling and analysis programs. The need for carbon systems and associated sampling and analysis would be reduced over time as contaminant levels decrease due to natural attenuation and implementation of the groundwater remedial alternative.

## VIII. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Each of the remedial alternatives summarized in this plan has been evaluated with respect to the nine (9) evaluation criteria set forth in the NCP, 40 C.F.R. Section 300.430(e)(9). These nine criteria can be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. A description of the evaluation criteria is presented below:

Threshold Criteria:

1. Overall Protection of Human Health and the Environment addresses whether a remedy provides adequate protection and describes how risks are eliminated, reduced, or controlled.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether a remedy will meet all of the applicable, or relevant and appropriate requirements of federal, State, and local environmental statutes and regulations.

Primary Balancing Criteria:

3. Long-term Effectiveness refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals are achieved.

4. Reduction of Toxicity, Mobility, or Volume through Treatment addresses the degree to which alternatives employ recycling or treatment that reduces toxicity, mobility, or volume of contaminants.

5. Short-term Effectiveness addresses the period of time needed to achieve protection and

any adverse impacts on human health and environment that may be posed during the construction and implementation period until cleanup goals are achieved.

6. Implementability addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

7. Cost includes estimated capital, operation and maintenance costs, and present worth.

Modifying Criteria:

8. State Acceptance indicates whether, based on its review of backup documents and the Proposed Plan, the State concurs with, opposes, or has no comment on the preferred alternative.

9. Community Acceptance will be assessed in the Record of Decision following a review of public comments received on the Proposed Plan and supporting documents included in the Administrative Record.

1. Protection of Human Health and Environment

The primary requirement of CERCLA is that the selected remedial action be protective of human health and environment. A remedy is protective if it eliminates, reduces or controls current and potential risks posed through each exposure/pathway to acceptable levels through treatment, engineering controls, or institutional controls.

Groundwater Remedial Alternatives: Alternative GW-1 (No Action) protects neither human health nor the environment. Human cancer risk and HI will not be reduced from the current levels of 2.7 x 10 -4 (cancer) and 8.6 (HI), both of which exceed levels suggested by regulatory guidance. Contaminant levels will exceed MCLs indefinitely over an increasing area as the contaminant plume migrates away from the site. Because this alternative does not meet this threshold criteria, it will not be considered further in this analysis.

Alternative GW-8 (Natural Attenuation and Groundwater Monitoring) would protect human health primarily through institutional controls that limit access to contaminated groundwater. Assuming that the institutional controls are implemented effectively, cancer and toxic risk would be 1.0 x 10 -4 (cancer) and 0.4 (HI), both of which are within the acceptable range. Natural attenuation would result in long-term reductions in contaminant concentrations. However, the area and concentrations of offsite contamination may increase due to the continuing migration of highly contaminated groundwater away from the site. The environment may not be protected, because contamination would be allowed to continue to migrate away from the former Transicoil property and additional areas could be affected by the contamination. Effects of contaminant migration to surface waters would likely be minimal, due to the volatilization of VOCs from the surface water to ambient air. Remedial technologies would not be used to reduce contaminant concentrations.

Alternatives GW-2, GW-4, GW-5, GW-6, and GW-7 that propose using a pump and treat system to contain and remediate contamination while relying on institutional controls and natural attenuation to address contamination beyond the property, protect human health and provide limited protection of the environment. All of these alternatives eventually would achieve MCLs in groundwater beneath the Transicoil property and prevent further migration of contaminant levels above MCLs beyond the property boundaries. Carcinogenic and non carcinogenic risks would be 1.0x10 -4 (cancer) and 0.4 (HI), both of which are within the acceptable range. Contaminant levels beyond the Transicoil property will be reduce through dilution and adsorption, but may remain above MCLs for a period of time due to the lack of an active offsite remediation component. However, a groundwater travel time analysis conducted by EPA indicates that the implementation of extraction wells on the Transicoil property could reduce the time required to achieve cleanup goals beyond the property boundary locations by 15 percent to 37 percent when compared to Alternatives GW-1 and GW-8. It should be noted that the actual time reduction that would be achieved has not been quantified. The environment beyond the Transicoil property boundaries, therefore, would be monitored to determine the actual future effectiveness of the onsite pumping. Effects of contaminant migration to surface waters would likely be minimal, due to the volatilization of VOCs from the surface water to ambient air. Institutional controls would be used to prevent access to contaminated groundwater during the remedial action. Alternative GW-4, however, may be somewhat less protective because the capture zone for the extraction wells would be reduce if the reinjection area is located downgradient of the extraction wells. This could result in the system being less effective in preventing contaminants in groundwater beneath the Transicoil property from migrating offsite unless it can be accomplished without adversely affecting the pumping influence of the extraction system. However, this option provides a benefit by allowing the water table to be replenished by replacing the extracted contaminated water with clean treated water.

Alternative GW-3 provides the maximum level of protection to human health and the environment. The extraction component beyond the Transicoil property would remediate contamination that already has migrated away from the property. Groundwater beneath the Transicoil property and beyond the property would be remediated to MCLs under this alternative. Cancer and toxic risk levels would be reduced to acceptable levels, $1.0 \times 10^{-4}$ (cancer) and 0.4 (HI) respectively, in a shorter period of time when compared to the alternatives that provide only pumping on the Transicoil property.

Drinking Water Remedial Alternatives: Alternative DW-1 (No Action) does not protect human health. Human carcinogenic and non-carcinogenic risks will not be reduced from the current levels of $2.71 \times 10^{-4}$ (cancer) and 8.6 (HI), both of which exceed levels suggested by regulatory guidance. Because this alternative does not meet this threshold criteria, it will not be considered further in this analysis.

Alternative DW-2 (Connection to Public Water Supply) provides maximum protection of human health, because it effectively eliminates human exposure to contaminated drinking water. Alternative DW-3 (Carbon Treatment at Residence Wellheads) provides acceptable protection of human health. Carcinogenic and non-carcinogenic risks associated with drinking water which contains contamination below MCLs would be $1.0 \times 10^{-4}$ (cancer) and 0.4 (HI), both of which are within the acceptable range. However, there still would be some risk of exposure at higher levels due to analytical or treatment system error.

2. Compliance with ARARs

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State standards, requirements, criteria and limitations which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA Section 121(d)(4). Applicable requirements are those substantive environmental requirements, criteria, or limitations promulgated under Federal or State laws that specifically address hazardous substances found at the site, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the Site.

Relevant and appropriate requirements are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law which, while not applicable to the hazardous materials found at the site, the remedial action itself, the site location or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the site. ARARs may relate to the substances addressed by the remedial action (chemical-specific), to the location of the site (location specific), or the manner in which the remedial action is implemented (action-specific).

In addition to applicable or relevant and appropriate requirements, the lead agencies may, as appropriate, identify other advisories, criteria, or guidance to be considered for a particular release. The "to be considered" ("TBC") category consists of advisories, criteria, or guidance that were developed by EPA, other federal agencies or states that may be useful in developing CERCLA remedies. A detailed listing of ARARs for the Selected Remedy is in Section X.B. of this Record of Decision.

Groundwater Remedial Alternatives: Except for ARARs setting forth MCLs, all alternative remedies would complied with all identified ARARs. The concentrations of VOCs currently in the ground water exceed MCLs as specified in the Safe Drinking Water Act. Alternative GW-8 may not be able to achieve compliance with the ARAR requirements within an acceptable period of time. If GW-8 is eventually able to achieve MCLs, it would take considerable longer period of time than the other alternatives would be able to achieve ARARs. It is anticipated that all pump and treat alternatives, GW-2, GW-3, GW-4, GW-5, GW-6, and GW-7, will be able to achieve ARARs requirements. GW-4 would be the alternative that would achieve the ARAR requirements in the most expeditious time period.

Drinking Water Remedial Alternatives: Both Alternatives DW-2 and DW-3 are anticipated to be able to be implemented in a manner which comply with all ARARs by adhering to established practices and standards. Alternative DW-2 can more readily achieve safe drinking water standards because the water supply will be permanent. Alternative DW-3 will have to rely on monitoring and proper maintenance to ensure that safe drinking water standards are met.

3. Long Term Effectiveness and Permanence

The alternatives will achieve long-term effectiveness and permanence in varying degrees, as discussed below long-term effectiveness is assessed by analyzing two factors: the magnitude of the residual risk, and the adequacy and reliability of the controls.

a. Magnitude of Residual Risk

Groundwater Remedial Alternatives: All of the alternatives employing pump and treat (GW-2 through GW-7) probably will require long-term implementation to achieve the cleanup objectives. Alternative GW-8, the natural attenuation alternative, will rely on institutional controls indefinitely, because contaminant levels would be reduced over a significant longer period of time. Precise estimates of the time required to achieve the cleanup objectives would be difficult to derive from the available information. Therefore, for the purposes of estimating the costs of the remedial alternatives, a period of 30 years has been used.

The residual risk from Alternative GW-8 (Natural Attenuation and Groundwater Monitoring) is acceptable, but highly dependent upon institutional controls. Alternative GW-8 relies primarily on institutional controls, such as local ordinances to prevent exposure to contaminated groundwater. Natural attenuation is not anticipated to significantly reduce contaminant levels in an acceptable timeframe because conditions on the Transicoil property are unlikely to support biological degradation of contaminants. Assuming that the institutional controls are implemented indefinitely, carcinogenic and non-carcinogenic risks of $1.0 \times 10^{-4}$ (cancer) and 0.4 (HI) will be achieved, both of which are in the acceptable range.

Alternatives GW-2, GW-4, GW-5, GW-6, and GW-7 (groundwater extraction and treatment on the Transicoil property) have acceptable residual risk and are less dependent upon institutional controls. These alternatives are anticipated to achieve contaminant levels below MCLs by extracting and treating groundwater and natural attenuation. Carcinogenic and non-carcinogenic risks of $1.0 \times 10^{-4}$ (cancer) and 0.4 (HI) will be achieved after MCLs are reached, both of which are in the acceptable range. Groundwater travel time analysis indicates that the implementation of an extraction system on the Transicoil property could reduce the time required to achieve cleanup goals at locations beyond the property boundary by 15 percent to 37 percent. Institutional controls would be used to prevent exposure to contamination during the remedial action.

GW-3 will use groundwater extraction both on and beyond the Transicoil property to reduce contaminant levels below MCLs. Carcinogenic and non-carcinogenic risks after MCLs are achieved would be $1.0 \times 10^{-4}$ (cancer) and 0.4 (HI), both of which are in the acceptable range. Institutional controls still would be used to prevent exposure to contamination during the remedial action.

Drinking Water Remedial Alternatives: Alternative DW-3 (Carbon Treatment at Residence Wellhead) will achieve acceptable residual risk. This alternative will achieve carcinogenic and non-carcinogenic risks of $1.0 \times 10^{-4}$ (cancer) and 0.4 (HI), both of which are in the acceptable range. However, these risk levels are contingent on the carbon vessels being replaced prior to contaminant breakthrough.

Alternative DW-2 (Connection to Public Water) will have minimal residual risk. This alternative will effectively eliminate the risk from Site-related contaminants. Residents would be supplied with treated public water.

b. Adequacy and Reliability of Controls

Groundwater Remedial Alternatives: Alternative GW-8 (Natural Attenuation and Groundwater Monitoring) has questionable adequacy and reliability. This alternative relies almost exclusively on institutional controls, such as local ordinances and groundwater monitoring. There is uncertainty both that all of the potentially affected areas can be addressed by these controls and that the public will comply with the controls indefinitely. While Alternatives GW-2 through GW-7 also rely on institutional controls, these alternatives prevent the further release of contamination beyond the Transicoil property and lower the potential risks if the institutional controls fail.

Alternative GW-7 (Metal-Enhanced Abiotic Degradation) could be adequate and reliable, but technical issues must be addressed. This alternative employs an innovative, unproven technology that has not been implemented at many sites. The ability of the technology to adequately treat all Site contaminants would have to be confirmed through a treatability study. If adequate treatability is confirmed, the alternative would be comparable to other treatment technologies considered (see below). This alternative would rely on the implementation of institutional controls.

The remaining alternatives (GW-2 through GW-6) are adequate and reliable because they employ air stripping, carbon adsorption, or UV/oxidation. These technologies have been employed at sites with comparable contamination and are anticipated to be able to reduce Site contaminants to the required levels. The technologies are well established and available from a variety of vendors. These alternatives would also rely on the implementation of institutional controls.

Drinking Water Remedial Alternatives: Alternative DW-3 (Carbon Treatment at Residence Wellhead) has moderate adequacy and reliability because it depends on continuing sampling and analysis to identify when carbon vessels should be changed out. The possibility of exposure to contaminant levels above MCLs also exists if analytical error occurs or if exceedences occur between sampling events.

Alternative DW-2 (Connection to Public Water) has high adequacy and reliability. This alternative would effectively eliminate the possibility of exposure to contaminated drinking water. The supply of public water is highly regulated and there is a high degree of confidence that a continuing supply of clean water would be supplied.

4. Reduction of Toxicity, Mobility, and Volume

Groundwater Remedial Alternatives: None of the alternatives will be able to collect all contaminated groundwater because of technology limitations and geologic conditions (fractured bedrock). The extent to which each alternative is able to reduce contaminant toxicity, mobility, and volume is as follows.

Alternative GW-8 (Natural Attenuation and Groundwater Monitoring) provides very limited reductions in toxicity, mobility, and volume. This alternative relies solely on natural attenuation to reduce contaminant levels. Because conditions at the Transicoil property probably will not support the biodegradation component of natural attenuation, toxicity reductions would be achieved through dilution and adsorption over a long time frame. The mobility of the contaminants would not be reduced and a larger area would be affected. The volume of contaminated groundwater above the MCL could increase.

The alternatives employing a pump and treat system to address contamination on the Transicoil property (GW-2, GW-4, GW-5, GW-6, and GW-7) will significantly reduce the toxicity, mobility, and volume of contamination. Toxicity would eventually be reduced to the acceptable risks associated with MCLs. The mobility of contamination originating on the Transicoil property would be hydraulically contained by the extraction system. Reductions in contamination beyond the Transicoil property would rely on natural attenuation. However, some additional reduction would be achieved by removing the Transicoil property as a source of continuing contamination. UV/oxidation and metal-enhanced abiotic degradation would destroy contaminants onsite. Contaminants collected by carbon eventually would be destroyed when the carbon is regenerated offsite.

Alternative GW-3 (groundwater extraction on and beyond the Transicoil property) would also significantly reduce the toxicity, mobility, and volume of contamination. The extraction system would address all known areas of contamination and reduce contaminant concentrations both on the former Transicoil property and away from the property to below MCLs. Contaminants collected on the Transicoil property would be removed and destroyed through treatment. Contaminants collected beyond the property boundary at lower concentrations would be transferred to surface waters without treatment at levels that meet surface-water standards.

Drinking Water Remedial Alternatives: None of the alternatives are intended to provide a reduction of toxicity, mobility, and volume. The alternatives focus only on providing a supply of drinking water to residents potentially affected by Site contaminants. Reduction of toxicity, mobility, and volume is addressed through the groundwater remedial alternatives discussed above.

5. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to achieve protection of human health and the environment and any adverse impacts that may be posed during the construction and operation period until performance standards are achieved.

Groundwater Remedial Alternatives: Alternative GW-8 (Natural Attenuation and Groundwater Monitoring) will not result in any potential short-term risks to the community and workers with the exception of readily mitigated risks to workers performing groundwater monitoring. However, the components of this alternative will have to be performed indefinitely.

Alternatives requiring pump and treat only on the Transicoil property (Alternatives GW-2, GW-4, GW-5, GW-6, and GW-7) will result in similar risks to workers and the community. Risks to the community during construction may arise due to fugitive dust that may be generated during drilling and construction activities. Monitoring of fugitive dust may be required to ensure that the community is protected. Standard methods to reduce the amount of dust generated can be implemented easily during drilling. Dust is not anticipated to contain contaminants because soil contamination has not been observed. Worker exposure during construction and operation of the treatment systems will be mitigated through the use of engineering controls and personal protective equipment. Alternative GW-2 may result in emissions of contaminants to the atmosphere if an air stripper is used and air pollution control equipment is not employed, however, these emissions will be required to meet any applicable air emission limitations. Other treatment technologies will not result in air pollutant emissions.

Alternative GW-3 (groundwater extraction on and beyond the Transicoil property) will have similar risks to the workers and communities as the other pump and treat alternatives. The added number of extraction wells to be installed beyond the Transicoil property will present an additional risk from fugitive dust that may need to be mitigated.

Drinking Water Remedial Alternatives: Alternative DW-3 (Carbon Treatment at Residence Wellheads) has the least amount of risk to workers, provided that safe work practices are employed.

Alternative DW-2 (Connection to Public Water Supply) worker risk is associated with construction activities, rather than exposure to contamination. This alternative will have to be managed to minimize the environmental impact associated with controlling erosion and required stream crossings. Measures to monitor and control fugitive dust may be required as part of construction activities.

6. Implementability

Implementability refers to the technical and administrative feasibility of a remedy, from design through construction, operation and maintenance. It also includes coordination of federal, State, and local governments to clean up the Site. The technical feasibility, administrative feasibility, and availability of services and material for each alternative are described below.

a. Technical Feasibility

Groundwater Remedial Alternatives: Alternative GW-7 (metal-enhanced abiotic degradation) employs an Innovative, unproven technology. The ability of this technology to achieve the cleanup objectives is uncertain. This uncertainty would be reduced through satisfactory completion of a treatability study.

The pump and treat alternatives (GW-2 through GW-6) employ either very simple technologies (groundwater monitoring) or technologies that are well-established (extraction wells, air stripping, carbon adsorption, UV/oxidation). These alternatives are considered to be technically feasible. However, the component of GW-3 requiring groundwater extraction beyond the Transicoil property will be difficult to implement because of the amount of work that would be required. Installation of an extraction system and piping will be difficult in the residential area. Alternative GW-8 (natural attenuation) would be the easiest alternative to implement from a technical perspective.

Drinking Water Remedial Alternatives: Alternative DW-2 (Connection to Public Water Supply) has the highest technical feasibility because it is an established practice, with minimal possibility of system failure. Alternative DW-3 (Carbon Treatment at Residence Wellhead) has high technical feasibility; unlikely system failures could be identified through a monitoring program and adequate capacity.

b. Administrative Feasibility

Groundwater Remedial Alternatives: The alternatives are generally similar to each other in terms of administrative feasibility and are considered to be feasible. All pump and treat alternatives will require compliance with equivalent reinjection permit requirements and/or compliance equivalent NPDES permit limitations for discharging either treated or untreated groundwater. Five-year Site reviews are required for each alternative because contaminated groundwater exceeding MCLs will remain on the Site during the remedial action. The alternatives with specific administrative feasibility issues that may make implementation difficult are discussed below.

Implementation of Alternative GW-8 (Natural Attenuation and Groundwater Monitoring) may be hampered by possible public perception that it is not protective enough because no active remediation efforts would be implemented. The long-term reliance on institutional controls to prevent exposure to contaminated groundwater over a large area may also be difficult, particularly if previously unaffected areas lose the use of existing water supplies.

Alternative GW-3 (groundwater extraction on and beyond the Transicoil property) will be difficult to implement because of the need to obtain access or easements from approximately 20 or more private landowners for installation of extraction wells.

Drinking Water Remedial Alternatives: Alternative DW-3 has high administrative feasibility; permits and interaction with other agencies are not required. Alternative DW-2 has moderate administrative feasibility; construction activities will require a significant amount of approvals from and interactions with local authorities and the NPWA.

c. Availability of Services and Materials

Groundwater Remedial Alternatives: With the exception of Alternative GW-7 (metal-enhanced abiotic degradation), all alternatives use technologies and equipment that are readily available from a number of vendors. Alternative GW-7 will require a treatability test to confirm that the relatively unproven technology of metal-enhanced abiotic degradation can treat Site contaminants effectively. Although a treatability test also will be required for UV/oxidation to determine the appropfiate size and power of the treatment unit, there is considerably less uncertainty associated with the ability of UV/oxidation to treat Site contaminants.

Drinking Water Remedial Alternatives: Services and materials are readily available for both Alternatives DW-2 and DW-3.

7. Cost

This criterion examines the estimated costs for each remedial alternative evaluated in the Feasibility Study Report. A summary comparison of capital, O&M, and Present Worth costs for each alternative are presented in Tables 3 and 4, below. Detailed alternative cost estimates can be found in Appendix C of the Feasibility Study.

Groundwater Remedial Alternatives:  Alternative GW-8 is obviously the least expensive option, however, no active treatment of the existing groundwater contamination will be provided.  Alternatives GW-2, GW-4, and GW-6 are the least expensive options that provide treatment and removal of the existing groundwater contamination.  Alternative GW-6 is mid-range treatment option that has a higher capital cost than GW-2, GW-4, and GW-6. Alternative GW-7 is the most expensive option than only provides for pumping of the Transicoil property groundwater because of significantly higher capital cost.

The most expensive option is alternative GW-3, however, this option provides additional pumping of the contaminated groundwater beyond the Transicoil property.

Table 3 below presents a comparative cost summary of the groundwater alternatives.

Table 3
Groundwater Remedial Alternatives
Cost Summary

| Alternative | Capital Cost | Annual O&M Cost | Total O&M Cost | Present Worth |
|---|---|---|---|---|
| GW-2 | $378,000 | $29,204 | $448,937 | $830,000 |
| GW-3 | $1,797,000 | $62,620 | $962,623 | $2,760,000 |
| GW-4 | $489,000 | $35,000 | $551,000 | $1,040,000 |
| GW-5 | $774,000 | $43,000 | $666,000 | $1,440,000 |
| GW-6 | $444,000 | $44,364 | $681,983 | $1,130,000 |
| GW-7 | $1,380,000 | $50,664 | $778,830 | $2,160,000 |
| GW-8 | $88,000 | $16,416 | $252,354 | $350,000 |

Note: Total O&M Cost is based on a five percent discount rate over 30 years. Present worth is capital cost plus total O&M costs.

Drinking Water Remedial Alternatives: DW-2 is significantly more expensive than DW-3 due primarily to the capital cost. However, there is no annual O&M cost projected for DW-2 because it is assumed that the local water authority will accept the responsibility for ownership and all future O&M cost for this remedial alternative.

Table 4
Drinking Water Remedial Alternatives - Cost Summary

| Alternative | Capital Cost | Annual O&M Cost | Total O&M Cost | Present Worth |
|---|---|---|---|---|
| DW-2 | $2,340,000 | $0 | $0 | $2,340,000 |
| DW-3 | $227,000 | $62,000 | $950,000 | $1,180,000 |

Note: Total O&M Cost is based on 5 percent discount rate over 30 years. Present worth is capital cost plus total O&M cost.

8.  State Acceptance

The Commonwealth of Pennsylvania Department of Environmental Protection (PADEP) has assisted EPA in the review of reports and site evaluations. The PADEP agrees with the approach of EPA's selected Remedy as described in the Declaration above.

9.  Community Acceptance

A public meeting on the Proposed Plan was held on August 6, 1997 at the Fairview Village Assembly Hall in Worcester Township, Montgomery County, Pennsylvania.  Comments received orally at the public meeting and in writing during the comment period are referenced and addressed in the attached Responsiveness Summary.

Most of the comments received during the public meeting focused on three issues.  One of the issues involved EPA's proposal to discharge treated water to a surface water discharge near the site as described in alternative GW-2.  Several people expressed concerns about the pumping system affecting the water capacity of private wells near the site that will still remain in use after public water is provided.  EPA has addressed that comment in this Record of Decision by allowing the possibility of reinjection of the treated water as described in alternative GW-4 if it can be shown that such reinjection will not adversely affect the containment effects of the pumping system.  The reason that EPA did not consider reinjection initially was because that some preliminary modeling completed during the RI/FS indicated that reinjection at some specific locations could adversely impact the containment capability of the pumping system.  This issue will be further studied during a pre-design study to determine if the reinjection system could be located appropriately not to adversely impact the containment capability of the pumping system.  If this determination can be substantiated, then alternative GW-4 will be implemented.  If this determination cannot be made, then alternative GW-2 will be implemented.

A number of people were concerned that EPA had determined their home wells were not potentially affected by the Site and were, therefore, not going to be offered a no-cost connection to the proposed public water supply extension.  They expressed concern about the potential effects that plans to deepen a nearby quarry might have on their water supply both from a contamination and water capacity standpoint.  It was explained that the EPA Superfund could not address, under CERCLA authorities, affects that the quarry might have on the water capacity.  However, it was explained that if operations at the quarry were found to adversely affect contamination migration from the North Penn Area 12 Superfund Site, then EPA could identify the quarry's owner/operator as a potential responsible party.  If EPA further determines that their wells could be potentially affected by Site contamination, EPA could specify that the public water system be further extended.

Several people also questioned whether or not they would be able to maintain their well for non-consumption purposes after their homes are connected to the supply system.  EPA informed them that there are no regulations or local requirements that would prevent them from maintaining their wells for such use.  However, each well would have to be disconnected from the home distribution system to prevent any possibility of cross-contamination of the public supply system.  EPA will also continue to specify the abandonment of the wells as part of the remedial action.  Individual home owners could request that their wells be left opened at the time they are contacted regarding being connected to the public supply system.

In summary, the Selected Remedy is believed to provide the best balance of trade-offs among the alternatives evaluated with respect to the nine criteria.  Based on the information available at this time, EPA believes the Selected Remedy will protect human health and the environment, will comply with ARARs and be cost-effective.  In addition, permanent treatment options would be utilized to the maximum extent practicable.

## IX. THE SELECTED REMEDY; DESCRIPTION, PERFORMANCE STANDARDS AND COSTS FOR EACH COMPONENT OF THE REMEDY

### A. General Description of the Selected Remedy

EPA has carefully considered State and community acceptance of the remedy prior to reaching the final decision regarding the remedy. The Agency's preferred remedy is set forth below. Based on current information, this alternative provides the best balance among the alternatives with respect to the nine criteria that EPA uses to evaluate each alternative. The selected remedy consists of the following components:

1. A groundwater extraction and treatment system utilizing either an air stripper with vapor phase carbon or a liquid phase carbon adsorption unit. The treated groundwater will be reinjected into the ground by injection wells, an infiltration bank, or spray irrigation, as specified in alternative GW-4, if it can be demonstrated that such reinjection can be accomplished without adversely impacting the ability of the pumping system to contain the existing contamination from migrating from the former Transicoil property portion of the Site. A pre-design study will be completed to provide this demonstration. If the study shows that reinjection is not feasible, then the treated water will be discharged to a tributary to Stoney Creek as specified in alternative GW-2.

2. Based on several comments by one responsible party and a review of recently developed draft EPA guidance regarding natural attenuation, EPA has not selected natural attenuation as the preferred remedy for contaminated groundwater which lies beyond the influence of the selected pump and treat extraction system. The PRP comments noted, that not enough technical information may be available to adequately evaluate natural attenuation at this site, while the EPA guidance re-emphasizes the need for adequate natural attenuation data to be available to determine that a cleanup goal can be achieved within a reasonable time frame before selection of natural attenuation as a remedy. Since there is some indication, however, that natural attenuation may be a viable remedy for the extended plume, EPA is requiring a study be conducted during the pre-design, design, or implementation of the extraction system to determine what, if any, remedial measure(s)(including natural attenuation or modification of the extraction system) may be needed or is technically practicable to reduce site related contaminants to MCL concentrations within a reasonable time frame. Implementation of any selected measure(s) may require an Explanation of Significant Differences determination or an Amendment to this Record of Decision.

3. An alternative water supply as specified in alternative DW-2. The public water supply will be extended to provide public water to residents whose wells have been adversely affected or could potentially be adversely affected by groundwater contamination from the Site.

4. Long term groundwater monitoring to evaluate the performance of the groundwater extraction and treatment system and to ensure that all affected and potentially affected residents are provided public water.

5. Institutional controls that will prohibit the use of groundwater on the former Transicoil property, and restrict the use of Site-related contaminated groundwater as a drinking water supply source.

Each component of the selected remedy, its performance standards, and costs are listed below.

B. Description, Performance Standards, and Cost of each Component of the Selected Remedy

1. Groundwater Remediation - An extraction and treatment system utilizing either an air stripper with vapor phase carbon or a liquid phase carbon adsorption unit will be implemented. The treated groundwater will be reinjected into the ground by injection wells, an infiltration bank, or spray irrigation, if such reinjection it can be accomplished without adversely impacting the ability of the pumping system to contain the existing contamination from migrating from the former Transicoil property. A pre-design study will be completed to demonstrate the feasibility of a reinjection system. If the study shows that reinjection is not feasible, then the treated water will be discharged to a tributary to Stoney Creek.

1.a. Description

The contaminated groundwater beneath the former Transicoil property shall be remedied through extraction and treatment utilizing either an air stripper with vapor phase carbon adsorption or a liquid phase carbon adsorption unit. A pre-design study will be conducted to determine whether it would be feasible to reinject the treated groundwater by injection wells, an infiltration bank, or spray irrigation and not adversely affect the ability of the pumping system to contain the contaminated groundwater from leaving the Transicoil property. If reinjection is found not to be feasible, then the treated water will be discharged to a nearby tributary to Stoney Creek. Spent carbon will be periodically shipped to an appropriate off-site facility to be regenerated. Groundwater beyond the Former Transicoil property will be evaluate during a study conducted during pre-design, design, construction, or the implementation of the extraction system to determine if any other remedial measure (i.e. natural attenuation) is required and/or technically practicable to reduce site-related contaminants to MCL concentrations within a reasonable timeframe in areas outside the pumping influence of the selected extraction system.

1.b. Performance Standards

1.b.1. Extraction wells shall create a groundwater capture zone that hydraulically contains the most contaminated groundwater that lies beneath the former Transicoil property from migrating beyond the property. The scheme, location, and pumping rates described in Section VII.A.2 and illustrated in Figure 6 must be used as the pumping system. Other schemes that are able to provide equivalent performance to the designated pumping system could be identified during the remedial design stage with the actual number of wells and location of extraction wells determined at that time. Any proposed equivalent pumping system will be subject to approval by EPA, after consultation with the Commonwealth of Pennsylvania.

1.b.2. During the pre-design phase, at least one round of samples shall be collected and analyzed for volatile organic compounds, from existing monitoring wells and the additional site monitoring wells, in order to determine the extent of the groundwater contaminant plume at that time. Pre-design activities shall also be conducted to determine the feasibility of reinjecting the treated groundwater.

1.b.3. Groundwater shall be treated using an either an air stripping treatment system with a vapor phase carbon adsorption, or a liquid phase carbon adsorption system. The treatment system shall be capable of removing the site-related contaminants from the extracted groundwater, unattended, on a continuous, 24-hour-per-day performance basis.

1.b.4. A Performance Monitoring Plan shall be developed. This plan shall be developed to evaluate the performance of the extraction and treatment system and shall require that the system be fully monitored. Several additional monitoring wells will be installed as specified in Section VII.A.2 and Figure 6 of this ROD, and the need to install any additional monitoring wells to adequately determine the extent of contamination or to adequately evaluate the performance of the groundwater remediation system will be determined or approved by EPA, in consultation with the Commonwealth of Pennsylvania. If new public or private supply wells are placed into service in the vicinity of the Site, then consideration shall be given to include these wells in the monitoring program. This would monitor any potential change in contaminant migration that could occur due to pumping influences of these new supply wells.

1.b.5. An Operation and Maintenance Plan shall be developed for the groundwater extraction system during the remedial design phase. The operation and maintenance plan must specify system operation procedures and maintenance requirements to ensure that system performs within design criteria and the requirements of the performance standards. At a minimum, the influent and effluent from the treatment facility shall be sampled twice per month for volatile organic compounds (VOCs). Operation and maintenance of the groundwater extraction system shall continue for an estimated 30 years or such other time period as EPA, in consultation with the Commonwealth of Pennsylvania, determines to be necessary, based on the statutory reviews of the remedial action which shall be conducted no less often than every five years from the initiation of the remedial action in accordance with the EPA guidance document, Structure and Components of Five-Year Reviews (OSWER Directive 9355.7-02, May 23, 1991). 5-year statutory reviews under Section 121 of CERCLA will be required, as long as hazardous substances remain onsite and prevent unlimited use and unrestricted access to the Site. The performance of the groundwater extraction and treatment system shall be carefully monitored on a regular basis, as described in the long-term ground water monitoring component of this Selected Remedy. The system may be modified, as warranted by the performance data collected during operation to achieve performance standards. These modifications may include, for example, alternate pumping of the extraction wells and the addition or elimination of certain extraction wells.

1.b.6. The Operation and Maintenance Plan shall be revised after construction of the extraction and treatment system has been completed if it is determined to be necessary by EPA, in consultation with PADEP.

1.b.7. Existing pumping and monitoring wells which serve no useful purpose shall be properly abandoned in accordance with PADEP's Public Water Supply Manual, Part II, Section 3.3.5.11 and Montgomery County Health Department Rules and Regulations Section XVII, in order to eliminate the possibility of these wells acting as a conduit for future groundwater contamination. Wells which EPA determines are necessary for use during the long term groundwater monitoring program will be properly maintained.

1.b.8. The ground water plume shall be pumped and treated until the MCL or the non-zero MCLG [40 C.F.R. °° 141.12, 141.50, and 141.60] for the contaminants of concern, whichever is more stringent, as listed below, is achieved.

The performance standard for major contaminants of concern in the groundwater are listed below:

| Contaminant | MCL(ug/1) | MCLG (ug/1) |
|---|---|---|
| Trichloroethene | 5 | 0 |
| 1,1-Dichloroethene | 7 | 7 |
| cis-1,2-Dichloroethene | 70 | 70 |

| | | |
|---|---|---|
| 1,2-Dichloroethene (total) | 0 | 70 |
| Tetrachloroethene | 5 | 100 |
| Chloroform (as trichloromethanes) | 100 | 0 |

1.b.9 If reinjection is demonstrated to be the appropriate method to dispose of the treated groundwater, then the requirements of an equivalent Water Quality Management Part 2 permit, 25 PA Code Section 91, must be met.

1.b.10. If the option to discharge the treated groundwater to the tributary of Stoney Creek is implemented, such discharge shall comply with the appropriate substantive requirements of the NPDES discharge regulations set forth in the Pennsylvania NPDES Regulations 25 Pa. Code º92.31, and the Pennsylvania Water Quality Standards (25 Pa. Code ºº93.1-93.9). Pursuant to the PADEP's determination monitoring for all the other contaminants of concern shall be conducted.

1.b.11. Air emissions from the air stripping unit, if it is utilized as the groundwater treatment technology, shall meet the requirements of the Resource, Conservation & Recovery Act ("RCRA") regulations set forth at 40 C.F.R. Part 264, Subpart AA - (Air Emission Standards for Process Vents). 40 C.F.R. º264.1032 (a) requires total organic emissions from all affected process vents at the Site to be below 1.4 kg/hr and 2800 kg/yr (3.1 tons/year) under this regulation or reduce, by use of a control device, total organic emissions by 95% by weight. The air emissions may also be required to comply with the Commonwealth of Pennsylvania regulations set forth at 25 Pa. Code, Chapter 127, Subchapter A. Those regulations require that emissions be reduced to the minimum obtainable levels through the use of Best Available Technology ("BAT"), as defined in 25 Pa. Code º121.1. Specific BAT requirements will be determined during the design phase of the remedy. At that time, it will be further determined which of the two regulations mentioned above will place the more stringent requirements on the remedy and that requirement will have to be complied with. It is anticipated that the installation of a vapor phase carbon adsorption system would satisfy the requirements of this performance standard.

1.b.12. Any off-site shipment of spent carbon shall comply with all applicable federal, State, and local laws, regulations, and requirements. With respect to the operations at the Site generally, with the substantive requirements of 25 Pa. Code º264.18 (location requirements for hazardous waste treatment facilities), ºº264.170 - 178 (in the event that hazardous waste generated as part of the remedy is managed in containers), ºº264.191 - 197 (in the event that hazardous waste generated as part of the remedy is managed in tanks), and 25 Pa. Code Chapter 264, Subpart J (in the event that hazardous waste is managed, treated or stored in tanks).

1.b.13. Monitoring of the existing wetland areas shall be conducted during the implementatory of the remedial action to determine if any dewatering effects are occurring. Figure 3-8 of the Remedial Investigation Report shows the location of the wetlands areas near the Site that have been identified. If dewatering is found to occur and it is found to adversely affect any endangered species or their habitat, a consultation will be made with the Commonwealth of Pennsylvania and the U.S. Fish & Wildlife Service to determine what mitigation activities may need to be implemented.

1.b.14. The extraction and treatment system shall avoid, minimize or mitigate impacts on floodplains and wetlands. The operation of the extraction and treatment system shall comply with the requirements of Executive Order No. 11988 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on floodplains), and Executive Order No. 11990 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on wetlands).

1.b.15 A study shall be conducted during the pre-design, design, or implementation of the extraction system to determine what, if any, remedial measure(s) (including natural attenuation or modification of the extraction system) may be needed or technically practicable to reduce site related contaminants to MCL concentrations within a reasonable time frame. Implementation of any selected measure(s) may require an Explanation of Significant Differences determination or an Amendment to this Record of Decision.

1.c. Groundwater Remedy Implementation

It may become apparent after completion of the study required by the performance standard specified in paragraph 1.b.15, above or during implementation or operation of the ground water extraction and treatment system, that contaminant levels in the extracted and treated groundwater ceased to decline and remain constant at levels higher than Performance Standards over a portion of the contaminant plume. If EPA, in consultation with the PADEP, determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain the Performance Standards throughout the entire area or any portion of the contaminant plume; EPA, in consultation with the Commonwealth, may require that any or all of the following measures be taken, for an indefinite period of time, as modification(s) to the existing system:

a) A technical impracticability waiver demonstration for that portion of the plume that it may be technically impracticable to achieve and maintain the Performance Standards.

b) An alternative performance standard or alternative remedial strategy which can include but be limited to:

1) long-term gradient control provided by low level pumping, as a containment measure;

2) institutional controls may be established/maintained to restrict or regulate access to those portions of the aquifer where contaminants remain above performance standards; and

3) remedial technologies for ground water restoration may be reevaluated.

The decision to invoke any or all of these measures may be made during implementation or operation of the remedy or during the 5-year reviews of the remedial action. If such a decision is made, EPA shall amend the ROD or issue an Explanation of Significant Differences.

1.d. Estimated Costs

A detailed cost estimate of the groundwater remediation is portion of the Selected Remedy can be found in Appendix C of the Feasibility Study. [Cost shown below are cost of the groundwater remedy if reinjection is found to be appropriate and is implemented; cost shown within parenthesis ( ) are cost of the remedy if the surface water discharge option is found to be more appropriate and effective than the reinjection option and is implemented]

| | Reinjection | Surface Water Discharge |
|---|---|---|
| Estimated Capital Costs: | $ 489,000 | ($378,000) |
| Estimated Total O&M Costs: | $ 35,000 | ($ 29,000) |
| Estimated 30 Year Total Present Worth Costs: | $1,040,000 | ($830,000) |

2. Extension of Public Water Supply Line to Affected and Potentially Affected Residents

and Businesses

2.a. Description

This component of the remedy will provide a permanent source of potable water to the affected or potentially affected residents and businesses in the vicinity of the Site by extending the public water system. The North Penn Water Authority (NPWA) currently supplies public water to residents in Worcester Township and the Pennsylvania-American Water Company (PAWCO) supplies public water to residents in E. Norriton Township. The current public water supply systems have sufficient capacity to provide public water to the residents along the specified water line extension route.

2.b. Performance Standards

2.b.1 The water supply system shall be designed and constructed in compliance with the requirements of the NPWA and/or the PAWCO, and local and State requirements, as 4 appropriate and authorized under CERCLA.

2.b.2. Connections shall be offered and provided to all the residences and businesses along the water extension route as designated in Figure 8 or as determined by EPA, in consultation with PADEP, during the remedial design to be affected or potentially affected by contamination from the Site. Potentially affected wells include those that are within or near the boundaries of the contaminated groundwater plume and those that are hydraulically impacted by the remedial action.

2.b.3. The water line will be installed in a trench below the freeze line along the route indicated in the Figure 8 so that all businesses and residents that EPA determines are affected and potentially affected by the ground water contaminant plume can be provided hook-ups.

2.b.4. Independent connections will then be brought from the main into each of the businesses and residences affected or potentially affected by the contaminated groundwater plume from the Site.

2.b.5. Following hook-up, costs of public water usage shall be the responsibility of the appropriate residence or business.

2.b.6. Fire hydrants will be installed along the water line route in accordance with local requirements.

2.b.7. All areas impacted by the construction activities during remedy implementation shall be graded, restored and revegetated, to their original condition to the extent feasible.

2.b.8. The existing residential wells shall be abandoned unless selected by EPA for long term monitoring or requested to be used for non-consumption purposes by the resident. Well abandonment shall be completed in accordance with the requirements of the Pennsylvania Safe Drinking Water Act 25 PA Code 109.602 and consistent with PADEP's Public Water Supply Manual, Part 11, Section 3.3.5.11. and Montgomery County Health Department Regulations, Chapter XVII Any former private supply well not abandoned and intended for non-consumption purposes will be completely disconnected from the home distribution system so that there is no possibility for cross contamination of the public supply system.

2.b.9. The installation of the water line shall avoid, minimize and mitigate impacts on floodplains and wetlands (e.g., installation of the municipal water line). The performance standard will be compliance with Executive Order No. 11988 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on floodplains), and Executive Order No. 11990 and 40 CFR Part 6, Appendix A (regarding avoidance, minimization and mitigation of impacts on wetlands).

2.c. Estimated Costs

| | |
|---|---|
| Estimated Capital Costs: | $ 2,340,000 |
| Estimated Total O&M Costs: | $ 0 |

Estimated 30 Year Total Present Worth Costs: $2,340,000

A detailed cost estimate for Alternative DW-2 - Connection to Public Water Supply can be found in Appendix C of the Feasibility Study Report. EPA assumes that there will no O&M cost associated with this portion of the remedy because it is assumed that an established public water company will assume ownership and all O&M responsibilities after construction is completed and the system becomes operational.

3. Institutional Controls

3.a. Description

Institutional controls will be implemented to prohibit the use of groundwater on the former Transicoil property portion of the Site to prevent any adverse impacts on the pump and treat system as required by the groundwater portion of the remedy specified by this ROD. Institutional controls will also be implemented to prevent any future exposure to contaminated groundwater that could result in potential adverse impacts on human health from the installation and use of new residential wells near the Site.

3.b. Performance Standards

3.b.1. A deed restriction, or other appropriate and equivalent mechanism, shall be implemented to prohibit the use of groundwater beneath the former Transicoil property to prevent any adverse impacts on the pumping and treating of contaminated groundwater on the property as required by this ROD. Such deed restriction shall be appropriately recorded with the Montgomery County Recorder of Deeds.

3.b.2. The implementation of the existing Montgomery County Health Department Regulations at Section VII will be implemented and relied upon to limit any future exposure to site related contaminated groundwater that could result in potential adverse impacts on human health from the installation and use of new individual supply wells near the Site. This regulation requires a permit prior to construction and approval prior to use of any new or modified supply well. As part of the permit procedures, sampling of the well is required. The purpose of the sampling is verify that water from the well will meet MCLs prior to use. The regulation also provides for revocation of the permit or approval of the well if a new condition is identified which affects the quality of the well.

3.c. Estimated Cost

| | |
|---|---|
| Estimated Capital Cost: | $10,000 |
| Estimated Total Cost: | $ 0 |

Estimated 30 Year Present Worth Cost: $10,000

This cost estimate has been included and is broken out of the estimated cost of the groundwater remedy presented in Section 1.c above and as detailed in Appendix C of the Feasibility Study Report.

4. Groundwater Monitoring

4.a. Description

This portion of the remedy requires long term monitoring of selected wells to evaluate the effectiveness of the groundwater remediation system, and to ensure that groundwater contamination from the Site is not adversely affecting supply wells that are located beyond the extent of the proposed water line extension.

4.b. Performance Standards

4.b.1. A long term monitoring program will be implemented to evaluate the effectiveness of the groundwater remediation system, and to ensure that groundwater contamination from the Site is not adversely affecting supply wells that are located beyond the extent of the proposed water line extension.

4.b.2. A plan for the ground water monitoring program shall be included in the operation and maintenance plan for the groundwater pump and treat system. The plan shall include the sampling of a sufficient number of wells to adequately monitor the effectiveness of the groundwater remediation system, and to ensure that the groundwater contamination is not extending to residents who are using private wells and are located beyond the extent of the proposed water line extension. EPA, in consultation with PADEP, will approve/determine the number, location and appropriate construction details of the monitoring wells necessary to satisfy the objective of this performance standard.

4.b.3. The installation of additional monitoring wells may be required. The number, locations and construction details of these monitoring wells shall be approved/determined by EPA during the remedial design, in consultation with the PADEP.

4.b.4. The wells shall be sampled quarterly for the first three years. Based on the findings of the first three years of sampling, the appropriate sampling frequency for subsequent years will be approved/determined by EPA in consultation with the PADEP.

4.b.5. Sampling activities and operation and maintenance activities shall continue until such time as EPA, in consultation with the Commonwealth of Pennsylvania, approves/determines that the performance standard for each contaminant of concern has been achieved throughout the entire area of ground water contamination or a technical impractibility demonstration has been approved by EPA in consultation with PADEP.

4.b.6. If EPA and the Commonwealth makes a determination that the performance standard for each contaminant of concern has been achieved throughout the entire area of ground water contamination; the wells shall be sampled for twelve consecutive quarters throughout the entire plume and if contaminants remain at or below the performance standards, the operation of the extraction system shall be shut down.

4.b.7. Annual monitoring of the groundwater shall continue for five years after the system is shutdown.

4.b.8. If subsequent to an extraction system shutdown, annual monitoring shows that groundwater concentrations of any contaminant of concern are above the Performance Standard set forth in 1.b.9. above, the system shall be restarted and continued until the performance standards have once more been attained for twelve consecutive quarters. Semi-annual monitoring shall continue until EPA determines, in consultation with the Commonwealth of Pennsylvania, that the Performance Standards in 1.b.9. for each contaminant of concern has been achieved on a continuing basis.

4.c. Estimated Costs

The estimated costs for long term ground water monitoring are included in the cost estimate for the ground water remediation listed in 1.c. above.

5. Worker Safety

5.a. All Site remedial work shall be completed in accordance with Occupational Safety and Health Administration ("OSHA") standards set forth at 29 C.F.R. Parts 1910, 1926 and 1904 governing worker safety during hazardous waste operations.

6. Five-Year Reviews

6.a. Five-year reviews shall be conducted after the remedy is implemented to assure that the remedy continues to protect human health and the environment. A 5-year Review Work Plan shall be required and shall be approved by EPA in consultation with the PADER.

## X. STATUTORY DETERMINATIONS

EPA's primary responsibility at Superfund sites is to select remedial actions that are protective of
human health and the environment. Section 121 of CERCLA also requires that the selected remedial action comply with ARARs, be cost effective, and utilize permanent treatment technologies to the maximum extent practicable. The following sections discuss how the selected remedy for the North Penn Area 12 Superfund Site meets these statutory requirements.

A. Protection of Human Health and the Environment

Based on the baseline Human Health Risk Assessment for the Site, measures should be considered to reduce potential risk from several VOCs in the groundwater. Groundwater and the several VOC contaminants were selected because potential health hazards for some exposure scenarios exceeded the EPA target range of 1.0 x 10 -4 (or 1 in 10,000), and 1.0 x 10 -6 (or 1 in 1,000,000) for lifetime cancer risk or a non-cancer Hazard Index of one (1).

The extension of a public water supply component of the selected remedy will provide a permanent alternative water supply to affected and potentially affected residences and businesses which will prevent current human exposure to groundwater contaminants., however, it will not actively reduce the contaminants in the soil or ground water, or prevent migration of contaminated groundwater. The groundwater pump and treat system will reduce the contamination in the groundwater.

The selected remedy protects human health and the environment by reducing levels of contaminants in the groundwater to those levels required by ARARs through extraction and treatment. The groundwater extraction and treatment system shall reduce the levels of contaminants of concern in the groundwater to achieve MCLs and/or non-zero MCLG as required by the Safe Drinking Water Act, 42 U.S.C. ºº 300(f) - 300(j), and 40 C.F.R. ºº 141.12, 141.50, and 141.61. Reinjection or Discharge of the treated water through any of the discharge point options will not adversely affect human health or the environment, provided that all

Performance Standards and ARARs are met.

Implementation of the selected remedy will not pose any unacceptable short term risks or cross media impacts to the Site, or the community.

B. Compliance with and Attainment of Applicable or Relevant and Appropriate Requirements ("ARARs")

The selected remedy will comply with all applicable or relevant and appropriate chemical-specific, location-specific and action-specific ARARs. Those ARARs are:

1. Chemical Specific ARARs

a. MCLs - The selected remedy will be designed to achieve compliance with chemical-specific ARARs related to groundwater at the site. The MCLs and non-zero MCLG, for the contaminants of concern from the North Penn Area 12, which are listed under the performance standards for Groundwater Remediation portion (see section XI.B.1.b.8 above) of the selected remedy, are applicable for this action. The groundwater extraction and treatment system shall reduce the levels of contaminants of concern in the groundwater to achieve MCLs as required by the Safe Drinking Water Act, 42 U.S.C. ºº 300(f) - 300(j), and 40 C.F.R. ºº 141.12, 141.50, and 141.61. If a non-zero Maximum Contaminant Level Goal ("MCLG") has been established and is more stringent than the MCL, the MCLG shall be attained.

2. Location Specific ARARs

a. Erosion Control - The Pennsylvania Erosion Control Regulations, 25 PA Code ºº 102.4 - 102.5, 102.11 - 102.13, and 102-22 -102.24, regulate erosion and sedimentation control. These regulation are applicable to the excavation and grading activities associated with the selected remedy.

b. Wetlands - Under 25 PA, Code º 269.23, the siting of a hazardous waste treatment unit is prohibited in a wetland area. The onsite treatment system will have to be located such that it is not in wetland areas onsite.

c. Groundwater Extraction Within the Delaware River Basin - Delaware River Basin Commission (DRBC) regulations require DRBC approval of all projects with groundwater extraction of 10,000 gallons per day (gpd) in a groundwater protected area (GWPA). All of Montgomery County is designated as a GWPA, DRBC Resolution No. 80-18. The estimated extraction rate of 35 gallons per minute (gpm) equates to approximately 50,000 gpd. Per agreement between the DRBC and EPA, a formal permit is not required for EPA-lead projects and EPA will acknowledge the following requirements as ARARs:

1.) DRBC Groundwater Protected Area Regulations, No. (6),(f); Water Code of the Basin, Section 2.50.2 - Proposed water withdrawal well(s) shall be equipped with readily accessible capped port(s) and drop pipe(s) so that water levels may be measured under all conditions.

2.) DRBC Ground Water Protected Area Regulations, No. 9; Water Code of the Basin, Section 2.50.2 - Covered Project water withdrawal well(s) and surface water intakes shall be metered with an automatic continuous recording device that measures to within five percent of actual flow. [a record of daily withdrawals also shall be maintained, and monthly totals shall be reported to DRBC].

3.) DRBC Ground Water Protected Area-Regulations. No. 10 - If the construction, monitoring, or any other data or information demonstrates that the operation of the water withdrawal well or surface water intake significantly affects or interferes with any domestic or other existing wells, an alternative supply of water or other mitigating measures shall be provided.

4.) DRBC Ground Water Protected Area Regulations. No. 4; Water Code of the Basin. Section 2.20.4 - The operation of a water withdrawal project shall not cause long-term progressive lowering of groundwater levels, permanent loss of storage capacity or substantial impact on low flows of perennial streams.

3. Action Specific ARARs

a. Reinjection of Treated Groundwater - Section 3020 of RCRA specifically addresses waste injection in the context of CERCLA and RCRA cleanup actions. Section 3020 (a) bans hazardous waste disposal by underground injection into or above an underground source of drinking water (within one-quarter mile of the well). However, Section 3020 (b) exempts from the ban all reinjection of treated contaminated groundwater undertaken as part of a remedial action conducted under Section 104 or 106 of CERCLA. To qualify for the exemption, the following three conditions must be met: (1) The injection is a CERCLA response action; (2) the contaminated groundwater must be treated to substantially reduce hazardous constituents prior to such injection; and, (3) the response action or corrective action must be sufficient to protect human health and the environment. If reinjection is demonstrated to be feasible for the groundwater portion of the selected remedy, then this exemption would apply. All three conditions are met: (1) the reinjection is part of a CERCLA response action, (2) contaminated is required to be treated to substantially reduce hazardous constituents in accordance with the performance standard specified in section 1.b.9 above, and (3) the response action will protect human health and the environment as discussed in Sections VII.A and X.A above.

b. Reinjection of Treated Groundwater - If reinjection is demonstrated to be the appropriate method to dispose of the treated groundwater, then the requirements of an equivalent Water Quality Management Part 2 permit, 25 PA Code Section 91, must be met.

c. Surface Water Discharge - National Pollutant Discharge Elimination System ("NPDES") discharge regulations set forth at 25 PA Code º92.31, the Pennsylvania NPDES regulations and 25 PA Code ºº95.1 - 95.3, the Pennsylvania Wastewater Treatment Regulations, with consideration of 25 PA Code ºº93.1 - 93.9, the Pennsylvania Water Quality Standards, as a "to be considered", would be an ARAR if reinjection is found not to be appropriate and a surface water discharge is the appropriate method used for disposal of the treated groundwater. Ground water collected under the selected remedy shall be treated to comply with these applicable substantive requirements prior to discharge.

d. Air Emission for the Groundwater Treatment Unit - Air emissions from the air stripping unit, if it is utilized as the groundwater treatment technology, shall meet the requirements of the Resource, Conservation & Recovery Act ("RCRA") regulations set forth at 40 C.F.R. Part 264, Subpart AA - (Air Emission Standards for Process Vents). 40 C.F.R. º264.1032 (a) requires total organic emissions from all affected process vents at the Site to be below 1.4 kg/hr and 2800 kg/yr (3.1 tons/year) under this regulation or reduce, by use of a control device, total organic emissions by 95% by weight. The air emissions may also be required to comply with the Commonwealth of Pennsylvania regulations set forth at 25 Pa. Code, Chapter 127, Subchapter A. Those regulations require that emissions be reduced to the minimum obtainable levels through the use of Best Available Technology ("BAT"), as defined in 25 Pa. Code º121.1. Specific BAT requirements will be determined during the design phase of the remedy. At that time, it will be further determined which of the two regulations mentioned above will place the more stringent requirements on the remedy and that requirement will have to be complied with. It is anticipated that the installation of a vapor phase carbon adsorption system would satisfy the requirements of this performance standard.

Fugitive dust emissions generated during remedial activities will be controlled in order to comply with fugitive dust regulations in the federally-approved State Implementation Plan ("SIP") for the Commonwealth of Pennsylvania, 25 PA Code ºº 123.1 - 123.2.

25 PA Code ºº 123-31 and 123.41 which prohibits malodors detectable beyond the former Transicoil facility property line is applicable to the selected remedial alternative.

e. Contaminated Groundwater, Treatment Residuals, and Other Contaminated Site Derived Waste - The contaminated groundwater must be handled as a RCRA hazardous waste pursuant to the "Contained-In Policy" under RCRA. Since the TCE in the contaminated groundwater at the Site is believed to be the result of inappropriate disposal of spent degreasing solvent that contained TCE, the contaminated groundwater handled as a "F001" RCRA listed waste. Therefore, contaminated groundwater, drill cuttings, well purge water, spent carbon and any other treatment residuals (other than treated groundwater) must be handled consistent with the following substantive requirements, which are applicable to on-site activities. With respect to the operations at the Site generally must comply, with the substantive requirements of 25 Pa. Code º264.18 (location requirements for hazardous waste treatment facilities), ºº264.170 - 178 (in the event that hazardous waste generated as part of the remedy is managed in containers), ºº264.191 - 197 (in the event that hazardous waste generated as part of the remedy is managed in tanks), and 25 Pa. Code Chapter 264, Subpart J (in the event that hazardous waste is managed, treated or stored in tanks).

f. Well Drilling - The substantive requirements of 25 Pa. Code Chapter 107 is applicable to the drilling of any new wells at the Site. These regulations are established pursuant to the Water Well Drillers License Act, 32 P.S. º 645.1 et seq.

4. To Be Considered Requirements

a. Executive Order 11990 (Protection of Wetlands) - CWA Section 404. Mitigation measures, such as seasonal adjustment of pumping rates or possible relocation of the discharge point, may be required to address effects on wetlands. While the Executive Order is not an ARAR, EPA includes this requirement as a "To Be Considered" standard.

b. Well Abandonment - The substantive requirements of the PADEP's Public Water Supply Manual, Part 11, Section 3.3.5.11 and Montgomery County Health Department Regulations Section XVII, regarding the proper plugging and abandonment of wells, are applicable to residential and other water supply wells, and are relevant and appropriate to monitoring wells in order to eliminate the possibility of these wells acting as a conduit for future groundwater contamination.

c. Surface Water Discharge - Consideration will be 25 PA Code ºº93.1 - 93.9, the Pennsylvania Water Quality Standards, as a "To Be Considered" if reinjection is found not to be appropriate and a surface water discharge is the appropriate method used for disposal of the treated groundwater.

C. Cost Effectiveness

The selected remedy is cost-effective in providing overall protection in proportion to cost, and meets all other requirements of CERCLA. Section 300.430(f)(ii)(D) of the NCP requires EPA to evaluate cost-effectiveness by comparing all the alternatives which meet the threshold criteria - protection of human health and the environment and compliance with ARARs - against three additional balancing criteria:  long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; and short-term effectiveness.  The selected remedy meets these criteria and provides for overall effectiveness in proportion to its cost. The combined estimated present worth cost for the selected remedy presented in this Record of Decision is $3,380,000.  The Proposed Plan estimated that the preferred alternative would costs $3,170,000. The difference in estimated costs between the proposed plan and this Record of Decision is primarily due to EPA's decision to allow the reinjection of the treated groundwater rather than discharge to surface water.  A pre-design study will be conducted to determine the feasibility of reinjection, specified in alternative GW-4, and if it can be shown that reinjection will not adversely impact the affects of the pumping system containment characteristics, then reinjection can be implemented.  If the pre-design study concludes that reinjection cannot be implemented without adversely impacting the containment characteristics of the pumping system, then the treated groundwater will be discharged to surface water as specified in alternative GW-2.  If a surface water discharge option is implemented, substantive requirement of the NPDES regulations would have to met.  This change in the preferred remedy was made in response to comments receive from members of the public sector and from one of the responsible parties during the public comment period.  EPA estimates that a reinjection system would be only slightly more costly than a surface water discharge.  However, EPA believes that the implementation of either method, if found to be technically feasible and appropriate, would be cost effective.  Detailed capital and O&M cost estimates for the alternatives included in the selected remedy are contained in Appendix C of the Feasibility Study.

D. Utilization of Permanent Solutions and Alternative
Treatment Technologies-to the Maximum Extent-Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized while providing the best balance among the other evaluation criteria.  Of those alternatives evaluated that are protective of human  health and the environment and meet ARARs, the selected remedy provides the best balance of tradeoffs in terms of long-term and short-term effectiveness and permanence, cost, implementability, reduction in toxicity, mobility, or volume through treatment, State and community acceptance, and preference for treatment as a principal element.

Under the selected remedy, groundwater extraction utilizing a pumping system that both treats contaminated groundwater using either an air stripper unit or a carbon adsorption unit, and also restricts further migration of contaminated groundwater, is more cost-effective than the other alternatives evaluated.  The selected remedy will reduce contaminant levels in the Class IIA aquifer, a known source of drinking water, and reduce the risks associated with ingestion and inhalation of the groundwater to the maximum extent practicable, as well as provide long-term effectiveness.

The selection of extending the public water supply system to provide an alternative drinking water source to affected and potentially affected residents, provides the best balance of trade-offs among the nine NCP selection criteria for the alternative drinking water portion of the remedy. The remedy is more costly than the carbon filter alternative, however, it also provides the highest degree of long-term effectiveness and permanence, and provides an increased level of protection to human health and the environment.

E.     Preference for Treatment as a Principal Element

The selected remedy satisfies, in part, the statutory preference for treatment as a principal element.  The contaminated groundwater alternative addresses the primary threat of future ingestion and inhalation of contaminated groundwater through treatment using either an air stripping unit or a carbon adsorption unit.  EPA has determined that both technologies are equally effective in removing site related contaminants from the contaminated groundwater and the cost of the two treatments systems are comparable. The actual treatment system to be used will be determined during the design of the remedial action.

## XI. DOCUMENTATION OF CHANGES FROM PROPOSED PLAN

### A. Treated Ground Water Discharge Options

The treated groundwater effluent will be discharged by either reinjecting the treated groundwater or by discharging the treated groundwater through a surface discharge. One of the responsible parties for the Site and members of the public sector commented on EPA decision to discharge treated groundwater through a surface water discharge. The commentors encouraged EPA to consider reinjecting the treated groundwater to replace the groundwater that would be remove from the aquifer. Some commentors indicated concern about future groundwater capacity because a nearby quarry had recently requested permission to deepen the quarry operation and that could have adverse impacts on local water quantity. EPA had originally rejected the reinjection option because modeling had indicated that reinjection would adversely impact the containment affects of the pumping system. EPA recognizes that there may be reinjection scenarios that were not evaluated, and has decided to allow for the re-evaluation of additional reinjection scenarios as a pre-design study activity. If the study can show that reinjection can be accomplished without adversely affecting the containment affects of the pumping system and is technically feasible, then EPA will allow reinjection for the disposal of treated groundwater. If it cannot be shown that reinjection is technically feasible and appropriate, then the treated groundwater will be discharge to a surface water as was originally decided.

### B. Groundwater-Remediation Beyond the Influence of the Extraction System

Based on several comments by one responsible party and a review of recently developed draft EPA guidance regarding natural attenuation, EPA has not selected natural attenuation as the preferred remedy for contaminated groundwater which lies beyond the influence of the selected pump and treat extraction system. The PRP comments noted that not enough technical information may be available to adequately evaluate natural attenuation at this site, while the EPA guidance re-emphasizes the need for adequate natural attenuation data to be available to determine that a cleanup goal can be achieved within a reasonable time frame before selection of natural attenuation as a remedy. Since there is some indication, however, that natural attenuation may be a viable remedy for the extended plume, EPA is requiring a study be conducted during the pre-design, design, or implementation of the extraction system to determine what, if any, remedial measure(s) (including natural attenuation or modification of the extraction system) may be needed or is technically practicable to reduce site related contaminants to MCL concentrations within a reasonable time frame. Implementation of any selected measure(s) may require an Explanation of Significant Differences determination or an Amendment to this Record of Decision.

SECTION XI

RESPONSIVENESS SUMMARY
FOR THE
PROPOSED REMEDIAL ACTION PLAN
FOR THE
NORTH PENN AREA 12/TRANSICOIL SUPERFUND SITE
WORCESTER TOWNSHIP, MONTGOMERY COUNTY,
PENNSYLVANIA

Public Comment Period
July 15, 1997, through September 15, 1997

North Penn Area 12/Transicoil Superfund Site

Responsiveness Summary
for the
Proposed Remedial Action Plan

TABLE OF CONTENTS

# Responsiveness Summary
## North Penn Area 12/Transicoil Superfund Site
## Worcester Township, Montgomery County, Pennsylvania

This Responsiveness Summary is divided into the following sections:

Overview: This section discusses the U.S. Environmental Protection Agency's (EPA) preferred alternatives for remedial action at the North Penn Area 12/Transicoil Superfund Site (North Penn 12 Site; the site).

Background: This section provides a brief history of community relations activities during remedial planning at the site.

Part I: This section provides a summary of commentors' major issues and concerns, and EPA's responses to those issues and concerns. "Commentors" may include local homeowners, businesses, the municipality, and potentially responsible parties (PRPs).

Part II: This section provides a comprehensive response to all significant comments and is comprised primarily of the specific legal and technical questions raised during the public comment period. If necessary, this section will provide technical detail to answers from Part I.

Any points of conflict or ambiguity between information provided in Parts I and II of this Responsiveness Summary will be resolved in favor of the detailed technical and legal presentation contained in Part II.

## Overview

On July 15, 1997, EPA announced the opening of the public comment period and published the Proposed Remedial Action Plan (Proposed Plan) for the North Penn 12 Superfund Site, located in Worcester Township, Montgomery County, Pennsylvania. The Proposed Plan details EPA's preferred clean-up alternatives to clean up the site contamination, giving consideration to the following nine evaluation criteria:

Threshold Criteria

ò Overall protection of human health and the environment
ò Compliance with Federal, state, and local environmental and health laws

Balancing Criteria

ò Long-term effectiveness and permanence
ò Reduction of mobility, toxicity, or volume of contaminants
ò Short-term effectiveness
ò Ability to implement
ò Cost

Modifying Criteria

- ò State acceptance
- ò Community acceptance

EPA carefully considered state and community acceptance of the clean-up alternatives before reaching the final decision regarding the clean-up plan. The Record of Decision (ROD) details EPA's final clean-up decision.

EPA's selected remedy is outlined below. Based on current information, this remedy provide the best balance among the alternatives with respect to the nine evaluation criteria EPA used to evaluate each alternative. To speed and simplify cleanup, EPA proposed an alternative to address the contaminated ground water and drinking water. The remedy to address the ground water contamination is noted with the letters GW and the remedy to address the drinking water contamination is noted with the letters DW. As a result of comments received during the public comment period of the Proposed Plan, EPA has modified its preferred remedy. EPA will now allow reinjection (Alternative GW-4) of the treated ground water if a pre-design study can demonstrate that reinjection can be accomplished without adversely impacting the containment characteristics of the pumping system. If this demonstration cannot be made then the treated ground water will be discharged to surface water (Alternative GW-2). The two alternatives are identical except for the treated water disposal method.

Alternative GW-4: Ground Water Extraction at Source, Air Stripping or Carbon Treatment, and Reinjection or, Alternative GW-2: Ground Water Extraction at the Source, Air Stripping or Carbon Treatment, and Discharge

- ò Install seven new extraction wells and convert three existing monitoring wells into extraction wells at the site.

- ò Reinject the treated ground water or discharge the treated water to a drain south of the site on Trooper Road where the water eventually will flow into Stony Creek.

- ò Evaluate during the pre-design, design, or implementation of the extraction/treatment system on the former Transicoil property to determine if any other remedial measure(s) (including natural attenuation or modification of the extaction system) may be needed or is technically practicable to reduce site related contaminants to MCL concentrations within a reasonable timeframe.

- ò Monitor residential wells to evaluate the effectiveness of the groundwater remedy.

- ò Prohibit the use and/or pumping of ground water on the former Transicoil property.

Alternative D W-2: Connect Affected and Potentially affected Residents to Public Water Supply

- ò Install new water mains in areas affected or potentially affected by site related contaminated ground water.

- ò Offer affected or potentially affected residents the option to be connected to a public water supply system.

ò Install the necessary plumbing, including all related equipment, to connect each affected or potentially affected resident that accepts a connection to the public supply system.

ò Properly abandon existing residential wells.

ò Implement institutional controls to restrict the use of, or exposure to, contaminated ground water.

ò Monitor the movement of contaminants to ensure that all affected or potentially affected residents are offered and provided connections to the public supply system.

Background

Some members of the community are knowledgeable about the North Penn 12 Site and its past operations. Many residents became interested in the site when preliminary

investigations at the site indicated contamination in ground water.

EPA first initiated community relations activities in November 1990, with the publication of a fact sheet notifying residents of the status of activities at the site. Approximately 70 people attended a February 1991, public meeting during which EPA discussed the bankruptcy claim filed by Eagle-Picher Industries, the owner of the Transicoil property. At the meeting many residents wanted to know the results of a recent round of sampling EPA had conducted as well as who would pay for the cleanup.

In December 1991, EPA issued a second fact sheet to update residents on activities at the site. On January 24 and 25, 1994, EPA conducted community interviews with area r residents. These interviews allowed EPA to speak with residents one-on-one about their concerns and questions regarding the site.

EPA issued the community relations plan (CRP) for the North Penn 12 Site in August 1995. The CRP highlighted issues, concerns, and interests of the community located near the site and provided background information about the Superfund process and the site. In addition, the CRP listed EPA's community relations objectives and activities to encourage public participation in site activities.

To announce the availability of and to obtain public input on the Proposed Plan, EPA held a public comment period from July 15, 1997, through September 15, 1997. During the public comment period, EPA issued a fact sheet and held a public meeting at the Fairview Village Assembly Hall on August 6, 1997. The purpose of the public meeting was to provide residents with information about the site and the proposed clean-up alternatives and to allow residents to ask questions about or comment on the site and EPA's proposed clean-up alternatives. EPA announced the public meeting, the opening of the public comment period, and the availability of the Proposed Plan in a public notice placed in the Philadelphia Inquirer on July 28, 1997, and in the Montgomery County Observer on July 23, 1997.

The August 1997 fact sheet highlighted EPA's preferred alternatives to clean up the contamination at the North Penn 12 Site, announced the availability of the Proposed Plan in the information repository, provided a brief history of the site, invited the public to comment on the Proposed Plan, and announced the public meeting.

To announce the extension of the public comment period to September 15, 1997, EPA placed a public notice in the Montgomery County Neighbors section of the Philadelphia Inquirer on August 26, 1997.

Part I: Summary of Commentors' Major Issues and Concerns

This section provides a summary of commentors' major issues and concerns and EPA's responses to those issues and concerns. "Commentors" may include local homeowners, businesses, the municipality, and PRPs. The major issues and concerns about the proposed clean-up alternatives for the North Penn 12 Site received during the public meeting on Wednesday, August 6, 1997, and during the public comment period are grouped into the following categories:

A. Preferred Ground Water Alternative
B. Preferred Drinking Water Alternative
C. The PRPs
D. The Timing of the Cleanup
E. Residential Well Concerns
F. EPA's Monitoring Program
G. The Contaminants and Associated Risks
H. Other Concerns

A. Preferred Ground Water Alternative

1. Why would EPA have to discharge the ground water if it was safe?

EPA Response: The treated groundwater has to be disposed in some manner. EPA examined many disposal options and after evaluating all the options it was concluded that a surface water discharge was the best option for the remedy selected However, after taking into account public comments that requested EPA to allow reinjection of the treated groundwater, EPA has decided that if it can be demonstrated that reinjection of the treated groundwater will not adversely impact the containment c characteristics of the extraction system, then reinjection will be the disposal method used.

2. Why is EPA proposing to discharge contaminants that come out of the monitoring or filtering wells into the creek? Will residents be able to drink the water after it is discharged?

EPA Response: EPA proposed to discharge treated water, not contaminants, into the creek. The treatment system, either air stripping or carbon adsorption, will be designed to remove the volatile organic contaminants in the contaminated groundwater and the levels of contaminants will be reduce to Water Quality Standards for surface water discharge, Maximum Contaminant Levels (MCLs) will be the goal established for groundwater cleanup.

3. If EPA pumps 35 gallons of water per minute out of the 11 extraction wells, could the aquifer be depleted causing residents to lose the water in their wells?
How can EPA be sure that residents' wells will not run dry even though EPA proposes to extract water?

EPA Response: The yield of each well will vary. EPA used computer models to determine how much water would need to be pumped in order to meet EPA's goal of containing the contamination. Based on the modeling results EPA does not expect the aquifer to be depleted In addition, EPA will install additional monitoring wells and monitor the domestic wells in the area to ensure that the water level does not fluctuate too drastically. Also, most home wells within the immediate area of the site will no longer be pumped because they will be connected to public water. The reduction in the pumping of the home wells should off-set the pumping from the pump and treat system. Also, the public water used by the residents will be recharged to the groundwater when placed into the septic systems currently used by most residents in the area.

4. Did EPA considered using reinjection to return the water to the ground?

EPA Response: EPA did consider reinjection wells to return the water to the environment. However, the modeling that was conducted indicted that reinjecting the treated groundwater could hinder effectiveness of the pumping system in preventing contaminants from moving off the site. Also, the cost for installing the reinjection wells was approximately $200,000 greater than the discharge option. However, EPA only considered one reinjection well configuration during its modeling effort and acknowledges that there could be other feasible configurations that could be implemented. Therefore, EPA has included in its selected remedy a provision to study other reinjection well configuration options, and EPA is now proposing in this ROD to allow reinjection to be implemented as part of the selected remedy, if reinjection can be determined not to adversely impact the containment characteristics of the extraction system.

5. Instead of discharging the water, could EPA give it to the North Penn Water Authority?

EPA Response: EPA also evaluated this option. However, if EPA had chosen that option, implementation would become an issue. Permits would have to be obtained for the water supply well and treatment system These factors would also add to the overall cost of the selected remedy.

6. Given the geology of the area, could reinjection affect the decontamination?

EPA Response: The possibility of reinjection impacting the contamination would depend on the location of the reinjection wells. As discussed above, modeling that EPA conducted indicated that reinjection would adversely affect the ability of the pumping system to prevent contamination from migrating away from the former Transicoil property. However, there may be other reinjection well configurations that may be implemented that will not cause this adverse effect.

7. Why did EPA determine that reinjection was not an appropriate technology for this site?

EPA Response:  EPA did consider reinjection wells to return the water to the environment.  However, the modeling that was conducted indicted that reinjecting the treated groundwater could hinder effectiveness of the pumping system in preventing contaminants from moving off-site.  Also, the cost for installing the reinjection wells was approximately $200,000 greater than the discharge option.  However, EPA only considered one reinjection well configuration during its modeling effort and acknowledges that there could be other feasible configuration that could be implemented. Therefore, EPA has included in its selected remedy a provision to study other reinjection well configuration options, and if a reinjection configuration can be identified that does not adversely impact the containment characteristics of the pumping system, EPA will allow reinjection to be implemented as part of the selected remedy.

8. Even though EPA proposes to discharge treated water into a pond, the pond runs into a seasonal stream.  EPA should consider the ecological implications of discharge.

   EPA Response:  EPA has considered the ecological impacts of the preferred alternatives and has researched the regulatory requirements for discharging the water.  By law, EPA is required to meet all applicable or relevant and appropriate requirements (ARARs) with respect to hazardous substances remaining on the Site and has factored these elements into the remedial alternatives.

9. A resident expressed his formal opposition to EPA's preferred ground water alternative. He suggested that EPA choose Alternative GW-4 (Ground Water Extraction at Source, Air Stripping or Carbon Treatment, and Reinjection).

   EPA Response: As discussed above, EPA has taken this recurring comment into consideration and will allow reinjection if its determined to be feasible as studied during the pre-design stage.  If reinjection is found not to be feasible, then the treated groundwater will be discharged to surface water as was originally proposed.

10. Why is EPA proposing to extract ground water from around the perimeter of the site even though the well showing the increase of contaminants is in the center of the site?

    EPA Response:  EPA is proposing to extract groundwater from the area that has the highest degree of contamination and EPA believes to be the remaining source of the contamination.  The well that is referenced has shown an increase in contamination, however, it is not the highest degree of contamination on the site.  The contaminant concentrations in the referenced well were lower in concentration than in the area that is being proposed for pumping.  One purpose of the pumping system is to contain the existing contamination at the source, pumping a well further from the source could enhance migration of the contamination plume to areas that had not been previously significantly impacted.

B. Preferred Drinking Water Alternative

1. The water that residents would receive in the water lines, will it come from

Worcester's aquifers? Does Worcester lease those aquifers?

EPA Response: The water supply will be provided by the North Penn Water Authoriry. The North Penn Water Authority's uses a number of sources including surface water from their treatment facility, groundwater from their supply wells, and drinking water from neighboring supply systems. The water that will be provided to the system that is required by this remedy will most likely be from a combination of these sources.

2. Why is EPA proposing to clean up the ground water if EPA also proposes to connect residents to the public water supply? Why not allow the contaminants to attenuate naturally?

   EPA Response: EPA's remediation policy requires that EPA attempt to replenish and clean tip contaminated groundwater. Although residents closest to the site will be connected to public water, there is a possibility that the contamination could move further off-site. Therefore, EPA has decided to clean up the highest degree of groundwater contamination and prevent it from migrating further. EPA is concerned about the contamination continuing to migrate to residential wells that are located beyond the planned water line extension area. EPA is requiring that the most contaminated groundwater beneath the former Transicoil property be extracted and treated The groundwater away from the former Transicoil property will be evaluated to determine if other measures (i.e. natural attenuation) are feasible and/or appropriate to insure a timely remediation of the groundwater in the areas where the groundwater is less contaminated

3. Either EPA or the PRPs should extend the water main to all residences potentially affected. If trichloroethene (TCE) is found in residential wells, other than those found to be contaminated, all residents would have the option to connect if necessary.

   EPA Response: EPA's proposal for a water line extension does include all wells in which TCE has been found and also includes many non-contaminated wells that EPA believes could potentially be affected Areas which EPA believes have little or no potential for future contamination, based on the residential sampling results, have not been included in plans to be connect to the public water extension. If future monitoring results would indicate there is a problem or potential problem with residences not planned to be connected to public water, then EPA could determine at t that time to have additional homes connected to the public supply system.

4. A resident expressed her opinion that water lines should be installed for all residents in the area because her understanding was that EPA is unsure if the contaminants will

   migrate once the extraction process starts.

   EPA Response: As mentioned above, EPA does plan to connect homes that it has determined to be potentially affected by contamination ftom the site. However, EPA is limited by its statutory authority from advancing the water line beyond those area that it believes could potentially be affected by the Site. However, there are areas that EPA believes are now not impacted or could potentially be impacted by the Site. If conditions change in the future, then EPA could provide additional connections to the public water or require other appropriate action to remedy the problem.

5. A resident expressed his formal approval of EPA's drinking water alternative.

   EPA Response: EPA acknowledges the comment.

6. If there is the potential for something in the future to interfere with residential wells not connected to public water, why not extend the water main to all those residences?

   EPA Response: EPA is only authorized to respond where there is a release or threatened release of hazardous substances or pollutants and contaminants. There is no established risk at residences not scheduled to be connected to public water. If non-site related activities impacts contamination migration from the site, then whomever is responsible for the that activity can become a responsible party for the S Site. When such an activity occurs, EPA has the authority to appropriately address the situation.

7. Since the residences along North Trooper Road are within the contaminated area, why is EPA not proposing to connect them to public water?

   EPA Response: Residents along North Trooper Road are not within the area of contamination. Further, based on past sampling and current site conditions, EPA believes that there is no future threat of contamination from the site to affect wells in this area Residents did express concern about a nearby quarry expanding its operations. If in the future, it is found that such an activity causes a change in site conditions and contamination is a threat to home wells on North Trooper Road, then EPA can take appropriate action as discussed above.

8. One resident commented that, from a mechanical standpoint, it is illogical not to run the water main along North Trooper Road.

   EPA Response: EPA is only authorized to respond where there is a release or threatened release of hazardous substances or pollutants and contaminants. There is no established risk at residences not scheduled to be connected to public water. In addition, the extension on Township Line Road between Valley Forge and Trooper Roads serves closes the loop between the water main on Valley Forge Road and the extension proposed for Potshop and Trooper Roads. This will allow water to be provided to residents during periods of maintenance of the water line.

9. In the future, if the contamination migrated to residences not connected to public water or if something else happened, would those residences be able to connect to public water?

   EPA Response: As discussed above, EPA could require additional action if conditions change and/or additional areas are found to be potentially impacted by the site. EPA could require additional public water connections, if that is found to be the appropriate action.

10. Will EPA give residents the choice between connecting to public water and maintaining their wells?

EPA Response: All residents along the water line route will be offered a connection. EPA is not aware of any regulation or requirement that would mandate connection to the water line in Worcester Township. If after an offer is made to provide a connection to public water is made and if it is refused, any future desire to connect to the water line would be at the home owners'expense. East Norriton Township requires that any resident within 150 feet of a public water supply must connect. If a resident refuses connection to the public water supply system and is later required to connect to the system by East Norriton Township, then that connection will be at the home owner's expense.

11. Will EPA hold any additional meetings to advise residents scheduled to be connected to public water concerning water pressure, gallons per minute, and what sort of service to expect?

EPA response: EPA plans to conduct an availability session with the community after the remedial design is completed to discuss with residents the design of the system and the schedule of follow up construction activities. EPA also will contact residents on an individual basis to formally offer to the individual home owners a connection to public water supply system. This will allow for one-on-one contact between EPA and homeowners. EPA will contact residents once the water lines are ready to be installed to the homes because residents will need to sign access agreements granting access to their property for the purpose of installing the connection to the water main.

12. Will residents scheduled to be connected to public water be required to sign any kind of waiver to never connect back to their wells?

EPA Response: These details will be determined during the design and construction stage of the remedy and will also depend who is conducting the remedy, EPA or the responsible parties for the Site. If EPA is performing the remedy, then EPA will not a require that a waiver be signed but will require that a right of entry agreement be signed that would allow the water connection to be installed. At the time of the connection to public water, there would have to be a total disconnect from the well. This is a requirement that is enforced by the local water supply companies to prevent possible cross-contamination of the public water supply.

13. A resident expressed concern that EPA was giving an unfair financial advantage to residents scheduled to be connected to the public water supply. She believed that home buyers are more likely to purchase a home that is connected to public water than a home with a well because of the danger this Superfund site poses. She also stated that all residents who wish to be connected to public water should be given the opportunity

since risks posed by the Superfund site is public knowledge.

EPA Response: As discussed above, EPA is not authorized to extend the water line to any area that is not affected or potentially affected by a release or threatened release of a hazardous substance or pollutant or contaminant from the site. EPA cannot take action based merely on perceptions or potential property value issues.

14. Should residents who do not have contamination above the acceptable risk level be required to pay to a connection to the public water supply?

EPA Response: Any residential well that has been affected or could potentially be affected will be offered a connection to the public water supply system at no cost to the resident. However, if EPA has determined that a resident is not potentially affected and the water line is not planned to be extended to that particular area, then any connection to public water will at the home owners expense. As discussed above, EPA is only authorized to provide public water to affected or potentially affected residents.

15. A resident identified an East Norriton Township ordinance requiring residences within 150 feet of a water main to connect to that water main. The resident indicated a residence on EPA's map that was not scheduled to be connected to public water but was within 150 feet of the main.

EPA Response: EPA has verified that E. Norriton Township does have an ordinance that mandate any structure within 150 feet of public water to connect to the public water. Therefore, any resident in E. Norriton Township that is within 150 feet of the water line will be offered a connection to the public water supply.

16. A resident inquired whether his property, located at 1648 Landis Road, was included in EPA's plans to connect residents to the public water supply?

EPA Response: Yes, EPA does expect that a connection to public water will be offered to the resident at 1648 Landis Road.

17. A resident commented that, of the people he spoke with regarding EPA's proposed clean-up alternatives, many would prefer a clean-up plan allowing them to continue to use their wells.

EPA Response: EPA has not receive many comments opposing the plan to extend the water line. In fact, some residents that are located outside the proposed water line extension have requested that they also be offered connections.

18. A resident felt he should not have to pay for the public water supply connection or other associated costs.

EPA Response: Affected residents will not have to pay for the connection to public water. Whoever conducts the cleanup will pay for all associated costs. However, the residents will have to pay water usage bills once they are connected to the public water system.

19. A resident expressed his formal opposition to EPA's preferred drinking water alternative. He suggested that EPA choose Alternative DW-3(Carbon Adsorption at Residence Well Head).

EPA Response: EPA noted the comment and considered it when selecting the final clean-

up plan. However, the public water supply provides a more permanent solution to the contaminated drinking water problem. Also, since public supplies are required to meet drinking water standards, there is a better assurance that the supply will be safe to drink.

C. The PRPs

1. Are there any PRPs who are not bankrupt?

EPA Response: Yes, the only responsible party that filed for bankruptcy was Eagle Picher, Inc. which was the last owner of Transicoil, Inc. There are several other former owner/operators that EPA is currently investigating as potential responsible parties.

2. Who will pay for the cleanup? Will EPA pay for the cleanup?

EPA Response: EPA will first offer the responsible parties the opportunity to conduct the design and clean up activities at the site. If an agreement can be reached, it will be documented in a Consent Decree between EPA and the responsible party(ies). If the responsible parties fail to agree to complete the necessary clean up activities, then the EPA may order the responsible parties to conduct the cleanup or EPA, itself, may conduct the clean up utilizing the Superfund. EPA then will follow up with enforcement action to recover the cost incurred from the non-participating responsible parties.

3. Is Nike Park contaminated and, if so, is the government a PRP?

EPA Response: Based on soil sampling results, EPA found similar levels of contamination in the soil at the Nike facility as was found on the Transicoil facility property. Those levels where found not to pose a environmental or health threat. EPA has information suggesting that the Nike facility used TCE during its operations and may have disposed of spent solvent which contained TCE on the Nike facility property.

This activity could have contributed to the groundwater contamination problem. EPA is further investigating this possibility. EPA did notified the U.S. Army that it could be a PRP in a general notice letter dated June 7, 1988.

4. Will someone other than the property owner pay for the public water supply connection into the houses, particularly at residences that are set back several hundred feet from the road?

EPA Response: Yes. Whoever conducts the cleanup, either the responsible party(ies) or EPA, will pay for all costs associated with the public water supply connection. The home owner will be responsible for payment of the quarterly water usage bills.

5. Who was responsible for monitoring Transicoil during the years the company was operating?

EPA Response: Reportedly, the Transicoil facility began its operations in 1952. Federal regulations regarding hazardous waste handling and disposal activities did not become effective until 1980. Therefore, during the first 28 years of the facility's

operations, there was very little regulation or monitoring of the disposal activities at the site.

D. The Timing and Cost of the Cleanup

1. What is the total cost of the proposed clean-up alternatives?

EPA Response: Based on comments received during the public meeting and the public comment period, EPA has revised the selected remedy from the preferred remedy presented in the proposed plan. EPA will allow the reinjection of the treated groundwater if it can be demonstrated during a pre-design study that reinjection can be implemented without adversely affecting the containment characteristics of the extraction system. If this demonstration cannot be made then a surface water discharge will be used.

The total present worth of Aternative GW-4 which includes reinjection is estimated to be $1,040,000. The total present worth of Alternative DW-2 is estimated to be $2,340, 000. Therefore, the total present worth of both alternatives if reinjection is implemented as part of the remedy is approximately $3,380,000.

The total present worth of the alternative GW-2 which includes a surface water discharge is estimated to be $830,000. The total present worth of Alternative DW-2 is estimated to be $2,340,000. Therefore, the total present worth of the proposed alternatives if a surface water discharge is implemented as part of the remedy is approximately $3,170,000.

2. Will EPA install the water lines before the extraction system is started? Will water be brought down the streets first so that if something goes wrong with the extraction wells residents will have fresh water?

EPA Response: EPA anticipates that the water extension construction will most likely occur before to the pump and treat system is implemented because the design for the water line extension is more straight forward and less complicated that the design for the pump and treat system. The design of the pump and treat system will also take a longer period time to complete because of the pre-design study necessary to evaluate the feasibility of reinjection. However, details of the remedial action will not be known until the design of the two components of the remedial action are completed.

3. What is the time period EPA proposes for the cleanup?

EPA Response: After the ROD is issued that specifies the appropriate remedial action for the Site, EPA will notify the responsible parties for the Site to determine if they are willing to complete the design and implement the remedial action. If the responsible parties are willing to implement the remedial action, then negotiations will be conducted to document their commitment to complete the design and implement the remedial action. The design process is estimated to take nine months to one year to complete (an additional six months may be required for the pre-design study for the groundwater remedy) and construction is estimated to take about one year to complete. Based on the above, it could take approximately 30 months to complete the water line extension and approximately 36 months to complete the pump and treat system. Actual cleanup of the contaminated groundwater to the MCLs is estimated to take approximately 30 years.

4. What will be done between now and when the cleanup is started if the contaminants are still present?

EPA Response: EPA will continue to enforce the existing removal order that requires either quarterly or semi-annual sampling of residential wells in the area. The order also requires the installation and maintenance of carbon filter systems if the MCL for TCE is exceeded.

5. Will residents have to wait until all problems are worked out with the water lines before EPA begins treating the ground water?

EPA Response: EPA does not anticipate any problems with the design and construction of the water line. So as discussed above, the water line will most likely be constructed and placed into service before the pump and treat system is constructed and able to be operated.

6. EPA mentioned that installing reinjection wells would cost an additional $200,000 over the discharge option. What percentage is that of the total clean-up cost?

EPA Response: The total present worth of the cost for the groundwater remedy which includes reinjection is $1,040,000. Therefore, the additional $200,000 for reinjection wells is approximately twenty percent of the estimated cost for the groundwater remedy.

7. Who will pay for the water line if it is installed?

EPA Response: All the costs associated with the water line construction and connections would be paid by whoever conducts the cleanup. Either the PRPs will conduct the cleanup under an agreement with an EPA order, or EPA will conduct the cleanup using money from the Superfund. If EPA uses money from the Superfund, EPA would recover the costs later through litigation. The only costs residents would have would be quarterly water usage bills.

8. Since the North Penn Water Authority sells water, will residents be required to pay for the installation of the water line to their homes? Will the North Penn Water Authority pay for the water lines to be installed on the roads, or will EPA take on that responsibility?

EPA Response: Either the responsible party(ies) or EPA will assume the cost of the water line installation. Neither the residents nor the North Penn Water Authority will be responsible for such the costs. Residents will only be responsible for quarterly water usage bills. Once construction of the water lines are complete, the North Penn Water Authority will assume responsibility for operating and maintaining the lines.

E. Residential Well Concerns

1. If the nearby quarry drills an additional 120 feet deeper, could residents lose the water in their wells?

EPA Response: EPA does not know exactly what affects could result from the deepening

of the quarry. The pumping activities planned for the site should not have any significant adverse affect on the quantity of water available for off-site wells. The pumping system has been designed to contain the most contaminated groundwater from migrating further to residential locations. It should also be pointed out that the affects of pumping groundwater from the Site should be offset some what from the closing of the over 100 residential wells that will be connected to the public water system. Any adverse affects from deepening of the quarry will be the responsibility of the quarry owner and should be considered when and if the quarry is granted permission to deepen their operation.

2. When EPA sampled wells on the eastern side of the facility, did EPA consider the depth of the residential drinking wells?

EPA Response: It was assumed that residential wells were in the 60 to 100 foot depth range. EPA did not make detailed comparisons of the depths because there are many fractures in the bedrock in the area so the depth of the wells may not make a difference. The assumed depths were taken into consideration when developing the s selected the remedial measures for the site.

3. What should residents do if their shallow wells run dry because of EPA's clean-up activities but they are not allowed to dig a new well and are not connected to the water main.

EPA Response: The area of influence that the pumping wells will affect should not be large enough to impact surrounding shallow residential wells from a water quantity stand-point. In addition, the resident who asked the question is on the opposite side of the groundwater divide and should not be impacted by the extraction system. However, if a residential well should go dry, there is no reason why a replacement well couldn't be drilled. There will not a prohibition on drilling of additional residential wells; however, there is an existing Montgomery County Health Department regulation that requires a supply be sampled and shown to be safe to drink before it can be placed into use. There are standards contained in the Montgomery County Health Department regulations that are consistent with the federal drinking water standards that have to be met. If a newly drilled will is found to be contaminated then treatment can be provided to meet the standards.

4. Will residents be prohibited from using water from any wells in the area?

EPA Response: No, if residents wish to maintain a well for a purpose other than drinking water, such as agricultural use, EPA has found no regulations prohibiting such use. However, those wells will have to be disconnected completely from the home distribution systems to ensure that there is no possibility of cross-contaminating the public water supply.

5. If Montgomery County decides to prohibit the use of area wells in the future, how will residents find out about the prohibition?

EPA Response: If Montgomery County makes the decision to prohibit residents from using their wells for purposes other than drinking water, EPA believes that the County would notify residents in the same way it notifies residents of other regulations.

6. Can EPA guarantee that current and future activities at the site will not affect the

quantity or quality of the well water residents currently receive?

EPA Response: EPA cannot guarantee the results that are expected from the proposed remedial action. However, studies that have been conducted indicate that water quality beneath site and beneath residential areas near the site should improve as the remedial action is implemented The studies also show that the affects of the proposed pumping system should only influence the water beneath the site and should not affect water quantity in any off-site wells. The connection of residential wells to the public water supply should also have a positive impact on groundwater quantity in the vicinity of the Site.

7. What will happen if EPA's clean-up activities cause problems with residential wells?

EPA Response: EPA doesn't anticipate any problems with residential wells after the pump and treat system is installed and becomes operational. Pumping will be adjusted to only drawdown the water levels directly beneath the former Transicoil property. Also, residents located nearest to the property will be provided with public water. If for any reason there are still impacts to remaining residential supply wells, then EPA could require the provision of public water or carbon filtration systems. EPA may conduct a removal action at any point as it's deemed necessary. EPA will continue to require that wells be monitored during the remedial design. During the design process, if EPA finds, for example, that the ground waterflow has changed or any other condition arises that was not previously known or present, EPA may undertake a appropriate corrective action. EPA has the flexibility to respond to new situations and new conditions as they arise.

8. Will residents be able to dig new wells in the area in the future?

EPA Response: Residents will be able to drill new wells in the future; however, they must comply with Montgomery County Health Department regulations. Residents would have to sample the water to ensure that it is safe to drink and follow any other relevant installation requirements in accordance with the Montgomery County Health Department Regulations before a permit for installation and use can be issued.

9. If something should happen to the wells at those residences not connected to public water, will EPA's first reaction be to install a carbon filtration system to treat the water?

EPA Response: Most homes near the site will be offered connection to the Public water system, however, if residential wells that are still used were found to contain site related contamination, EPA could consider taking action to remediate the problem. EPA has found that installing a carbon filtration system is a quick and easy method for treating the contaminated wells on a short term basis. However, should something happen to these wells during the remedial action, EPA would evaluate the situation at the time to determine the appropriate response action.

10. What is involved in abandoning or decommissioning a well?

EPA Response: Usually the mechanical parts, i.e. the pump, are dismantled and removed. The well is filled with grout or a similar substance, and the well is provided with a permanent cover. The Montgomery County Heath Department Regulations at Section 17-8 specify the standards that must be followed during well abandonment activities.

11. If residents choose to maintain their wells, what would the homeowner's responsibility be for present and future costs?

EPA Response: If a resident chooses not to connect to public water supply after being offered a free connection, then the resident will become responsible for any future contamination problem with the well. If the well is determined to be unsafe for consumption purpose in the future, the resident would be responsible for the cost of abandoning the well and for the cost of establishing an alternative drinking water supply.

12. EPA proposes to ban the future drilling of new wells. However, if the quarry's blasting dries up the wells of residents not connected to public water, what will happen to these residents' ability to obtain water?

EPA Response: As discussed above, EPA does not propose to ban the future drilling of wells. Future well drilling would be regulated by Montgomery County Health Department Regulations. Sampling of the well is required to verify that the well water is safe for use as a potable source of drinking water supply. If contamination is found in the well, treatment can be provided to provided to reduce the contaminants to acceptable levels.

13. If the source of the water in each well is different, could the long-term results of the cleanup be different in each well?

EPA Response: Yes, monitoring will be required during the course of the remediation to evaluate the effectiveness of the ground water remediation system.

14. From a hydrogeologic perspective, under fractured subsurface conditions, where does most of the water in residential wells come from? Does it come from old aquifers or is it from long-term rainfall infiltration?

EPA Response: The source of the water in the wells is determined by the depth of the wells. The recharge area is at the top of the hill where the former Transicoil facility is located, so much of the water comes from rain water and infiltration. Further downgradient, more regional flow provides the water.

F. EPA's Monitoring Program

1. Is there a chart that shows the location of those wells EPA has monitored or currently monitors, and the levels of contaminants in those wells?

EPA Response: EPA included a map in Figure 2 of the Proposed Plan detailing the locations and TCE concentrations of the residential wells surrounding the site that have been monitored in the past.

2. A resident expressed concern for residents whose wells EPA had not been monitoring. He felt that EPA should inform all area residents of the levels of contaminants in their wells.

EPA Response: Over 100 residential wells near the Site have been extensively monitored in accordance with an order issued to several responsible parties to the Site. When sampling was completed, results have been sent to the residents. If any individual has not been receiving the results from the well sampling, they should notify EPA and the results will be compiled and forwarded as appropriate. EPA will continue to require monitoring beyond the extent of the proposed water line and to ensure that the residences beyond the extent of the water line continue not to be impacted.

3. Will EPA increase the size of the monitoring area following completion of the cleanup? Will EPA increase the size of the monitoring area regardless of the chosen clean-up plan? Will EPA increase the size of the monitoring area prior to starting the cleanup to verify the contaminated areas?

EPA Response: The monitoring program for the site will be developed as the remedial activities are further designed and developed. The monitoring program will be designed to evaluate the effectiveness of the extraction and treatment system and will also be developed to ensure that all affected and potentially affected home wells are provided connections to the public supply system. The cleanup activities will not be considered complete until it is demonstrated that contamination is reduced below drinking water standards (MCLs) in all groundwater associated with the Site. During the cleanup activities, monitoring will be conducted to evaluate the performance of the pump and treat system and to assure that any resident whose well that has been affected or that could potentially be affected is provided an opportunity to connect to the public water supply extension. The details of the monitoring system will be developed during the remedial design stage.

4. Does EPA have data from testing upgradient of the well where the increased level of contaminants was found? Does EPA have enough data points upgradient of the well that showed an increase in contaminant levels to understand where the contamination is coming from?

EPA Response: The level of TCE contamination in well T-6 which was once used as a Transicoil supply well has increased from its 1988 level of 33 ppb to a 1995 level of 100 ppb. This well is located on the Transicoil property very near the peak of the groundwater divide that exists at the Site. Therefore, EPA believes that there probably are no upgradient wells to T-6. It is not know why the TCE concentration has increased in this well. EPA will, however, require monitoring of this well when the groundwater monitoring portion of this remedy is designed and implemented. Sampling of downgradient wells near the Site have not shown any increase in contamination and wells on this side of the divide will continue to be monitored.

5. A resident stated that her well had never been tested. She inquired if her well would be tested and what the process is for selecting wells to be tested.

EPA Response: EPA does not test all wells in an area, but tries to take a representative sample to understand the situation in that area. EPA will determine if this well should be included in the future monitoring efforts.

6. Does EPA always test the same wells or different ones each time? Is the selection process random, geographical, etc.?

EPA Response: The selection process is not a random one, EPA selects a monitoring system that it believes is able to produce information representative of the study area.

The wells that are designated as part of the monitoring are sampled periodically during the course of the study. If information is obtained that indicates that additional wells are needed to better define the extent of contamination then adjustments are made to the monitoring system by adding wells to be sampled. This has happened at the North Penn Area 12 Site. A set of wells were included in the initial residential well monitoring program based of their proximity to the Site. As sampling information was obtained that showed that the extent of contamination extended beyond the monitoring system, additional residential wells were added to the monitoring program.

7. After installing the water lines, will EPA continue to test area wells? At what point will EPA stop testing? What causes EPA to stop testing? How long will EPA monitor the wells in the area? Will EPA continue to test residential wells during the clean-up process?

EPA Response: Both monitoring wells and residential wells will continue to be monitored after the public water supply lines are extended. This monitoring will be conducted to evaluate the performance of the groundwater treatment system and to ensure that all affected or potentially affected residents are provided a safe source of drinking water. EPA will only cease monitoring after it has been shown that contaminated groundwater has been cleaned up to meet the safe drinking water standards (MCLs) for all site related contaminants.

8. Will EPA continue to monitor residents on the borderline, that is, those residences that are extremely close to those to be connected to public water?

EPA Response: EPA will continue to monitor a set of residential wells that are outside the public water supply line extension to ensure that all affected or potentially affected residents are provided a safe drinking water supply.

9. How long will EPA continue to test the wells once the clean-up goals have been achieved?

EPA Response: EPA will require that the monitoring continue on a quarterly basis for three years after the groundwater cleanup standards (MCLs) are achieved. If contaminant levels are maintained for during that period of time, the treatment system will be allowed to shutdown. Monitoring will then be required to continue for another five years on an annual basis. If cleanup levels are maintained during the five year period, monitoring will be allowed to cease. If the five year monitoring shows that contamination exceeds the clean up standards, then the system must be re-started.

10. A resident believed his carbon filtration unit was working correctly and inquired if that system would continue to be tested and analyzed during the 30-year operation and maintenance (O&M) period.

    EPA Response: All residents that currently have carbon filters installed will be offered connection to the public water supply line. If a resident refuses to accept a connection when offered, then the responsibility for O&M of the carbon filter system will be at his/her own expense.

11. A resident inquired why Figure 2 of the Proposed Plan did not indicate that her well has been sampled in the past. She also commented that her well had been sampled for the last three or four years and she has only received letters that indicate that no contamination over the MCLs has been found in her well. She requested that the actual sample results

    be provided.

    EPA Response: There apparently was a mistake made when Figure 2 was prepared. EPA has requested the responsible party who is conducting the residential well sampling to provide actual sample concentrations when sending the letters notifying residents of their sampling results.

12. A resident stated that her well is extremely shallow. She is concerned that it could run dry if the water table is lowered due to clean-up activities. She requested that EPA continue to monitor her well during the clean-up process for quality and quantity of water.

    EPA Response: EPA will take this request under consideration during the design of groundwater monitoring system.

G. The Contaminants and Associated Risks

1. Has EPA summarized the medical data used to determine the acceptable risk levels of the contaminants?

    EPA Response: EPA's has set cleanup standards for site related contaminants by establishing standards based on the Maximum Contaminant Levels (MCLs) as required by the Safe Drinking water Act, 42 U.S.C. °°300(f) - 300(j), 40 C.F.R.. °°141.12,141.50, and 141.61 for each contaminant. The MCL is the standard set for public water supply systems under the Safe Drinking Water Act. This standard is based upon the risk associated with the contaminant and the available technologies to remove the contaminants from groundwater.

EPA has verified the use of the MCL by evaluating two types of risk. The first type is non-cancer health effects, called the hazard index. The acceptable level for the hazard index is less than one. The second risk is cancer risk. The acceptable risk range for cancer risk is between one in 1,000,000 and one in 10,000.

EPA's has determined that the risks from contaminants if cleaned to the MCLs, fall within EPA's acceptable risk range for both non-cancer and cancer risks.

2. How does the North Penn 12 Site compare to other sites in terms of the levels of TCE and other contaminants present? What is the increased cancer risk caused by the contaminant levels? Given the level of TCE residents find in their wells, should they be concerned? How much increase in a person's cancer risk will be caused by the levels present?

EPA Response: It difficult to compare the health threat posed by North Penn Area 12 Site to other contaminated sites since the type, number, and concentration of contaminants at other sites vary to a large degree from site to site. However, the potential calculated cancer risk from future exposure to contaminated groundwater located beneath the former Transicoil property is approximately 3.4 additional cancer cases for every 10,000 people which is above the EPA's acceptable level of 1 additional cancer case for every 10,000 people. The non-cancer Hazard Index is 7.8 for children and 5.9 for adults, both of which are over the acceptable level of 1.

For comparison purposes, the cancer risk of the average person living in the United States is approximately one in three. Therefore, EPA is very conservative in estimating

the a protective risk level of exposure because EPA's unacceptable risk is one in 10,000 or greater. This risk means that if there is a chance that greater than one extra person out of 10,000 people has the chance to contract cancer as a result of the contamination present, EPA will clean up the contamination to below that risk level.

3. Are the risks that EPA has calculated for the site for current hypothetical situations or situations that will not exist in the future?

EPA Response: EPA calculated hypothetical risks to future on-site residents. These risks would become a reality if no treatment occurred at the site and a person installed a well on the site and consumed the levels of contaminants currently present in the water at the site.

Another way the risks could become a reality would be if EPA did not take action at the site, the contaminants migrated to an off-site well, and residents consumed that water.

4. If EPA took no action at the site, would the contamination disappear in five or ten years?

EPA Response: EPA has not calculated definite times that it would take for the groundwater to remediate. It is difficult to predict how long it would take for the contaminants to attenuate naturally.

5. Is there a way to measure the concentration of contaminants in the soil or did EPA only test the aquifer for contamination? Did EPA find that the TCE is continuing to move through the system?

EPA Response: EPA did sample soil at the site and in stream sediment. EPA did not find any site related contamination in the soil that would result human health risk above EPA acceptable levels. Risk in levels above EPA acceptable health levels were only found in the ground water. Therefore, EPA believes that the main contamination is being transported via the ground water. Contaminants are not in the soil, rather they are dissolved in water.

6. What is EPA's theory on why contamination levels in monitoring well T-6 are increasing?

EPA Response: The increased reading was unusual. In most wells the contamination decreased. EPA will continue to require the well be sampled to try to determine the possible reason for the increase.

7. Is it possible that blasting at the quarry could affect the bedrock and the fractures in it? Is it possible that the blasting could shift the area of contamination? Is it possible that whatever is done at the quarry could affect the ground water flow on the site? Would it change the ground water divide?

EPA Response: When EPA first examined this site, the quarry did not seem to affect the contamination. A ground water divide runs through the former Transicoil property and groundwater on the north and west side of the Site runs down away from the quarry and has had a greater impact on the contamination than groundwater on the quarry side of the site. When the pump and treat system is installed, the divide could change by increasing the gradient toward the quarry side of the site. One purpose of the pump and treat system is to prevent the contamination from moving away from the site. EPA also

will continue to monitor wells in the area to assure that no area that are now unaffected by the site become affected in the future. If it is found that activities at the quarry adversely affect the migration of contamination from the site, the quarry owner could be named a PRP.

8. Is it true that the contamination is mostly north and west of the site?

EPA Response: Yes. EPA found most of the ground water contamination that exceeded MCLs in residential wells north and west of the former Transicoil facility which is considered to be the main source of the contamination.

## H. Other Concerns

1. A resident expressed his opinion that what was happening at the site was unfair. He felt that no resident should have to be burdened with the problems caused by the site. EPA should spend whatever amount of money is necessary to clean up the site.

   EPA Response: EPA noted the comments and has considered them when selecting the final clean-up plan.

2. Will EPA implement the preferred clean-up alternatives unless someone presents important information to the contrary?

   EPA Response: EPA has considered all comments and questions submitted by the public in making its remedy selection.

3. Is information about Superfund sites accessible to the public?

   EPA Response: When a site is placed on the National Priorities List, it becomes public knowledge. There is an information repository for each site where EPA keeps all relevant documents about the site for the public to view. The information repository for the North Penn 12 Site is located at the Lansdale Library and at EPA's Region III Regional Office in Philadelphia. In addition, EPA Region III maintains a web site that contains information about all the Superfund sites in Region III.

4. How fast does the water flow through soil from the surface down to an aquifer approximately 100-feet deep?

   EPA Response: The rate at which the water flows through the soil depends on the type of soil. Around the North Penn 12 Site there is a lot of clay in the soil, so the water tends to move slower.

5. Will residents vote on EPA's recommendations?

   EPA Response: No. The public meeting and public comment period are the public's opportunity to express their concerns and ask questions about EPA's proposed clean-up plan. EPA will take all of the public's comments and questions into consideration before deciding on the final clean-up plan.

## Part II: Comprehensive, Technical, and Legal Responses to Comments

This section provides technical detail in response to comments or questions on the North Penn 12 Site. EPA received these comments or questions by mail or e-mail during the public comment period. These comments or questions may have been covered in a more general fashion in Part I of this Responsiveness Summary. The following specific comments are addressed:

A. Comments of O'Brien & Gere Engineers, Inc. on behalf of Schlumberger Industries, Inc., a PRP.

In a three-page letter dated August 13, 1997, Schlumberger Industries, Inc. (Schlumberger) submitted comments prepared by O'Brien & Gere Engineers, Inc., concerning EPA's Proposed Plan to clean up the North Penn 12 Site. In addition, Schlumberger submitted a nine-page letter dated May 27, 1997, commenting on the Final Feasibility Study. Schlumberger requested that EPA include these comments as part of the company's comments on the Proposed Plan. The comments contained in each letter are addressed below. The responses are grouped as they were presented in each letter.

The comments included in Schlumberger's August 13, 1997 letter are addressed below:

1. EPA did not evaluate completely Nike Park's contribution of volatile organic compound (VOC) contamination to the ground water. The distribution of VOCs detected in residential water supplies suggests the potential for VOC sources other than the Transicoil facility. Therefore, the contribution of VOCs from Nike Park and the responsibility of other parties should be investigated further.

EPA Response: EPA believes that sufficient evaluation of the contamination from the site has been completed. EPA did conduct rather extensive soil sampling on the former Nike facility property and additional investigations were conducted to evaluate the contribution that Nike activities could have had on groundwater contamination near the Site. EPA continues to evaluate Nike and other potential responsible parties that could have contributed to the Site related contamination.

2. As part of the selected drinking water alternative, EPA should clarify that connections to the public water main extension, during the remedial action, only will be offered to residences with drinking water concentrations of TCE or other site-related exceeding the MCLs.

EPA Response: Connection to the public water supply extension will be offered to every home along the designated water line extension route. EPA will require that offers be made for connections to every affected and potentially affected resident. This action is part of a long term remedial action and in order to adequately protect all potentially affected residents from the possibility of their home wells from being contaminated in the future and to provide permanent protection from Site related contamination, comprehensive coverage of the alternative drinking water remedy is required.

3a. EPA should consider reinjection as a discharge option for the ground water remedy. Reinjection returns ground water to the hydrogeologic system, thereby reducing or eliminating significant losses of water from the local ground water basin or potential effects to local ground water supplies. Since EPA did not identify a VOC soil or residual contaminant source during the remedial investigation, there are no indications that reinjection would affect VOC concentrations in ground water negatively. The absence of a soil or residual source allows reinjection to be accomplished by various methods, including reinjection wells or infiltration basins.

EPA Response: EPA has included in its selected remedy for groundwater the possibility to reinjection treated groundwater rather than discharge to surface water as was originally proposed. However, before reinjection can be implemented, it must be demonstrated that the reinjection will not adversely affect the containment characteristics of the extraction system. A pre-design study will be necessary to make the demonstration. Modeling conducted by EPA as part of the remedial investigation indicated that reinjection could adversely affect the containment characteristics of the pumping system. If such a demonstration cannot be made then the treated water will be discharged to surface water as was previously proposed.

3.b. EPA's cost estimates appear under-estimated, particularly for O&M. Given the uncertainties in the ground water pumping rates, influent quality, and treatment methods and requirements, it is likely that reinjection could be implemented at a lower cost than surface water discharge. Therefore, cost concerns should not result in the elimination of the reinjection option.

EPA Response: EPA did not eliminate reinjection solely on the basis of cost but primarily because modeling indicated that reinjection would adversely affect the ability of the pumping system from preventing the migration of the higher concentration contamination from moving to residential areas at the Site. However, as discussed above, EPA will consider the possibility of reinjection if it is demonstrated to be feasible.

4. As EPA proposes, ground water pumping may not affect ground water travel times or VOC concentrations measurably at residential receptors, given the complex hydrogeologic setting and the current distribution of VOC concentrations in the ground water. The ground water model did not include a quantitative analysis of travel times or remedial time frames. As part of the remedial design phase, EPA should evaluate further the possible effects of pump-and-treat on ground water flow and VOC transport.

EPA Response: The time travel model was not intended to be a quantitative model. Because of the uncertainty relating to the groundwater conditions, EPA decided to have a qualitative model performed to indicate if pumping of the contaminated groundwater on the former Transicoil property would produce a positive affect on the remedy regarding the time it would take to achieve MCL at locations near the residential wells. EPA believes that the modeling did adequately show that beneficial results would be obtained from the pumping on the former Transicoil property.

5. The Montgomery County Health Department implemented a new regulation effective February 1, 1997, (Individual Water Supply System Regulations, Chapter 17, Section 17) which requires the abandonment of any well no longer in use. In addition, individual water supply systems must meet current drinking water standards for VOCs, including TCE, 1,1,1-trichloroethane, and 1,1-dichloroethene, or be treated to meet these standards. Enforcing this regulation would prohibit water use from new or modified water supply wells with impacted ground water above MCLs. Therefore, EPA should consider further natural attenuation as an appropriate ground water alternative for on-site ground water.

EPA Response: EPA is aware of the Montgomery County Health Department Regulations and in fact has based a portion of its institutional controls for the Site on this regulation. However, this regulation would only address potential exposure to new wells that are drilled and used as supply wells. This regulation requires sampling of new supply wells before they can be used for consumption purposes. The ROD will require expansion of the monitoring system to include a monitoring of areas where new supply wells are located in the area of the Site to ensure that after new supply wells become functional, they continue to provide safe water to drink. This requirement does not affect EPA's decision to require pumping and treating of contaminated of contaminated groundwater

beneath the former Transicoil property. The pump and treat system will provide a means to remove and contain contamination that exists beneath the former Transicoil property. The recognition of the Montgomery County Health Department regulation will help prevent exposure to contaminated groundwater in future residential areas.

6. Schlumberger Limited recommends that the groundwater remedial alternative selected for the Site be flexible enough so that the groundwater remedial objectives can be met with an appropriate and effective remedial technology that is more specifically developed during the Remedial Design phase. The study can be accomplished by allowing for further evaluation within a specified time frame as part of the Remedial Design work. Within this time frame, a demonstration through appropriate hydrogeologic and engineering studies would be conducted with site-specific factors to support a specific groundwater remedial alternative.

Response: EPA agrees in part with this request. EPA agrees that additional study information should be developed to verify that reasonable measures are implemented (i.e. natural attenuation) to achieve cleanup standards (MCLs) in the residential areas away from the former Transicoil property.

The comments included in Schlumberger's May 27, 1997 letter are addressed below:

1. As stated in the FS Report, one of EPA's remedial action objectives (RAO) is to "prevent exposure or potential exposure to ground water that contains concentrations of COCs from the site that are above clean-up goals [MCLs]." A second RAO is to "[u]se appropriate remedial technologies to reduce concentrations of COCs from the site in the ground water that are above clean-up goals." There is no clear risk basis for using this RAO. Specifically, given the response measures implemented, currently there are no unacceptable risks associated with contaminated ground water and it is likely that future potential risks will be within EPA's acceptable risk criteria within a reasonable amount of time based on the reported declining ground water COC concentrations. The FS Report did not support the establishment of the second RAO based on the ARARs. EPA should reevaluate the need for this second RAO since the first achieves the ARARs established for the site.

EPA Response: The RAO in question is based on the prevention of continued degradation to the environment (in groundwater) outside the limits of the Transicoil property, also future risks for exposure to offsite contamination. By pumping and treating the highest area of contamination of the plume, the MCL cleanup times in the areas away from this pumping influence will be reduced and further spreading of the plume will also be reduce. However, no substantial evidence exists to support the contention regarding the decline of future risks. Although contaminant concentrations in some wells have declined with time, a clear trend has not been demonstrated. Further, the agency is mandated to restore groundwater to a state of beneficial use. For this reason, if no other, an attempt should be made to reduce contaminant level in groundwater, thus supporting the need for the second RAO.

2. EPA did not evaluate a current exposure pathway for ground water since residential wells where contaminant concentrations were observed in excess of the MCLs had been provided with treatment systems, thereby eliminating potential risks. Data presented in the FS Report indicated that the COC concentrations in on-site and off-site ground water are decreasing with time. This observation indicated that the potential risks associated with ground water exposure also will decline with time. A review of more recent sampling data may support the apparent decline of COC concentrations further. As documented in the Remedial Investigation (RI) Report, EPA observed similar concentration reductions in off-site wells. Further reductions in COC concentrations

   would result in lower calculated risks, such that risk associated with potential ground water exposure may be reduced to an acceptable range within a reasonable amount of time.

   EPA Response: Its agreed that the concentrations of chemicals appear to be declining with time. This could be occurring because of the apparent lack of a defined source in the soil or bedrock. However, maintaining this trend cannot be assumed, especially in a fractured-rock aquifer, where contamination adsorbed on and stored in fractures can be released at erratic rates over time (100 %g/l of TCE in well T-6 in 1995 after several years of concentrations less than 50 %g/l). It is unreasonable to assume, for the purpose of the risk assessment, that a given chemical will be at an estimated concentration at some point in the future. Therefore, using either 95th% upper confidence level or the maximum observed concentration is reasonable. Schlumberger acknowledges that the correct current methodology, therefore the comment is unjustifiable.

3. The amount of residential well data is a limiting factor to the understanding of groundwater flow and contaminant fate and transport and the potential effectiveness of the remedial alternatives. In the RI and FS Reports, EPA did not investigate or discuss regional ground water quality with respect to VOC concentrations.

   EPA Response: Its agreed that it would be helpful to have better data on residential well construction, but this type of information is difficult to obtain. It is also recognized that there is a regional groundwater contamination problem in the North Penn area and that the there is a potential for other source of contamination to exists. However, EPA believes that the former Transicoil property is the likely source of the contamination observed residential wells near the site. Although detailed data are limited regarding residential well construction, the available data from the area indicate that most residential wells are less than 200 feet deep, and many are less than 100 feet deep, because they are drilled until they reach the most-shallow reliable groundwater. Therefore, it is reasonable to assume that most of the residential wells are contaminated by the local source, of Transicoil is the most likely.

4. If dispersion is an important influence on the presence of TCE on and around the site, then ground water extraction may disperse TCE within the aquifer further. The complexity of contaminant transport should be considered carefully when EPA plans future remedial activities.

EPA Response: Although groundwater flow at the site likely is predominantly through fractures and bedding planes, in the absence of continuous strong pumping influences, such as the Center Point Training Center (CPTC) production well, groundwater does not necessarily move only along paths of preferred flow that are oriented along strike. At North Penn 12, its believed that the topographic variation predominantly controls the direction of flow in the absence of pumping. This is obvious from potentiometric maps of the site and region. Transicoil's location on a topographic high and the disposition of the terrain makes it a very-likely scenario that contaminated groundwater moves from the site to the north and possibly to the northeast. This factor was considered in the groundwater-extraction modeling and the remedial measures designed based on that modeling.

5. EPA's conclusions regarding the benefits of ground water extraction based on the modeling work cannot be supported technically. It is critical to the formulation of a successful remedy that the remedial plan be flexible enough to allow for a more thorough understanding of hydrogeologic and contaminant transport conditions, prior to the selection of a final remedy. Further modeling should be conducted to decide on the appropriate remedy to meet the MCLs.

EPA Response: Development of the groundwater flow model considered all of the hydrogeologic information available for the Transicoil Site and the surrounding area. Site-specific information was rather limited, but did include the results of an aquifer response test and several sets of water level measurements. Regional data used in developing the model included estimates of the hydraulic conductivity of the Brunswick Formation and comparative estimates for the Lockatong, based on well yield data. The model provides a realistic overall representation of the observed potentiometric surface within the model domain. It incorporates the hydrologic effects of streams in the model area and uses a reasonable recharge rate based on the average annual rainfall. However, as noted, it is not considered to be rigorously calibrated to detailed flow conditions in this highly heterogeneous fractured rock aquifer. Consequently, it has only been used to test the potential effectiveness of various extraction well scenarios and to make rough comparative evaluations between different remedial alternatives. It has not been used for predictive simulations.

Travel Time Analysis

The travel time analysis presented in Appendix E of the Feasibility Study emphasized repeatedly that only a relative comparison was made between the No-Action Alternative and the On-Site Extraction Alternative. The results were presented as a range of potential reductions in cleanup time specifically to avoid the impression that actual cleanup times were being predicted. This comparative use of the groundwater flow model depends on its ability to represent the effects of an on-site groundwater extraction system on overall flow patterns in the down-gradient area. While the model is not calibrated to represent the details of flow in the fractured rock aquifer, it does provide realistic representation of the large-scale flow patterns. And, it uses valid hydrogeologic concepts, with the best available estimates of aquifer parameters, to estimate the effects of on-site extraction wells on those flow patterns.

Incorporation of Off-site Pumping of Residential Wells and Production Wells

It is true that the model does not explicitly include off-site residential wells and production wells. It is unlikely that the residential wells have a clearly defined effect on the large-scale groundwater flow, because they are widely dispersed and the individual pumping rates are low. Furthermore, the emphasis of the travel time analysis was on changes in groundwater flow caused by the on-site extraction alternative. No changes in residential well pumping are foreseen as a result of this.

The production well at the CPTC is believed to divert the natural hydraulic gradients in the eastern part of the site area from the northwest toward the north and northeast. Some groundwater from the site may actually be drawn into the Training Center well. However, the FS analysis does not rely on this well to maintain its capture zone in the future, because its operation is under independent control.

Direction of Groundwater Flow

As noted in the Remedial Investigation Report, the primary direction of groundwater flow appears to be toward the north west. This is the primary flow direction indicated in the model. However, the hydraulic characteristics of the aquifer are believed to be anisotropic, with the primary axis of hydraulic conductivity directed along the strike of the bedding planes. This anisotropy, which is reflected in the groundwater model, would tend to magnify the effects of hydraulic gradient components in the east-west direction. Water level measurements taken in 1988 show significant mounding in the area of the septic system drain field on the Transicoil Site, with a resulting hydraulic gradients radiating outward to the west, north, and northeast. This mounding would likely have

caused westward migration of contaminants from the site. However, more recent water-level data no longer show the groundwater mound at the drain field. This suggests that the driver for westward flow has been removed and the primary flow direction is now to the northwest, as represented in the model.

6. EPA's theoretical travel time estimates for ground water migration to the receptor wells for the no action alternative and the on-site extraction alternative overlap considerably. Therefore, there is not sufficient information to conclude that any difference in the travel time would occur if EPA implemented on-site extraction. EPA's analysis did not consider the effects of the nearby production well at the Center Point Training Center or residential well pumping on ground water flow paths and travel times. Further, the analysis assumes that the percent change in the travel time is linear for all parameters such that the percent change would be valid for any condition of on-site extraction. This assumption is not technically valid since: (1) the effect of extraction on the ground water velocity and overall travel time is a function of the area of influence and hydraulic gradients and is not a linear relationship for combinations of site parameters; and (2) the portion of the ground water travel path affected by extraction, which occurs only in the area hydraulically influenced by extraction, will vary for different aquifer parameters and may not be significant with respect to the total travel time to the receptor well.

The technical basis for using the travel time alone, and not concentrations for the assessment of the clean-up time frame for wells outside the capture zone, is not clear. The model only considers retardation and does not include the effects of dispersion or other attenuation mechanisms that affect contaminant migration and concentration. The assumption that a 15 to 37 percent reduction in the total travel time will result in a concentration reduction occurring proportionally sooner is doubtful and may not be valid.

EPA Response: Overlapping of Travel Time Analysis Ranges

The ranges in Table E-2 overlap because of uncertainty in the aquifer parameters used in the model and in the transport parameters used in the particle tracking. However, for any given set of parameters, the analysis showed a decrease in travel times to the receptor locations as a result of on-site extraction.

CPTC Production Well not Considered in Travel Time Analysis

It is true that the CPTC production well was not considered in the analysis. Contaminants that are within the capture zone of this well would not reach any of the receptor locations used in the analysis as long as the pumping rate of that production well is maintained. However, the particle tracking was done backwards from the receptor locations. If the production well had been included in the analysis, different flow paths would have been generated leading to receptors 4 and 5. These particle tracks would probably show some deflection around the capture zone of the CPTC well. The travel times for the deflected particle tracks would also be affected by an on-site extraction system. The differences in travel times might be greater or less than the differences simulated without the production well.

Linearity of % Change in Travel Time across Range of Hydraulic Parameters and Pumping Rates

The analysis does not assume that changes in aquifer parameters or pumping rates would have a linear effect on travel times. Simulations were done for only one set of aquifer parameters. The values used were estimates based on the available site-specific and regional information. Uncertainty in these estimates was acknowledged by expressing the results as ranges, but no formal attempt at analysis of the effects of uncertainty was attempted.

Technical Basis For Using Travel Time Rather Than Concentration For Cleanup Time

Assessment

Travel time alone was used as an indicator of the potential for on-site extraction to shorten cleanup time because it was judged that there is not sufficient information available to support credible solute transport modeling. As explained in Appendix E of the Feasibility Study, there are several solute transport mechanisms that would affect the simulated concentrations at receptor locations if a solute transport model were being used. Advection is usually one of the dominant processes. Advective transport was rather conveniently simulated using the groundwater flow model and particle tracking, without the necessity of making numerous additional assumptions about the other transport processes. Historical observation of the concentrations in monitoring and residential wells around the Transicoil Site seem to indicate a general decline in concentrations. This is attributed to natural attenuation. Natural attenuation is an observed phenomenon that probably includes the processes of advection, dispersion, and degradation, although it is not clear which of these is the strongest attenuation mechanism. The implication of this comment is that degradation may be the dominant process, and, if so, it would over-ride any differences in contaminant travel times. This contention, however, has not been proven. The degradation rates of VOC contamination are difficult to predict. As indicated in Appendix E of the Feasibility Study, experience suggests that decay rates for VOCs are relatively slow. The observed concentration reductions at the Transicoil Site may be mostly due to the advective processes that were represented in the travel time analysis.

7. In the FS Report, EPA rejected the potential use of reinjection for the disposal of extracted ground water. However, EPA did not provide a sufficient technical basis for rejecting this option. EPA's ground water model may not be an adequate representation of the hydrogeologic characteristics of the site and was not calibrated correctly due to a lack of data. The actual effect of reinjection is not known. Reinjection would only reduce the capture zone if the resulting hydraulic influence of reinjection overlaps the extraction areas of influence. As this is dependent on the injection rate and conductivity which are not well-known, it is equally possible that reinjection could be conducted without making capture more difficult.

   EPA Response: The economical use of reinjection depends upon its application near the site to limit the required construction of piping and associated structures.

   Unfortunately, this increases the likelihood that the reinjection will affect the groundwater conditions at the site hydraulically. Therefore, the use of reinjection under the assumed hydrogeologic conditions does not appear to offer an advantage to remediation. However, EPA has reconsidered as a result of this comment and others received during the public comment period for the Proposed Plan and now is proposing to allow reinjection if it can be demonstrated that it will not have any adverse impact on the containment characteristics of the pumping system.

8. In the RI Report, EPA suggested that VOC concentrations in some residential water supplies may increase initially before decreasing due to natural attenuation. However, EPA did not provide data in the RI and FS Reports to support this conclusion.

   EPA Response: Historical trends on contaminant concentrations in residential wells have exhibited both increases and decreases. Between the sampling in 1990 and 1991 and the sampling in 1995, several residential wells sampled during both periods showed increases in TCE and/or 1,1,1 -TCA. Such increases may indicate that migration of masses of groundwater with elevated levels of contamination through the groundwater system.

9. EPA concluded that additional data are needed to assess more thoroughly the natural attenuation potential at the site. Therefore, the remedial design for the site should be flexible enough to include further consideration of the role and effectiveness of natural attenuation on VOC concentrations in on-site and off-site areas.

EPA Response: See response to comment # 2 above.

10. The RI/FS did not provide data regarding the organic material within the groundwater or aquifer matrix beneath the site, or other site-specific data, with the exception of oxygen and pH, which are now commonly used to perform detailed assessments of degradation potential for VOCs due to naturally occurring processes. On a preliminary basis, the VOCs detected and their concentrations indicate the possible degradation of TCE.

Evidence of detection of many of the products of biological degradation of PCE, TCE, and 1,1,1-TCA (namely 1,1-DCE, 1,2-DCE, and 1,1-DCA). As concluded in the FS Report, additional data are needed to more thoroughly assess the natural degradation potential at the site. In consideration of this, the remedial plan for the Site should be flexible enough to include further detailed consideration of the role and effectiveness of natural attenuation on VOC concentrations in the on-site and off-site areas.

EPA Response: The conclusion that there is a lack of organic material needed for active biodegradation was based on the fact that this generally is true in deep aquifers because oxidation consumes most organic material soon after recharge to the aquifer, unless there is a large source such as a spill of petroleum hydrocarbons. Preliminary indications are that no biological degradation of TCE is presently occurring.

What one would expect to see as daughter products of TCE are primarily cis-1,2-DCE, and vinyl chloride; neither are present in detectable concentrations in most of the wells. While 1,1-DCE is present in some wells, it is not likely to be a result of the biological breakdown of TCE. When TCE undergoes biological reductive dechlorination it has been found that the first breakdown product is most commonly cis-1,2-DCE, the next-most-common form is trans-1,2-DCE, and the least common is 1,1-DCE.

If the 1,1-DCE found in the groundwater was a result of biodegradation we would also expect to see the cis and trans forms in greater (or at least comparable) concentrations. It is more likely that the 1,1-DCE is either the result of some abiotic degradation or that it was introduced into the environment in that form.

More importantly, even if the low concentration of 1,1 DCE indicated some type of breakdown of TCE, the relative concentration of 1,1-DCE to TCE (there is typically 1 order of magnitude more TCE than 1,1-DCE in any given well), the lack of any daughter products at the toe of the plume, and the fact that the contaminants have been present in the ground for 20 to 40 years lead to the conclusion that it is having no significant positive effect on the migration or remediation of the groundwater.

Because no significant concentrations of daughter products are present, and because the aquifer matrix is deep fractured rock which is not typically considered to contain the organic substrate necessary to support biological reductive dechlorination, we believe the conservative assumption that degradation should not be counted on to significantly reduce contaminant concentrations is reasonable. The availability of supportive data in the future may necessitate revisiting this conclusion.

11. Several of the remedial alternatives rely on natural attenuation processes to reduce COC concentrations in ground water. This is reasonable because the historic data indicate that natural attenuation is occurring, thereby reducing VOC concentrations in on-site and off-site ground water. However, EPA did not consider natural attenuation fully in the

detailed evaluation of alternatives in the FS Report.

EPA Response: Its agreed that potential benefits of natural attenuation could have been identified more consistently, particularly for Alternative GW-1 (no action), but the conclusions of the FS are not affected by this. Alternatives GW-2, GW-6, GW-7 (onsite extraction and treatment, offsite natural attenuation) , and GW-8 (natural attenuation with institutional controls) note natural attenuation. Alternative GW-3 (onsite and offsite extraction) did not need to invoke it, as the contaminants would be extracted. The conclusions based on the FS and ROD would not be affected by the noted inconsistency.

12. EPA indicated that the overall effectiveness of pump-and-treat remedial alternatives is substantially greater than natural attenuation. However, the limited effectiveness of ground water extraction to affect low-level COC concentrations in ground water, especially in fractured rock aquifers, is well documented. It may not be feasible or possible to permanently remediate ground water to MCLs in a shorter time frame than that for natural attenuation. Further, ground water extraction could adversely affect ground water conditions (dewatering and reduction of residential and nearby public water supplies).

EPA Response: Its recognized a number of pump-and-treat remedial systems have not been very successful, and that groundwater extraction may be associated with some of the indicated negatives. That is one of the reasons for including Alternative GW-8 (natural attenuation) in the FS report. The difficulties with pump-and-treat, potential dewatering issues, and the uncertainty associated with predicting the time to achieve remedial goals have been documented throughout the FS report and have been taken into consideration in developing the remedial alternatives.

13. EPA did not include, or underestimated, several items for the pump-and-treat remedial alternatives which should be considered. Therefore, the costs presented underestimate the actual costs that would be associated with their implementation, possible affecting the overall cost analysis. Some examples:

System Pretreatment: Capital and O&M costs are not considered for possible pre-treatment requirements for metals or other considerations that could result in the fouling of other unit processes.

Monitoring Costs: Identified costs for ground water and treatment system monitoring and data analysis and reporting appear low for Contract Lab Program (CLP) level data, given the need for liquid and vapor monitoring requirements for Alternatives GW-2 and GW-3.

Pipe Installation/Trenching: Trenching costs appear low for Alternative GW-3 since asphalt, concrete, and other materials at the surface would increase the cost. Site restoration costs are not provided for any of the alternatives except DW-2, which could be substantial for off-site areas under Alternative GW-3. Costs also were not included for installation of electrical lines and bedding materials in the trenches for Alternatives GW-2 through GW-7.

O&M Costs: O&M costs appear low for Alternatives GW-2 through GW-7, which could be significant since O&M costs over a 30-year period represent a significant portion of the present worth values. It appears that costs for equipment repair and replacement, which can be substantial, were not considered, especially for the number of extraction points considered in Alternative GW-3. It also appears that costs for stripper backwashing and disposal and sand filter replacement were not included for Alternatives GW-2 and GW-3. Monitoring costs also appear low.

EPA Response:

System Pretreatment:

Metals pretreatment has been evaluated and is not anticipated to be require. It is unknown if biofouling would be an issue at the site. Biocide vendors have indicated that if total plate count of the extracted groundwater exceeds 100 colony forming units per milliliter biocide application may be needed. Data for the North Penn Area 12 site are not available to determine if a biocide would be required.

Estimated capital costs for a biocide system for a 35 gallons per minute extraction system is $2,000. Annual O&M associated with providing biocide chemical is estimated at $15,000 per year, a present worth cost (5% interest rate, 30 years) of approximately $230,000. The present worth cost of on-site pump and treat alternatives would increase by an estimated $232,000.

Use of a biocide may be a NPDES permitting issue for alternatives discharging to surface waters, unless liquid-phase carbon is used. We recommend that the potential for biofouling be addressed during the design phase of the remedial action through evaluation of groundwater quality and treatment system design specifications.

Monitoring Costs - Contract Laboratory Program (CLP) Data:

The costs for data analysis were based on laboratory quotations for standard (non-CLP) data deliverables. Review of the quotations indicates that the costs do not reflect CLP deliverables. The surcharge to provide CLP-level results is estimated by the laboratory at 1.5%. If CLP data are required, the increase in analytical costs would result in an increased present worth of approximately $10,000 for Alternatives GW-4 and GW-8, and $20,000 for Alternatives GW-2, GW-3, GW-5, GW-6, and GW-7. These increases are less than 3% of the original estimates of the original estimated present worth, within the FS reports targeted cost estimate accuracy range of -30 to +50 percent. These same assumptions were used for all alternatives.

Pipe Installation/Trenching and Site Restoration:

Is agreed that possible surface conditions for Alternative GW-3 (on-site and off-site extraction) may result in increased trenching costs. Its also agreed that costs for the additional site restoration activities for this alternative should be considered due to the extensive area that would be affected by the off-site alternative. Inclusion of such costs would make this alternative, already the most costly evaluated, even more expensive than the other alternatives. The off-site trenching costs could be increased by $25,000 (10% of total contingency, 1% of total present worth cost) to account for these activities. This cost increase is within the FS report's targeted cost estimate accuracy range. Site restoration activities have not been called out as a separate cost for the on-site treatment component of the other alternatives. Installation of electrical lines and bedding materials have also not been called out as separate cost items. The costs for electrical line are included in associated cost items such as "power and instrumentation". Costs were not included for pipe bedding materials, this may add another $l0,000 to $20,000 ($4 to $8/foot) to the cost of the onsite treatment alternatives. The detailed costs would be the same for all alternatives incorporating an on-site treatment component. These additional costs, if any, are anticipated to be within the FS report's targeted cost estimate accuracy range.

O&M Costs:

We agree that estimated O&M costs do not include equipment repair and replacement. Assuming an annualized repair/replacement cost of 10% of original equipment and instrumentation costs, the total present worth would increase approximately 2% (GW-7), 6% (GW-5), 10% (GW-2 and GW-4), 14% (GW-6) and 18% (GW-3). These increased costs are within the FS report's targeted cost estimate accuracy range.

The cost estimate assumed a low-profile air stripper which does not require a backwash

system. Our experience with these systems is that periodic manual cleaning, if found to be required, could be accomplished for less than $1,000 per year. Periodic sand filter media replacement, if required, would not result in significant increased costs. The original cost for the sand filter is estimated at $2,000.

14. The recent residential well VOC data are not included in the FS Report. The RI Report (CH2M Hill, January 1996) included residential well VOC data through January 1995. Figure 1-7 of the FS Report presents a range in TCE levels for residential wells based on data (including preliminary data) through July 1996. For consistency, it would be helpful to include and evaluate the 1996 residential well VOC data, so that the comparison of historical VOC concentrations presented in the RI Report (Table 4-25) from 1990-1995 could be continued with more recent data. An evaluation of historical residential ground water data may further demonstrate the potential effects of the natural attenuation, as discussed herein.

EPA's Response: The figure in the June, 1996 draft report illustrating TCE concentrations in residential wells used the maximum TCE concentration observed through January, 1996. The corresponding figure in the October, 1996 final report was updated per EPA request to reflect preliminary July, 1996, data (July, 1996 Schlumberger Monthly Report) indicating that lot 18-16 (Benner) had TCE above the MCL. These data were also used in the February, 1997 revisions to the final report. We consider this approach to be a conservative method of identifying residences that could potentially be affected by the groundwater contamination, particularly given the uncertainty associated with predicting plume migration using residential well data. We agree that a time comparison of concentrations over time may be beneficial. Preliminary review of the available residential well data, however, indicates that there is limited evidence of significant concentration decreases over the short time frame (January 1995 - January 1996) covered by the residential well data. Conclusions based on the FS report are not anticipated to change. All the residential well data generated as required by the August 22, 1995 - Administrative Order for Removal Response Action, Docket No. III-95-56-DC will be placed into the administrative record for the site.

15. On page 1-15 of the FS Report, micrograms per liter is defined as "mg/L". The correct abbreviation, as utilized in other FS Report sections, should be "Ig/L". The

groundwater concentration fro monitoring wells and residential wells are subsequently reported with the mg/L units, although the reported numerical concentrations are actually in "Ig/L". This should be noted in the future to avoid possible confusion by reviewers of the FS Report or prior to adaptation of this section for the ROD.

EPA's Response: The use of the "mg/L" on pages 1-15 and 1-16 is an error; the units should read "Ig/L". The numerical concentration values reported are correct, however, the wrong abbreviation was used as noted.

FIGURES

<IMG SRC 97088C>
<IMG SRC 97088D>
<IMG SRC 97088E>
<IMG SRC 97088F>
<IMG SRC 97088G>
<IMG SRC 97088H>
<IMG SRC 97088I>
<IMG SRC 97088J>

Appendix A

Administrative Record Index

NORTH PENN AREA 12
ADMINISTRATIVE RECORD FILE * **
INDEX OF DOCUMENTS

III. REMEDIAL RESPONSE PLANNING

1. Report: Hydrogeologic Evaluation of the Influence of Production Well Pumping on Groundwater Movement, prepared by JACA Corporation, 2/20/87. P. 000001-000014.

2. Report: Technical Evaluation of Zone of Contamination 12 Transicoil Incorporated Site, Worcester, Pennsylvania; prepared by Versar, Inc., 7/15/88. P. 000015-000088.

3. Report: Preliminary Health Assessment for the Transicoil Inc. (Zone 12) North Penn Area Site, Worchester, Pennsylvania, prepared by the Office of Health Assessment Agency for Toxic Substances and Disease Registry (ATSDR), 9/29/88. P. 000089-000091.

4. Letter to Ms. Roseanne M. Mistretta, U.S. EPA, from Mr. Marc L. Greenberg, Eagle-Picher Industries, Inc., re: Designation of the Project Coordinator, for the respondents at the site, 6/9/89. P. 000092-000092.

5. Administrative Order by Consent In The Matter Of: Transicoil Site, Docket No. III-89-14-DC, Eagle-Picher Industries, Inc., and Transicoil, Inc., respondents, 6/29/89. P. 000093-000121.

6. Letter to Ms. Marcia E. Mulkey, U.S. EPA, from Ms. Mary Letzkus, Environmental Resources Management, Inc., re: Notification that Ms. Letzkus has no conflict of interest in working at the site, 7/7/89. P. 000122-000122.

7. Letter to Mr. Paul Harper, Eagle-Picher Industries, from Mr. Christopher B. Pilla, U.S. EPA, re: Designation of the EPA Project Coordinator, for the site, 7/13/89. P. 000123-000123.

8. Letter to Mr. Christopher B. Pilla, U.S. EPA, from Mr. Mark Johnson, Eagle-Picher Industries, Inc., re: Designation of Remedial Investigation/Feasibility Study (RI/FS) contractor for the site, 7/13/89.

P. 000124-000124.

* Administrative Record File available 5/14/96, updated 7/18/97.

** The North Penn Area 12 Removal Administrative Record is hereby included by reference.

9. Letter to Mr. Dennis Cunningham, U.S. EPA, from Mr. Ronald J. Chernik, Dynamac Corporation, re: Transmittal of the RI/FS work plan for the site, 8/31/89. P. 000125-000145. The work plan is attached.

10. Memorandum to Mr. Jim Feeney, U.S. EPA, from Ms. Cynthia Kennedy, U.S. EPA, re: Transmittal of review comments for the draft RI/FS work plan, 10/13/89. P. 000146-000164. The comments are attached.

11. Letter to Mr. James J. Feeney, U.S. EPA, from Mr. Nicholas Cianfrone, Dynamac Corporation, re: Review of the RI/FS work plan, 11/9/89. P. 000165-000171.

12. Memorandum to Mr. Jim Feeney, U.S. EPA, from Ms. Donna Abrams, U.S. EPA, re: Review of the draft RI/FS work plan, 11/17/89. P. 000172-000174. The review is attached.

13. Letter to Mr. James J. Feeney, U.S. EPA, from Mr. Woodrow R. Cole, Pennsylvania Department of Environmental Resources (PADER), re: Comments on the draft RI/FS work plan and request for information concerning the aquifer pumping test, 11/30/89. P. 000175-000176.

14. Letter to Mr. Mark M. Johnson, U.S. EPA, from Mr. James J. Feeney, U.S. EPA, re: Comments on the draft RI/FS work plan, 12/01/89. P. 000177-000185.

15. Facsimile transmittal letter to Mr. Jim Feeney, U.S. EPA, from Mr. Woodrow R. Cole, PADER, re: Review of draft RI/FS work plan, 12/08/89. P. 000186-000191. A memo detailing PADER's hydrogeological concerns about the site is attached.

16. Letter to Mr. Mark M. Johnson, Transicoil Inc., from Ms. Karen D. Johnson, U.S. EPA, re: Transicoil's status with regard to further legal actions by the EPA, 2/1/90. P. 000192-000221. The following are attached:

    a) trip reports;
    b) sampling data analysis;
    c) chain of custody reports;
    d) handwritten notes concerning trip visits.

17. Letter to Mr. James Feeney, U.S. EPA, from Ms. Mary Letzkus, Environmental Resources Management, Inc., re: Response to U.S. EPA comments on the draft RI/FS work plan, 3/16/90. P. 000222-000249. The comments and revisions to the work plan are attached.

18. Memorandum to Mr. James J. Feeney, U.S. EPA, from Ms. Dawn A. Ioven, U.S. EPA, re: Comments concerning the draft RI/FS work plan, 5/4/90. P. 000250-000264. A memorandum requesting a review of the work plan and a revised portion of the work plan are attached.

19. Letter to Mr. James J. Feeney, U.S. EPA, from Mr. Bruce Beach, Dynamac Corporation, re: Submittal of oversight soil sampling results, 12/10/90. P. 000265-000411. The soil sampling results are attached.

20. Letter to Mr. James M. Feeney, U.S. EPA, from Mr. Francis P. McCune, Eagle-Picher Industries, Inc., re: Confirmation of a telephone conversation between Mr. Feeney and Mr. Paul Harper regarding developments in Bankruptcy Court and the full implementation of the RI/FS work plan, 2/15/91. P. 000412-000412.

21. Letter to Mr. Scott McEwen, CH2M Hill, from Mr. Patrick M. McManus, U.S. EPA, re: Comments on the draft RI/FS work plan for the site, 10/8/93. P. 000413-000431. Comments from the U.S. EPA hydrogeologist, U.S. EPA toxicologist, and PADER are attached.

22. Letter to Mr. Scott McEwen, CH2M Hill, from Mr. Patrick M. McManus, U.S. EPA, re: Comments on the December, 1993, draft RI/FS work plan for the site, 1/12/94. P. 000432-000451. Comments from the U.S. EPA hydrogeologist, U.S. EPA toxicologist, and the PADER site manager are attached.

23. Report: North Penn Area 12 Draft RI/FS Work Plan, prepared by CH2M Hill, 3/94. P. 000452-000658.

24. Letter to Mr. Patrick M. McManus, U.S. EPA, from Mr. Stephen Brand, CH2M Hill, re: Transmittal of well construction logs for the site, 4/22/94. P. 000659-000677. The construction logs are attached.

25. Memorandum to Mr. Patrick M. McManus, U.S. EPA, from Ms. Dawn A. Ioven, U.S. EPA, re: Comments on the draft sampling and analysis plan for the site, 6/2/94. P. 000678-000679.

26. Memorandum to Mr. Patrick M. McManus, U.S. EPA, from Ms. Barbara Rudnick, U.s. EPA, re: Comments on the draft sampling and analysis plan for the site, 6/15/94. P. 000680-000683.

27. Memorandum to Mr. Patrick M. McManus, U.S. EPA from Mr. Robert S. Davis, U.S. EPA, re: Comments on the draft sampling and analysis plan for the site, 6/23/94. P. 000684-000685.

28. Letter to Mr. Patrick M. McManus, U.S. EPA, from Ms. Monica D. Jones, U.S. EPA, re: Review and comments on the field sampling and quality assurance plans for the site, 6/29/94. P. 000686-000702. A Quality Assurance Project Plan Review Checklist is attached.

29. Report: North Penn Area 12 Sampling and Analysis Plan, prepared by CH2M Hill, 7/94. P. 000703-000997.

30. Letter to Mr. Stephen Brand, CH2M Hill, from Mr. Patrick M. McManus, U.S. EPA, re: Comments on the sampling and analysis Plan, 7/1/94. P. 000998-000999.

31. Letter to Mr. Stephen Brand, CH2M Hill, from Mr. Patrick M. McManus, U.S. EPA, re: Transmittal of PADER's comments on the sampling and analysis plan, 7/11/94. P. 001000-001002.

32. Letter to Mr. Patrick M. McManus, U.S. EPA, from Mr. Stephen Brand, CH2M Hill, re: Response to comments on the sampling and analysis plan for the site, 7/20/94. P. 001003-001009. The comments and a Federal Express airbill are attached.

33. Letter to Mr. Stephen Brand, CH2M Hill, from Mr. Patrick M. McManus, U.S. EPA, re: Approval of the sampling and analysis plan, 9/8/94. P. 001010-001010.

34. Letter to Mr. Patrick M. McManus, U.S. EPA, from Ms. Lanny Helms, Target Environmental Services, Inc., re: Transmittal of the quality assurance plan for screening services at the site, 11/28/94. P. 001011-001022. The quality assurance plan is attached.

35. Memorandum to Mr. Mike Showlter and Ms. Susan Guicheteau, CH2M Hill, from Mr. Stephen Brand, CH2M Hill, re: Project sampling instructions, 2/7/95. P. 001023-001032.

36. Letter to Mr. Patrick M. McManus, U.S. EPA, from Ms. Lisa Senior, U.S. Department of the Interior, Water Resources Division, re: Explanation and transmittal of water-level recorder charts from tests conducted on wells at the site, 7/19/95. P. 001033-001048. The charts are attached.

37. Memorandum to Mr. Patrick M. McManus, U.S. EPA, from Mr. Robert S. Davis, U.S. EPA, re: Review and comments on the remedial investigation report, 9/26/95.

P. 001049-001051.

38. Memorandum to Mr. Patrick M. McManus, U.S. EPA, from Ms. Dawn A. Ioven, U.S. EPA, re: Review and comments on the draft remedial investigation report, 9/29/95. P. 001052-001054.

39. Letter to Mr. Patrick M. McManus, U.S. EPA, from Mr. Chet Zazo, PADER, re: Comments on the remedial investigation report, 10/6/95. P. 001055-001056.

40. Memorandum to Mr. Patrick M. McManus, U.S. EPA, from Ms. Barbara Rudnick, U.S. EPA, re: Review and comments on the remedial investigation report, 10/23/95. P. 001057-001061.

41. Letter to Mr. Stephen Brand, CH2M Hill, from Mr. Patrick McManus, U.S. EPA, re: Comments on the remedial investigation report, 10/24/95. P. 001062-001067.

42. Letter to Mr. Patrick M. McManus, U.S. EPA, from Ms. Lisa Senior, U.S. Department of the Interior, Water Resources Division, re: Transmittal and explanation of water-level recorder charts from tests conducted on wells at the site, and final map of the water levels of the wells, 12/8/95. P. 001068-001102. The charts and map are attached.

43. Report: North Penn Area 12 Remedial Investigation Report, prepared by CH2M Hill, 1/96. P. 001103-001810.

44. Report: North Penn Area 12 Site Trip Report and Report of Results, prepared by Roy F. Weston, Inc., 2/9/96. P. 001811-001911. A transmittal letter is attached.

45. Letter to Mr. Don Henne, U.S. Department of the Interior, from Mr. Patrick M. McManus, U.S. EPA, re: Transmittal of the final draft of the remedial investigation report for the site, 2/28/96. P. 001912-001912.

46. Letter to Mr. Charles Sardo, Township Manager, Township of Worcester, from Mr. Patrick M. McManus, U.S. EPA, re: Transmittal of the remedial investigation report for the site, 3/19/96. P. 001913-001913.

47. Report: North Penn Area 12 Remedial Investigation Report, Addendum 1, prepared by CH2M Hill, 4/96. P. 001914-001953.

48. Report: Evaluation of Geophysical Logs for North Penn Area 12 Superfund Site, Montgomery County, Pennsylvania, prepared by U.S. Geological Survey, 1996.

P. 001954-001982. A March 18, 1997, transmittal letter to Mr. Patrick M. McManus, U.S. EPA, from Mr. Dennis W. Risser, U.S. Department of the Interior, is attached.

49. Report: North Penn Area 12 Feasibility Study Report, prepared by CH2M Hill, 2/97. P. 001983-002238.

50. Memorandum to Mr. Patrick M. McManus, U.S. EPA, from Mr. Thomas Nilan and Lee Davis, CH2M Hill, re: North Penn Area 12 - Preliminary Review of Requirement for Metals Treatment, 5/6/97. P. 002239-002243.

51. Proposed Plan, North Penn Area 12 Site, 7/97. P. 002244-002278.