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EPA Superfund
Record of Decision:

PUCHACK WELL FIELD
EPA ID: NJD981084767
OU 01
PENNSAUKEN TOWNSHIP, NJ
09/28/2006

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2

DATE: SEPT 26, 2008

SUBJECT: Record of Decision (ROD) for the Puchack Well Field Superfund Site

FROM: Carole Petersen, Chief,
New Jersey Remediation Branch

TO: George Pavlou, Director
Emergency and Remedial Response Division

Attached for your review and concurrence is the draft ROD for the Puchack Well Field Superfund Site (Site) located in Pennsauken, Camden County, New Jersey. This decision document presents the Selected Remedy for groundwater contamination and is the first of two RODs planned for the Site.

The Site is located in a commercial, industrial and residential neighborhood of Pennsauken Township, Camden County, New Jersey. The Puchack Well Field Site, Operable Unit 1 (OU1), is defined by the groundwater that contains concentrations of total chromium greater than the New Jersey Department of Environmental Protection's (NJDEP's) Groundwater Quality Standard of 70 parts per billion (ppb).

The Puchack Well Field consists of six municipal wells that are owned and were once operated by the City of Camden. Groundwater contamination, including chromium and volatile organics, was first detected at the Puchack Well Field in the early 1970's. Chromium contaminant levels exceeded the EPA Maximum Contaminant Levels (MCL) for total chromium. This resulted in one of the wells being closed in 1975. Additional wells were shut down as unacceptable levels of contamination were detected in them. The entire well field was generally terminated in 1984. NJDEP allowed the continued controlled pumping of Puchack Well #1 to act as a temporary plume containment measure until 1998. The Site was placed on the National Priorities List (NPL) on March 6, 1998.

Based on EPA's investigation/total chromium in the aquifer units ranged from non-detectable levels to 10,250 ppb.

The major components of the Selected Remedy in the attached ROD include:

- ♦ Geochemical fixation through injection of a reducing agent to treat groundwater containing concentrations of total chromium greater than the New Jersey Groundwater Quality Standard of 70 ppb;

- ♦ Implementation of a long-term groundwater sampling and analysis program to assess the effectiveness of the action and natural attenuation of the chromium contamination overtime; and,

- ♦ Institutional controls, such as designation of a Classification Exception Area, to restrict the installation of wells and the use of groundwater in areas of chromium-contaminated groundwater.

I am available to discuss any questions regarding the ROD for the Puchack Well Field Superfund Site.

Attachment

RECORD OF DECISION

Operable Unit 1 - Chromium Contaminated Groundwater

Puchack Well Field Superfund Site,

Pennsauken, Camden County, New Jersey

United States Environmental Protection Agency

Region 2

September 2006

DECLARATION STATEMENT

RECORD OF DECISION

SITE NAME AND LOCATION

Puchack Well Field Site (EPA ID#NJD981084767)
Pennsauken, Camden County, New Jersey
Operable Unit 1

STATEMENT OF BASIS AND PURPOSE

This decision document presents the Selected Remedy to address chromium contaminated groundwater at the Puchack Well Field Superfund Site, in Pennsauken, Camden County, New Jersey. The groundwater is contaminated with volatile organic compounds (VOCs) and chromium. The VOC contamination is a region-wide issue that emanates from numerous, widespread sources and it is therefore not practicable to address the VOCs through this site remedy. The region-wide VOC contamination is being addressed under State of New Jersey authority. Therefore, this remedy addresses the chromium contaminated groundwater. The Selected Remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record established for this site.

The State of New Jersey concurs with the Selected Remedy.

ASSESSMENT OF THE SITE

The response. action selected in this Record Of Decision (ROD) is necessary to protect public health, or the environment from actual or threatened releases of hazardous substances from the site into the environment.

DESCRIPTION OF THE SELECTED REMEDY

The Selected Remedy described in this document represents the first of two planned remedial phases, or operable units, for the Puchack Well Field Superfund Site.

The Selected Remedy for groundwater is comprised of in-situ treatment using geochemical fixation, monitored natural attenuation and institutional controls.

The major components of the Selected Remedy include:

- Geochemical fixation through injection of a reducing agent to treat groundwater containing concentrations of total chromium greater than the New Jersey Groundwater Quality Standard of 70 parts per billion (ppb)

- Implementation of a long-term groundwater sampling and analysis program to assess the effectiveness of the action and natural attenuation of the chromium contamination over time; and,

- Institutional controls, such as designation of a Classification Exception Area, to restrict the installation of wells and the use of groundwater in areas of chromium-contaminated groundwater.

DECLARATION OF STATUTORY DETERMINATIONS

Part 1: Statutory Requirements

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and treatment technologies to the maximum extent practicable.

Part 2: Statutory Preference for Treatment

Geochemical fixation of the groundwater's chromium contamination satisfies the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Part 3: Five-Year Review Requirements

Because the remedy will not result in hazardous substances, pollutants, or contaminants remaining above levels that allow for unlimited use and unrestricted exposure, a five-year review will not be required.

However, because it may take more than five years to attain remedial action objectives and cleanup levels, a policy review may be conducted within five years of construction completion for the site to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for the site.

- Chemicals of concern and their respective concentrations may be found in the "Site Characteristics" section.

- Baseline risk represented by the chemicals of concern may be found in the "Summary of Site Risks" section.

- A discussion of cleanup levels may be found in the "Remedial Action Objectives" section.

- A discussion of source materials constituting principal threats may be found in the "Principal Threat Waste" section.

- Current and reasonably-anticipated future groundwater use assumptions are discussed in the "Current and Potential Future Site and Resource Uses" section.

- A discussion of potential groundwater use that will be available at the site as a result of the Selected Remedy is discussed in the "Remedial Action Objectives" section.

- Estimated capital, annual operation and maintenance (O&M), and total present worth costs are discussed in the "Description of Alternatives" section.

- Key factors that led to selecting the remedy (i.e., how the Selected Remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decisions) may be found in the "Comparative Analysis of Alternatives" and "Statutory Determinations" sections.

George Pavlou, Director
Emergency and Remedial Response
Division
EPA - Region 2

9/28/06
Date

DECISION SUMMARY

Operable Unit 1 - Chromium Contaminated Groundwater

Puchack Well Field Superfund Site,

Pennsauken, Camden County, New Jersey

United States Environmental Protection Agency

Region 2

September 2006

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SITE NAME, LOCATION AND BRIEF DESCRIPTION

The Puchack Well Field Site is located in a commercial, industrial and residential neighborhood of Pennsauken Township, Camden County, New Jersey. The Puchack Well Field Site Operable Unit 1 (OU1) is defined by the location of the chromium-contaminated groundwater that contains concentrations of chromium greater than the New Jersey Department of Environmental Protection's (NJDEP's) Groundwater Quality Standard for total chromium of 70 parts per billion (ppb).

The chromium-contaminated groundwater is situated in an area roughly bounded to the north by Route 90, to the east by Westfield Avenue, to the south by Cove Road, and to the west by the Conrail railroad track. Residences, schools, churches, commercial buildings, industrial development, and two cemeteries occupy this area.

The Puchack Well Field, which is located within the boundaries of OU1, consists of six municipal wells that are owned and were once operated by the City of Camden (Figure 1). During operation, the six wells had a combined capacity of six million gallons per day (MGD). The area surrounding the Well Field is used for residential, commercial and industrial purposes. Several hundred single and multi-family residential buildings, commercial buildings and industrial facilities are located near the Puchack Well Field. One section of the Pennsauken Industrial Park is located approximately one-half mile to the northeast of the Puchack Well Field, while another section is located approximately one-quarter mile to the southwest. Conrail railroad tracks are situated approximately 500 feet to the northeast and southeast of the Well Field. The tollgate for the Betsy Ross Bridge (Route 90) is located approximately 250 feet to the east.

There are no known operating drinking water or industrial production wells within the chromium-contaminated plume.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

Groundwater contamination, consisting of trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), tetrachlorethene (PCE), and chromium, was first detected at Puchack Well #4R/6-70 in the early 1970s. Further sampling indicated the presence of hexavalent chromium, a form of chromium with relatively high solubility and toxicity, and trivalent chromium, another form of chromium which has relatively low solubility and toxicity, at concentrations above the EPA Maximum Contaminant Level (MCL). This resulted in Puchack Well #4R/6-70 being removed from service in 1975.

In 1978, chromium was detected in Puchack Well #5/5A. This well was removed from service sometime between 1981 and 1983. In 1982, chromium was detected in Puchack Wells #s 2, 3/3A, and 6-75/7. In 1984, general use of the Well Field was terminated. However, NJDEP allowed the continued controlled pumping of Puchack Well #1 to act as a temporary plume containment measure. Groundwater extracted from Puchack #1 was either discharged to Puchack Creek next to the Puchack Site or blended. with the Camden City potable water supply. This pumping was discontinued in 1998.

In 1997, the United States Geological Survey (USGS), in cooperation with the NJDEP, initiated a field investigation of the groundwater contamination in the Pennsauken Township area. Based on sampling results from this USGS investigation, total chromium levels in the Middle aquifer (i.e., the shallowest water bearing unit) were found to range from non-detectable levels to 10,250 ppb. In the Intermediate Sand aquifer, chromium concentrations ranged from 2.0 ppb to 9,070 ppb, and in the Lower aquifer, the levels ranged from non-detect to 3,454 ppb.

The Puchack Well Field Site was placed on the National Priorities List (NPL) on March 6, 1998.

Once EPA's field investigations were completed, the final OU1 Remedial Investigation (RI) report describing the RI results was drafted and then finalized in January 2006. The final OU1 Feasibility Study, which describes the various alternatives considered to remediate the site, was completed in June 2006.

The results of the OU1 RI and the FS are summarized in this Record of Decision (ROD). Both documents can be found in the Administrative Record repositories for the site.

HIGHLIGHTS OF COMMUNITY PARTICIPATION

On July 7, 2006, EPA released the RI/FS, the Proposed Plan, and supporting documentation for the OU1 groundwater remedy for comment. These documents were made available to the public in the administrative record repositories maintained at the EPA Region 2 office (290 Broadway, New York, New York 10007) and the Pennsauken Free Public Library (5605 Crescent Blvd. Pennsauken, NJ 08110). EPA published a notice of availability involving the above-referenced documents in the Courier-Post newspaper on July 7 and 8, 2006. The public comment period was originally scheduled from July 7, 2006 to August 7, 2006.

On July 26, 2006, EPA held a public meeting at the Rutgers University Camden Campus, to inform local officials and interested citizens about the Superfund process, to discuss the findings of the RI/FS, to present the remedial alternatives for the site, and to respond to questions and comments from area residents and other attendees.

In response to a request at the public meeting to extend the public comment period 90 days, EPA agreed to a 30-day extension. EPA published a notice in the Courier-Post on August 7, 2006, extending the public comment period for the additional 30 days to September 6, 2006.

Responses to the comments received at the public meeting and in writing during the public comment period are included in the Responsiveness Summary section of this ROD(see Appendix V).

SCOPE AND ROLE OF OPERABLE UNIT

This action, referred to as Operable Unit 1 (OU1), will be one of two actions for the site. OU1 addresses the chromium contaminated groundwater at the site. Operable Unit 2 (OU2) will address chromium contaminated soils and be the focus of a future ROD for this site.

The investigations performed prior. to and during the RI indicated that there is contamination of the groundwater with volatile organic contaminants (VOCs) such as trichloroethene (TCE). The VOC contamination is commingled with the chromium plume and also extends well beyond the boundaries of the site.

The VOC contamination is a regional problem derived from multiple sources unrelated to the site. These sources are being addressed individually under State authority and are not addressed as part of this Superfund action. Currently, all water pumped from area wellfields is being treated at the production wellheads to remove VOCs prior to distribution, in compliance with State and federal drinking water regulations.

The Selected Remedy will treat the distinct chromium plume, which impacted the Puchack Well Field.

SUMMARY OF SITE CHARACTERISTICS

The nature and distribution of groundwater contamination at and near the Puchack Well Field Site is complex. The results of previous investigations, including those conducted by the USGS in cooperation with the NJDEP, have identified numerous complexities of the aquifer system stratigraphy, hydrogeology, and geochemistry at the Site, as well as the existence of multiple potential contaminant sources and changes in historical pumping.

The field investigation for OU1 included the completion of soil borings, subsurface soil and aquifer sediment sampling, downhole geophysical surveys, monitoring well installation and development, groundwater sampling, and synoptic and continuous water level measurements. The majority of this work was conducted from July 20, 2000 through June 8, 2001.

The following activities were completed:

- A total of 16 borings were advanced using hollow stem auger methods at selected potential source areas. A total of 60 soil and geologic sediment samples were collected for chemical analyses.
- A total of 28 borings were advanced using mud rotary drilling methods.
- A total of 47 subsurface soil and geologic sediment samples (and 6 duplicate samples) were collected from 43 monitoring well borings for chemical analysis.
- Downhole geophysical logging was conducted at 27 locations.
- A total of 64 monitoring wells were installed and developed at .27 locations.
- Thirteen groundwater samples from 13 monitoring and water supply wells were collected for chemical analyses from October 1999 to December 1999.
- 135 groundwater samples from 88 monitoring wells were collected for chemical analyses from August 2000 to April 2001.

Site Hydrogeology

In Pennsauken Township and vicinity, permeable layers of sand and gravel of the Pennsauken Formation and Quaternary deposits cap most of the extent of the outcrops of the Cretaceous

sediments that form the Potomac-Raritan-Magothy (PRM) aquifer system. Sands and gravels of the Pennsauken Formation are believed to have been deposited in a fluvial environment in which a series of down cutting channels were incised into the sediments below. The Quaternary deposits change from gravels and gravelly sand at Trenton to clayey silt at Philadelphia, most likely representing a change in the depositional environment. Due to the complex interaction of the individual layers, caused by the various depositional methods, discontinuities in individual units are common, resulting in hydraulic connections between the units. Major confining units can contain either sand or clay lenses, which serve as either local water bearing zones or as local confining units.

The following information provides a summary of the hydrogeologic features at the site:

- There are four water-bearing units in the Potomac-Raritan-Magothy aquifer system: the Upper aquifer (mostly unsaturated in the study area) , the Middle aquifer, the Intermediate Sand, and the Lower aquifer, all separated by leaky confining units.
- A detailed delineation of the hydrostratigraphic framework in the study area indicates that there are areas of cut-and-fill in the confining units. These create permeable zones that apparently do not prevent passage of water through the confining units.
- There are downward head gradients between the Middle aquifer and Intermediate Sand that promote movement of contaminated water between these two water-bearing units.
- Although hydraulic heads between the Intermediate Sand and the Lower aquifer are now similar, it is likely that during full-scale pumping at the Puchack Well Field, a greater downward head gradient between these two units existed. These conditions probably contributed to the movement of chromium contamination from the Intermediate Sand into the Lower aquifer and to the Puchack wells.
- During full-scale pumping at the Puchack Well Field, groundwater flow direction, locally, was probably toward the northeast, but now has shifted to the southeast.
- A general increase in water level elevations of over two feet in all aquifers from 1998 to 2000 was observed.
- The current groundwater velocity is estimated to be 310 feet/year (ft/yr) (0.85 ft/day), based on a $V = K * I / n$, where :

  V = average linear velocity (ft/day)
  K = hydraulic conductivity (150 ft/day)
  I = hydraulic gradient (0.0017 ft/ft)
  n = effective porosity (0.3)

Groundwater Contamination

Inorganic Contamination:

Chromium in groundwater is the primary contaminant of concern at the Puchack Site. There are also scattered detections of mercury with no apparent pattern. The areal extent of the chromium plume at levels of total chromium above 70 ppb (the New Jersey Groundwater Quality Standard) in the Middle aquifer, Intermediate Sand and Lower aquifer is presented in Figures 2, 3, and 4, respectively. Major findings of chromium groundwater contamination include:

- Chromium-contaminated groundwater forms plumes in each of three water-bearing zones: the Middle aquifer, the Intermediate Sand, and the Lower aquifer.
- Chromium was detected in the Middle aquifer above 70 ppb in two samples, one located underlying the former site of SGL Chrome and one underlying the Pennsauken Landfill. The chromium detected at SGL Chrome was not detected above 70 ppb either downgradient of this location in the Middle aquifer or directly below this location in the Intermediate Sand or Lower aquifer.
- The position and orientation of chromium detected in the Middle aquifer when compared to groundwater flow information, indicate the SGL chromium contaminant source area is related to the site. Groundwater flow data do not support the possibility that the contamination underlying the Pennsauken Landfill is related to the site.
- Chromium-contaminated groundwater has moved through more permeable lenses in confining units between the water-bearing zones in response to downward vertical head gradients, resulting in contamination reaching deeper water bearing units.
- The plumes in the Intermediate Sand and Lower aquifer are moving to the southeast, an apparent shift in direction, since the shut down of the Puchack Well Field in 1998.
- Chromium concentrations in the groundwater plumes have generally decreased from 1997-1998 to 2000-2001. One exception to this trend was observed in MW-14 (Intermediate Sand) where chromium levels have increased, presumably due to the shift in groundwater flow direction after the Puchack Well Field was shut down.

The concentration of hexavalent chromium, also known as Cr (VI), in the groundwater at any given location over time can be affected by several physical mechanisms. The concentration can be reduced through the physical replacement of contaminated groundwater with upgradient water; this process is called advection. Dilution also occurs as the uncontaminated groundwater flows into the plume area. The third mechanism is dispersion, which occurs when the permeability of sediments along the path of groundwater flow vary. This may cause contamination to spread ahead of the average groundwater flow, as well as laterally along the flow. All three of these mechanisms were or are occurring, to some extent, at the site and were enhanced during periods in which the Puchack Well Field wells were pumping.

The chromium groundwater concentrations can also be affected by chemical mechanisms; these mechanisms typically decrease the concentration of the more soluble form of chromium, hexavalent chromium. Under the moderately acidic conditions that prevail in much of the aquifer system local to the site, some hexavalent chromium may adsorb to the sediment. However, the adsorption process is reversible so the chromium may not be permanently bound to the sediments. Another chemical mechanism is the conversion (i.e., chemical reduction) of hexavalent chromium to trivalent chromium. This process not only reduces the toxicity of the chromium, but causes it to precipitate out of the dissolved state and become immobile.

There are no longer any known active sources of chromium discharge at the site. However, during periods when there was an active discharge of chromium, EPA believes the contamination moved down through the top soil layers into the Middle aquifer. The hexavalent chromium plume continued to migrate both vertically and horizontally while being impacted by the reducing and adsorption factors of the sediments, depleting these factors over time.

The chromium contamination moved vertically until its movement was impeded by an impermeable confining unit. Then, the plume moved eastward until it reached a permeable area of the confining unit and was able to migrate downward into the lower levels of the aquifer. Historically, during the period of active chromium discharge, it is believed the plume's velocity was much greater than it is now, perhaps as much as a thousand feet a year. Given both the current groundwater velocity of 310 ft/yr and the retardation factor for chromium in present conditions, the hexavalent chromium plume now has an estimated velocity of between 5 and 12 ft/yr. Due to its much higher retardation factor, the trivalent chromium in the groundwater is relatively immobile.

Organic Contamination:

There is a wide variety of VOCs found commingled with the site's chromium-contaminated groundwater. The VOC contamination also extends well beyond the boundaries of the chromium plume. The VOC contamination is a regional problem derived from multiple sources unrelated to the site. Water produced at area well fields is being treated for VOCs at the respective wellheads to ensure compliance with State and federal regulations. The sources of VOCs are being addressed individually under State authority and are not addressed as part of this Superfund action.

The areal extent of the VOCs in the Middle aquifer, Intermediate Sand and Lower aquifer is presented in Figures 5, 6, and 7, respectively. Major findings of VOC contamination include:

- The most frequently detected VOC is TCE; others (including PCE, 1,1,1-TCA, and benzene, toluene, ethyl benzene, and total xylene (BTEX)) are detected less frequently.
- VOC contamination is more widespread in all water-bearing units than chromium contamination. Coherent VOC plumes have not been identified.
- Based on the variety of compounds and widespread distribution, multiple sources of VOCs are likely.
- At several locations, VOC concentrations have declined and there is evidence of degradation of the VOCs, particularly the chlorinated compounds, as cis-1,2-dichloroethene and vinyl chloride are detected, and their frequency and concentrations increase with depth in the aquifer system.
- As with the chromium plume, there is evidence of movement of VOC contamination.

The most prevalent VOCs within the site are halogenated aliphatic compounds such as TCE, tetrachloroethylene (PCE), and 1,1,1-trichloroethane (1,1,1-TCA). The fate of the organic contaminants in groundwater often depends on the interactions with microbes in the aquifer. However, as with the chromium contamination, decreases in concentration of VOCs at a specific location over time can also be the result of physical and chemical mechanisms.

The VOC contamination appears to have originated from a number of sources. As mentioned previously, the VOCs occur over an area that overlaps and extends well beyond the boundaries of the site's chromium plume. It is likely that in areas where the VOCs and chromium occur together, they will compete for the natural substrate's capacity to chemically reduce contamination.

CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

Groundwater Uses: Groundwater underlying the site is considered by New Jersey to be Class II-A, a source of potable water; however, no complete exposure pathways to chromium contaminated groundwater are known. All residents in the area of the site are currently on public supplied water, which is treated to assure all drinking water standards are met for VOCs, or other contaminants. If chromium contaminated groundwater is used as drinking water in the future, significant health risks would exist.

SUMMARY OF SITE RISKS

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimates the human health risk which could result from the contamination at the site if no remedial action were taken.

Human Health Risk Assessment

A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification* - identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. *Exposure Assessment* - estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed. *Toxicity Assessment* - determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of effect (response). *Risk Characterization* - summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative assessment of site-related risks.

Chromium was identified as the contaminant of concern for this OU1 remedial action. Although the human health risk assessment (HHRA) evaluated the risks from all contaminants in the groundwater at the site, including the VOCs, only the summary results for chromium are presented in this section. The HHRA identified exposure routes and human receptor groups and provided quantitative estimates of the magnitude, frequency and duration of exposure. As residential use of groundwater can include exposure via ingestion, dermal contact and inhalation (e.g., during showering), the HHRA for the FS evaluated these exposure routes.

In this assessment, exposure point concentrations were estimated using the minimum of the 95 percent upper confidence limit (UCL) and the maximum concentration (Appendix II, Table 1). Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably expected to occur at the site. The RME is intended to estimate a conservative exposure case that is still within the range of possible exposures. The exposure pathways and receptor populations that were evaluated are presented in Appendix II, Table 2.

Non-carcinogenic risks were assessed using a hazard index (HI) approach, based on a comparison of expected contaminant intake and safe levels of intake (reference doses). Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects. RfDs, which are expressed in units of milligrams per kilogram per day (mg/kg-day), are estimates of daily exposure levels for humans which are thought to be safe over a lifetime (including sensitive individuals). Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical incidentally ingested from contaminated soil) are compared to the RfD to derive the hazard quotient for the contaminant in the particular medium. The HI is derived by adding the hazard quotients for all compounds within a particular medium that impacts a particular receptor population.

An HI greater than 1 indicates that the potential exists for non-carcinogenic health effects to occur as a result of site-related exposures. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. The toxicity values, including reference doses for the contaminants of potential concern at the site, is presented in Appendix II, Table 3.

The HI for groundwater from the Middle aquifer for both the RME exposure scenarios exceeded the acceptable HI of 1 for the adult resident (68), child resident (168), combined child/adult resident (87) , and adult site worker (20). The HI for the RME exposure scenarios for the Lower aquifer also exceeded the acceptable HI of 1 for the adult resident (35), child resident (88), combined child/adult resident (46), and adult site worker (10). Using either exposure scenario, both the Middle and Lower aquifers had non-carcinogenic risks above the acceptable HI of 1, primarily due to chromium (Appendix II, Table 4).

Potential carcinogenic risks were evaluated using the cancer slope factors developed by EPA for the contaminants of potential concern. Cancer slope factors (SFs) have been developed for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to generate an upper-bound estimate of the excess lifetime cancer risk associated with exposure to the compound at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the SF. Use of this approach makes the underestimation of the risk highly unlikely.

For known or suspected carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to a carcinogen. These risks are probabilities that usually are expressed in scientific notation, (such as 1×10^{-4}). An excess lifetime cancer risk of 1×10^{-4} indicates that one additional incidence of cancer may occur in a population of 10,000 people who are exposed under the exposure conditions identified in the BHHRA. As stated in the NCP, the acceptable risk range for site-related exposure is 10^{-4} to 10^{-6} (or approximately one in 10,000 to one in one million).

Since chromium is not considered to be a carcinogen for oral exposure, there is no carcinogenic risk from ingestion of drinking water. Although chromium IV is classified as a carcinogen for inhalation exposures, chromium is not expected to volatilize to the air during showering; therefore, there is no inhalation exposure expected from chromium. Thus, there are no carcinogenic risks to summarize for chromium exposure.

Ecological Risks

OU1 addresses chromium contaminated groundwater. The contaminated groundwater is not impacting surface water resources. Therefore an ecological risk assessment for this operable unit was not performed. EPA will assess the ecological risk from this site as a part of the OU2 RI.

Uncertainties

The procedures and inputs used to assess risks in this evaluation, as in all such assessments, are subject to a wide variety of uncertainties. In general, the main sources of uncertainty include:

- environmental chemistry sampling and analysis
- environmental parameter measurement
- fate and transport modeling
- exposure parameter estimation
- toxicological data

Uncertainty in environmental sampling arises in part from the potentially uneven distribution of chemicals in the media sampled. Consequently, there is uncertainty as to the actual levels present. Environmental chemistry-analysis error can stem from several sources, including the errors inherent in the analytical methods and characteristics of the matrix being sampled.

Uncertainties in the exposure assessment are related to estimates of how often an individual would actually come in contact with the chemicals of concern, the period of time over which such exposure would occur, and in the models used to estimate the concentrations of the chemicals of concern at the point of exposure.

Uncertainties in toxicological data occur in extrapolating both from animals to humans and from high to low doses of exposure, as well as from the difficulties in assessing the toxicity of a mixture of chemicals. These uncertainties are addressed by making conservative assumptions concerning risk and exposure parameters throughout the assessment. As a result, the risk assessment provides upper-bound estimates of the risks to populations near the site, and is highly unlikely to underestimate actual risks related to the site.

More specific information concerning public health and environmental risks, including a quantitative evaluation of the degree of risk associated with various exposure pathways, is presented in the HHRA report.

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in the ROD, may present an imminent and substantial endangerment to the public health, welfare, or the environment.

REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are specific goals to protect human health and the environment. These objectives are based on available information and standards such as

applicable or relevant and appropriate requirements (ARARs) and risk-based levels established in the risk assessment.

The following RAOs for the chromium-contaminated groundwater at the site address human health risks and environmental concerns:

- Prevent or minimize potential current and future human exposures, including groundwater ingestion and dermal contact with groundwater, that presents a significant risk to public health and the environment.

- Minimize the potential for migration of the chromium-contaminated groundwater plume.

- Restore the chromium-contaminated groundwater to drinking water standards within a reasonable timeframe.

There are currently no complete pathways to site-contaminated groundwater, because there are no known chromium contaminated wells in use. However, if contaminated groundwater were to be used as a drinking water source in the future, significant health risks would exist. In addition, if contaminated groundwater were used in industrial processes, significant human health risks may exist. Thus, remedial actions must minimize the potential for human exposure to contaminated groundwater.

The cleanup of this site is based on remediating the chromium-contaminated groundwater to within acceptable levels, which in this case would be the NJ Groundwater Quality Standard for total chromium, 70 ppb. This is more conservative than EPA's Maximum Contamination Level (MCL) for total chromium, 100 ppb. The chromium cleanup goal was selected to both reduce the risk associated with exposure to this contaminant to an acceptable level and to ensure minimal migration of chromium.

The risks posed by VOCs will be addressed through State actions. Such measures as well-head treatment are currently being used, as appropriate, to address VOCs at public supply wells to ensure potable water meets all health based standards.

DESCRIPTION OF ALTERNATIVES

CERCLA requires that each remedial alternative be protective of human health and the environment, be cost effective, comply with other statutory laws, and utilize permanent solutions and alternative treatment technologies and resource recovery technologies to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principal element for the reduction of toxicity, mobility or volume of hazardous substances.

Consistent with expectations set out in the Superfund regulations, none of the remedies rely exclusively on institutional controls to achieve protectiveness.

Potential applicable technologies were identified and screened using effectiveness, implementability and cost as the criteria, with the most emphasis on the effectiveness of the

remedial action. Those technologies that passed the initial screening were then assembled into four remedial alternatives.

Except for the No Action Alternative (Alterative 1), each groundwater remedial alternative would be coupled with institutional controls to limit the potential exposure of the public to the chromium contamination in the groundwater. Institutional Controls are typically restrictions placed to minimize human exposure, while allowing continued monitoring to track contaminant migration. Institutional Controls are generally used in conjunction with other remedial technologies. Consistent with expectations set out in the Superfund regulations, none of the remedies rely exclusively on Institutional Controls to achieve protectiveness.

The time frames below for construction do not include the time for designing the remedy nor the time to procure necessary contracts. Because each of the action alternatives are expected to take longer than 5 years, a site review will be conducted every 5 years (Five-Year Reviews) until remedial goals are achieved.

Alternative 1 - No Action

The No Action alternative was retained for comparison purposes as required by the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). No remedial actions would be implemented as part of the No Action alternative. This alternative does not include institutional controls.

Total Capital Cost	$0
Operation and Maintenance	$0
Total Present Net Worth	$0
Timeframe	0 years

Alternative 2 - Monitored Natural Attenuation (MNA)/Institutional Controls/In-Situ Treatment (Contingency Remedy)

In this alternative, hexavalent chromium would be allowed to be reduced to trivalent chromium by the natural reducing capacity of the aquifer sediment until the total chromium concentration of 70 ppb is achieved. Hexavalent chromium is toxic, mobile (i.e., soluble in water), and highly unstable. It can easily be reduced to trivalent chromium by chemicals (e.g., ferrous iron) found in soil and groundwater. Trivalent chromium is relatively non-toxic, not mobile (precipitated out from water and fixated to soil particles), and extremely stable. The reaction is not reversible under normal environmental conditions. A bench-scale study has demonstrated that the reduction capacity in the aquifer sediment is sufficient to reduce the hexavalent chromium in the plume. Due to the reduction and retardation properties of the aquifer, it is expected that the chromium plume would migrate slowly (up to tens of feet per year) and would not migrate far.

If this alternative were to be selected, monitoring wells would be installed downgradient of the contaminated plume to provide a point of reference for the monitoring program. Groundwater within the plume would be sampled to monitor the contaminant concentrations and hexavalent chromium reduction over time. Additional monitoring wells may be installed, as necessary, to

allow for comprehensive monitoring of the contaminated groundwater. If monitoring indicates that a certain portion of the plume has migrated past the downgradient monitoring wells, an in-situ treatment remedy would be implemented. Depending on the in-situ treatment approach, either a permeable reactive barrier (PRB) (Alternative 2A), or geochemical fixation (Alternative 2B) would be used. Institutional controls, such as the establishment of a groundwater classification exception area (CEA), would be implemented to prevent exposure to contaminated groundwater.

Alternative 2 (MNA only)

Total Capital Cost	$308,000
Operation and Maintenance	$838,000(cumulative for 30 years)
Total Present Net Worth	$1.2 million
Timeframe	30 years

Alternative 2A (MNA with PRB as the Contingency Remedy)

Total Capital Cost	$9.43 Million
Operation and Maintenance	$1.03 Million (cumulative for 30 years)
Total Present Net Worth	$10.5 Million
Timeframe	< 30 Years

Alternative 2B (MNA with in-situ geochemical fixation as the Contingency Remedy)

Total Capital Cost	$6.74 Million
Operation and Maintenance	$1.03 Million (cumulative for 30 years)
Total Present Net Worth	$7.8 Million
Timeframe	< 30 Years

Alternative 3 - In-Situ Treatment/MNA/Institutional Controls

In this alternative, an in-situ treatment zone would be created using reducing agents in selected areas either downgradient of or within the plume area.

There are several non-toxic reducing agents that can be used. The specific reducing agent, which will be selected during the design phase of this remedy, will reduce hexavalent chromium to trivalent chromium in the Middle, Intermediate Sand and Lower aquifers. The trivalent chromium will precipitate out of solution and total chromium concentrations in the groundwater are expected to meet the 70 ppb criteria. Depending on the in-situ treatment approach, either PRB (Alternative 3A), or geochemical fixation (Alternative 3B and 3C) would be selected.

The PRB and geochemical fixation differ not only on the typical treatment agents used, but also in how they are applied. In geochemical fixation the treatment reagents are injected directly into the groundwater plume. PRBs involves injecting chemical reagents into the aquifer to create a reduction zone perpendicular to the groundwater's flow path. The groundwater is treated as it passes through the reduction zone.

Alternatives 3A and 3B would target the most contaminated portion of the chromium plume, meaning the plume containing chromium at concentrations greater than 1,000 ppb, leaving the

remainder of the plume to be reduced through natural processes. Alternative 3C would treat the entire chromium plume that is above the 70 ppb total chromium cleanup goal. The 70 ppb chromium groundwater plume is roughly 3 to 4 times larger in area than that portion of the plume characterized by 1,000 ppb of chromium.

Groundwater monitoring and institutional controls, such as the establishment of a groundwater CEA, would be implemented to ensure there is no exposure to contaminated groundwater.

Alternative 3A (PRB>1,000 ppb)

Total Capital Cost	$13.6 Million
Operation and Maintenance	$838,000 (cumulative for 30 years)
Total Present Net Worth	$14.5 Million
Timeframe	< 30 Years

Alternative 3B (in-situ geochemical fixation>l,000 ppb)

Total Capital Cost	$11.1 Million
Operation and Maintenance	$838,000 (cumulative for 30 years)
Total Present Net Worth	$12.0 Million
Time frame	< 30 Years.

Alternative 3C (in-situ geochemical fixation>70 ppb)

Total Capital Cost	$16.7 Million
Operation and Maintenance	$838,000 (cumulative for 30 years)
Total Present Net Worth	$17.6 Million
Time frame	5-10 Years

Alternative 4 - Groundwater Extraction/Treatment/Off-Site Disposal/Long-Term Groundwater Monitoring/Institutional Controls

In this alternative, contaminated groundwater would be extracted from the aquifer and treated "ex-situ", meaning in a newly constructed water treatment facility. Treatment of extracted groundwater would include inorganic removal using chemical reduction and precipitation such as with ferrous iron as a reducing agent, and VOC removal using air stripping. Treated water would be re-injected into the aquifer through injection wells. Excess treated groundwater would be discharged to off-site surface water. Groundwater monitoring would be performed to evaluate changes in contaminant concentrations and distributions over time. Institutional controls, such as the establishment of a groundwater CEA, would be implemented to prevent exposure to contaminated groundwater.

Total Capital Cost	$13.6 Million
Operation and Maintenance	$18.1 Million (cumulative for 30 yrs)
Total Present Net Worth	$32.1 Million
Time frame	> 30 Years

COMPARATIVE ANALYSIS OF ALTERNATIVES

In selecting a remedy, EPA considered the factors set out in CERCLA § 121, 42 U.S.C. § 9621, by conducting a detailed analysis of the viable remedial response measures pursuant to the NCP, 40 CFR § 300.430(e)(9) and OSWER Directive 9355.3-01. The detailed analysis consisted of an assessment of the individual response measure against each of nine evaluation criteria and a comparative analysis focusing upon the relative performance of each response measure against the criteria.

Threshold Criteria - The first two criteria are known as "threshold criteria" because they are the minimum requirements that each response measure must meet in order to be eligible for selection as a remedy.

1. Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternative 1 would not provide protection of human health, since contamination would persist in groundwater, and potential exposure to contaminated groundwater would not be restricted. There is no mechanism to monitor the migration of the contamination. Alternatives 2 through 4 are equally protective of human health by implementation of institutional controls restricting the future use of contaminated groundwater. Alternative 2 would utilize the natural reductive capacity of the aquifer to reduce and fixate the hexavalent chromium to meet cleanup standards.

A limited number of groundwater samples has shown that hexavalent chromium concentrations have been attenuated by more than 50 percent between 1998 and 2000. A bench-scale study has shown that the aquifer sediment has an adequate reductive capacity to potentially reduce the hexavalent chromium plume. Alternative 2 also includes in-situ treatment as a contingency remedy should any part of the chromium plume migrate past an established compliance zone. Alternatives 3 and 4 would utilize active treatment processes to reduce the toxicity, mobility and volume of the chromium to meet the 70 ppb cleanup standard.

Alternative 1 would not be protective of the environment. Alternatives 2 through 4 would provide protection of the environment as the contaminant migration would be restricted by natural attenuation or active treatment.

2. Compliance with applicable or relevant and appropriate requirements (ARARs)

Section 121 (d) of CERCLA and NCP § 300.430(f) (1) (ii) (B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, 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 cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State

environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those State standards that are identified by a state in a timely manner and that are more stringent than Federal requirements may be applicable. Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting laws that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well-suited to the particular site. Only those State standards that are identified in a timely manner and are more stringent than Federal requirements may be relevant and appropriate.

Compliance with ARARs addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides a basis for invoking a waiver.

Alternative 1 would not comply with the chemical-specific ARAR for groundwater (i.e., the 70 ppb chromium cleanup goal), while Alternative 2 through 4 would comply with the chemical-specific ARAR and achieve remedial goals in the long-term. Long-term groundwater monitoring is a component of Alternatives 2 through 4 to assess the degree of compliance achieved over time. Alternatives 2, 3 and 4 would comply with location- and action-specific ARARs.

A complete list of ARARs can be found in Appendix II, table 6 of this ROD.

Primary Balancing Criteria - The next five criteria, criteria 3 through 7, are known as "primary balancing criteria". These criteria are factors with which tradeoffs between response measures are assessed so that the best option will be chosen, given site-specific data and conditions.

3. Long-term effectiveness and permanence

A similar degree of long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain on-site following remediation and the adequacy and reliability of controls.

Alternative I would not be effective or permanent, since the contaminants would not be monitored and there would be no mechanism to prevent future exposure to contaminated groundwater. Alternatives 2 through 4 would be effective when combined with institutional controls. Alternative 2 would rely on natural mechanisms to reduce contaminant levels. The results from groundwater sampling and a bench-scale study have demonstrated this would be a viable approach. Alternative 2 also includes active in-situ treatment as a contingency remedy should the chromium plume migrate past a compliance zone. Alternatives 3 and 4 would actively treat contaminants. The effectiveness of these alternatives would be assessed through periodic groundwater monitoring and five-year reviews. The relative degrees of effectiveness and permanence associated with Alternatives 2, 3, and 4 are generally comparable; however, it is expected that Alternative 3 would meet the cleanup goals more quickly than Alternative 2. It is

believed that Alternative 3C, which addresses the entire chromium plume, would meet the cleanup goals in the shortest timeframe.

The in-situ treatment technologies under Alternatives 2 and 3 have been implemented at other Superfund sites. Additional bench-scale studies and a pilot-scale treatability study would be required to develop design parameters.

4. Reduction of toxicity, mobility, or volume

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 1 would not reduce the toxicity, mobility, and volume (TMV) through treatment as no active treatment of contaminated groundwater occurs. The toxicity and volume would eventually be reduced for Alternatives 1 and 2 by the. natural reduction capacity of the aquifer sediment. Alternative. 2 would, reduce the TMV through treatment if the in-situ treatment were implemented. It is expected that Alternatives' 3 and 4 would significantly reduce the TMV of the contaminated groundwater through treatment in a quicker time frame than Alternative 2. These alternatives involve reduction and immobilization of contaminants in the groundwater, thereby reducing toxicity. It is anticipated that Alternative 3 would achieve the most reduction in TMV in the shortest duration. Alternatives 2 and 4 would achieve reduction of toxicity and volume in the long-term.

5. Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community and the environment during construction and operation of the remedy until cleanup levels are achieved.

For Alternative 1, protection of the community and workers during remedial activities would not be applicable as no remedial action is occurring. Air monitoring, engineering controls and appropriate worker personal protective equipment (PPE) would be used to protect the community and workers for Alternatives 2 through 4.

There are no potential adverse impacts associated with construction and implementation of Alternative I. Construction of the injection wells under Alternative 2 (if required as a contingency remedy) would have temporary negative impacts on the commercial, business and the residences located near the proposed installation location. Alternative 3 would also have temporary impact to the commercial business and residences due to installation and operation of injection wells.

Alternative 4 would have the greatest short-term impacts to the community. The pump and treat system would be operated for approximately 30 years in commercial, business and residential areas. This would entail significant construction, including installation o. f pipes to carry water from recovery wells to a treatment plant, and then the treated water back to re-injection wells.

Alternative 3C, In-Situ Geochemical Fixation, would achieve the cleanup goals in the shortest duration, expected to be in the five- to ten-year range. A definitive timeframe to meet the

cleanup goals for Alternatives 2, 3A, 3B and 4 is unknown, but would be significantly longer (at least twice as long) than Alternative 3C. It is expected that Alternative 4 would take the longest of the alternatives to achieve cleanup goals.

6. Implementability

Implement ability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Alternative 1 would be easiest both technically and administratively to implement. Alternatives 2 and 3 would be moderately difficult to implement. Alternative 4 is the most difficult to implement as there is limited space available to lay the necessary piping and to build the treatment facility. Also, significant uncertainties remain on how effectively the treated water can be re-injected into the aquifer. If the some (or all) of the treated groundwater cannot be re-injected, then a potentially more costly and logistically difficult alternative for disposing of the treated water would have to be found. Alternatives 2, 3 and 4 would require access agreements from the neighboring properties. Alternative 4 may also require leasing or purchasing properties for the treatment facility.

7. Cost

Includes estimated capital and O&M costs, and net present worth value of capital and O&M costs.

Alternative 1 incurs no cost but also provides no protection to human health or the environment. Alternative 2 costs are low unless the in-situ treatment contingency remedy is required. Alternative 3 costs are higher than Alternative 2, and Alternative 4 is by far the most expensive.

The cost estimates for the in-situ treatment technologies under Alternatives 2 and 3 are highly dependent on the effective radius of treatment. The cost estimates could vary significantly should the site conditions differ from the cost assumptions. Cost sensitivity analyses were performed for Alternatives 3A, 3B, and the 3C. Cost increases up to 71 percent were experienced if the injection point spacing was reduced by half. Other factors that could have significant effect on the cost estimates may include the injection duration at each location and the number of injection events.

Modifying Criteria - The final two evaluation criteria, criteria 8 and 9, are called "modifying criteria" because new information or comments from the state or the community on the Proposed Plan may modify the preferred response measure or cause another response measure to be considered.

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8. State acceptance

Indicates whether based on its review of the RI/FS reports and the Proposed Plan, the state supports, opposes, and/or has identified any reservations with the selected response measure.

The State of New Jersey concurs with EPA's Selected Remedy, Alternative 3C.

9. Community acceptance

Summarizes the public's general response to the response measures described in the Proposed Plan and the RI/FS reports. This assessment includes determining which of the response measures the community supports, opposes, and/or has reservations about.

EPA solicited input from the community on the remedial response measures proposed for the site. Oral comments were recorded from attendees of the public meeting. Written comments were received from Siemens Water Technologies, the New Jersey Environmental Federation, the Merchantville-Pennsauken Water Commission, Henry S. Cole & Associates, Inc., Environ, Sharon Finlayson and South Jersey Legal Services.

During the public comment period, a number of commenters expressed reservations about EPA's Proposed Plan. While the comments did not generally have an particular concerns regarding the preferred alternative, a number of commenters were concerned that the remedy was deals solely with the chromium contamination, rather than the groundwater contaminated with volatile organics in and around the site.

In Appendix V, the Responsiveness Summary addresses all comments received, both verbal and written.

PRINCIPAL THREAT WASTE

Principal threat wastes are considered source materials, i. e., materials that include or contain hazardous substances, pollutants or contaminants that act as a reservoir for migration of contamination to groundwater, surface water, or as a source for direct exposure. Contaminated groundwater is generally not considered to be source material, however Non-Aqueous Phase Liquids (NAPLs) in groundwater may be viewed as source material. As this is only the first operable unit ROD, the second operable unit ROD may address areas of "principal threat" waste.

SELECTED REMEDY

Based upon consideration of the results of the OU1 Site investigations, the requirements of CERCLA, the detailed analysis of the remedial alternatives and public comments, EPA has determined that Alternative 3C is the appropriate remedy for chromium contaminated groundwater at the Site. This remedy best satisfies the requirements of CERCLA Section 121 and the NCP's nine evaluation criteria for remedial alternatives, 40 CFR § 300.430 (e) (9). This remedy includes the following components:

- Geochemical fixation through injection of a reducing agent to treat groundwater containing concentrations of total chromium greater than 70 ppb;

- Implementation of a long-term groundwater sampling and analysis program to assess the effectiveness of the action and natural attenuation of the chromium contamination over time; and,

- Institutional controls such as designation of a Classification Exception Area, to restrict the installation of wells and the use of groundwater in areas of chromium contaminated groundwater.

The Selected Remedy creates an in-situ treatment zone using a geochemical fixation process which uses reducing agents within the chromium-contaminated plume area. The chemical reducing agent would reduce hexavalent chromium to trivalent chromium in the contaminated aquifer, allowing the chromium to precipitate out of solution. Geochemical fixation would be used to treat the entire area of groundwater that contains chromium above the cleanup goal of 70 ppb.

The estimated cost of the Selected Remedy for OU1 is $17,600,000. Summaries of the estimated remedy costs for the Selected Remedy are included in Appendix II, Table 5 of this ROD. The cost estimates are based on the best available information regarding the anticipated scope of the overall remedy. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedy. These are order-of-magnitude engineering cost estimates that are expected to be within +50 to -30 percent of the actual project costs.

Based on the information available at this time, EPA and the State of New Jersey believe the Selected Remedy provides the best balance of trade-offs among the response measures with respect to the nine evaluation criteria. EPA believes that the Selected Remedy will be protective of human health and the environment, will comply with ARARs, will be cost effective, and will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

STATUTORY DETERMINATIONS

As was previously noted, CERCLA § 121(b)(1) mandates that a remedial action must be protective of human health and the environment, cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Section 121(b)(1) also establishes a preference for remedial actions which employ treatment to permanently and significantly reduce the volume, toxicity or mobility of the hazardous substances, pollutants, or contaminants at a site. CERCLA § 121(d) further specifies that a remedial action must attain a degree of cleanup that satisfies ARARs under federal and state laws, unless a waiver can be justified pursuant to CERCLA § 121(d)(4).

Protection of Human Health and the Environment

The Selected Remedy, Alternative 3C, will be protective of human health and the environment through the treatment of chromium-contaminated groundwater and institutional controls. Groundwater monitoring and institutional controls will further ensure that chromium-contaminated groundwater will not impact human health and the environment.

The Selected Remedy will, over time, eliminate all significant risks to human health and the environment associated with the chromium contaminated groundwater. This action will result in

the reduction of potential exposure levels to chromium-contaminated groundwater to within EPA's generally acceptable risk for non-carcinogens. Implementation of the Selected Remedy will not pose unacceptable short-term risks or adverse cross-media impacts.

Compliance with ARARs

The Selected Remedy for chromium-contaminated groundwater will comply with ARARs.

The Selected Remedy for groundwater has been developed to meet Federal and State ARARs for drinking water. Pursuant to the New Jersey Ground Water Quality Standards, N.J.A.C. 7:9-6 et seq., the groundwater at the site is classified as IIA, which means it

is a current or potential source of drinking water. The more restrictive of Federal or New Jersey standards is being used as the cleanup level for chromium in groundwater.

A complete list of ARARs can be found in Appendix II, Table 6 of this document.

Cost Effectiveness

EPA has determined that the Selected Remedy is cost-effective and represents a reasonable value for the money to be spent. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP § 300.430 (f) (1) (ii) (D)). EPA evaluated the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility, or volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of the selected remedy was determined to be proportional to costs and hence, this alternative represent a reasonable value for the money to be spent.

The Selected Remedy is cost effective as it has been determined to provide the greatest overall protectiveness for its present worth costs.

Utilization of Permanent Solutions and Alternative Treatment Technologies

EPA has determined that the Selected Remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs to the extent practicable, EPA has determined that the Selected Remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and State and community acceptance.

The Selected Remedy will provide adequate long-term control of risks to human health and the environment through treatment of the chromium-contaminated groundwater, long-term monitoring and institutional controls. The Selected Remedy does not present short-term risks

different from the other alternatives. The Selected Remedy employs innovative technologies that have proved successful at other sites having chromium contaminated groundwater.

Preference for Treatment as a Principal Element

Through the use of geochemical fixation to treat the chromium-contaminated groundwater, the Selected Remedy meets the statutory preference for the use of remedies that employ treatment that reduces toxicity, mobility or volume as a principal element to address the principal threats at the site.

Five-Year Review Requirements

The Selected Remedy will not result in chromium-contaminated groundwater remaining above levels that allow for unlimited use and unrestricted exposure. However, the Selected Remedy may take more than five years to attain the remedial action objectives and chromium cleanup levels for the groundwater. Therefore, a policy review may be conducted within five years of construction completion for the site to ensure that the remedy is, or will be, protective of human health and the environment.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Puchack Well Field Site was released for public comment on July 7, 2006. An extension was requested by interested parties. On August 7, 2006, EPA granted an extension of the comment period. The comment period closed on September 6, 2006.

The Proposed Plan identified Alternative 3C (in-situ treatment/MNA/institutional controls) for chromium contaminated groundwater as EPA's selected alternative. EPA reviewed all written and verbal comments submitted during the public comment period. The comments received are documented in the Responsiveness Summary. EPA made no significant changes to the remedy, as originally identified in the Proposed Plan.

APPENDIX I

FIGURES

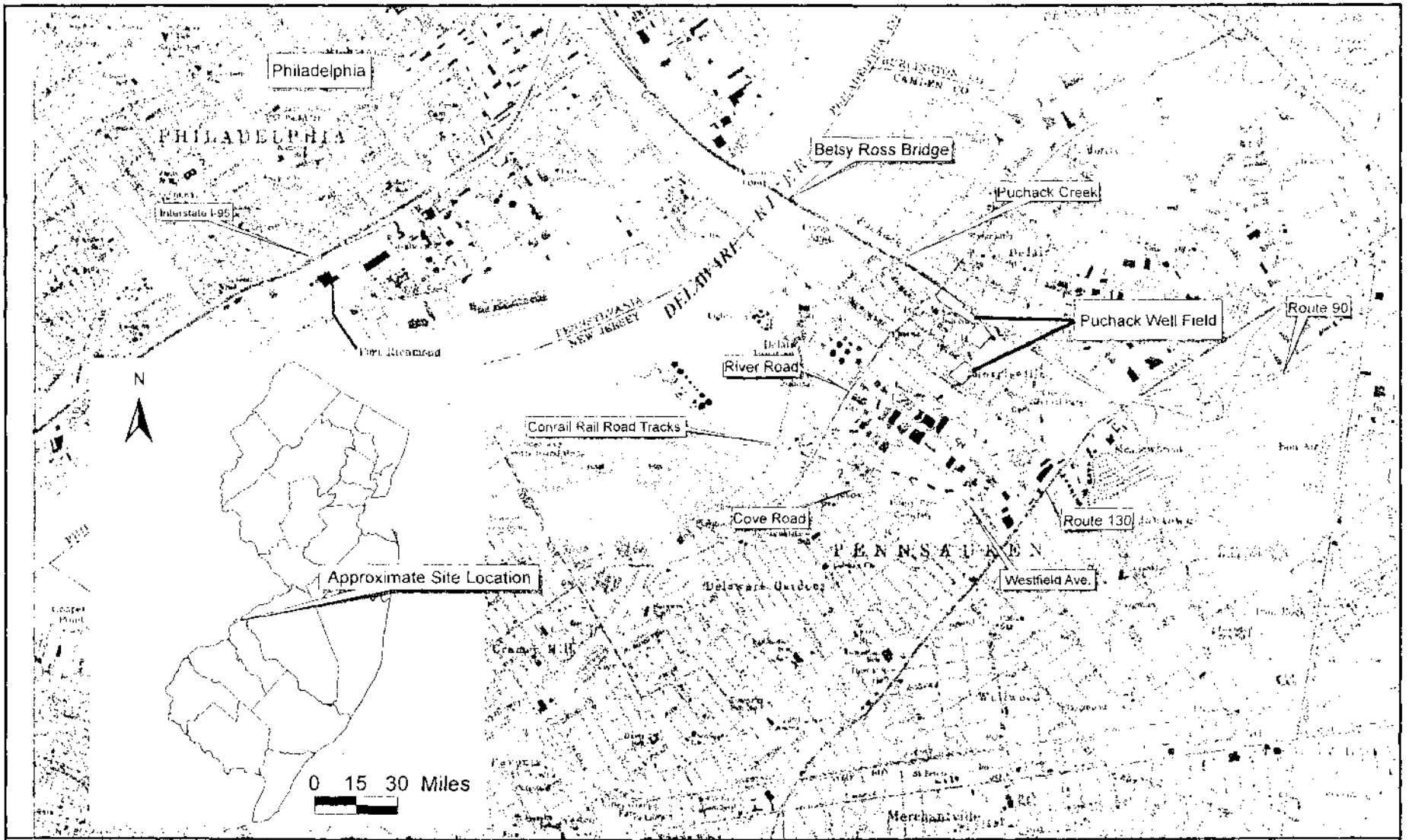

Figure 1
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

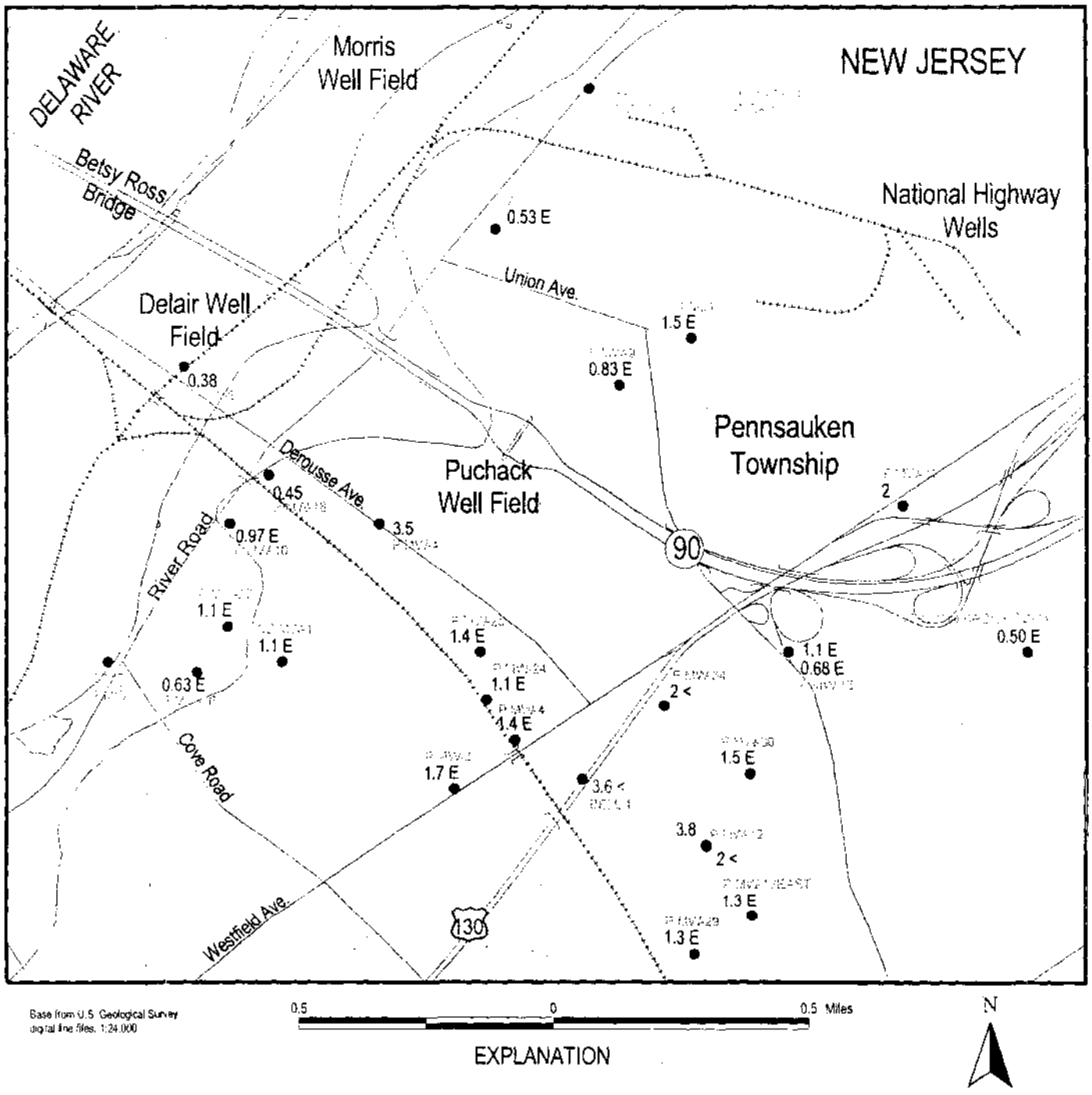

Figure 2. Aerial extent of chromium contaminated groundwater in the Middle aquifer, 1999 - 2001, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey. (Figure prepared by the USGS)

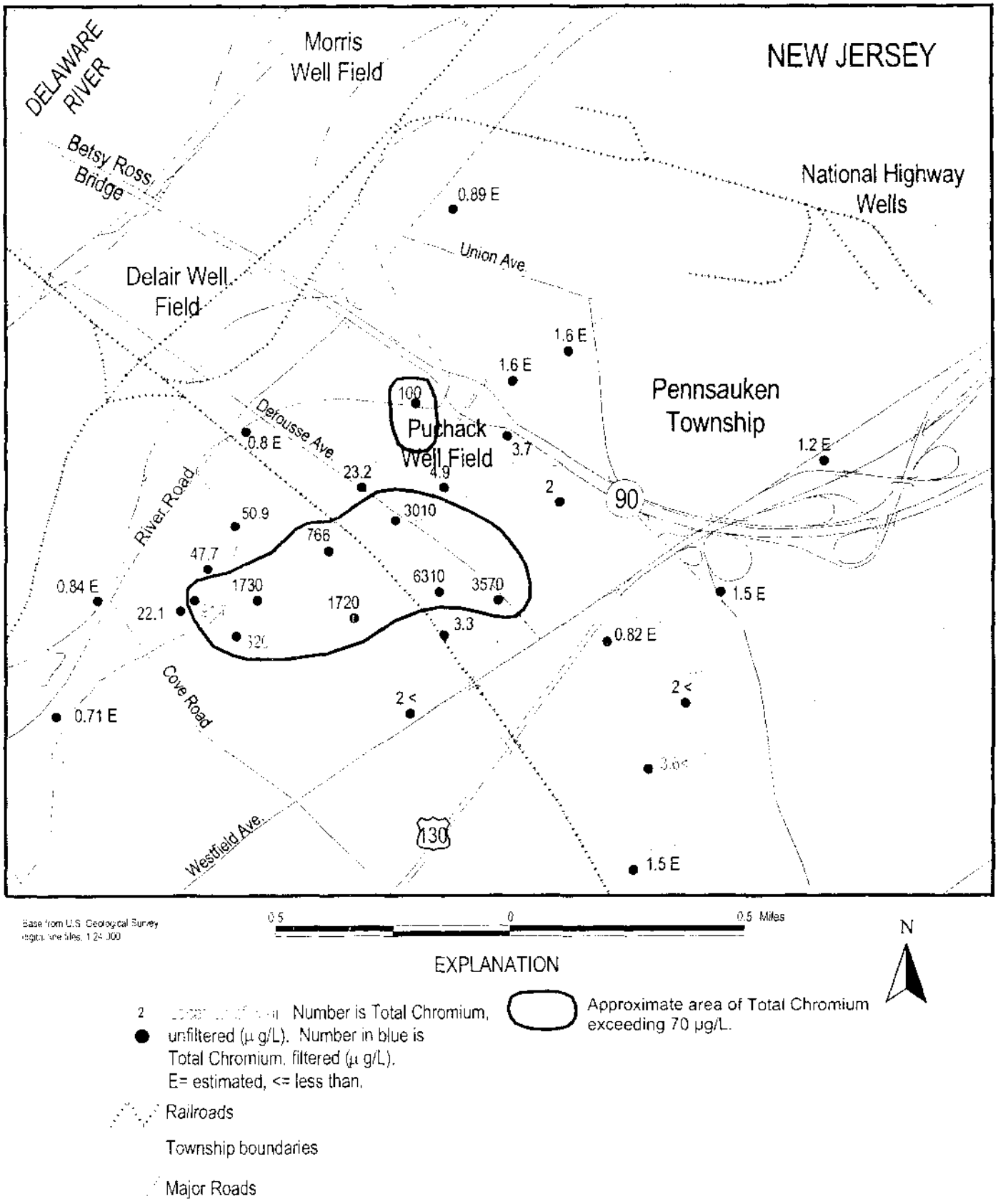

Figure 3. Aerial Extent of Chromium Contaminated Groundwater in the Intermediate Sand, 1999 - 2001, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey. (Figure prepared by the USGS)

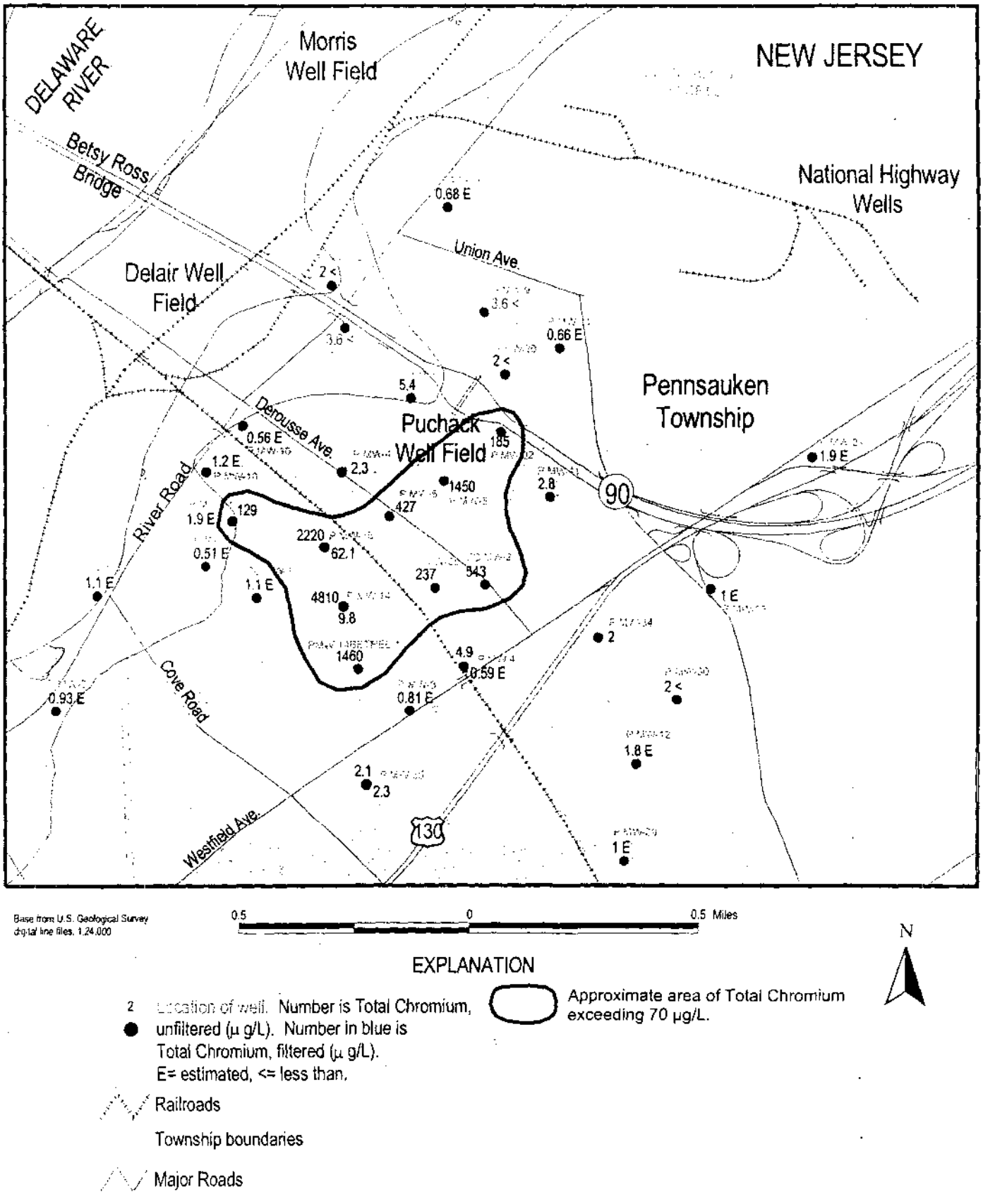

Figure 4. Aerial extent of chromium contaminated groundwater in the Lower aquifer, 1999 - 2001, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey. (Figure prepared by the USGS)

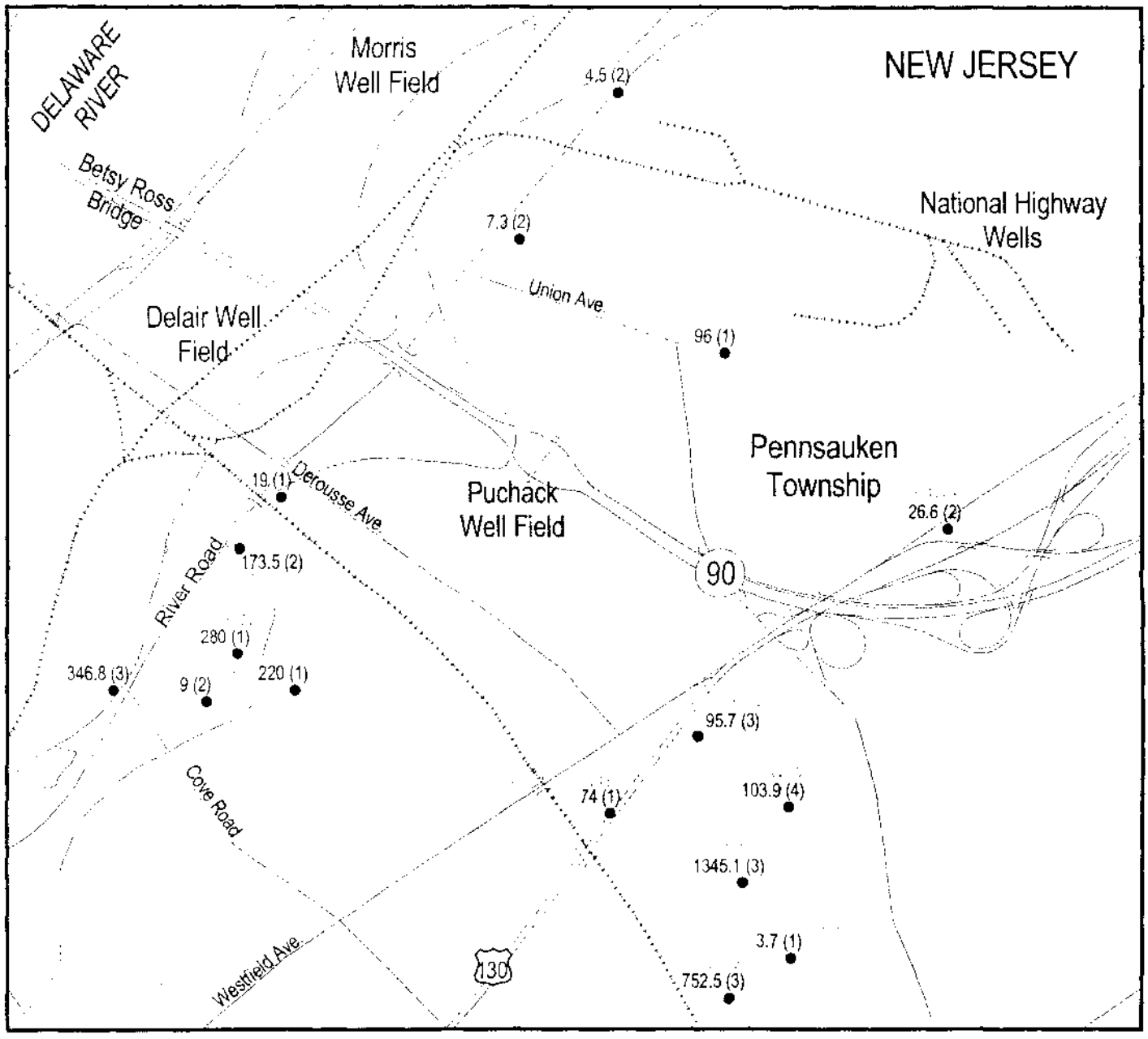

Figure 5. Aerial Extent of Volatile Organic Compound Contaminated Groundwater in the Middle Aquifer, 1999 - 2001, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey. (Figure prepared by the USGS)

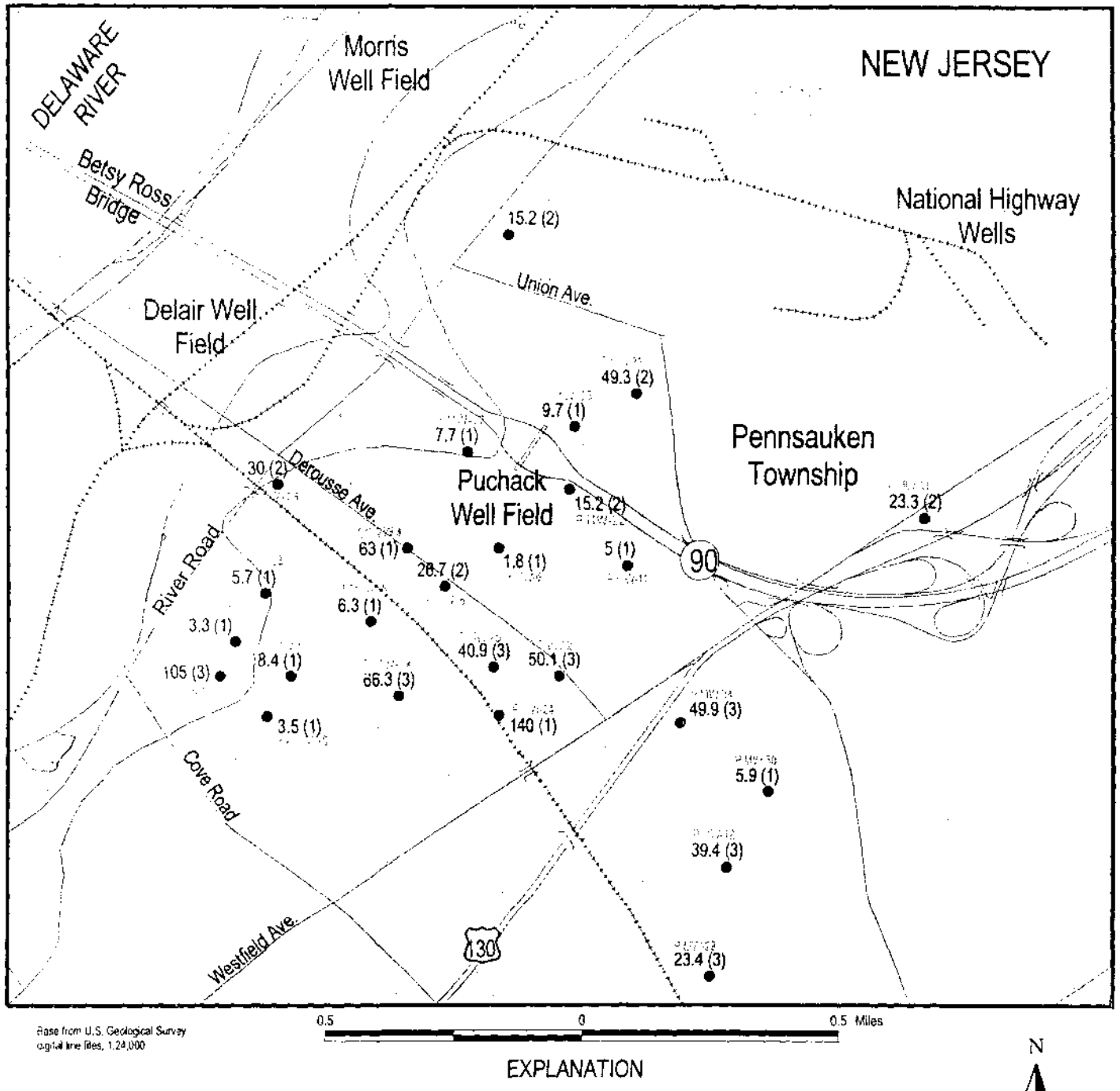

Figure 6. Aerial Extent of Volatile Organic Compound Contaminated Groundwater in the Intermediate Sand, 1999 - 2001, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey. (Figure prepared by the USGS)

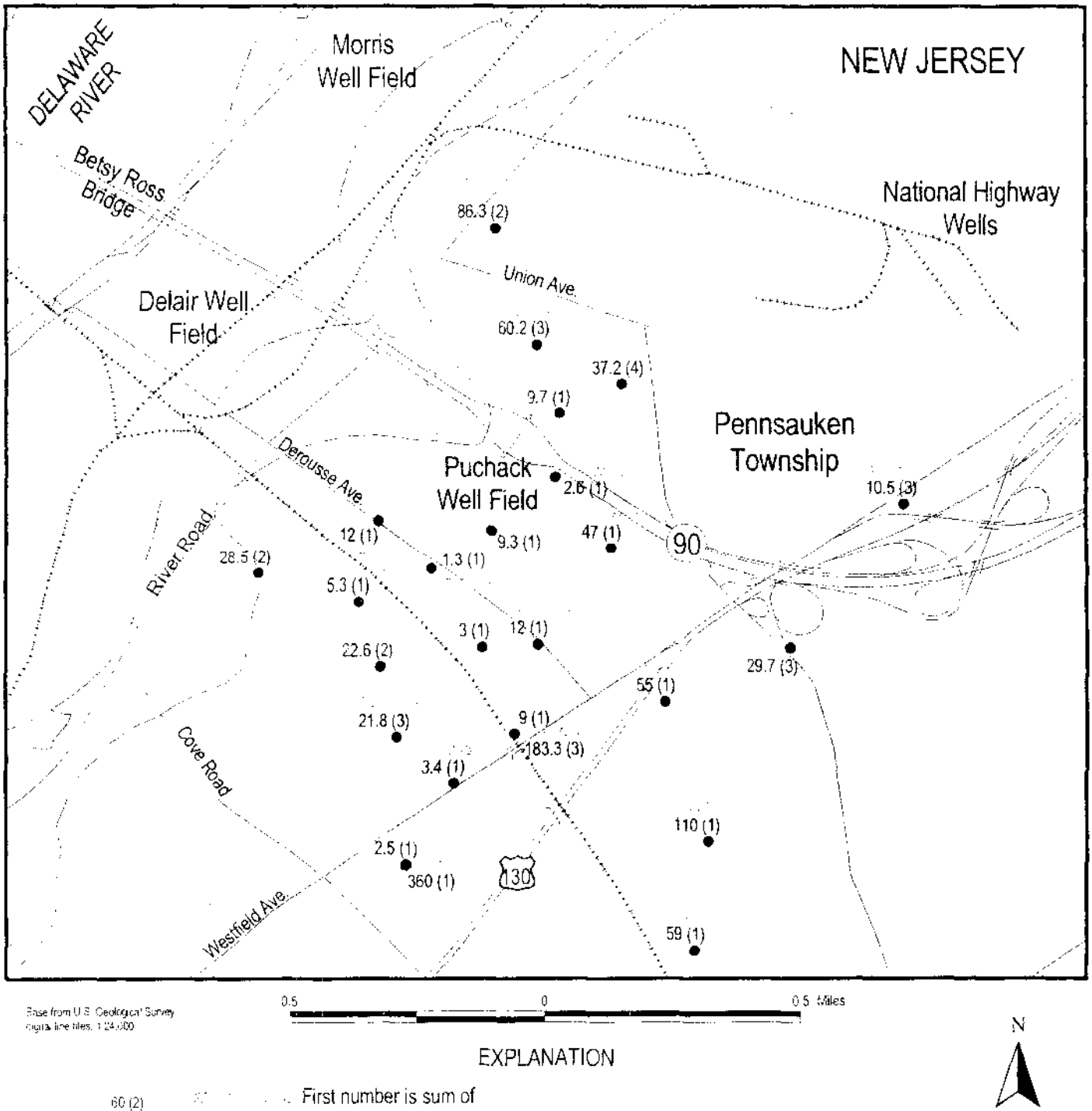

Figure 7. Aerial Extent of Volatile Organic Compound Contaminated Groundwater in the Lower Aquifer, 1999 - 2001, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey. (Figure prepared by the USGS)

APPENDIX II

TABLES

TABLE 1

Page 1

Summary of Chemicals of Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater - Middle Aquifer

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Tap Water	Chromium	0.45	8290	µg/l	15/15	6100	µg/l	99% Cheb.

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater - Lower Aquifer

Exposure Point	Chemical of Concern	Concentration Detected		Concentration Units	Frequency of Detection	Exposure Point Concentration (EPC)	EPC Units	Statistical Measure
		Min	Max					
Tap Water	Chromium	0.51	6310	µg/l	36/37	3200	µg/l	99% Cheb.

Max = Maximum value detected
99% Cheb. = 99% Chebyshev (mean,std)

TABLE 2

Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Onsite/ Offsite	Rationale for Selection/Exclusion of Exposure Pathway
Current/Future	Groundwater	Groundwater	Tap water - Middle Aquifer	Resident	Adult	Ingestion	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may use groundwater as drinking water.
						Dermal	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering.
					Child (0-6 yr)	Ingestion	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may use groundwater as drinking water.
						Dermal	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering.
				Site Worker	Adult	Ingestion	Onsite	Public water supply wells can draw on contaminated aquifer, and workers may use groundwater as drinking water while at work.
			Tap water - Lower Aquifer	Resident	Adult	Ingestion	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may use groundwater as drinking water.
						Dermal	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering.
					Child (0-6 yr)	Ingestion	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may use groundwater as drinking water.
						Dermal	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering.
				Site Worker	Adult	Ingestion	Onsite	Public water supply wells can draw on contaminated aquifer, and workers may use groundwater as drinking water while at work.
		Indoor Air	Water Vapors at Showerhead - Middle Aquifer	Resident	Adult	Inhalation	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering.
					Child (0-6 yr)	Inhalation	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering.
			Water Vapors at Showerhead - Lower Aquifer	Resident	Adult	Inhalation	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering
					Child (0-6 yr)	Inhalation	Onsite	Public water supply wells can draw on contaminated aquifer, and residents may be exposed to groundwater while showering

Summary of Selection of Exposure Pathways

The table describes the exposure pathways associated with the groundwater that were evaluated for the risk assessment, and the rationale for the inclusion of each pathway. Exposure media, exposure points, and receptor populations are included.

TABLE 3

Non-Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value	Oral RfD Units	Absorp. Efficiency (Dermal)	Adjusted RfD (Dermal)	Adj. Dermal RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates of RfD:
Chromium[1]	Chronic	3.0E-3	mg/kg-day	2.5%	7.5 E-5	mg/kg-day	GI Tract	900	IRIS	01/03/02

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC	Inhalation RfC Units	Inhalation RfD	Inhalation RfD Units	Primary Target Organ	Combined Uncertainty /Modifying Factors	Sources of RfD: Target Organ	Dates:
Chromium[1]	Chronic	1.0E-4	mg/cu. m	2.9E-5	mg/kg-day	Lungs	300	IRIS	0/03/02

[1] The RfD for hexavalent chromium has been applied to total chromium

Key

IRIS: Integrated Risk Information System, U.S. EPA

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information which is relevant to the contaminants of concern in groundwater. When available, the chronic toxicity data have been used to develop oral reference doses (RfDs) and inhalation reference doses (RfDi).

TABLE 4

Cancer Toxicity Data Summary

Pathway: Oral/Dermal

Chemical of Concern	Oral Cancer Slope Factor	Units	Adjusted Cancer Slope Factor (for Dermal)	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Chromium[1]	NA	-----	NA	-----	D	IRIS	01/03/02

Pathway: Inhalation

Chemical of Concern	Unit Risk	Units	Inhalation Slope Factor	Slope Factor Units	Weight of Evidence/ Cancer Guideline Description	Source	Date
Chromium[1]	1.2E-2	mg/cu. m.	4.2E+1	mg/kg-day	A	IRIS	01/03/02

[1] Chromium VI is an A carcinogen by the inhalation route, but D carcinogen by the oral route. The CSF for hexavalent chromium has been applied to total chromium.

Key

IRIS: Integrated Risk Information System, U.S. EPA

EPA Group:

A - Human carcinogen
D - Not classifiable as a human carcinogen

Summary of Toxicity Assessment

This table provides carcinogenic risk information which is relevant to the contaminants of concern in groundwater. Toxicity data are provided for both the oral and inhalation routes of exposure.

TABLE 4

Page 1

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tap Water	------	------	------	------	------
						Total Risk =	------

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child (0-6 yr)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tab Water	------	------	------	------	------
						Total Risk =	------

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child (0-6 yr) - Combined

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tab Water	------	------	------	------	------
						Total Risk =	------

TABLE 4

Page 2

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tab Water	------	------	------	------	------
						Total Risk =	------

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tap Water	------	------	------	------	------
						Total Risk =	------

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child (0-6 yr)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tab Water	------	------	------	------	------
						Total Risk =	------

TABLE 4

Page 3

Risk Characterization Summary - Carcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child (0-6 yr) - Combined

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tab Water	------	------	------	------	------
						Total Risk =	------

Scenario Timeframe: Current/Future
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogenic Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tab Water	------	------	------	------	------
						Total Risk =	------

Summary of Risk Characterization - Carcinogens

The table presents cancer risks (CRs) for each route of exposure and for all routes of exposure combined. The Risk Assessment Guidance for Superfund states that, generally, the acceptable cancer risk range is 10^{-4} to 10^{-6}.

TABLE 4

Page 1

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tap Water	Chromium	GI Tract	56	-----	12	68
							Groundwater Hazard Index Total =	68

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tap Water	Chromium	GI Tract	130	-----	38	168
							Groundwater Hazard Index Total =	168

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child (0-6) - Combined

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tap Water	Chromium	GI Tract	70	-----	17	87
							Groundwater Hazard Index Total =	87

TABLE 4

Page 2

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Current/Future
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Middle Aquifer	Tap Water	Chromium	GI Tract	20	-----	-----	20
							Groundwater Hazard Index Total =	20

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tap Water	Chromium	GI Tract	29	-----	6	35
							Groundwater Hazard Index Total =	35

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child (0-6)

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tap Water	Chromium	GI Tract	68	-----	20	88
							Groundwater Hazard Index Total =	88

TABLE 4

Page 3

Risk Characterization Summary - Noncarcinogens

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult/Child (0-6) - Combined

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tap Water	Chromium	GI Tract	37	-----	9	46
							Groundwater Hazard Index Total =	46

Scenario Timeframe: Current/Future
Receptor Population: Site Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Risk			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater - Lower Aquifer	Tap Water	Chromium	GI Tract	10	-----	-----	10
							Groundwater Hazard Index Total =	10

Summary of Risk Characterization - Non-Carcinogens

The table presents hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure. The Risk Assessment Guidance for Superfund states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-cancer effects.

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

Item No.	Item Description	Quantity	Unit Cost	Unit	Extension
CAPITAL COSTS					
Construction Costs					
1.	Work Plan Preparation	1	$ 70,600	LS	$ 70,600
2.	Mobilization/Demobilization	1	$ 66,000	LS	$ 66,000
3.	Construction Management	1	$ 1,283,936	LS	$ 1,283,936
4.	Construction QC/Chemical Analysis/H&S	1	$ 1,283,936	LS	$ 1,283,936
5.	Geochemical Fixation and Monitoring Wells	1	$ 8,559,574	LS	$ 8,559,574
6.	Institutional Controls	1	$ 17,700	LS	$ 17,700
	SUBTOTAL CONSTRUCTION COSTS				$ 11,281,746
	General Contractor Fee (10% construction)				$ 1,128,175
	Design Engineering				500,000
	Bench / Pilot Scale Studies				1,000,000
	Resident Engineering/Inspection				$ 500,000
	Contingency (20%)				$ 2,256,349
	TOTAL CAPITAL COSTS				**$ 16,666,269**
ANNUAL MONITORING COSTS					
7.	Project Planning and Organization	1	$ 1,700	LS	$ 1,700
8.	Sampling Labor	1	$ 24,300	LS	$ 24,300
9.	Sampling Equipment	1	$ 14,600	LS	$ 14,600
10.	Sample Analysis and Data Validation	1	$ 10,200	LS	$ 10,200
11.	Data Evaluation and Reporting	1	$ 16,800	LS	$ 16,800
	Total Annual Monitoring Costs				**$ 67,600**
FIVE YEAR REVIEW					
12.	Five Year Review Report	1	$ 35,300	LS	**$ 35,300**
PRESENT WORTH OF COSTS					
13.	Total Capital Costs				$ 16,666,269
14.	Long-term Monitoring (30 year duration)				$ 838,848
15.	Five-Year Reviews (30 year duration)				$ 76,171
	TOTAL PRESENT WORTH				**$ 17,581,289**

Assume $ 17,581,000

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

No. 1 Work Plan Preparation

Assume 2 persons for 2 months.
Assume salary rate of $35/hour.
Assume salary multiplier of 3.

2 persons x $ 35 /hour x 40 hours/week x 4.2 weeks/month x 2 mo x 3 multiplier

= $ 70,560

			Assume:	**$**	**70,600**

No. 2 Mobilization/Demobilization

Materials/supplies	6 mo	x	2000 per mo	$	12,000
Utilities during construct	6 mo	x	2000 per mo	$	12,000
Temp Facilities	6 mo	x	2000 per mo	$	12,000
Misc	6 mo	x	5000 per mo	$	30,000
			Total:	**$**	**66,000**

No. 3 Construction Management

PM at 5% of construction cost	$	427,979
Construction supervision/oversight at 10% of construction cost	$	855,957
Total:	**$**	**1,283,936**

4 QC/Chemical Analysis/Health and Safety

QC at 5% of construction cost	$	427,979
Chemical analysis at 5% of construction cost	$	427,979
Health and Safety at 5% of construction cost	$	427,979
Total:	**$**	**1,283,936**

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

No. 5 Total Construction Cost (labor & material)

Monitoring Wells	$	160,828	**See page 4 for details**
Injection Points	$	1,814,158	**See page 5 for details**
Geochemical Fixation	$	6,584,588	**See page 6 for details**
Total Construction Cost	**$**	**8,559,574**	

No. 6 Institutional Controls

Filing of the necessary paperwork to secure groundwater Classification Exemption Area (CEA)

Assume 1 persons for 1 month.
Assume salary rate of $35/hour.
Assume salary multiplier of 3.

1 person x	$	35	/hour x	40 hours/week	4.2 weeks/month x	1 month x	3 multiplier	
	= $	17,640						
Assume:	**$**	**17,700**						

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

Monitoring Well Installation

Intermediate Monitoring Well
Assume a depth of 150 ft

Mud Drilling, 4" Dia	100 ft	x	$	47	per LF	$	4,678
Mud Drilling, 4" Dia	50 ft	x	$	51	per LF	$	2,562
2-inch Stainless Steel	130 ft	x	$	30	per LF	$	3,900
10 slot screen	20 ft	x	$	20	per LF	$	393
Concrete Pad 2' x 2' x 4'	1 ea	x	$	118	each	$	118
Bentonite Seal	1 ea	x	$	53	each	$	53
Silica Sand	20 ft	x	$	14	per lf	$	286
5' Steel protective casing	1 LS	x	$	200	each	$	200
Well Development	3 hr	x	$	160	per hr	$	480
Decon of equipment	1 day	x	$	112	per day	$	112
Drum	4 each	x	$	90	each	$	358
Total for One Intermediate Well						$	13,140

Deep Monitoring Well
Assume a depth of 250 ft

Mud Drilling, 4" Dia	100 ft	x	$	47	per LF	$	4,678
Mud Drilling, 4" Dia	150 ft	x	$	51	per LF	$	7,686
2-inch Stainless Steel	160 ft	x	$	30	per LF	$	4,800
10 slot screen	90 ft	x	$	20	per LF	$	1,768
Concrete Pad 2' x 2' x 4'	1 ea	x	$	118	each	$	118
Bentonite Seal	1 ea	x	$	53	each	$	53
Silica Sand	90 ft	x	$	14	per lf	$	1,285
5' Steel protective casing	1 LS	x	$	200	each	$	200
Well Development	3 hr	x	$	160	per hr	$	480
Decon of equipment	1 day	x	$	112	per day	$	112
Drum	6 each	x	$	90	each	$	537
Total for One Deep Well						$	21,717

Misc Items

Drum disposal	36 each	x	$	120	each	$	4,320
Development/Decon Water Disposal	40000 gal	x	$	0.35	gal	$	14,000
Driller oversight	14 day	x	$	600	per day	$	8,400
Driller mobilization	1 LS	x	$	3,899	each	$	3,899
Tank Rental	2 tank (21,000 gal)	x	$	1,225	each	$	2,450
Well Development Equipment	2 week	x	$	236	week	$	472
Contingency	1 LS	x	$	1,000	each	$	1,000
Total misc.						$	34,541

Total Cost for 3 Intermediate and 4 Deep wells **$ 160,828**

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

Injection Wells

Shallow Injection Well
Assume a depth of 100 ft, with 25 ft of screen

Mud Drilling, 4" Dia	100 ft	x	$ 47 per LF	$	4,678
2-inch Carbon Steel	75 ft	x	$ 30 per LF	$	2,250
10 slot screen	25 ft	x	$ 20 per LF	$	491
Concrete Pad 2' x 2' x 4'	1 ea	x	$ 118 each	$	118
Bentonite Seal	1 ea	x	$ 53 each	$	53
Silica Sand	25 ft	x	$ 14 per lf	$	357
5' Steel protective casing	1 LS	x	$ 200 each	$	200
Decon of equipment	1 day	x	$ 112 per day	$	112
Well Development	3 hr	x	$ 160 per hr	$	480
Drum & Disposal	4 each	x	$ 210 each	$	840
Total for One Middle Aquifer Injection Well				$	9,579

Intermediate Injection Well
Assume a depth of 150 ft, with 20 ft of screen

Mud Drilling, 4" Dia	100 ft	x	$ 47 per LF	$	4,678
Mud Drilling, 4" Dia	50 ft	x	$ 51 per LF	$	2,562
2-inch Carbon Steel	130 ft	x	$ 30 per LF	$	3,900
10 slot screen	20 ft	x	$ 20 per LF	$	393
Concrete Pad 2' x 2' x 4'	1 ea	x	$ 118 each	$	118
Bentonite Seal	1 ea	x	$ 53 each	$	53
Silica Sand	20 ft	x	$ 14 per lf	$	286
5' Steel protective casing	1 LS	x	$ 200 each	$	200
Decon of equipment	1 day	x	$ 112 per day	$	112
Well Development	3 hr	x	$ 160 per hr	$	480
Drum & Disposal	4 each	x	$ 210 each	$	840
Total for One Intermediate Injection Well				$	13,622

Deep Injection Well
Assume a depth of 250 ft, with 90 ft of screen

Mud Drilling, 4" Dia	100 ft	x	$ 47 per LF	$	4,678
Mud Drilling, 4" Dia	150 ft	x	$ 51 per LF	$	7,686
2-inch Carbon Steel	160 ft	x	$ 30 per LF	$	4,800
10 slot screen	90 ft	x	$ 20 per LF	$	1,768
Concrete Pad 2' x 2' x 4'	1 ea	x	$ 118 each	$	118
Bentonite Seal	1 ea	x	$ 53 each	$	53
Silica Sand	90 ft	x	$ 14 per lf	$	1,285
5' Steel protective casing	1 LS	x	$ 200 each	$	200
Well Development	3 hr	x	$ 160 per hr	$	480
Decon of equipment	1 day	x	$ 112 per day	$	112
Drum & Disposal	6 each	x	$ 210 each	$	1,260
Total for One Deep Injection Well				$	22,440

For this Alternative, 50 Deep 48 Intermediate and 4 Middle Aquifer Injection Wells are needed

Total Cost	**$**	**1,814,158**

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

Geochemical Fixation Reagent Costs (using sodium metabisulfite)

Delivery point spacing and configuration		150 ft spacing, Middle aquifer = 600 ft, Intermediate Sand =7400 ft, Lower Aquifer = 7000 ft			
Total Injection Points	=	102			
Total Mass of Chromium in Plume	=	5000 kg	=	96154	moles Chromium
Assume 100% of plume treated	=	5000 kg	=	96154	moles Chromium
Based on stoichiometry 0.75 mole reagent/ mole Cr			=	72100	moles Reagent
@ 190 g/mole		13699 kg	=	15	tons
Factor of Safety of 20, dilution, buffering capacity of aqui		300 tons reagent			
Cost of Reagent	$1/lb	$600,000			
Water 5,000,000 gallons		$5 per/1000gallon			
	=	$50,000			
Total Chemical Cost		**$650,000**			

Reducing Agent Cost Based on - vendor cost for similar injection material

Chemical Injection Labor

App Crew B23					
1 Foreman		$ 358			
4 Laborers		$ 1,327			
1 Injection Equipment		$ 3,497			
1 3 Ton Truck		$ 194			
	Per day	$ 5,375	x	1020	days
	=				
Total Labor Cost			**$**	**5,482,398**	

Injection Monitoring

Monitoring points		
10 intermediate sand	$	131,396
10 Lower aquifer	$	217,170
Misc well installation cost	$	103,623
Total monitoring well cost	**$**	**452,190**

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

Annual O&M
Assume annual monitoring on long-term basis

No. 7 Project Planning and Organization
Assume 1 Project Manager @ $40 per hour for 4 hours
Assume 1 Engineer @ $30 per hour for 8 hours
Assume 1 Technician @ $20 per hour for 8 hours
Assume salary multiplier of 3

=	$	40	per hour x	4	hours x	3	multiplier +	
	$	30	per hour x	8	hours x	3	multiplier +	
	$	20	per hour x	8	hours x	3	multiplier	
=	$	1,680	per sampling event					
Assume:	**$**	**1,700**	**per sampling event**					

No. 8 Sampling Labor
Assume 3 persons for 10 x 10 hour days @ $30 per hour
Assume 3 wells per day including purging and sampling
Two Sampling personnel and one Sample Management Organizer/Field Team Leader
Assume salary multiplier of 3

3	persons x		10	hours/day x	9	days x	$	30	/ hr x	3
=	**$**	**24,300**	**per sampling event**							

No. 9 Sampling Equipment
Assume sample shipping cost of $200 per day
Assume sampling equipment (e.g., bailers and pumps) @ $300 per day
Assume PPE @ $20 per person per day
Assume miscellaneous materials @ $200 per day

Shipping	$	200	per day x	9 days =	$	1,800
Sampling Equipment	$	300	per day x	9 days =	$	2,700
Monitoring Equipment	$	200	per day x	9 days =	$	1,800
PPE	$	60	$'20 per set/2 set /day x	9 days =	$	540
Vehicle Rental	$	80	per day x	9 days =	$	720
Per Diem	$	120	Per person/day	27 man days =	$	3,240
Misc	$	200	per day x	9 days =	$	1,800
fDW Disposal	$	2,000	each x	1 each =	$	2,000
=	**$**	**14,600**	**per sampling event**			

No. 10 Sample Analysis and Validation
Assume groundwater samples will be collected from 20 monitoring wells + 7 new wells; analyzed for chromium and natural attenuation parameters

Total No. of Samples:	27 samples
	2 field duplicate
	2 MS
	2 MSD
	9 Field Blank
	9 Trip Blanks
	51 Total Samples Per Sampling Event

Assume	$	200	per sample for biodegradation parameters
	$	200	Total sample cost

Analysis Cost:		51	samples x	$	200	
	= $	10,200	per sampling event			

Total Analysis & Validation:		$	10,200
	Assume:	**$**	**10,200**

No. 11 Data Evaluation and Reporting (Annual Monitoring)
Assume 2 senior engineers/chemists at $35 per hour for 80 hours per sampling event
Assume salary multiplier of 3

=		2	person x	$	35	per hour x	80	hours x	3	multiplier
=	**$**	**16,800**								

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

No. 12 Five Year Review

Assume 5-year reviews will be conducted every 5 years for 30 years.
Work includes: 5-year review of groundwater monitoring data
Preparation of report

Assume 2 person for 1 weeks
Assume salary rate of $35/hour.
assume multiplier of 3

	2 persons x		$	35 /hour x	40 hours/week	x	4.2 weeks/month x	1 month x	3 multiplier			
Total	$	35,280										
Assume	**$**	**35,300**										

Table 5
Alternative 3C: In Situ Treatment (Geochemical Fixation)/MNA/Institutional Controls
Puchack Well Field Superfund Site

Present Worth Calculations

Assume discount rate is 7%: **0.07**

This is a problem of the from find (P give A, i, n) or (P/A,i,n)

P = Present Worth
A= Annual amount
i = interest rate
Assume 7%

No. 14 **Total Long-term Monitoring Costs**

This is a recurring cost every year for 30 years

This is a problem of the form find (P given A, i, n) or (P/A,i,n)

P = Present Worth
A= Annual amount
i = interest rate
Assume 7%

Looking up the interest rate tables for i = 7% and n = 30 years
The multiplier for (P/A) = **12.409**

No. 15 **Total 5-year review costs**

This cost occurs every 5 years for 30 years.

nedd to calculate the effective interest rate i_e

Given i = 7% (nominal interest rate)	0.07		
m = # of compounding periods = 5 years	5		
$i_e = (1+i)^m - 1$	0.403 =	40% / 5 years	

$$P = A^* \frac{(1+i)^n - 1}{i(1+i)^n}$$

in this case there are 6 - 5yr periods

n = 6	6	2	3
i =	0.403	0.403	0.403
The multiplier is =	**2.158**	**1.221**	**1.584**

Table 6
Potential Location-Specific ARARs
OU1 Feasibility Study
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Federal National Environmental Policy Act (NEPA),	Statement of Procedures on Floodplain Management and Wetlands Protection	40 CFR 6, Appendix A	To Be Considered	Establishes EPA policy and guidance for carrying out Executive Order 11988 - Protection of Floodplains. Action must avoid adverse effects, minimize potential harm and restore and preserve natural and beneficial values of the floodplain.	The potential effects of any action will be evaluated to ensure that the planning and decision-making reflect consideration of flood hazards and floodplains management, including restoration and preservation of natural, undeveloped floodplains.
Federal (Non-Regulatory)	Floodplains Executive Order	EO 11988	To Be Considered	Federal agencies are required to reduce the risk of flood loss, to minimize impact of floods, and to restore and preserve the natural and beneficial values of floodplains.	The potential effects of any action will be evaluated to ensure that the planning and decision making reflect consideration of flood hazards and floodplains management, including restoration and preservation of natural undeveloped floodplains.
Federal (Non-Regulatory)	Wetlands Executive Order	EO 11990	To Be Considered	Federal agencies are required to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance natural and beneficial values of wetlands.	Remedial alternatives that involve construction must include all practicable means of minimizing harm to wetlands. Wetlands protection considerations must be incorporated into the planning and decision-making process for remedial alternatives.
Federal Endangered Species Act	Protection of threatened and endangered species	16 USC 1531 et seq.; 40 CFR 400	Applicable	Standards for the protection of threatened and endangered species	The potential effects of any action will be evaluated to ensure that any endangered or threatened species would not be affected.
Federal Fish and Wildlife Conservation Act	Statement of Procedures for Non-game Fish and Wildlife Protection	16 USC 2901 et seq.	Applicable	Establishes EPA policy and guidance for promoting the conservation of non-game fish and wildlife and their habitats. Action must protect fish or wildlife.	Potentially applicable for construction activities which may impact non-game fish and wildlife and their habitats.
Federal Fish and Wildlife Coordination Act	Statement on Procedures for coordination with Fish and Wildlife Services	16 USC 661	To Be Considered	This law requires that any Federal agency that proposes to modify a body of water consult with the United States Fish and Wildlife Service (USFWS).	During the identification, screening, and evaluation of alternatives, the effects on streams and wetlands will be evaluated. If an alternative modifies a body of water or potentially affects fish or wildlife, EPA must consult the USFWS.

Table 6
Potential Location-Specific ARARs
OU1 Feasibility Study
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
Federal National Historic Preservation Act	Procedures for preservation of historical and archeological data	16 USC 469 et. seq.; 40 CFR 6.301(c)	Applicable	Establishes procedures to provide for preservation of historical and archeological data that might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	Potentially applicable if historical or archeological data is encountered during remediation.
New Jersey Flood Hazard Area Control Act	Floodplain Use and Limitations	N. J. A. C. 7:13	Applicable	State standards for activities within floodplains	Floodplain use and limitations must be considered during remediation.
New Jersey Freshwater Wetland Protection Act	Freshwater Wetlands Protection Act Rules	N. J. S. A. 13:9B-1; N. J. A. C. 7:7A	Applicable	Establish requirements for the protection of freshwater wetlands. Requires permits for construction within wetland areas.	Potentially applicable for construction activities performed in the vicinity of a wetland or waterway.
New Jersey Endangered and Non Game Species Conservation Act	Protection of threatened and endangered species	N. J. S. A. 23:2A-1 to -13	Applicable	Standards for the protection of endangered, non-game and exotic wildlife.	The potential effects of any action will be evaluated to ensure that any endangered or threatened species would not be affected.
New Jersey Endangered Plant Species List Act	Endangered Plant Species Program	N.J.S.A. 13.1B-15.151 to -15.158; N.J.A.C. 7:5B	Applicable	Standards for the protection of endangered plant species.	The potential effects of any action will be evaluated to ensure that any endangered or threatened species would not be affected.
New Jersey Soil Erosion and Sediment Control	Soil Erosion and Sediment Control Standards	N.J.A.C. 16.25A	Applicable	Requires erosion mitigation during construction activities.	Requires erosion control consideration during construction activities.
New Jersey Noise Control Act of 1971	Noise Control	N.J.A.C. 7:29	Applicable	Limits the noise generated from any industrial, commercial, public service or community service facility.	Limits the noise that can be generated during remedial activities.

Table 6
Potential Chemical-Specific ARARs
OU1 Feasibility Study
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description
Federal Resource Conservation and Recovery Act	Groundwater Protection Standards and Maximum Concentration Limits	40 CFR 264, Subpart F	Applicable	Establishes standards for groundwater protection
Federal Safe Drinking Water Act	National Primary Drinking Water Standards-Maximum Contaminant Levels (MCLs) and Maximum Contaminant Level Goals (MCLGs)	40 CFR 141	Relevant and Appropriate	Establishes health- and technology-based standards for public drinking water systems. Also establishes drinking water quality goals set at levels at which no adverse health effects are anticipated, with an adequate margin of safety.
Federal Safe Drinking Water Act	National Secondary Drinking Water Standards-Secondary MCLs	40 CFR 143	To Be considered	Establishes standards for public drinking water systems for those contaminants which impact the aesthetic qualities of drinking water.
State of New Jersey Statues and Rules	Groundwater Quality Standards	N.J.A.C. 7:9-6	Applicable	Table 1 and Table 2 establish standards for the protection of groundwater quality. Used as the primary basis for setting numerical criteria for groundwater cleanups.
State of New Jersey Statues and Rules	Primary Drinking Water Standards-Maximum Contaminant Levels (MCLs)	N.J.A.C. 7:10	Relevant and Appropriate	Establishes MCLs that are generally equal to or more stringent than SDWA MCLs.
State of New Jersey Statues and Rules	State Secondary Drinking Water Standards-Secondary MCLs	N.J.A.C. 7:10-7	To Be considered	Establishes standards for public drinking water systems for those contaminants which impact the aesthetic qualities of drinking water.

Table 6
Potential Action-Specific ARARs
OU1 Feasibility Study
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
COMMON TO ALL ALTERNATIVES					
Federal Resource Conservation and Recovery Act	Identification and Listing of Hazardous Waste	40 CFR 261	Applicable	Identifies solid wastes which are subject to regulation as hazardous wastes.	Generation of hazardous wastes possibly includes spent carbon or contaminated soil. Hazardous wastes must be handled and disposed of in accordance with RCRA. Chemical testing and characterization of waste is required.
Federal Resource Conservation and Recovery Act	Standards Applicable to Generators of Hazardous Waste	40 CFR 262	Applicable	Establishes requirements (e.g., EPA ID numbers and manifests) for generators of hazardous waste.	Standards will be followed if any hazardous waste is generated onsite.
Federal Resource Conservation and Recovery Act	Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities	40 CFR 264	Relevant and Appropriate	Establishes the minimum national standards which define acceptable management of hazardous waste.	Generation and storage of hazardous waste. May not apply to remediation sites if owner complies with requirements listed in 264,1(j).
Federal Occupational Safety and Health Act	Worker Protection	29 CFR 1904	Applicable	Requirements for recording and reporting occupational injuries and illnesses	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.
Federal Occupational Safety and Health Act	Worker Protection	29 CFR 1910	Applicable	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations. Includes training requirements and construction safety requirements.	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.
Federal Occupational Safety and Health Act	Worker Protection	29 CFR 1926	Applicable	Safety and health regulations for construction.	Under 40 CFR 300.38, requirements of OSHA apply to all activities which fall under jurisdiction of the National Contingency Plan.
New Jersey Statutes and Rules	Technical Requirements for Site Remediation	N.J.A.C. 7:26E	Applicable	Established minimum regulatory requirements for investigation and remediation of contaminated sites in New Jersey.	Operation of any treatment facility must comply with the regulation.
New Jersey Statutes and Rules	Hazardous Waste Regulations	N.J.A.C. 7:26G-5, -8, -11	Applicable	Establish hazardous waste regulations by adopting Federal regulations on identification and listing of hazardous waste, standards for owner and operators of hazardous waste treatment, storage and disposal facilities, and land disposal restrictions.	Alternative development must consider the regulatory requirements.

Table 6
Potential Action-Specific ARARs
OU1 Feasibility Study
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
			OFF-SITE DISPOSAL		
Discharge of Treated Groundwater					
Federal Safe Drinking Water Act	Underground Injection Control Program	40 CFR 144	Applicable	Establishes performance standards, well requirements, and permitting requirements for groundwater reinjection wells.	Must comply with requirements for reinjection of treated groundwater.
New Jersey Statutes and Rules	New Jersey Pollutant Discharge Elimination System	N.J.A.C. 7:14A	Applicable	Establishes standards for discharge of pollutants to surface water and groundwater	Disposal of treated groundwater to surface water or by reinjection will require a NJPDES permit.
Transportation and Disposal of Hazardous Wastes					
Federal Resource Conservation and Recovery Act	Standards Applicable to Transporters of Hazardous Waste	40 CFR 263	Applicable	Establishes standards which apply to persons transporting manifested hazardous waste within the United States.	Transport of waste that is characterized as hazardous.
Federal Resource Conservation and Recovery Act	Land Disposal Restrictions	40 CFR 268	Applicable	Identifies hazardous wastes which are restricted from land disposal. All listed and characteristic hazardous waste or soil or debris contaminated by a RCRA hazardous waste and removed from a CERCLA site may not be land disposed until treated as required by LDRs.	Waste disposal must comply with LDRs
Federal Hazardous Material Transportation Act	Hazardous Materials Transportation Regulations	49 CFR 107, 171, 172, 177 to 179	Applicable	Regulates transportation of hazardous materials.	Transportation of hazardous wastes must comply with the regulation.
New Jersey Statutes and Rules	Transportation of Hazardous Materials	N.J.A.C. 16:49	Applicable	Regulates shipping/transport of hazardous materials.	Must comply with requirements for off-site transport of hazardous materials.

Table 6
Potential Action-Specific ARARs
OU1 Feasibility Study
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

Act/Authority	Criteria/Issues	Citation	Status	Brief Description	FS Consideration
OFF-GAS MANAGEMENT					
New Jersey Air Pollution Control Act	Permits and Certificates for Minor Facilities	N.J.A.C. 7:27 Subchapter 8	Applicable	Describes requirements and procedures for obtaining air permits and certificates.	Applicable to remediation alternatives which involve discharge of vapor.
New Jersey Air Pollution Control Act	Ambient Air Quality Standards	N.J.A.C. 7:27 Subchapter 13	Applicable	Rules that govern the emission of and such activities that result in the introduction of contaminants into the ambient atmosphere.	Need to meet requirements when discharging off-gas.

APPENDIX III

ADMINISTRATIVE RECORD INDEX

PUCHACK WELL FIELD SITE
ADMINISTRATIVE RECORD FILE UPDATE
INDEX OF DOCUMENTS

1.0 SITE IDENTIFICATION

1.4 Site Investigation Reports

P.	100001 - 100007	Report: Puchack Well Field. (City of Camden Water Department), Pennsauken, Camden County. NJ 03101, EPA ID#D981084767. submitted by Ms. Donna L. Gaffigan, NJDEP,. March 18, 1988.
p.	100008 - 100629	Report: Hazard Ranking System Documentation Package, Puchack Well Field, Pennsauken Township, Camden County, New Jersey. Volume 1 of 3, prepared by Region II Superfund Technical Assessment and Response Team, Roy F. Weston, Inc., prepared for U.S. EPA, Region II, April 1997.
p.	100630 - 101139	Report: Hazard Ranking System Documentation Package, Puchack Well Field, Pennsauken Township, Camden County, New Jersey, Volume 2 of 3, prepared by Region II Superfund Technical Assessment and Response Team, Roy F. Weston, Inc., prepared for U.S. EPA, Region II, April 1997.
P.	101140 - 101770	Report: Hazard Ranking System Documentation Package, Puchack Well Field, Pennsauken Township, Camden County, New Jersey, Volume 3 of 3, prepared by Region II Superfund Technical Assessment and Response Team, Roy F. Weston, Inc., prepared for U.S. EPA, Region II, April 1997.

3.0 REMEDIAL INVESTIGATION

3.2 Sampling and Analysis Data/Chain of Custody Forms

P.	300735 - 301016	Report: Operable Unit 1 Treatability Study Sample Collection Report, Puchack Well Field Superfund Site, Remedial Investigation/Feasibility Study (RI/FS) Pennsauken Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, November 11, 2005.

PUCHACK WELL FIELD SITE
ADMINISTRATIVE RECORD PILE
INDEX OP DOCUMENTS

3.0 REMEDIAL INVESTIGATION

3.3 Work Plans

P. 300001-300127 — Plan: Final Work Plan, Volume 1, Puchack Well Field Site, Remedial Investigation/Feasibility Study, Pennsauken Township, Camden County, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, May 22, 2000.

P. 300128 - 300469 — Plan: Final Quality Assurance Project Plan for the Puchack Well Field Site Phase I RI/FFS, Pennsauken, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, June 2, 2000.

P. 300470 - 300734 — Letter to Mr. Stephen Cipot, U.S. EPA, Region II New Jersey Superfund Branch, from Mr. Richard L. Walker, Hydrologic Simulation Unit, United States Department of the Interior, re: Puchack Project-Quality Assurance Project Plan, August 24, 2000. (Attachment: Quality Assurance Project Plan (QAPP) for the USGS Field Data Collection at the Puchack Well Field Superfund Site, Pennsauken Township, Camden County, New Jersey, prepared by U.S. Geological Survey, prepared for U.S. EPA, Region II, July 2000.)

3.3 Work Plans

P. 301017 - 301147 — Plan: Draft Work Plan Volume II. Puchack Well Field Superfund Site. OU2 Remedial Investigation/Feasibility Study, Pennsauken Township. New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, December 23, 2002. (**NOTE: Pages 301055-301147 of this document are CONFIDENTIAL. They are available for review with proper authorization at the U.S. EPA, Region 2 Superfund Records Center, 290 Broadway, New York, NY.**)

P. 301148 - 301514 — Plan: Final Quality Assurance Project Plan Addendum. OU1 Treatability Study, Puchack Well Field Superfund Site, Pennsauken, New Jersey, prepared by CDM Federal Programs Corporation, prepared by U.S. EPA, Region II, May 6, 2004.

3.4 Remedial Investigation Reports

P. 301515 - 301664 — Report: Groundwater Sample Data, August 2000-April 2001, Puchack Well Field Superfund Site, Remedial Investigation/Feasibility Study (RI/FS), Pennsauken Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, June 29, 2001.

P.	301665 - 301784	Letter to Mr. Stephen Cipot, Remedial Project Manager, U.S. EPA, Region II, from Mr. Joseph Mayo, for Ms. Jeanne Litwin, CDM Federal REM, CDM Federal Programs Corporation, July 11, 2001. (Attachment: Report: Technical Memorandum: Surveying of 65 New Monitoring Wells. 23 Existing Wells and 16 Soil Boring Locations. Remedial Investigation/ Feasibility Study (RI/FS), Puchack Well Field Superfund Site, Pennsauken Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, July 11, 2001.)
P.	301785 - 301979	Report: Draft Preliminary Evaluation of Remedial Options for Groundwater, Puchack Well Field Superfund Site. Remedial Investigation/ Feasibility Study (RI/FS) , Pennsauken. New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, October 1, 2001.
P.	301980 - 302018	Report: Final Human Health Risk Assessment, Puchack Well Field Site, OU1, Remedial Investigation/Focused Feasibility Study, Pennsauken Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, March 28, 2003.
P.	302019 - 302059	Report: Bench Scale Test Plan: Treatability Study of In Situ Technologies for Remediation of Hexavalent Chromium in Groundwater, Puchack Well Field Superfund Site, New Jersey, prepared by Pacific Northwest National Laboratory, Operated by Battelle for the U.S. Department of Energy, April, 2004.
P.	302060 -	Report: Final Operable Unit 1 Remedial 302317 Investigation Report. Puchack Well Field Superfund Site, Remedial Investigation/Feasibility Study (RI/FS) Pennsauken Township. New Jersey^ Volume I of II. prepared by CDM Federal Programs Corporation, prepared for U.S.EPA, Region II, June 22, 2005.
P.	302318 - 302950	Report: Final Operable Unit 1 Remedial Investigation Report, Puchack Well Field Superfund Site, Remedial Investigation/Feasibility Study (RI/FS) Pennsauken Township, New Jersey, Volume II of II, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, June 22, 2005.
P.	302951 - 303101	Report: Treatability Study of In Situ Technologies for Remediation of Hexavalent Chromium in Groundwater at the Puchack Well Field Superfund site, New Jersey, prepared by Pacific Northwest National Laboratory, for the U.S. Department of Energy, January 2006.
P.	303102 - 303104	Report: OU1 RI Report Response to EPA Comments on the OU1 RI, Puchack Well Field Superfund Site, Puchack Well Field, Pennsauken Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, June 30, 2006.

3.5 Correspondence

P.	303105 - 303105	Memorandum to Ms. Angela Carpenter, Acting Chief, Southern New Jersey Remediation Section, U.S. EPA, Region II, from Mr. Michael Poetzsch, RCRA/Superfund Coordinator, RCRA Programs Branch, U.S. EPA, Region II, re: Review of OU1 Remedial Investigation Report, Puchack Well Field Superfund Site, Pennsauken Township, Camden County, NJ, November 5, 2003.
P.	303106 - 303106	Memorandum to Ms. Michelle Granger, Remedial Project Manager, New Jersey Remediation Branch, U.S. EPA, Region II, from Ms. Mindy J. Pensak, Coordinator, Biological Technical Assistance Group, U.S. EPA, Region II, re: Puchack Well Field Site, OU1, Remedial Investigation/ Feasibility Study, November 17, 2003.
P.	303107 - 303121	Letter to Ms. Michelle Granger, Remedial Project Manager, New Jersey Remediation Branch, U.S. EPA, Region II, from Mr. Frank Tsang, P. E., Site Manager, CDM Federal Programs Corporation, re: Treatability Study Kick-Off Meeting Minutes, October 22, 2003, Puchack Well Field Superfund Site, Remedial Investigation/Feasibility Study, Pennsauken Township, New Jersey, November 20, 2003.
P.	303122 - 303123	Memorandum to Ms. Angela Carpenter, Acting Chief, Southern New Jersey Remediation Section, U.S. EPA, Region II, from Mr. Gavin Lau, Environmental Scientist, Air Programs Branch, U.S. EPA, Region II, re: Draft Operable Unit 1 Remedial Investigation Report Puchack Well Field Superfund Site Remedial Investigation/Feasibility Study (RI/FS) Pennsauken Township, New Jersey - Air Programs Branch Review, November 26, 2003.
P.	303124 - 303139	Letter to Mr. Frank Tsang, CDM-FPC, from Ms. Carole Petersen, Chief, New Jersey Remediation Branch, U.S. EPA, Region II, re: Comments on the Draft Operable Unit One Remedial Investigation Report for the Puchack Well Field Superfund Site, Pennsauken Township, Camden County, New Jersey, December 17, 2003.
P.	303140 - 303143	Memorandum to Ms. Angela Carpenter, Acting Chief, Southern New Jersey Remediation Section, U.S. EPA, Region II, from Mr. Seth Ausubel, Chief, Freshwater Protection Section, U.S. EPA, Region II, re: The Draft Remedial Investigation/Feasibility Study (RI/FS) for Operable Unit (OU-1) of the Puchack Well Field Site, Pennsauken Township, New Jersey, January 3, 2004.

4.0 FEASIBILITY STUDY

4.3 Feasibility Study Reports

P.	400001 - 400268	Report: Final Feasibility Study Report. Puchack Well Field Superfund Site, Remedial Investigation/Feasibility Study Pennsauken Township, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, May 22, 2006.
P.	400269 - 400272	Response to EPA's 5/15/06 Comments on the OU1 FS, Puchack Well Field Superfund Site, Pennsauken Township, New Jersey, undated.

4.6 Correspondence

P.	400273 - 400275	Letter to Mr. Jonathon Gorin, Remedial Project Manager, U.S. EPA, from Akshay Parikh, Office of Wellfield Remediation, State of New Jersey, Department of Environmental Protection, re: Puchack Wellfield, Draft Feasibility Study Report, April 25, 2006.

7.0 ENFORCEMENT

7.7 Notice Letters and Responses - 104e's

P.	700001 - 700018	Letter to attached list of addressees, from Ms. Janet Feldstein, Strategic Integration Manager, Emergency & Remedial Response Division, U.S. EPA, Region II, re: Request for Information Pursuant to the Federal "Superfund" Law for the Puchack Well Field Site, Pennsauken, New Jersey, December 15, 1999.

10.0 PUBLIC PARTICIPATION

10.2 Community Relations Plans

P.	10.00001-10.00039	Report: Draft Community Involvement Plan, Puchack Well Field Superfund Site, Pennsauken Township, Camden County, New Jersey, prepared by CDM Federal Programs Corporation, prepared for U.S. EPA, Region II, February 13, 2003.

11.0 TECHNICAL SOURCES AND GUIDANCE DOCUMENTS

11.3 State Guidance

P.	11.00001-11.00068	Report: Simulation of Ground-Water Flow in the Potomac-Raritan-Magothy Aquifer System, Pennsauken Township and Vicinity, New Jersey, U.S. Geological Survey Scientific- Investigations Report 2004-5025, prepared by U.S. Department of the Interior, U.S. Geological Survey, prepared in cooperation with the New Jersey Department of Environmental Protection and the U.S. Environmental Protection Agency.

APPENDIX IV

STATE LETTER

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

Mr. George Pavlou, Director
Emergency and Remedial Response Division
U.S. Environmental Protection Agency
Region II
290 Broadway
New York, NY 10007-1866

SEP 27 2006

Re: Puchack Wellfield Superfund Site
Record of Decision

Dear Mr. Pavlou:

The New Jersey Department of Environmental Protection (NJDEP) has reviewed the "Record of Decision, Operarable Unit 1 Chromium Contaminated Groundwater, Puchack Wellfield Superfund Site, Pennsauken, Camden County, New Jersey" prepared by the U.S. Environmental Protection Agency (USEPA) Region II in September 2006 and concurs with its selected remedy to address chromium contaminated groundwater at the site. The selected remedy is in-situ treatment using geochemical fixation, combined with monitored natural attenuation and institutional controls.

The major components of the selected remedy include:

- Injection of a reducing agent to treat groundwater containing concentrations of chromium greater than 70 parts per billion;

- Implementation of a long-term groundwater sampling and analysis program to assess the effectiveness of the action and natural attenuation of the chromium contamination over time; and,

- Institutional controls, such as designation of a Classification Exception Area, to restrict the installation of wells and the use of groundwater in areas of chromium contaminated groundwater.

NJDEP appreciates the opportunity to participate in the decision making process to select an appropriate remedy to address the chromium contaminated groundwater at the site and is looking forward to future cooperation with USEPA to implement the selected remedy.

If you have any questions, please call Edward Putnam, Assistant Director of the Remedial Response Element, at 609-984-3078.

Sincerely,

Irene Kropp, Assistant Commissioner
Site Remediation and Waste Management Program

C: Edward Putnam, Assistant Director, Remedial Response Element, NJDEP
Carole Petersen, Chief, New Jersey Remediation Branch, USEPA

APPENDIX V

RESPONSIVENESS SUMMARY
Puchack Well Field Superfund Site Pennsauken. New Jersey

INTRODUCTION

This Responsiveness Summary provides a summary of the public's comments and concerns regarding the Proposed Plan for the Puchack Well Field Superfund Site's (Site) Operable Unit 1 preferred remedy, and EPA's responses to those comments. All comments summarized in this document have been considered in EPA's final decision for the selection of remedial alternatives for the site.

This Responsiveness Summary is divided into the following sections:

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS: This section provides the history of community involvement and interests regarding the Site.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS, CONCERNS AND RESPONSES: This section contains summaries of oral comments received by EPA at the public meeting, EPA's responses to these comments, as well as responses to written comments received during the public comment period.

The last section of this Responsiveness Summary includes attachments, which document public participation in the remedy selection process for this site. They are as follows:

Attachment A contains the Proposed Plan that was distributed to the public for review and comment;

Attachment B contains the public notices that appeared in the Courier Post;

Attachment C contains the transcripts of the public meeting, and

Attachment D contains the written comments received by EPA during the public comment period.

I. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

Early in the Remedial Investigation phase of the project, EPA met with residents and local interest groups to learn about the concerns of the community. More recently, EPA has met with local interest groups to discuss the plans for the Site.

On July 7, 2006, EPA released the Proposed Plan and supporting documentation for the groundwater remedy to the public for comment. EPA made these documents available to the public in the administrative record repositories maintained at the EPA Region 2 office (290 Broadway. New York, New York) and the Pennsauken Free Public Library (5605 Crescent Boulevard, Pennsauken, NJ 08110). EPA published a notice of availability involving these

documents in the Courier-Post newspaper on July 7 and 8, 2006. EPA opened a public comment period which ran from July 7, 2006 until August 7, 2006. Due to a request for a public comment period extension. EPA published a notice in the Courier-Post on August 7 to extend the public comment period until September 6. 2006. On July 26. 2006, EPA held a public meeting at the Rutgers University Camden Campus to inform local officials and interested residents about the Superfund process, to present the preferred remedial alternatives for the site, solicit oral comment, and respond to any questions.

II. COMPREHENSIVE SUMMARY OF MAJOR QUESTIONS, COMMENTS. CONCERNS, AND RESPONSES

PART 1: Verbal Comments

This section summarizes comments received from the public during the public comment period along with EPA's responses.

A. SUMMARY OF QUESTIONS AND EPA's RESPONSES FROM THE PUBLIC MEETING CONCERNING THE PUCHACK WELL FIELD SITE - JULY 26, 2006

A public meeting was held July 26, 2006, at 7:00 p. m. in the Fine Arts Building of Rutgers University Camden Campus, in Camden, New Jersey. In addition to a brief presentation of the investigation findings, EPA presented the Proposed Plan and preferred alternative for the site, received comments from meeting participants, and responded to questions regarding the remedial alternatives under consideration. Attachment C includes the entire transcript of the public meeting.

A summary of comments raised by the public following EPA's presentation are categorized by relevant topics as follows and presented below:

a. Clarifying Questions Regarding the Proposed Plan
b. Volatile Organic Contamination
c. Questions on Alternatives Presented in the Proposed Plan
d. Technical Questions on the Preferred Alternative
e. Concerns About Other Well Fields
f. TAG grants. Environmental Justice and Community Outreach
g. Funding for Cleanup and Potentially Responsible Parties
h. Risk Assessment - Cleanup Standards

a. Clarifying Questions Regarding the Proposed Plan and Public Meeting

Comment #1: A number of commenters requested that EPA extend the comment period for 90 days.

EPA response: EPA extended the public comment period by 30 days, to September 6, 2006. in response to the requests received at the public meeting.

Comment #2: A commenter asked the depth of each aquifer referred to the Proposed Plan. And another commenter mentioned that the name of the aquifer was never mentioned in the proposed plan.

EPA response: The Middle aquifer is 70 feet below ground surface. The Intermediate Sand and the Lower aquifer are 150 feet and 180 feet below ground surface, respectively. These units are all part of the Potomac-Raritan-Magothy (PRM) aquifer.

Comment #3: Several commenters noted that the Puchack Well Field Superfund Site is a Superfund site and therefore needs to be cleaned up to the highest standards despite cost.

EPA response #3: Cost is just one of nine criteria considered when making a remedial decision for a Superfund site. Due to issues ranging from disruption of the local community to the length of time for cleanup, the most costly option for this site, (pump and treat) was not selected. The selected remedy, while less expensive than pump and treat, is expected to clean up the chromium plume more rapidly than any other alternative and without unacceptable disruptions to the public. Also, the most stringent groundwater/drinking water standard for chromium will be met by the selected remedy.

Comment #4: Several commenters pointed out that the Site is at a legally and procedurally critical stage, during which EPA will be making the most important decision about the Site for the foreseeable future. The Record of Decision is a key document in the Superfund process, and decisions memorialized in the document are not going to be changed based on future input or information.

EPA response: The Record of Decision (ROD) is a public document that explains which cleanup alternative or alternatives will be used to remediate a site. A remedy selected in a ROD can be altered or changed after adoption of the ROD if needed. Federal rules allow for the ROD to be amended or for an Explanation of Significant Differences to be issued altering or changing the remedy selected in the ROD. If a ROD is amended a public comment period is required.

Comment #5: A commenter noted that the presentation given by EPA was misleading because EPA asked for questions. The commenter noted that the meeting and the public comment period wasn't simply an opportunity to ask EPA questions, but was an opportunity for the public to present objections, statements and summaries to the record.

EPA Response #6: The commenter is correct, public meetings are held to allow the community, and every attendee, to provide any comment they would like on the proposed remedy.

Comment #7: Several commenters were unclear what EPA meant by "Institutional controls. " The commenters were especially concerned that those controls would allow the Puchack Well Field to he used in the fill lire. They felt that the Well Field should he closed permanently, and wanted to know it EPA intends to permanently "decommission" the wells at the Well Field.

EPA Response: Institutional controls (ICs) are actions, such as legal controls, that help minimize the potential for human exposure to contamination by ensuring appropriate land or resource use. EPA has no plan to permanently decommission the Puchack Well Field Site. Public supply wells are regulated by the state of New Jersey.

Comment #8: One commenter asked for clarification of the Proposed Plan. She was unclear what was meant by the remark that where VOCs and chromium occur together in a plume, they will compete for the aquifer's substrate's natural capacity to reduce contamination. She wanted to know if that meant the chromium will "grab onto" the natural substrate at the expense of the VOCs being able to do that.

EPA Response: Where VOCs and chromium occur commingled, the contaminants will compete for any natural reducing capacity of the aquifer. Simply put, it is possible that the VOCs lessen the aquifer's natural capacity to reduce chromium, and vice versa.

Comment #9: Several commenters wished to know if the actual wells at the Puchack Well Field Site were part of the Site and what the cleanup plan was for the Well Field itself.

EPA Response: Operable Unit One for the Site is defined as the groundwater plume that is contaminated with chromium at levels above 70 parts per billion (ppb). EPA's remedy for OU1 is to remediate the entire area of the plume that contains chromium at levels greater than 70 ppb. OU2 will address the source areas which are also part of the Site. The chromium plume underlies the Puchack Well Field. EPA does not intend to rehabilitate the Well Field.

Comment #10: One commenter asked whether EPA tested water samples for the whole range of priority pollutants and whether there were exceedancesfor chemicals aside from VOCs and chromium.

EPA Response: EPA did test for the whole range of priority pollutants in addition to chromium and VOCs. There were sporadic detections of other pollutants such as lead and mercury. The number of these detections was limited and the contaminants were not consistently found throughout the chromium plume.

Comment #11: One commenter asked for a copy of the power point presentation.

EPA Response: EPA provided copies of the power point presentation to anyone who requested it.

b. Questions on groundwater contamination from Volatile Organic Contaminants.

Comment #12: Several commenter s were concerned that the proposed remedy would not address the VOC contamination. Commenters asserted that VOC contamination was one of the main reasons the Puchack Well Field was shut down, that EPA is "totally shirking its responsibility" by not dealing with the VOCs.

EPA Response: The entire region (Camden County and elsewhere in Southern NJ) in which the Site is located is plagued by problems of VOC-contaminated groundwater. It is an area-wide problem stemming from multiple sources. Under state authority, the NJDEP is evaluating and addressing some identified sources of VOC groundwater contamination in the area. While VOC sources are being addressed under state authority, VOCs are being treated effectively at the public water supply wells in use in the area using common, well tested technology. Virtually all the well fields in the region incorporate VOC treatment so that all established drinking water standards are met. The chromium contaminated plume, on the other hand, is well defined and resulted from a limited amount of sources located in the vicinity of the Puchack Well Field. [Please see responses to the written comments in Part 2 below for a more in-depth discussion of this issue].

Comment #13: One commenter wanted to know if the plume of VOCs has been delineated.

EPA Response: There is not a single plume of VOCs in the area. Rather there have been elevated levels of various VOCs at various levels found throughout many areas in Camden County, including areas commingled with the chromium plume and far distant from the plume. It is for this very reason, i.e., no distinct VOC plume impacting the Puchack Well Field, that EPA is focusing on the distinct and highly toxic chromium plume that impacted the Well Field. Various sources and suspected sources of VOC groundwater contamination in the area are currently being investigated or addressed by the state of New Jersey through state authority.

Comment #14: One commenter suggested that EPA simply look at the discreet area of VOCs that contributed to the Puchack Well Field contamination.

EPA Response: Data collected during the RI does not indicate a discreet area, nor discreet plume, of VOCs that was impacting the Puchack Well Field. In fact, the VOCs outside the chromium contaminated groundwater plume were often detected at higher concentrations than inside the plume.

Comment #15: One commenter pointed out that at the end of the cleanup EPA will not be able to say that the groundwater meets all acceptable standards, except for chromium. And that the cleanup, therefore, fails to restore the groundwater to appropriate standards for all relevant contaminants.

EPA Response: The cleanup will restore the groundwater to levels at or below federal drinking water standards for chromium. The VOC contamination, part of a larger problem in the vicinity of the Site, will continue to be addressed through various state actions at the VOC source areas. In addition, while these potential source areas are being investigated and remediated, the state assures that all drinking water standards are met through regulating the public water supply and requiring well head treatment at the local well fields.

Comment #16: One commenter claimed that the VOCs in raw wafer from public supply wells has been increasing over the previous 12 years. This commenter asked whether there arc more sources of VOCs coming under the river from Pennsylvania, for example.

EPA Response: Modeling has shown that it is unlikely that VOCs are moving under the Delaware River and impacting well fields in Camden County.

Comment #17: Has anyone determined the source areas for the VOCs?

EPA Response: There are a number of areas which are identified or being investigated to determine if they are source areas for VOCs in the area. The state of New Jersey, under its legal authority, has undertaken a number of investigations at a number of facilities in the vicinity of the site which address VOCs.

c. Remarks on Alternatives Presented in the Proposed Plan

Comment #18: One commenter noted that a pump and treat system used at some other Superfund site did not work adequately. He noted that pump and treat technology is old technology.

EPA Response: Pump and treat systems have been used to successfully remediate groundwater contamination at other Superfund sites. Nevertheless, it was not considered the best alternative for this Site (due to other reasons, including higher costs, logistical issues and a longer remediation timeframe) and therefore was not proposed by EPA.

d. Technical questions on the Preferred Alternative

Comment #19: A commenter asked where the technology' has been used before and whether it has been successful.

EPA Response: This technology, while considered innovative has been used successfully to remedy chromium contaminated groundwater plumes at other Sites. [Please see Part 2 of The Responsiveness Summary, below, for a more detailed discussion of this issue].

Comment #20: A commenter wished to know whether the reducing agent which would be used in the preferred alternative would affect other contaminants that may be in the groundwater.

EPA Response: A reducing agent may also act to chemically reduce other contaminants, including VOCs that are commingled with the chromium plume. EPA will address this technical consideration in the remedial design phase of the project to assure that the agent used will adequately address the chromium contamination. The reducing agent that will be used must be effective and safe for use at the site.

Comment #21: A commenter asked if EPA considered digging out sources of contamination.

EPA Response: EPA is addressing source areas through an ongoing remedial investigation for the Site's second operable unit. Alternatives, such as source removal, will be analyzed during that phase of the cleanup.

Comment #22: One commenter was concerned because he believed the chromium plume is moving at 300 feet a year and he felt it may impact the Kirkwood Cohansey aquifer.

EPA Response: The groundwater in the vicinity of the Site moves at a velocity of approximately 300 feet per year, however, the chromium contaminated groundwater plume moves slower than this, at less than 20 feet per year. The slower movement of the plume is due to the high retardation factor of the aquifer sediments. The plume has impacted the aquifer underlying the site. know: n as the PRM aquifer, not the Kirkvvood Cohansey aquifer.

Comment #23: One commenter wanted to know what types of chemicals will be used to convert hexavalent chrome to trivalent chrome.

EPA Response: The specific reagent to be used during the cleanup will be determined during the design phase of the cleanup. Certain food-grade reagents such as calcium polysulfide, ferrous sulfate or sodium dithionite have been used successfully at other Sites, and therefore will be considered during design. EPA will encourage community input during the remedy's design.

Comment #24: One commenter wished to know the mechanism by which hexavalent chrome is converted to trivalent chrome.

EPA Response: The reducing agent added to the groundwater will directly react with hexavalent chromium to convert it to the more stable, less toxic and less soluble form of chromium known as trivalent chromium. The reagent can also react with the naturally occurring ferric iron in the aquifer sediment, converting it from ferric iron to ferrous iron. The ferrous iron will then react with hexavalent chromium to convert it to trivalent chromium. Treatability studies performed by EPA using site sediments indicate that the trivalent chromium, once formed, will readily precipitate out of the solution.

Comment #25: A commenter asked whether all the causes of contamination been removed and whether source areas may still be adding to the existing pollution.

EPA Response: Sources of contamination to the groundwater are being investigated currently by EPA through a second operable unit RI. Data collected during the RI will be used by EPA to develop a range of alternative and will result in a future ROD.

e. Concerns About Other Well Fields

Comment #26: Once commenter asked if EPA were concerned that the well fields in Merchantville/Pennsauken are drawing the plume toward them and whether there is significant migration of the plume.

EPA Response: Due to the natural retardation factors of the sediments, the chromium plume does not travel very rapidly. After the final Puchack Well Field Well was shut down, and therefore no longer controlling the plume. EPA and the U.S. Geological Service (USGS) performed a study to determine what effects this would have on the plume's migration. The findings indicated that the chromium plume is migrating slowly in a south-east direction, away

from the nearest well fields (Morris and Delair). Data collected since that time confirms those findings.

f. TAG grants. Environmental Justice and Community Outreach

Comment #27: Some commenters expressed dissatisfaction with EPA's slow progress in the cleanup of the Site and lack of coordination with the community, and expressed concern that this may be because the local community is comprised of minorities and people with low income. Further to this, a commenter requested that EPA work with the local community throughout the process and that the community be able to retain its own technical consultant.

EPA Response: EPA has met with the local community throughout the RI/FS process and looks forward to continuing to meet with the community to address your concerns. EPA will consider all comments received during the public meeting and public comment period prior to selecting a final remedy. The Agency has spent a significant amount of time to study and characterize contamination at the site and is ready to proceed to select and implement a remedy at the Site to address groundwater contamination. EPA expects to continue to have meaningful public input throughout the implementation of the remedy. The community has applied for a Technical Assistance Grant (TAG) for the site. Through this type of grant, if approved. EPA will provide funds to the community to hire its own technical consultant to comment on technical reports on behalf of the grantees. EPA has some comments on the application and has scheduled a meeting with the applicants from this community to try to resolve the issues. We support the TAG program and if the TAG grant is awarded to this community, we look forward to working with the community's technical consultant, as well as community members through all aspects of the cleanup.

Comment #28: Several commenters noted that it was difficult for non-scientist citizens to understand the basis of the proposed remedy. They asked that more lime be allowed so that a scientist could be hired through an EPA Technical Assistance Grant (TAG).

EPA Response: The local community has been working with EPA for some time to obtain a TAG grant for this Site. EPA strongly supports the local community's efforts to pursue a TAG grant and has scheduled additional meetings to help the community address certain aspects of the submitted grant that need revisions. (Please see Response to Part 1 Comment #1)

g. Funding a Cleanup and Potentially Responsible Parties

Comment #29: Several commenters wished to know if EPA was pursuing parties potentially responsible for the contamination, to help finance the remedy.

EPA Response: EPA has and continues to perform enforcement investigations with the goal of identifying Potentially Responsible Parties. [Note that shortly after the July 26 public meeting, EPA identified one Potentially Responsible Party, SGL Chrome. Please see Part 2 below for a more detailed discussion of this issue]

h. Risk Assessment - Cleanup Standards

Comment #30: A commenter was concerned that since the chromium cleanup standard is for total chromium it will not be protective since 90% of the chromium in the groundwater is hexavalent.

EPA Response: The total chromium standard is protective of groundwater even if all the chromium in the groundwater were hexavalent. [Please see Part 2 below for a more detailed discussion of this issue].

Comment #31: Several commenters felt that the chromium standard was not protective.

EPA Response: EPA and NJDEP have developed protective standards for chromium, based on total chromium. For this remedy, EPA is proposing to meet the more stringent of the two standards (NJDEP's), which is 70ppb.

PART 2: Written Comments

1) Comments From Siemens Water Technologies

Comment 1: The in-situ effort for the reduction of hexavalent chromium to trivalent chromium cannot be guaranteed based upon the hydrogeological occludes and non-homogeneity of the soils - The mixing of materials added by injection to provide an in situ reducing environment within the groundwater for the reduction of hexavalent to trivalent is, at best, an art, and cannot, given the non-homogeneity of the soils, be expected to be thoroughly mixed and/or dispersed throughout the extent of the aquifer. We have seen numerous attempts at in-situ treatment that have failed, with the residues of the materials injected still present when another (non in-situ) treatment is tried for the cleanup after the failure of the in situ treatment, making another attempt at treatment more difficult (i.e. adding to the problem instead of eliminating it).

EPA Response: In EPA's experience, ex-situ treatment of groundwater to remove chromium has not always been satisfactory. In fact, the poor performance of pump-and-treat systems in the mid-1980s was the driving force toward developing subsurface treatment technologies such as the selected remedy, geochemical fixation.

The EPA guidance document "In Situ Treatment of Soil and Groundwater Contaminated with Chromium. October 2000" (EPA/625/R-00/005) presents several examples of successful in situ treatment of chromium contaminated groundwater at sites in. among other places. Indiana, California, and South Carolina. EPA's guidance document also notes that not only is geochemical fixation a proven technology, but it has a significant advantage over other technologies as it not only substantially reduces the time required to remediate chromium-contaminated sites it also reduces treatment (operating) costs. This is consistent with the findings of the Puchack Well Field Site's Operable Unit One Feasibility Study.

EPA recognizes that any treatment system (either in-situ or ex-situ) will be limited by the natural variability of the aquifer material. EPA expects that prior to full scale operation of the remedy, a

pilot study will be performed to help lessen those uncertainties.

Comment 2: The reduction of hexavalent chromium to trivalent chromium does not eliminate the problem, it only masks it - changing the chromium to a different oxidized state does not eliminate the need to maintain the total chromium standard as set forth by the State of New Jersey (70 ppb). In those areas of the plume where the chromium concentrations exceed the total chromium level of 70 ppb, treatment will still be required to reduce the total chromium levels. A natural attenuation of the chromium within the aquifer will not mitigate this problem.

Response: Chromium is a natural element and cannot be destroyed. Most natural chromium exists as chromite (a trivalent chromium oxide) in soil at concentrations ranging from 30 to 60 parts per million (ppm) with up to hundreds of ppm. The reduction of dissolved hexavalent chromium to trivalent chromium, converts chromium to its natural state as a solid trivalent oxide or oxyhydroxide (the solid phase usual, y also contains iron).

Trivalent oxide/oxyhydroxide is typically not very soluble in groundwater under natural conditions. The treatability studies conducted during this Site's RI ("Treatability Study of In Situ Technologies for Remediation of Hexavalent Chromium in Groundwater at the Puchack Well Field Superfund Site, New Jersey" January 2006) demonstrated that once the hexavalent chromium is reduced in the local sediments, it precipitates as a solid in the aquifer. Column studies demonstrated that the process is not reversible, and therefore EPA expects that the chromium will not be re-mobilized after the remedy. A pilot study prior to implementation of the remedy and a monitoring program after implementation will be performed to confirm those laboratory findings.

Simply stated, the remedy will reduce concentrations of chromium in the groundwater for total chromium, not for simply the hexavalent form.

Please also see Response to Part 2 Comment 18.

Comment 3: The reduction of hexavalent chromium to trivalent chromium, if treatment is required, will make this treatment much more costly - by reducing the hexavalent chromium to trivalent chromium, if treatment is required, the removal of trivalent chromium can only he removed by precipitation technologies. A less expensive, ion exchange alternative, would not be available for this, as trivalent chromium is not well ionized nor well attracted to ion exchange medias. For this reason also, we question the EPA's statements that "Trivalent chromium is relatively non-toxic, not mobile (precipitated out from water and fixated to soil particles), and extremely stable." Trivalent chromium is not well ionized, as we indicated earlier, and thus is not attracted to ion exchange sites within soils. As such, therefore, unless the trivalent chromium is precipitated as a sulfate, it is very mobile within the aquifer. The only way to prevent the mobility would be to precipitate the trivalent chromium(generally as a sulfate). Ferrous sulfate is normally used for this, in wastewater applications, but the resultant effluent stream has significant pH swings based upon water chemistry and could require significant secondary in-situ treatment of the aquifer to bring these levels to within potable limits. We don't believe that these costs, nor the inherent mixing risks we discussed earlier have been considered in the costing for this alternative.

Response: As discussed in the previous response, the trivalent chromium precipitate is not typically leachable and trivalent chromium does not typically dissolve into the aqueous phase. Therefore, EPA expects that there will be substantially low levels (well below clean up levels) of aqueous trivalent chromium in the water after treatment. These expectations are based, in part, by the confirmatory findings of the treatability studies where no trivalent chromium was detected during column studies of the treated aquifer material.

Please note that the cleanup goal for the groundwater is 70 ppb of total chromium, regardless of whether the chromium is hexavalent or trivalent. This is the established level considered protective for use as drinking water. After implementation of the selected remedy, it is anticipated that this level will be met and no additional ex-situ treatment will be required. EPA considers this remedy to be cost effective.

Please also see Response to Part 2 Comment 18.

Comment 4: EPA did not consider a much less costly ex-situ treatment technology (once through ion exchange) in their costing for alternatives and have thus not truly represented ex-situ treatment costs - Siemens Water Technologies Corp, as well as others, are participating in a large EPA study at the Glendale/Burbank (CA) Chromium Superfund Site for the removal of hexavalent chromium in potable water. Chromium, in the hexavalent state, though more toxic, as the EPA indicates, is much more readily (inexpensively) removed by ion exchange, as the hexavalent chromium is fully ionized and removed by ion exchange mediums. The ion exchange resins then accumulate the hexavalent chromium and are then disposed of in accordance with EPA procedures. A number of technologies have been (and are being) evaluated by the EPA ' s contractor, McGuire Malcolm Pirnie, for the removal of the hexavalent chromium. We have developed an ion exchange resin that is significantly more efficient and less costly to operate for the removal of hexavalent chromium and we think this technology is probably much more economical and certainly more predictable and reliable than an in situ method that is fraught with unknowns. At the EPA's request, we would like the ability to demonstrate this technology, cither in a bench scale or pilot scale form to prove this point.

Response: The Feasibility Study for Puchack Site evaluated a pump-and-treat alternative. The alternative is substantially more costly than the in-situ treatment alternative. Due to its inherent limited capacity and the high cost of replacing spent resin, ion exchange is generally used to polish treated water in large scale application. It is unlikely ion exchange will produce any cost savings over the traditional precipitation methods used in a pump-and-treat system. Additionally, ion exchange technology will not reduce the time frame for remediation (estimated at 2 to 3 times greater than the selected remedy) nor would it alleviate the logistical concerns with a pump-and-treat recovery/injection system as discussed in the Site's FS.

2) Comments from Environ on behalf of SL Industries, Inc.

Comment 5: The NJDEP is developing a new GWOS for hexavalent chromium, EPA should incorporate current NJDEP research in selecting a cleanup number.

Response: In November 2005 NJDEP revised it's GWQS for total chromium to 70ppb. This number is more stringent than the federal MCL for total chromium of 100ppb. EPA selected the more stringent and most up-to-date NJDEP criteria for this remedy. NJDEP concurred with EPA's decision.

Comment 6: The definition of GUI in the Proposed Plan is markedly different from the Remedial Investigation Report and other documents related to this Site, which indicated that OUl includes the investigation and remediation of chromium, VOC and semi-VOC compounds contaminating the groundwater. This affirms EPA's intent to include treatment of VOC contamination that coincides with the chromium plume. By separating the remedial action into two components the remedy is in violation of the NCP (40 CFR 300) which directs EPA to select remedial strategies that are cost-effective and that to be eligible for selection, remedies must ensure overall protection of human health and the environment. The current remedy fails to comply with these regulatory requirements as it is neither cost-effective nor fully protective of human health and the environment.

Response: The primary goal of OUl is the investigation and cleanup of site-wide chromium contaminated groundwater. It was further clarified in the Final Feasibility Study Report that OUl focuses on the clean up of the Puchack chromium plume as the primary goal. This goal is also clearly stated in the Proposed Plan. The selected remedial action is cost effective and consistent with the NCP.

EPA is unclear what argument the commenter is making with regards to separating a remedial action into two components. If the commenter means into two operable units, one for groundwater and one for source areas, that is acceptable under NCP and commonly done at many Superfund sites. If the commenter is referring to the VOC issue then please see the **Response to Part 2 Comments #13 and #45.**

Comment 7: EPA ' s has provided no rationale for the selection of the preferred alternative based on expediency without regard to cost-effectiveness. There exists no pathway for human exposure and since the VOC contamination will not be remedied even if the chromium were remedied rapidly it would remove the potential risk from the groundwater. Also, the plume travels slowly, and data indicate that the concentrations have reduced more than 50% between 1998 and 2000. The commenter has proposed to select alternative 2 - Monitored Natural Attenuation because it is protective while being more cost-effective.

The preferred alternative will not significantly reduce the potential risk to human health as the unacceptable carcinogenic risk is driven solely by VOCs, and a significant portion of the non-carcinogenic risk is also driven by VOCs. Therefore, by simply treating the chromium without addressing the VOCs, the remedy would not allow use of the groundwater and will not remove any of the carcinogenic risk, nor a large portion of the non-carcinogenic risk, at least not to the extent mandated by the Superfund program. The preferred alternative will also not allow the Lower aquifer to be used again for potable purposes.

Response: The aquifer is used by other well fields as a potable source of water, once treated to remove VOCs. The Puchack Well Field was closed due to chromium contamination, which is the

primary contaminant at this Site and poses an unacceptable risk. Cost-effectiveness is one of nine criteria to be considered when selecting a remedy. The selected remedy, while more costly than monitored natural attenuation, better met other criteria, including short-term effectiveness and reduction of toxicity. mobility, or volume. As stated in other portions of the Responsiveness Summary, VOC contamination is being addressed through various state actions and at the wellhead.

Comment 8. The Source of Chromium Groundwater Contamination in OUI — The SL Site was not the source of the Puchack groundwater contamination, and EPA admits that by noting that OU2 will investigate and potentially identify source areas. Also the following:

- There is no chromium contamination in the Intermediate Sand and Lower Aquifer at the SL Site. There is no Middle Aquifer chromium contamination between the SL Site and the Puchack Well Field

- The SL Site started the operation in January 1969. Chromium was found at the Puchack Well Field in the early 1970s. There was not enough time for the chromium discharged from the SL Site to travel to the Pucack Well Field. The commenter suggested that the chromium contamination at the Puchack Well Field was originated from other source(s).

- There are other potential sources, and EPA should undertake additional actions against the other sources.

Response: The commenter is correct that no chromium contamination in the Intermediate Sand and Lower Aquifer was detected at the SGL property (i.e., the "SL Site" during the RI. However, the highest overall concentration of chromium found in the study was in the Middle aquifer just below the SGL properly. Additionally, based on the distribution of the chromium contamination and the groundwater How direction during the Well Field's operation, the Puchack Well Field chromium plume is directly downgradient from the SGL property. As a result, the SGL property was the most likely source for the Puchack Well Field contamination. EPA intends to conduct further investigations of the SGL property under during this Site's second Operable Unit.

Historic information indicates that SGL Chrome began operation in January 1969. SGL Chrome purchased the property from Du-Mor Hard Chrome and consolidated Du-Mor with Modern Hard Chrome of Camden. Du-Mor purchased the property from Nenin H. McKay on January 21. 1963. As a result, the discharge of chromium contaminated wastewater to the ground from the facility could have started as early as 1963. The commentor's estimate of chromium plume travel time was based on the assumption that current retardation capacity of the aquifer would have retarded the How of the chromium plume in the 1960s and 1970s. The assumes that the quantity of wastewater discharged was limited and that the wastewater contained relatively low levels of chromium. Historic information indicates that SGL Chrome discharged approximately 9,000 gallons per day of plating wastewater, or 3.3 million gallons per year. Soil samples from the SGL property contained chromium concentrations up to 37.000 ppm. The large quantity and apparently high chromium concentration of the plating wastewater during the 1960s and 1970s

would have rapidly depleted the adsorptive capacities of the soil. Therefore, the chromium waste from SGL Chrome could have migrated without much retardation during that time period.

Enforcement investigations are ongoing. EPA continues to gather soil and source data as part of the ongoing Operable Unit 2 RI. EPA will determine if additional potentially responsible parties exist for the chromium found in the Site's groundwater.

3) Comments from Sharon Finlayson - Pennsauken Environmental Coalition

Comment 9: Because the Technical Assistance Grant for the Puchack Environmental Coalition, Inc. (PEC) has not been finalized and awarded by USEPA, the group that was organized to oversee the remediation of the site has been unable to obtain a professional analysis of she remediation plans set forth by you and Region 2. Therefore, be advised that I, as a Board Member of PEC, consider the public record incomplete. As a citizen of the area impacted by the past and future of the Puchack Well Fields, I request that the comment period be extended until November 6. 2006 so that PEC can receive and utilize the grant for which it has applied, and submit informed comments and recommendations as provided for by Superfund law.

Response: A month prior to the announcement of the Proposed Plan, EPA met with members of the Coalition to discuss the status of the Site. At the public meeting, a request was made and subsequently EPA granted an extension to the comment period for an additional 30 days, until September 6.

Additional discussions with members of the Coalition and the general public occurred after the public meeting to answer questions concerning the proposed remedy. EPA believes that adequate time and information has been provided to allow for meaningful understanding by and comment from the public.

The Puchack Environmental Coalition submitted a TAG application in April 2003. Since that time. EPA has given feedback to the applicant for improvements necessary to make the application acceptable. While some changes have been made to the application, additional information is still necessary before EPA can process the application for potential funding.

Even if the Coalition were able to satisfactorily respond to EPA's information requests immediately following the public meeting, it is unlikely that the grant would have been awarded in a timely enough fashion to make the 90 day time extension useful.

If the Coalition is awarded the TAG, EPA looks forward to working with the Coalition's consultant throughout the upcoming OU1 RD and OU2 RI/FS activities.

Comment 10: The Puchack Well Fields should be permanently closed because the contamination is so extensive, varied and widespread, and because the source(s) of the pollution will not be remediated until some undetermined time in the future.

Response: A decision on the future of the Puchack Well Field will be made sometime after the remedy is complete. This decision will be made by NJDEP with input from EPA.

Comment 11: The proposed clean-up plan is inadequate. It addresses only one contaminant of concern, specifically hexavalent chromium.

Response: The contaminant of concern for the Site is chromium. The remedy addresses that contaminant.

Comment 12: The proposed plan to treat in-situ is unacceptable. The proposed plan does not remove hexavalent chromium (Cr6) but seeks to reduce its toxicity by altering it from a toxic, highly mobile state to Trivalent Chromium (Cr3) considered "not toxic and is not mobile " and the conversion from Cr6 to Cr3 is "is not reversible under normal environmental conditions." (material from public meeting, July 26, 2006)

Response: Please see **Responses to Part 2 Comments #2, #18 and #19.**

Comment 13: Due to their range of adverse health effects and high levels of contamination. Volatile Organic Compounds and Mercury must be removed from the Puchack Well Fields Superfund Site. VOCs and Mercury will remain a threat as long as they are present in the wells. A clean-up plan that lacks remediation of these very dangerous contaminants is incomplete.

Response: VOCs: As with nearly all Well Fields in the region, VOCs affected the Puchack Well Field prior to its closing due to chromium contamination. Since the entire region in which the Site is located contains areas of VOC contaminated groundwater. it was not surprising to find the Site's distinct chromium plume commingled in spots with some VOC contamination.

While no distinct plume of VOCs was found during the RI, VOC contamination was found to be widespread and present in all water bearing units. Based on the variety of volatile compounds found and their sporadic distribution, it is likely that in the vicinity of the Well Field there are multiple sources of VOC contamination. The Puchack Well Field Superfund site is located within a regional area of VOC contamination, but notably it also has a distinct and limited plume of chromium contamination.

NJDEP is currently working to address VOC contamination sources in the region through a number of actions, including, but not limited to, the ongoing investigations and cleanup of the Pennsauken Landfill. EPA understands that the public remains concerned regarding the area-wide VOC groundwater contamination. During the engineering design and implementation of the selected remedy at the Puchack Well Field Site. EPA will be collecting additional groundwater data, which will include some VOC data. We will share this data with state and community representatives for their consideration and provide assistance in interpreting these data, if requested.

Mercury: EPA believes the mercury detected at the Puchack Well Field occurs naturally. Mercury was detected in the Puchack Well Field at concentrations up to 5.8 ppb in 1986 and again at concentrations up to 0.77 ppb in 1996. During the remedial investigation, soil and groundwater samples were analyzed for mercury. Out of 133 groundwater samples, there were only seven groundwater samples that slightly exceeded the New Jersey standards of 2 ppb, the maximum being at 3.7 ppb. The Remedial Investigation detected mercury in 5 out of 54 aquifer

sediment samples, with the highest being 0.32 ppm. EPA also colleted 65 soil samples and analyzed for mercury. Mercury was detected in 9 soil samples, the maximum concentration being 0.16 ppm. The mercury background concentrations in the eastern United States range from 0.001 ppm to 0.2 ppm. Based on these sample results, EPA believes that mercury detections in the groundwater samples may be caused by small quantities of soil particulates entrained in the groundwater samples. As a result, mercury will not be targeted for treatment. Nevertheless, some water samples collected while monitoring the Site will be analyzed for mercury.

Comment 14: What reactive agent will he used in the in-situ Ceo Chemical Fixation treatment process for Cr(VI) ?

Response: The specific type of reagent to be used during the cleanup will be decided during the design phase of the cleanup. Certain food-grade reagents have been used successfully at other Sites, and therefore will be considered during design. Examples of reducing agents include calcium polysulfide, ferrous sulfate or chloride, sodium or calcium metabisulfite, sodium dithionite, or other similar compounds.

Comment 15: In that the in-situ treatment process is fairly young, please provide a history of the chosen treatment.

Response: Please see the Response to Part 2 Comment 1. The EPA guidance document "In Situ Treatment of Soil and Groundwater Contaminated with Chromium, October 2000" (EPA/625/R-00/005) summarizes the science and history of this technology, as well as providing a few examples of sites where it has been used. A copy of that guidance document will be made available in the public repository for the Site. The repository is located in the Pennsauken Free Public Library, 5605 Crescent Blvd, Pennsauken, NJ. The Document can also be found at line at the following address: http://www.epa.gov/nrmrl/pubs/625r00005/625r00005.pdf#search=%22 EPA%2F625%2FR-60%2F005%22

Comment 16: How many injection areas will be involved in the in-situ treatment?

Response: The preferred alternative will treat the entire chromium plume. The treatment will include injection of reducing agent into the ground through lines of injection wells. The location and spacing of the injection wells will be determined during the design phase. Injection wells will be located in accessible areas. Injection operations will be designed to minimize disturbance to the business and residents

Comment 17: Will there be any filtration of contaminants or of the converted chromium?

Response: No. The chemical reduction under the preferred alternative will occur within the aquifer. The converted chromium will precipitate out of solution and be adsorbed into the soil matrix.

Comment 18: What conditions might cause the reduced Trivalent Chromium to re-convert to Hexavalent Chromium?

Response: Chromium is a natural element and exists in soil as chromite (in the trivalent form) at concentrations up to hundreds of parts per million. The aquifer sediment at the Puchack Well Field Site contains up to tens of parts per million of chromium (in the trivalent form). Therefore, the reduction of hexavalent chromium to trivalent chromium is to convert chromium to its natural state. The converted chromium will be a small percentage of the naturally existing chromium. EPA is not aware of any sites or case studies where trivalent chromium has reverted back to the hexavalent form.

When the aqueous hexavalent chromium in groundwater is reduced, a solid trivalent chromium precipitate forms. The precipitate is typically a chromium-iron oxyhydroxide. Many scientific studies have been performed concerning the stability of this precipitate. Most studies have shown that under typical groundwater conditions, the precipitate is very stable and rarely is oxidized to release any hexavalent chromium to the aqueous phase. Studies and references discussing this stability include: J. Fruchter, 2002. ES&T, 36. 464-472; B. M. Sass, D. Rai. 1987, Inorg. Chem. 26, 2228-2232; S. Loyaux-Lawniczak. etal., 2001, ES&T. 35, 1350-1357; A. Davis. R. Olsen, 1995, Ground Water. 33, 758 -768; R. J. Bartlett and J. M. Kimble, 1976, J. Environ. Qual, 5, 379-383; J. Szecsody, et al., 2005 chapter 9, J. Jacobs, ed., Groundwater Remediation of Chromate, CRC Press. Many of these studies have been conducted with the addition of oxidizing materials such as oxygen (L. E. Eary and D. Rai, 1987, ES& T, 21, 1187-1193).

The only constituent in the environment known to oxidize the trivalent chromium precipitate is manganese dioxide (L. E. Eary and D. Rai, 1987, ES& T, 21,1187-1193). This condition would be highly unusual and not likely at the Puchack site. For this process to occur, the manganese dioxide would have to be present in the aquifer sediments and available for reaction (e.g., as surface coatings) with the trivalent chromium precipitates as it forms. In that case, the precipitate may oxidize; however, the aqueous hexavaient chromium will then be reduced and precipitated permanently in locations where the manganese oxide does not exist. In practice even where aquifer sediments do contain manganese oxides, aqueous hexavaient chromium is rarely detected (J. Fruchter, 2002, ES& T, 464-472). Research has also shown that the oxidation of the precipitate by manganese oxides is limited by surface alteration effects (S.E. Fendorf and R. J. Zasoski, 1992, ES& T, 26. 79-85). The real determination of the stability of any trivalent chromium precipitate at the Puchack site is the bench scale tests that were performed using actual aquifer sediments from the site. During these treatability studies (V. R. Vermeul, et al, 2006, Pacific Northwest National Laboratory), long term column tests were performed. Even at lower pH values, hundreds of pore volumes of groundwater were passed through the columns before any chromium was measured in the effluent. In addition, aquifer reduction capacity was also hundreds of pore volumes. These tests demonstrated that the local sediments have adequate capacity to reduce hexavaient chromium to the trivalent form. And that the trivalent chromium, once formed, will not be released from the sediment.

Comment 19: Are there any conditions under which Trivalent Chromium is harmful to health or the environment?

Response: Chromium is a naturally occurring element found in rocks, animals, plants, and soil. Trivalent chromium occurs naturally in the environment and is an essential nutrient. Hexavaient chromium and elemental chromium are generally produced by industrial processes.

According to the Federal Agency for Toxic Substances and Disease Registry (ATSDR), trivalent chromium is an essential nutrient. The Food and Nutrition Board of the National Academy of Sciences and National Research Council (NAS/NRC) states that a safe, adequate intake of chromium for an adult is 50 to 200 µg/day. 200 µg/day calculates to roughly 3 liters of water per day, containing 70ppb of trivalent chromium. ATSDR has advised against excessive use of dietary supplements containing chromium. Please also see the **Response to Part 2 Comment #48.**

Comment 20: Is any other form of chromium present in the contaminated well fields?

Response: Trivalent chromium occurs naturally in the environment. Hexavalent chromium was introduced to the groundwater through industrial discharges. Other forms of chromium are rare in the environment.

Comment 21: What will happen to the Volatile Organic Compounds present in the Puchack Well Field Super fund Site?

Response: The VOCs currently commingled with the chromium plume will presumably break down through natural biological or chemical reactions, break down due to the chemical regent added during the Site remedy, or migrate from the site.

Comment 22: What will happen to the Mercury present at the site?

Response: Mercury does not break down. It's unclear whether the low levels detected will be detected again. Please also see the Response to Part 2 Comment 13. EPA intends to continue to analyze for mercury during the design and monitoring phase of this cleanup.

Comment 23: What are the average levels of VOCs and mercury in wells that are used for public distribution in New Jersey?

Response: All drinking water in New Jersey must meet the established drinking water standards after treatment. NJDEP has set standards for VOCs and mercury in drinking water, at least as stringent as EPA's MCLs. Some examples of New Jersey standards are: benzene 1 ppb; 1,1-dichloroethylene 2 ppb; tetrachloroethene 1 ppb; 1,1,1-trichloroethane 30 ppb; trichloroethene I ppb; and mercury 2 ppb. Please contact the NJDEP Bureau of Safe Drinking Water for more information on public water supply in New Jersey, http://www.state.nj.us/dep/watersupply/safedrnk.htm

Comment 24: Will the contaminated plume continue to migrate during and after treatment?

Response: The chromium plume will continue to migrate during the remediation period. However, it will migrate very slowly (tens of feet per year) due to the natural retardation factor of the local aquifer's sediments. EPA expects to meet the cleanup standard of 70 ppb for total chromium in groundwater. When that cleanup level is met chromium contamination above appropriate standards will no longer exist.

Comment 25: Are any public drinking water wells in the area susceptible to contamination from the site, either now or in the future?

Response: After the final Puchack well was shut down, and therefore no longer controlling the plume, USGS performed a study to determine how the chromium plume's migration would be affected. The findings indicated that the chromium plume moved away from the nearest well fields (Morris and Delair). Data collected since that time confirms those findings. Regardless, EPA will monitor the chromium plume until the chromium contamination is remediated. Also see **Response to Part 2 Comment #42**.

Comment 26: When is the anticipated future of the Puchack Superfund Site?

Response: EPA will implement the selected remedy for the chromium plume until the chromium plume has met the cleanup objective. EPA will complete the investigation of the source areas in the near future. The future of the Site will be determined once it is remediated.

Comment 27: Have there been any discussions, formal or informal, about utilizing the Puchack Wells for public distribution following the remediation process?

Response: A decision on using the Puchack Well Field as a source of potable water will be made by NJDEP with input from EPA. That decision is not expected until after the Site is remediated.

Comment 28: 1 respectfully request that USEPA remediate the Puchack Well Super fund Site to the highest standard, using a pump and treat system, or other technology that would permanently remove all contamination from the water and soil. Additionally, I ask that you permanently close the Puchack Site so that it cannot be used for public consumption in the future.

Response: **Please see the Response to Part 2 Comment #4 on the pump and treat system, and the Response to Part 2 Comment #27 on the request to close the Puchack Well Field permanently.**

4) Comments from the New Jersey Environmental Federation

Comment 29: The NJ Environmental Federation asks that EPA keep the record open on this matter beyond the Sept. 7th, 2006 deadline for comments, because a full public process with informed testimony bolstered by a technical consultant to the community has not transpired in the short amount of time from the public meeting to the close of comments. A TAG grant has been applied for but not yet received, therefore the benefit of a fully vetted discussion on remedial alternatives has not been adequately provided. NJEF and the South Jersey Justice Alliance have asked for a 90 day extension, but that was denied. A 30 day extension was granted, but even that has proven to be too short a time to develop an adequate public record on this massive contamination at the Puchack Well Field.

Response: **Please see the Response to Part 2 Comment #9**

Comment 30: Does the EPA regard the plume as fully characterized as far as scope and contaminants?

Response: Yes. EPA believes the chromium plume is fully characterized such that EPA is able to develop and evaluate remedial alternatives.

Comment 31: Why are the VOCs not considered as part of the clean up plan. It is not satisfactory to limit the scope of the cleanup to one chemical of concern. Chromium, when volatile organics in excess of groundwater standards have been identified at the site. In fact, the health risk assessment states the excess lifetime cancer risk from residential use, well in excess of the target range of 1 in a million, had the most contribution from TCE, PCE and 1,l-DCE, all volatile organics. In addition, the Hazard Index for 180 in the Middle Aquifer, and 60 in the Lower Aquifer, well over the acceptable level of 1, and the factors contributing most significantly were chromium, AS WELL AS TCE and MANGANESE.

Response: **Please see the Response to Part 2 Comment #13 for the VOC question. And Please see the Response to Part 2 Comment #44 for the manganese issue.**

Comment 32: The remedial action objectives will not be met by the proposed cleanup, because the cleanup fails to contain and restore the groundwater to drinking level standards for all the contaminants found in the aquifer. VOC's are not addressed. The groundwater will not be available for future drinking water. It will have an "institutional control", which means a Classification Exception Area and well restrictions. "Restoration of groundwater" is predicted within 5-10 years, but only for the chromium levels. VOCs will not be addressed in the remedy at all.

Response: The remedial action objectives for this Site are to prevent exposure to contaminated groundwater, minimize the migration of the chromium contaminated plume and to restore the chromium contaminated groundwater to drinking water levels. The remedy described in the proposed plan and selected in the ROD is expected to achieve these goals.

Comment 33: What efforts are being made to make the responsible parties pay for the clean up of the plume? Does EPA have in process a legal strategy to name the responsible parties?

Response: EPA has issued a general notice letter to one potentially responsible party (PRP), SGL Hard Chrome. Enforcement investigations are ongoing. If during the OU2 RI/FS evidence is found identifying another source area, appropriate actions will be taken to attempt to name other PRPs. EPA will pursue PRPs to implement and/or fund future work, and will seek reimbursement for federal costs expended on the Site.

Comment 34: The Puchack wells should be closed and decommissioned permanently. What are EPA ' s plans for the wells?

Response: **Please see the Response to Part 2 Comment #27.**

Comment 35: Because the remedy does not clean up all the contaminants at the site, and does not restore the aquifer to drinking water quality, it fails to meet 8 of the 9 Superfund Evaluation Criteria. Only Criteria 4, Reduction of toxicity, mobility or volume of contaminants through treatment is partially met, but only partially, because VOC's volume or toxicity will not be reduced, only Chromium 6.

Response: Alternatives developed during the FS process are evaluated by EPA against nine established criteria. This detailed evaluation is presented in the FS and is summarized in the site's Proposed Plan. EPA and the State of New Jersey believe that the selected remedy provides the best balance of trade-offs among the response measures with respect to the nine evaluation criteria. EPA believes that the selected remedy will be protective of human health and the environment, will comply with applicable and relevant and appropriate requirements, will be cost effective and will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. As stated previously, VOCs throughout the area of the site will be addressed through state actions.

Comment 36: NJ Environmental Federation appreciates the efforts EPA has made to characterize the site and explore alternatives, and to be creative about addressing a widespread chromium contamination through use of innovative technologies. But we do not accept the proposed remedy as being protective of human health or the environment. It is a partial abatement of just one contaminant, chromium, and is in no way a permanent, health based remedy that restores the groundwater to unrestricted use. We propose a new alternative, #4, which reduces all the contaminants in the plume to drinking water and groundwater standards. That is the only remedy that meets the Superfund law criteria, and the only remedy that protects human health and the environment. We reject all the alternatives put forth by the EPA as unacceptable to the community. The Camden area has suffered too long from a burden of pollution that affects disproportionately urban residents who are black, Hispanic, or Asian, and low income. The health effects of cancer and asthma are felt across the population, but especially among the youth and elderly of the city and near suburbs. The EPA must go back to the drawing board and design a cleanup remedy that protects the most vulnerable, not the pocketbooks of the polluters.

Response: Chromium is the primary contaminant of concern at the Puchack Well Field Site. VOCs. while commingled with parts of the chromium plume, are found at significantly higher levels in areas outside the chromium plume compared to levels within the chromium plume. The VOCs found in groundwater under Camden County are being addressed by a number of state and federal actions. **Please also see the Response to Part 2 Comment #13.**

5) Comments from South Jersey Legal Services

Comment 37: The time period for public comments should be extended. The lime period allowed for the community to submit comments regarding this critical decision to be made by the EPA - the choice of remedy for clean up - was grossly inadequate, and the EPA has subverted the process for public participation by denying the community's request for an additional 90 day extension of the comment period. The EPA has been conducting investigations and preparing its RI/FS for several years, but released the draft report only in July, and allowed only 30 days for comments (subsequently extended for an additional 30 days).

Response: **Please see the Response to Part 2 Comment #9.**

Comment 38: The processing of the TAG grant was delayed due to a lapse in communication with the EPA, but has been put back on track. The community should be given the opportunity to obtain independent expert review prior to the deadline for comments.

Response: **Please see the Response to Part 2 Comment #9.**

Comment 39: EPA did not facilitate opportunity for public comments at hearing. EPA did not properly explain at the public hearing that the public hearing was for purpose of receiving comments and objections to EPA's proposed plan, but instead opened up a discussion for "questions ". Community representatives were not informed that the hearing constituted the only opportunity to provide input and criticism of the proposed clean up plan. This is further reason for providing additional opportunity to submit written comments.

Response: The July 26, 2006 meeting was not a public hearing, but rather a public meeting to enable the public to provide comment on the Proposed Plan. Information prepared to inform the public about the meeting, such as public notices (attached) and the Proposed Plan itself (attached), all clearly state that the meeting would provide an opportunity to comment on the Plan. In addition, a short presentation was given during the meeting discussing the superfund process. During the presentation, an EPA representative stated that the public meeting was a chance for the public to provide comments on the proposed remedy. Finally, the commenter raised this issue during the July 26, 2006 public meeting, and EPA agreed with the comment, further clarifying the purpose of the meeting for members of the audience who may have been confused.

Also, as made clear at the meeting and through information provided by EPA before and after the July 26. 2006 public meeting, the meeting was not the only opportunity for the public to comment on the preferred alternative. There was also a 30 day, later extended to a 60 day (July 7, 2006 - September 6, 2006), public comment period established by EPA during which time the public could submit written comments.

Comment 40: EPA's approach allows continuing contamination of groundwater. It is a major problem that while the groundwater is being treated, the source contamination remains in place and continues to pollute the groundwater. Community members questioned whether it is effective to remediate the groundwater before addressing the sources.

Response: There are no longer any active discharges of chromium at the site. All data collected, including not only the groundwater data but also some limited soil data, indicate that if a source area exists that continues to add to the problem, it's effects are negligible with respect to the volume of chromium currently in the plume. As stated in the human health risk assessment, the current chromium plume has potential human health risks if left untreated. Therefore, EPA believes that it is a priority to mitigate the chromium groundwater plume at this time to prevent further migration of the contamination, while potential source areas are further investigated under OU2. However, as part of OU2, EPA will proceed to investigate and address any soil remediation if determined necessary, in as timely a manner as possible in order to eliminate any potential long term impacts to groundwater.

Comment 41: EPA must prioritize clean up of sources (OU2). EPA needs to prioritize and speed up its proposed process for remediation of the sources (OU2). A delay of 2 years before a RI/FS is even proposed is unacceptable.

Response: EPA plans to propose a remedy for the source area(s) within approximately 2 years. This time frame includes completion of the field work and preparation of the RI and the FS. Please also see the **Response to Part 2 Comment 40.**

Comment 42: The Site creates danger of contamination of drinking water supply. As the EPA is aware, there are numerous active well fields in very close proximity to the site. Community members are very concerned about the spread of the contamination plume to drinking water sources. They question whether it is really safe to assume that the plume is not spreading contamination to the Morris-Delair well fields which are currently being used as Camden City's major water source, or other nearby well fields.

EPA must closely monitor all nearby drinking water sources. As part of the remediation plan, the EPA needs to actively test and monitor nearby water sources to make sure that the contamination is not spreading to other wells and develop a plan for action if it is discovered that wells are or may be soon contaminated.

EPA must plan for any unexpected spread of plume. Residents are concerned that if it is possible that the remediation activities, changes in use of the well, weather conditions such as droughts, or other factors could cause a change in the direction or speed of the migration of the plume, that EPA must have a way of monitoring for such changes and a plan to address them.

Response: Based on the remedial investigation sampling results, the chromium plume has not migrated to any of the nearby well fields, nor is it expected to affect local well fields in the near future. Morris-Delair well fields are the closest operating well fields to the Site, but they are upgradient of the contamination. Additionally, the RI revealed there is a groundwater divide between the Morris-Delair well fields and the Puchack Well Field Site that would prevent the migration of the chromium plume to the Morris-Delair well fields. The closest downgradient active well field is the Park Avenue Well Field, which is over a mile away from the Site. Given the fact that the chromium plume is estimated to migrate at less than 20 feet a year, EPA does not expect the chromium plume to migrate to the Park Avenue Well Field or any other operating public drinking water well fields in the area prior to its cleanup.

Nevertheless, until the OU1 remediation is complete. EPA will monitor the chromium plume to ensure that if it begins to migrate in such a way to threaten an operating well field, appropriate actions can be taken.

Monitoring of water from public supply well fields is done regularly under state authority to assure that all drinking water standards are met.

Comment 43: VOCs are a dangerous known carcinogen that must be removed from site. The EPA ' s proposal to address only the chromium at the site is completely unacceptable to the community. VOCs are also a dangerous toxin that are responsible for creating an elevated cancer risk associated with that site, and were found to be present at dangerously high levels.

Presence of VOCs in area is not a basis for failing to remediate for VOCs. The EPA states that VOCs will not be remediated because they are found to be prevalent in the area and are not

necessarily related to the Puchack site. The prevalence of VOC contamination in New Jersey is not grounds to ignore them when remediating a Supcrfund site. Many Superfund sites are primarily contaminated with VOCs, and the fact that VOCs may also be found elsewhere in the region should not affect plans to remove them from the Superfund site. The remedial plan for this site should provide for removal of VOCs from the VOC plume related to the Puchack wellfield.

Independent activities by NJ DEP is not a basis for failing to remediate VOCs. EPA also informed the community that the DEP was taking some measures to address VOCs in the area. If DEP ' s activities could be incorporated into a comprehensive remediation plan that would result in full remediation of VOC contamination, that could be an acceptable alternative. The EPA has not developed such a comprehensive plan, however. DEP's independent activities to remediate nearby contaminated sites is not a reason to exclude VOCs from the EPA ' s remediation plan for the Puchack Well Field.

Use of air strippers and similar methods to eliminate VOCs at the source is not an acceptable substitute for remediation. EPA has suggested that VOC contamination is not a problem because air strippers can remove VOCs before they enter the drinking water distribution system. This is not a basis for refusing to remediate the VOCs. The contamination left in the groundwater would continue to spread, and therefore poses a danger of exposure either through vapors from the groundwater or from exposure to contaminated soil, as well as the risk of contaminating nearby drinking water sources. The Morris Delair Well Field, Camden City's principal water source, has not had a VOC removal system, and even though there have been plans made to upgrade the system, it is not known whether the VOC air strippers are in place and proven to be fully operable. The stripper systems are known to fail occasionally and expose consumers to contaminated water, which has happened at other Camden well fields.

EPA has rejected the only alternative that would remediate at least those VOCs which are contained within the groundwater contaminated with chromium. Only alternative 4 would simultaneously remove VOCs, but EPA rejected use of that alternative.

Response: EPA developed a pump-and-treat alternative during the FS. This alternative was not selected as EPA's preferred alternative after comparison to the other alternatives, because it did not represent the best balance of trade-offs when evaluated against the remedy selection criteria, as explained in the ROD. Under a pump and treat scenario, the VOCs commingled with chromium would be removed to appropriate levels prior to reinjection of the treated groundwater. However, once the contaminant of primary concern (chromium) was adequately addressed, the pump-and-treat remedy would be terminated. While this alternative, if selected, would have removed some of the VOC load from the regional aquifer, it's overall effects in remedying the underlying VOC problems within Camden County would have been, at best, minimal. This is made evident if one considers that the highest detections of VOCs near the Well Field during the R. I sampling were located outside of the chromium plume area, and downgradient of the Well Field.

Please also see the Responses to Part 2 Comments #4 and #13.

Comment 44: EPA has failed to address manganese and mercury. Manganese and mercury were also found at the site, but the remediation plan does not address remediation of these contaminants.

Response: Manganese: During the remedial investigation, EPA analyzed for manganese in the groundwater and soil samples. Manganese concentrations that exceed the drinking water standard were detected in multiple groundwater samples randomly distributed throughout the study area.

A total of 54 aquifer sediment samples were collected. All but three samples have manganese concentrations below 21 mg/kg. The maximum manganese concentration of 107 mg/kg, which is an outlier, was detected at PMW-25M, which has low manganese concentrations in the groundwater sample. The next highest manganese concentration of 44.6 mg/kg was detected at PMW-12D, which also has low manganese concentrations in groundwater sample. EPA also collected 71 soil samples from soil borings. Fifteen soil samples have elevated manganese concentrations ranging from 60.3 mg/kg to 265 mg/kg. These 15 soil samples included 10 samples located at the SGL Hard Chrome facility, 2 samples each located at Mercon and Supertire, and one sample located at King Arthur. Manganese concentrations in the groundwater were elevated at both SGL Hard Chrome and King Arthur but not at Mercon and Supertire. According to an extensive study on element concentrations in soils (H. Shacklette and J. Bocmgen, 1984. USGS Professional Paper 1270), the geometric mean concentration of manganese in soils and surficial materials in the eastern US is 260 mg/kg, with concentrations ranging from <2 to 7,000 mg/kg. The estimated arithmetic mean is 640 mg/kg. Puchack site aquifer materials are typically below the mean values reported across the eastern United States.

Based on these sample results, EPA believes, with the possible exception of sample results at the SGL Flard Chrome facility, the manganese concentrations in groundwater are naturally occurring, as they cannot be related to specific source areas when comparing to the soil and aquifer sediment results. EPA plans to perform further investigations at the SGL Hard Chrome facility.

For the mercury question, **Please see the Response to Part 2 Comment #18**

Comment 45: EPA's proposed plan fails to meet remedial objectives. Because the EPA has not developed a remediation plan that will address all known contaminants, the clean up will not achieve remedial action objectives, as the groundwater will not be remediated to drinking waiter standards.

Response: The Remedial Objectives for the Site as described in the Proposed Plan are: to prevent exposure to contaminated groundwater; to minimize migration of the chromium contaminated plume; and to restore the chromium contamination to drinking water standards in a reasonable time frame. Through the use of in-situ treatment and institutional controls of the chromium contaminated groundwater. EPA expects the remedy will meet these objectives.

Comment 46: Chromium III is a known toxin. Although the EPA documents occasionally, and misleadingly, refer to chromium III as "non-toxic", chromium III is a contaminant and while considerably less toxic than chromium VI, it is not benign.

EPA's remediation plan does not protect against conversion of chromium III back to chromium VI. The EPA documents state that chromium III does not under ordinary circumstances convert back to the more toxic form of chromium VI, but do not discuss the possible scenarios under which such a conversion could occur, or how to address it if it does.

Remediation should provide for removal of chromium. The proposed remediation alternative converts chromium VI to the less toxic form but does not remove it from the site. Removal would be far more protective to health.

Response: **Please see the Responses to Part 2 Comments #2, #18 and #19.**

Comment 47: The EPA documents are not clear as to what standard is being used. At the public hearing, the EPA representatives stated that the groundwater would be remediated to a standard of 70 ppb, and that the remaining chromium would all be chromium III. The RI, however, refers to a standard of 100 ppb, and does not seem to specify whether remediation would be considered complete if the maximum total chromium would be at that 100 ppb level, i.e. that most of the remaining chromium were still chromium VI.

Response: In November 2005, the NJDEP promulgated a new, more stringent GWQS for total chromium. NJDEP reduced the standard from 100 ppb to 70 ppb. While the RI referred to the 100 ppb level in effect at the time the document was drafted, the FS and Proposed Plan reflect the new, more stringent standard. The chromium in the groundwater will be cleaned to the current NJ GWQS standard of 70 ppb for total chromium. **Please also see the Response to Comment #19.**

Comment 48: Even the proposed level of 70 ppb is not established to be sufficiently protective of health; a stricter standard must be used. There is a great deal of uncertainty about the current chromium standards. The EPA standard does not distinguish between the highly toxic chromium VI and chromium III, and has recently raised the total chromium standard from 50 to 100. Community members question the validity of this approach to regulating chromium and the basis for raising the standard. They are also concerned about use of this total chromium standard in the unusual situation presented at this site, where over 90% of the chromium is hexavalent. The New Jersey state chromium standards have been shown to have been developed by industry scientists and to be based on junk science, which has led to them being reexamined by the DEP. A more stringent and protective standard is therefore called for at this site.

Response: EPA has developed an MCL for total chromium, which is, as the commenter notes, 100 ppb. The NJGWQS is more stringent than that, which is why EPA selected it to remediate this Site. Please note that the risk-based concentrations (for a Hazard Index of 1) for both hexavalent chromium (110 ppb), and trivalent chromium, (55,000 ppb) are greater than 100 ppb. The 70 ppb GWQS is protective even if 100% of the chromium in the groundwater were hexavalent Please also see the **Response to Part 2 Comment #19.**

Comment 49: The EPA ' s chosen remedy should have a demonstrated record of success. At the public hearing, community members questioned the EPA as to where the alternative proposed by EPA been used and with what results. They did not receive any information. The RI does

mention some sites where certain technology has been used, but the EPA should evaluate and provide information to the community about the demonstrated success rate of these proposed methods of clean up.

Response: **Please see the Responses to Part 2 Comments #1 and #15.**

Comment 50: The EPA must consider all viable alternatives and all combinations of alternatives. The community members also questioned whether EPA considered all possible alternatives and combinations of alternatives. The EPA has justified its selection by presenting information that shows that the remedy selected is both reasonable in cost and one of the quickest methods, but has not explained whether there could be some combination of treatments that would result in more complete remediation, such as combining the in situ treatment with some elements of the pump and treat method.

Response: Prior to performing a Feasibility Study, EPA screens the known remedial technologies for a site, and then selects the most likely candidates for further analyses. Pump-and-treat technology used to remedy the chromium plume in conjunction with in-situ treatment for the same plume would not offer any benefits nor resolve the inherent logistical problems with a pump-and-treat system at the site (as described in the FS). **Please also See the Responses to Part 2 Comments #4 and #43.**

Comment 51: The alternative selected must remediate all contaminants and result in full clean up of the site. EPA needs to develop another alternative which provides for remediation of ALL contaminants to drinking water and groundwater standards that are fully protective of health

Response: **Please See the Responses to Part 2 Comment #45 and #13.**

Comment 52: The EPA should develop and present to the community their strategy for securing funding from PRP ' s. The community representatives questioned the EPA about their plans for securing funding, and encouraging EPA to hold the polluters responsible. EPA should present their strategy to the public.

Response: **See Response to Part 2 Comment #33.**

Comment 53: Camden City is a low income, predominately African-American and Hispanic community. Census data shows that Camden City is the poorest city of its size in the country, with a poverty rate of more than 1/3 of the population, and that less than 10% of its residents are non-Hispanic whites.

Camden residents have suffered from disproportionate environmental burdens. Camden City has served as a dumping ground for undesirable polluting facilities such as the regional incinerator, regional sewage treatment plant, numerous hazardous waste and scrap recyclers, a cement grinding plant, and a gypsum plant. It also contains over 100 known contaminated sites. Camden residents have health conditions linked to environmental contamination. Camden residents already are exposed to numerous dangerous toxins, as reflected in elevated cancer and asthma rates.

The area surrounding the Puchack Superfund site is a predominately lower income area and also bears a high level of environmental contamination. Pennsauken, while not as impoverished an area as Camden City, is a lower to middle income community with a significant African-American and Hispanic population. There are a significant number of homes near the Puchack site. The area contains other contaminated sites, including the Pennsauken Landfill, and various industrial uses.

Concerns for environmental justice mandate that the EPA give special priority and consideration to conducting a prompt and thorough remediation of this site. EPA should begin the remedy the disparity in treatment of Camden residents by giving special priority in remediating this third, and hopefully last, Superfund site affecting Camden City.

Response: EPA intends to implement the selected remedy as quickly as possible and to continue to work closely with the community during the design and implementation of the OU1 remedy, and the selection of the OU2 remedy.

Comment 54: EPA should restrict future use of the site so as to not allow reuse of the well field as a drinking water source. The community finds it completely unacceptable to use the Puchack Wellfield as a water source, given the past history of the site, the contamination found in the area, and the uncertainties associated with remediation. The wells must be permanently closed and decommissioned.

Response: **See Response to Part 2 Comment #27.**

6) Comments from Henry S. Cole, Ph. D. Henry S. Cole & Associates, Incorporated

Comment 55: Failure to address VOCs and Cancer Risks

The Proposed Plan (p. 4) includes the following remedial action objective:

- Prevent or minimize potential current and future human exposures including groundwater ingestion and dermal contact with groundwater that presents a significant risk to public health and the environment.

- Minimize the potential for migration of chromium contaminated groundwater plume.

- Restore the chromium contaminated groundwater to drinking water standards within a reasonable time frame.

Clearly, these Remedial Action Objectives are critical to reduce the risks and potential drinking water supply problems associated with hexavalent chromium. However, the remedial action objectives fail to include protection against the risks associated with ingest ion and inhalation of volatile organic compounds (VOCs) associated with contaminated groundwater in and near the Puchack Well Field. Failure to include VOC objectives represents a major deficiency in the Proposed Plan since the Remedial Investigation (RI), the Human Health Risk Assessment

(HHRA) and the Feasibility Study (FS) for the site all acknowledge that the total cancer estimated cancer risks are driven by VOCs rather than chromium. Note the following quote from p. 6-2 of the HHRA describing the "Reasonable Maximum Exposure " cancer risk assessments:

> "Total excess lifetime cancer risks from residential use of Middle Aquifer groundwater as drinking water were above the range of 10^{-6} to 10^{-4} due to the presence of VOCs. The total excess lifetime cancer risk for adult residents is 4. 7 x 10^{-3}, primarily from inhalation of volatile chemicals from groundwater while showering (4.5 x 10^{-3}) and from water ingestion (1. 7 x 10^{-4}). As shown in Table 9. la, four VOCs accounted for 99% of the total inhalation cancer risks for adult residents: TCE (4.3 x 10^{-3}), benzene (1.0x 10^{-4}), PCE (5.7 x 10^{-5}), and 1.1-DCE (5.6 x 10^{-5}). The same four VOCs accounted for over 99% of the total ingestion cancer risks for adult residents: PCE (5. 7 x 10^{-5}), benzene (4.3 x 10^{-5}), 1, l-DCE (3.8x10^{-5}), and TCE (2.9x 10^{-5}).
>
> Child resident cancer risks are higher than the adult cancer risks. For child residents, risks from inhalation exposures are about 160 times higher than risks from groundwater ingestion and 1600 times higher than risks from dermal contact. The total excess lifetime cancer risk for child residents is 1.6 x 10^{-2}, primarily from inhalation of TCE from groundwater while bathing (1.5 x 10^{-2}). As shown in Table 9.2a, other chemicals that contribute to the inhalation risks for child residents include benzene (3. 7x 10^{-4}), PCE (2.1 x10^{-4}), and 1,1-DCE (2.0x 10^{-4}). Four VOCs accounted for over 99% of the total ingestion cancer risks: PCE (3.3 x 10^{-5}), benzene (2.5 x 10^{-5}), 1,1-DCE (2.2. x 10^{-5}), and TCE (1.7 x 10^{-5})."

Even the less conservative "Central Tendency " cancer risk estimates are significantly higher than EPA ' s acceptable risk range.

> "The total excess lifetime CT cancer risk for adult residents was 4.1 x 10^{-4}, and for child residents was 2.2 x 10^{-3}, primarily from inhalation of volatile chemicals from groundwater while showering or bathing water and from water ingestion. The total cancer risks for residents when the adult and child risks are combined (i.e., ages 0-30 years) under the CT exposure scenario is 2.6 x 10^{-3}, above the EPA threshold range of 10^{-6} to 10^{-4}." (HHRA, p. 6-6).

Response: EPA has noted that the VOCs commingled with the chromium plume would pose an unacceptable risk to human health if the groundwater were used, untreated, for example for showering or ingestion. It should be noted that currently no one is using untreated water from the Site. The RI and Human Health Risk Assessment examined potential risks, as described by the commenter.

As discussed elsewhere in this responsiveness summary, the groundwater throughout Camden County contains VOCs at levels, if untreated, would be unsuitable for use by the public. For that reason, virtually all public water supply Well Fields in the area contain a treatment system to remove VOCs to meet drinking water levels, as per state regulations. It is also for that reason that the Remedial Action Objectives for this Site specify both preventing exposure to untreated, contaminated water (through institutional controls) and to treat the chromium plume to

groundwater standards through in situ treatment. **Please also see the Responses to Part 2 Comments #13, #43 and #45.**

Comment 56: The Proposed Plan's preferred remedy (Alternative 3C) also fails to meet those ARARs (Applicable or Relevant and Appropriate Requirements) associated with the drinking water standards (MCLs) for volatile organic compounds including TCE, PCE, and benzene. Furthermore, with regard to its failure to address VOCs, the preferred remedy fails to meet the community acceptance criteria, (e.g., See comments from South Jersey Environmental Justice Alliance and the New Jersey Environmental Federation regarding VOCs).

Response: **Please see the Responses to Part 2 Comments #35 and #55.**

Comment 57: Finally, neither the Proposed Plan nor the Human Health Risk Assessment evaluate an additional pathway of exposure - that associated with the potential inhalation of VOCs in indoor air resulting from vapor intrusion into buildings from soil and groundwater into buildings. Please note:

- Consideration of this exposure pathway and associated risks is an established part of risk assessment where there are VOCs in soil and/or groundwater. EPA documents contain abundant guidance on estimation of risks associated with vapor intrusion.

- Vapor intrusion may result in a completed pathway at present and does not depend on current or future use of contaminated drinking water.

- This pathway is most likely to present a problem where (a) Volatile carcinogens are elevated (b) where homes and buildings are located in and adjacent to the site and probable sites for future buildings (c) where the contamination is relatively shallow and/or (d) where soils are relatively permeable.

- In estimating the cumulative/additive risks associated with volatile carcinogens, EPA should add the inhalation risks associated with vapor intrusion to those associated with inhalation of VOCs originating from drinking water. Adding inhalation risks is likely to show even higher exceedances of EPA ' s acceptable cancer risks and non-cancer hazard index.

- EPA should conduct an analysis to determine areas most vulnerable to vapor intrusion and develop an Addendum to the Proposed Plan that includes: (a) a soil vapor survey to better delineate the distribution of VOCs (b) an estimate cancer risk associated with vapor intrusion and an estimate of total cancer risk associated with all potential pathways of exposure including vapor intrusion and drinking water (c) a evaluation of the remedial technologies/alternatives necessary to reduce risks associated with soil vapor and (d) selection of remedy.

- The soil vapor survey is necessary to ensure that significant hot spots are determined. Moreover, soil vapor surveys can be accomplished quickly and cost-effectively using real time analytical methods (e.g. Membrane Interface Probes [MIPs], Field GC and automated optimization methods [Triad Approach has been used in NJ].

Response: EPA agrees with the commenter that vapor intrusion is a contaminant pathway that warrants evaluation. EPA will perform a vapor intrusion evaluation for the Puchack Well Field Site as part of Remedial Investigation activities for OU2

Comment 58: EPA gives several rationales for not addressing VOCs in groundwater as part of the Operable Unit I Groundwater Cleanup.

> "There is a wide variety of VOCs found commingled with the Site's chromium contaminated groundwater. The VOC contamination also extends well beyond the boundaries of the chromium plume. These (VOC) sources are being addressed individually under State authority and are not addressed as part of this Superfund action." (Proposed Plan, p. 3)
>
> "The groundwater at the Puchack Site is also contaminated with VOCs. The RI results show that VOC contamination is scattered in and around the Puchack Site: VOC contamination is therefore a regional problem rather than specific to the Puchack Site. Municipal wells in the area have existing treatment facilities to remove VOCs from the extracted groundwater. In the PE [preliminary evaluation] report, remedial options for treatment of VOC contamination have also been evaluated, in addition to the treatment for chromium contamination. The evaluation results indicate that an additional large quantity of groundwater would need to be pumped in order to capture the VOC plumes. It therefore increases substantially the technical complexity and cost to the remedy. Given the above, this FS will only consider treatment of extracted VOCs together with the chromium. VOC contamination will not be targeted for in-situ treatment nor specifically extracted for treatment." (Draft Groundwater Feasibility Study, p. 2-2)

None of the reasons cited are individually or collectively sufficient to exclude the consideration of VOCs which account for nearly all of the estimated cancer risks associated with the site:

The fact that the VOC plume appears to have more sources and extends beyond the chromium plume is not a valid excuse for excluding VOCs from the remedial process. The site is a well field with multiple sources, contaminants and risks.

The Proposed Plan neglects to describe and evaluate in situ technologies that could be used to address groundwater that is contaminated both with chlorinated VOCs and hexavalent chromium. Consider for example, EPA's case study entitled, An In Situ Permeable Reactive Barrier for the Treatment of Hexavalent Chromium and Trichloroethylene in Ground Water (Environmental Protection Agency, EPA/600/R-99/095a September 1999). Either the Permeable Reactive Barrier approach or an in situ geochemical approach using a similar chemical mechanism could be considered. The reactive medium was composed entirely of granular iron, with an average grain size of 0.4 mm. The reactive medium was selected from various mixtures on the basis of reaction rates with Cr(VI), TCE and degradation products.
http:/www.epa.gov/ada/download/reports/prbdesign_vl.pdf#search=%22in%20situ%20treatment%20of%20chromium%20VOCs%22
Why not include in the Record of Decision (ROD) bench scale and/or pilot tests on in-situ technologies that attempt to simultaneously reduce hexavalent chromium and VOCs?

Response: **Please see the responses to Part 2 Comments #13, #43, #45 and #55.**

Comment 59: The Proposed Plan doesn't identify or evaluate technologies that would be effective in preventing vapor intrusion. There are many approaches that can be considered especially for treating hot spots. These include soil vapor extraction (for VOCs in zone of aeration) and two-phase vacuum extraction (removes VOC in vapor, aqueous and product phases).

Response: EPA has not yet performed a vapor intrusion evaluation for the Puchack Well Field Site. It will be done as part of Remedial Investigation activities for OU2. **Please also see the Response to Part 2 Comment #57.**

Comment 60: Statements that local public water treatment can remove VOCs with well-head technologies (e.g. using air strippers, etc.) are problematic. The Preferred Alternative as currently written (a) provides no assurance that local jurisdictions will actually install the technology and (b) places an unfair burden on the local jurisdictions that operate the well fields and (c) doesn't address the vapor intrusion/indoor air issue. In essence the Proposed Plan represents a de facto "No-Action" alternative for VOCs. The proposed remedy is flawed in that the costs and risks to the public associated with this alternative have not been evaluated or included in the decision-making.

Response: As stated previously, the VOCs commingled with the chromium plume associated with the Puchack Well Field Superfund Site are not impacting any operating well field and the highest detections of VOCs found during the RI weren't commingled, but rather were outside and downgradient from the Site. And. as stated in the Proposed Plan and during the public meeting, the area-wide VOC groundwater contamination in Camden County goes beyond the limited chromium plume that impacted the Puchack Well Field. It is an area wide problem that is being addressed through various state actions targeting VOC source areas and including well head treatment.

All water from the area well fields are being regularly tested, under state authority, for VOCs and other contaminants to ensure compliance with NJ standards. This is the case for every well field not only in the region but also in the state. Additionally, virtually every well field in the area uses well head treatment to remove VOCs. **Please also see the Responses to Part 2 Comments #13, #23 and #57.**

Comment 61: That (VOC) sources are being addressed individually under Slate authority and are not addressed as part of this Superfund action provides neither specificity nor assurance to the public. If the NJ DEP has specific measures that would address the VOC problem they should be described in the Preferred Alternative and Record of Decision as a formal part of the remedial plan. What is needed is a holistic, well-integrated cleanup plan that effectively marshals state and federal resources to protect public health and critical groundwater resources.

Response: This remedy is not a region-wide groundwater cleanup, but rather it is a site remediation for a chromium plume that had impacted the Puchack Well Field. The fact that there are both federal and state actions taken concurrently in a geographical area is common. EPA will

continue to share groundwater and soil data collected during the OU1 Remedial Design and during the OU2 RI/FS with NJDEP. **Please also see the Responses to Part 2 Comments #13 and #60.**

Comment 62: Chromium-related Issues. As stated in Section 3.0, EPA should attempt to limit both total chromium and hexavalent chromium. This is necessary to prevent the migration of chromium to operating well fields, which may increase their pumping rates in the future to satisfy growing demand. However, as EPA acknowledges there are a number of hydrological and geochemical uncertainties associated with in-situ technologies. For example:

It is not certain that such technologies will actually be capable of delivering chemical reducing agents to all areas of contamination.

Despite a cleanup standard of 70 µg/L for total chromium, the in-situ chemical reduction approach is not specifically designed to remove total chromium. There is no assurance that some portion of chromium (VI) converted to chromium (III) will not revert to chromium (VI). Similarly, not all chromium (III) is necessarily immobilized (e.g. adsorbed and removed from solution); this process is also reversible under certain conditions.

Moreover, there is considerable uncertainty regarding the protectiveness of the 70 µg/L cleanup standard. Reconsideration of all standards and decisions regarding chromium is necessary given recent evidence that industry consultants manipulated evidence and in doing so may have weakened a number of chromium-related regulatory decisions, i.e.:

A *Washington Post* article (February 24, 2006) describes a George Washington University/ Public Citizen journal article documenting that scientists working for the chromium industry failed to report inhalation studies showing fivefold increase in lung cancer deaths from moderate exposures to chromium. The Post article states that, "Company-sponsored scientists later reworked the data in a way that made the risk disappear." The apparent twisting of the science occurred at the same time that the chromium industry lobbied to block strict new OSHA limits for hexavalent chromium in workplace air.

The Journal of Occupational and Environmental Medicine recently took the highly unusual step of retracting a 1997 article stating that the "financial and intellectual input to the paper by outside parties was not disclosed." The outside parties refer to consultants for PG&E who, according to investigative reports by the Wall Street Journal and the Environmental Working Group, manipulated data in the article in order to obscure a link between exposure to contaminated well water and cancer death rate found by a Chinese scientist.

We are aware that state agencies such as New Jersey and California are now re-examining regulatory decisions based on data provided by various chromium interests. The public must be reassured that chromium cleanup standards are protective. Moreover, reevaluation of the chromium cleanup standard should include consideration of recent evidence that ingestion of chromium-contaminated drinking water may be associated with certain forms of cancer. Costa M; Klein CB, "Toxicity and carcinogenicity of chromium compounds in humans" Critical reviews in toxicology, 2006 Feb; 36(2):155-63. Abstract: Chromium is a human carcinogen

primarily by inhalation exposure in occupational settings. Although lung cancer has been established as a consequence of hexavalent chromium exposure in smokers and nonsmokers, some cancers of other tissues of the gastrointestinal and central nervous systems have also been noted. Except for a few reports from China, little is known about the health risks of environmental exposures to chromium. Likewise, there has been a lack of epidemiological studies of human exposure to hexavalent Cr by drinking water or ingestion, and it has been suggested that humans can perhaps tolerate hexavalent Cr at higher levels than the current drinking water standard of 50 ppb. This review highlights the most recent data on the induction of skin tumors in mice by chronic drinking-water exposure to hexavalent chromium in combination with solar ultraviolet light. This experimental system represents an important new animal model for chromate-induced cancers by ingestion of drinking water, and it suggests by extrapolation that chromate can likely be considered a human carcinogen by ingestion as well.

For these reasons, I would strongly recommend a buffer (compliance) zone that uses significant exceedance of background chromium concentration (on the order of 10 µg/L) as a trigger to take further measures to protect active well fields in the area. (See recommendations for additional points).

Response: There are uncertainties with any remedy for any site, however that does not mean a remedy should not be implemented. EPA plans to limit the uncertainties during the design of the selected remedy, which will include a pilot study prior to start up. **Please also see the Response to Part 2 Comment #1.** As for the concerns about trivalent chromium converting back to the hexavalent form, **please see the Responses to Part 2 Comments #2, #3 and #18.** For concerns about the chromium standard **please see the Response to Part 2 Comment #48.**

EPA sees no need to develop a "buffer zone" as described in the comment. The chromium plume will be monitored until it is remediated. In the unlikely event that the chromium plume were to migrate in such a way to threaten an operating well field, the monitoring effort will detect the movement so appropriate actions can be taken. **Please also see the Response to Part 2 Comment #42.**

Comment 63: Community Involvement. I would strongly support SJLS calls for an extension of the comment period. The extension should be of sufficient length to allow SJEJA to obtain its TAG advisor. This would provide an opportunity for a more detailed technical review and to facilitate communication between the community organizations, the TAG advisor and officials from EPA and NJ DEP prior to the issuance of the Record of Decision. In my judgment, based on several decades in working with the public on cleanup issues, I believe that there is a definite need to build a more trusting relationship with the community. Providing an extended comment period and creating a more in depth technical dialogue will help to increase the level of trust.

Response: **Please see the Response to Part 2 Comment #9.**

Comment 64: In order to address the concerns and problems described above, I would recommend the following revisions in the Remedial Action Objectives:

1. Permanently close and decommission the Puchack Well Field in order to ensure that the public is not exposed to VOCs and chromium in their drinking water. EPA should restrict future use of the site so as to not allow reuse of the well field as a drinking water source. According to the South Jersey Legal Services Inc., the community including the South Jersey Environmental Justice Alliance is strongly opposed to reopening the Puchack Well field as a public water source. Similarly, the NJ Environmental Federation has urged that the former Puchack supply wells be permanently closed and decommissioned. I agree with these positions given the past history of the site, the contamination found in the area, and the uncertainties and potential time associated with remediation.

2. Place Operable Unit 2 [control of sources] on a fast track. Take timely and effective measures to reduce the levels of both VOC and chromium contamination in source regions in order to prevent the continued release and migration of contaminants, potential exposures.

3. Fully delineate the distribution of VOCs in the Puchack Field Site and its environs. Evaluate and select remedial options that address VOC contamination at the site as well as chromium. Identify areas with the potential for vapor intrusion of VOCs and take effective and timely measures to prevent exposure to indoor air resulting from vapor intrusion. (See previous discussion).

4. To the maximum extent feasible, undertake remedial actions designed to reduce the concentrations of all contaminants in Puchack Well Field groundwater including chromium as well as VOCs. (See previous discussion).

5. Reconsider the quantitative remedial goal for chromium-contaminated groundwater for the Puchack Site, as follows: (a) numerical cleanup standards should be set for both total chromium and hexavalent chromium. The standards should be based on a scientifically valid review of scientific data. The total chromium standard should be reduced substantially below she current 70 µg/L in order to incorporate an adequate margin of safety. Please note that both California and the World Health Organization uses 50 µg/L total chromium as for drinking water standard. California Department of Health Services, Chromium 6 in Drinking Water, Background Information, Dec. 2004. http://www.dhs.ca.gov/ps/ddwem/chemicals/chromium6/Cr+6backgroundinfo.htm

6. Establish a compliance zone around the Puchack Well field site. The compliance levels for groundwater should be set as background concentrations for chromium and risk levels of 10^{-6} and QI of I (for cancer and non-cancer risks respectively).

7. Take necessary, timely and effective measures to protect (a) currently operating well fields in the area and (b) portions of aquifers that are clean and potentially usable for water supply in the future. Significant exceedances of compliance zone standards will trigger additional efforts to reduce the potential for migration (including source reduction measures, hydraulic barriers and additional treatment measures).

8. The Record of Decision should include a coordinated plan for cooperation between NJ DEP and Region 2 EPA. This plan should detail efforts aimed to address all source areas and contaminants including VOCs.

9. Extend the comment period and facilitate technical dialogue prior to the issuance of a Record of Decision.

Response: The concerns on which the commenter's above 9 recommendations are based have been addressed in the responses to the same commenter's previous comments, and also elsewhere in this Responsiveness Summary. **Please see the Responses to Part 2 Comments #9, #13, #42, #43, #45 and #s 55-63**. Nevertheless, EPA appreciates and recognizes the commenters recommendations.

7) Comments from Merchantville-Pennsauken Water Commission

Comment 65: The MPWC wishes to go on record endorsing the U.S. Environmental Protection Agency's Preferred Alternative and stands ready to support the initiative. We would hope that upon issuance of the Record of Decision the designated remediation will begin in an expeditious manner.

Response: EPA plans on moving ahead with the OU1 remedy in as timely a manner as possible.

ATTACHMENT A

PROPOSED PLAN

Superfund Program
Proposed Plan

U.S. Environmental Protection Agency, Region 2

Puchack Well Field Superfund Site
July 2006

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternative for addressing a plume of chromium contaminated groundwater at the Puchack Well Field Superfund Site (Site) in Pennsauken Township, New Jersey.

The U.S. Environmental Protection Agency's (EPA's) Preferred Alternative is Alternative 3C, *in-situ* geochemical fixation of chromium contaminated groundwater. This remedy would also include groundwater monitoring and institutional controls.

EPA is addressing the cleanup of the Site in two phases, called Operable Units. This Proposed Plan is for Operable Unit 1 (OU1), which, as stated above, addresses the Site's chromium contaminated groundwater. The Site's Operable Unit 2 (OU2), which is currently in the planning stage, will address the potential sources of the contamination. EPA will issue a Proposed Plan for OU2 at a later date.

This Proposed Plan includes summaries of all cleanup alternatives evaluated for use at the site. This document is issued by EPA, the lead agency for site activities, and the New Jersey Department of Environmental Protection (NJDEP), the support agency. EPA, in consultation with NJDEP, will select the final remedy for OU1 after reviewing and considering all information submitted during a 30-day public comment period. EPA, in consultation with NJDEP, may modify the preferred alternative or select another response action presented in this Proposed Plan based on new information or public comments. Therefore the public is encouraged to review and comment on all the alternatives presented in this document.

EPA is issuing this Proposed Plan as part of its community relations program under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, or Superfund). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation and Feasibility Study (RI/FS) reports and other documents contained in the Administrative Record for this site.

SITE DESCRIPTION

The Site is located in a commercial, industrial and residential neighborhood of Pennsauken Township, Camden County, New Jersey. The size of the Site's OU1 is defined by the presence of chromium in the groundwater at concentrations at or greater than the NJ Groundwater Quality Standard for total chromium of 70 parts per billion (ppb).

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
July 7, 2006 – August 7, 2006
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: July 26, 2006
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held in the Fine Arts Building, 314 Linden St, Room 110, at Rutgers University Camden Campus at 7:00pm. Parking available in Lot 13, directly across from the Fine Arts Building.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center, Region 2
290 Broadway, 18th Floor.
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday - 9 am to 5 p.m., by appointment.

Pennsauken Free Public Library
5605 N. Crescent Boulevard
Pennsauken, NJ 08110
(856) 665-5959

Based on the most recent data, the chromium contaminated groundwater is situated in an area roughly bounded to the north by Route 90, to the east by Westfield Avenue, to the south by Cove Road, and to the west by the Conrail railroad track. Residences, schools, churches commercial buildings, industrial development, and two cemeteries occupy this area (Figure 1).

There are four water-bearing units in the local area's aquifer system; the Upper, Middle, Intermediate Sand and

Lower aquifers. The Upper aquifer within the vicinity of the site is dry and will therefore not be discussed in this document. The aquifers are distinct, separated by layers of sediment and clay known as "confining units" or beds of lower permeability than that of the aquifer units. The confining units are permeable in some areas, which can allow passage of groundwater from one aquifer to another.

During full scale operation of the Puchack Well Field, the local groundwater flow direction was probably toward the northeast, but now, since pumping has ceased, it has shifted back to the southeast. The current estimated groundwater flow velocity is 310 feet/year.

SITE HISTORY

Groundwater contamination was first detected at a limited number of wells at the Puchack Well Field in the early 1970s. Subsequent sampling in the early 1980s showed contamination in additional wells. In 1984 use of the well field as a source of potable water was terminated. Other well fields, which remain unimpacted by the chromium plume, continue to be used to meet local and regional water needs. However, controlled pumping of some wells was continued in order to contain the contaminant plume. This pumping was discontinued in 1998 due to the difficulties meeting treatment requirements.

In 1997, the United States Geological Survey (USGS), in cooperation with the NJDEP, initiated a field investigation of the groundwater contamination of the Pennsauken Township area. Based on sampling results from this USGS investigation, total chromium levels in the Middle aquifer were found to range from non-detectable levels to 10,250 ppb levels, in the Intermediate Sand aquifer ranged from 2.0 ppb to 9,070 ppb, and in the Lower aquifer the levels of chromium ranged from non-detect to 3,454 ppb. Groundwater underlying the Pennsauken Landfill was also found to contain levels of chromium, however that plume is distinct and not related to this Site.

The Puchack Well Field Site was placed on the National Priorities List (NPL) on March 6, 1998.

After several rounds of groundwater studies, performed by NJDEP, USGS, and EPA, the field investigations were completed in 2001. The final Remedial Investigation (RI) report describing the RI results was completed in January 2006.

The results of the OU1 RI are summarized below, and form the basis for the development of the FS report, which was released concurrently with this Proposed Plan. Both documents can be found in the Administrative Record for the site.

SITE CHARACTERISTICS

The objective of the groundwater investigation was to characterize the vertical and horizontal extent of chromium contaminated groundwater contamination at the site. Using the results of previous investigations as a base, EPA planned and implemented the OU1 RI field investigations with support from USGS. The RI field investigation included the completion of 44 soil borings, installation of 64 new monitoring wells, and collection of 135 groundwater samples from 88 monitoring wells. The majority of this work was conducted from July 2000 through June 2001.

Inorganic Contamination in Groundwater

The primary groundwater contaminant of concern at the Site is chromium in the hexavalent form (Cr(VI)), which is far more soluble (i.e., mobile) and far more toxic than the trivalent form (Cr(III)).

The concentration of Cr(VI) in the groundwater at any given location over time can be affected by several physical mechanisms. The concentration can be reduced through the physical replacement of contaminated groundwater with upgradient water, this process is called advection. Dilution also occurs as the uncontaminated groundwater flows into the plume area. The third mechanism is dispersion, which occurs when the permeability of sediments along the path of groundwater flow vary, this may cause contamination to spread ahead of the average groundwater flow, as well as laterally along the flow. All three of these mechanisms are occurring, to some extent, at the site and were enhanced during periods in which the Puchack Well Field wells were pumping.

The chromium groundwater concentrations can also be affected by chemical mechanisms, these mechanism typically decrease the concentration of the more soluble form of chromium (Cr(VI)). Under the moderately acidic conditions that prevail in much of the aquifer system local to the Site, some Cr(VI) may adsorb to the sediment. However, the adsorption process is reversible so the chromium may not be permanently bound to the sediments. Another chemical mechanism is the conversion (i.e., chemical reduction) of Cr(VI) to Cr(III). This process not only reduces the toxicity of the chromium, but causes it to precipitate out of the dissolved state and become immobile.

There are no longer any known active dischargers of

chromium at the Site. However, during periods when there was an active discharge of chromium, EPA believes the contamination would have moved down through the top soil layers into the Middle aquifer. The Cr(VI) plume continued to migrate both vertically and horizontally while being impacted by the reducing and adsorption factors of the sediments, depleting these factors over time.

The chromium contamination moved vertically until its movement was impeded by a impermeable confining unit. Then the plume moved eastward until it reached a permeable area of the confining unit and was able to migrate downward into the lower levels of the aquifer. Historically, during the period of active chromium discharge, it is believed the plume's velocity was much greater than it is now, perhaps as much as a thousand feet a year. Given both the current groundwater velocity of 310 ft/yr and the retardation factor for chromium in present conditions, the Cr(VI) plume now has an estimated velocity of between 5 and 12 ft/yr. Due to its much higher retardation factor, the Cr(III) in the groundwater is relatively immobile.

Volatile Organic Compounds (VOCs) in the Aquifer

There is a wide variety of VOCs found commingled with the Site's chromium contaminated groundwater. The VOC contamination also extends well beyond the boundaries of the chromium plume. The VOC contamination is a regional problem derived from multiple sources unrelated to the Site. These sources are being addressed individually under State authority and are not addressed as part of this Superfund action.

The most prevalent VOCs within the site are halogenated aliphatic compounds such as tetrachloroethylene (PCE), trichloroethylene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA). The fate of the organic contaminants in groundwater often depends on the interactions with microbes in the aquifer. However, as with the chromium contaminants, decreases in concentration of VOCs at a specific location over time can also be the result of physical and chemical mechanisms.

The VOC contamination within the Site originated from a number of sources, and appears to have moved from the Middle aquifer, through more permeable lenses in the confining units, into the Intermediate Sand and Lower aquifers. As mentioned previously, this has occurred over an area that overlaps and extends well beyond the boundaries of the chromium plume. It is likely that in areas where the VOCs and chromium occur together, they will compete for the natural substrate's capacity to chemically reduce contamination.

SUMMARY OF OPERABLE UNIT 1 RISKS

Although only the chromium contaminated groundwater is being addressed through the OU1 remedial action, the human health risk assessment (HHRA) evaluated the risks from all contaminants in the groundwater at the Site, including the VOC. The HHRA, which is part of the Site's RI, identified exposure routes and human receptor groups and provided quantitative estimates of the magnitude, frequency and duration of exposure. As residential use of groundwater can include exposure via ingestion, dermal contact and inhalation (e.g., during showering), the HHRA for the FS evaluated these exposure routes.

OU1 addresses chromium contaminated groundwater. The contaminated groundwater is not impacting surface water resources, therefore an ecological risk assessment for this operable unit was not performed. EPA will assess the ecological risk from this Site as a part of the OU2 RI.

In this assessment, exposure point concentrations were estimated using the minimum of the 95 percent upper confidence (UCL) and the maximum concentration. Chronic daily intakes were calculated based on the reasonable maximum exposure (RME), which is the highest exposure reasonably expected to occur at the site. The RME is intended to estimate a conservative exposure case that is still within the range of possible exposures. Central tendency (CT) exposure assumptions were also developed.

Human Health Risk Assessment Findings

The carcinogenic risks and non-carcinogenic risks for groundwater exposures at the Site showed values that exceeded both EPA's target risk range for carcinogens and a Hazard Index (HI) of 1 (please see the box on the following page for an explanation of these terms).

The total excess lifetime cancer risk from residential use of Middle aquifer groundwater was determined to be 2.1×10^{-2} for the RME exposure scenario. The cancer risk for that population was 2.6×10^{-3} when CT exposure assumptions were used. For the groundwater in the Lower aquifer, the excess lifetime cancer risk from residential use was 2.3×10^{-3} for the RME

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a "reasonable maximum exposure" scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines exposure information and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a "one-in-ten-thousand excess cancer risk"; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a "hazard index" (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a "threshold level" (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

exposure scenario and 2.9×10^{-4} for the CT exposure scenario.

Thus the CT and RME exposures to groundwater from either the Middle and Lower aquifers would result in an excess lifetime cancer risk that exceeds EPA's target risk range of 10^{-4} to 10^{-6}. The chemicals that contribute most significantly to residential cancer risks estimates include TCE, PCE and 1,1- DCE.

The HI for groundwater from the Middle aquifer for both the RME and CT exposure scenarios were 180 and 47. The HI for the RME and CT exposure scenarios for the Lower aquifer were 60 and 16 respectively. Using either exposure scenario, both the Middle and Lower aquifers had non-carcinogenic risks above the acceptable HI of 1. The chemicals that contributed most significantly to the residential HI estimates for the aquifers were chromium, as well as TCE, and manganese. The manganese is believed to be naturally occurring.

REMEDIAL ACTION OBJECTIVES

The following remedial action objectives address the human health risks and environmental concerns posed by chromium contaminated groundwater at the Site:

- Prevent or minimize potential current and future human exposures including groundwater ingestion and dermal contact with groundwater that presents a significant risk to public health and the environment.

- Minimize the potential for migration of the chromium contaminated groundwater plume.

- Restore the chromium contaminated groundwater to drinking water standards within a reasonable timeframe.

There are currently no complete pathways to Site contaminated groundwater, because there are no known chromium contaminated wells in use. However, if contaminated groundwater were to be used as a drinking water source in the future, significant health risks would exist. In addition, if contaminated groundwater were used in industrial processes, significant human health risks may exist. Thus remedial actions must minimize the potential for human exposure to contaminated groundwater.

The cleanup of this Site is based on remediating the chromium contaminated groundwater to within acceptable levels, which in this case would be the NJ Groundwater Quality Standard for total chromium, 70 ppb. This is

more conservative than EPA's Maximum Contamination Level (MCL) for total chromium, 100 ppm. The cleanup goal was selected to both reduce the risk associated with exposure to contaminants to an acceptable level and to ensure minimal migration of contaminants.

The risk posed by VOCs will be addressed, as indicated previously, through State actions. Such measures as well-head treatment are being used, as appropriate, to address VOCs at public supply wells.

SUMMARY OF REMEDIAL ALTERNATIVES

Potential applicable technologies were identified and screened using effectiveness, implementability and cost as the criteria, with the most emphasis on the effectiveness of the remedial action. Those technologies that passed the initial screening were then assembled into four remedial alternatives.

Except for the No Action Alternative (Alterative 1), each groundwater remedial alternative would be coupled with institutional controls to limit the potential exposure of the public to the chromium contamination in the groundwater. Institutional Controls are typically restrictions placed to minimize human exposure, while allowing continued monitoring to track contaminant migration. Institutional Controls are generally used in conjunction with other remedial technologies. Consistent with expectations set out in the Superfund regulations, none of the remedies rely exclusively on institutional controls to achieve protectiveness.

The time frames below for construction do not include the time for designing the remedy nor the time to procure necessary contracts. Because each of the action alternatives are expected to take longer than 5 years, a Site review will be conducted every 5 years (Five Year Reviews) until remedial goals are achieved.

Alternative 1 - No Action

The No Action alternative was retained for comparison purposes as required by the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). No remedial actions would be implemented as part of the No Action alternative. This alternative does not include institutional controls.

Total Capital Cost	$0
Operation and Maintenance	$0
Total Present Net Worth	$0
Timeframe	0 years

Alternative 2 - Monitored Natural Attenuation (MNA)/Institutional Controls /*In-Situ* Treatment (Contingency Remedy)

In this alternative, hexavalent chromium would be allowed to be reduced to trivalent chromium by the natural reducing capacity of the aquifer sediment. Hexavalent chromium is toxic, mobile (i.e., soluble in water), and highly unstable. It can easily be reduced to trivalent chromium by chemicals (e.g., ferrous iron) found in soil and groundwater. Trivalent chromium is relatively non-toxic, not mobile (precipitated out from water and fixated to soil particles), and extremely stable. The reaction is not reversible under normal environmental conditions. A bench scale study has demonstrated that the reduction capacity in the aquifer sediment is sufficient to

THE NINE SUPERFUND EVALUATION CRITERIA

1. **Overall Protectiveness of Human Health and the Environment** evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

3. **Long-term Effectiveness and Permanence** considers the ability of an alternative to maintain protection of human health and the environment over time.

4. **Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment** evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

5. **Short-term Effectiveness** considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.

6. **Implementability** considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

7. **Cost** includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

8. **State/Support Agency Acceptance** considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

9. **Community Acceptance** considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

reduce the hexavalent chromium in the plume. Due to the reduction and retardation properties of the aquifer, it is expected that the chromium plume would only migrate slowly (up to tens of feet per year) and would not migrate far.

If this Alternative were to be selected, monitoring wells would be installed downgradient of the contaminated plume to provide a point of reference for the monitoring program. Groundwater within the plume would be sampled to monitor the contaminant concentrations and hexavalent chromium reduction over time. Additional monitoring wells may be installed, as necessary, to allow for comprehensive monitoring of the contaminated groundwater. If monitoring indicates that a certain portion of the plume has migrated past the downgradient monitoring wells, an *in-situ* treatment remedy would be implemented. Depending on the *in-situ* treatment approach, either a permeable reactive barrier (PRB) (Alternative 2A), or geochemical fixation (Alternative 2B) would be used. Institutional controls, such as the establishment of a groundwater classification exception area (CEA), would be implemented to prevent exposure to contaminated groundwater.

Alternative 2 (MNA only)	
Total Capital Cost	$308,000
Operation and Maintenance	$838,000 (cumulative for 30 years)
Total Present Net Worth	$1.2 million
Timeframe	30 years

Alternative 2A (MNA with PRB as the Contingency Remedy)	
Total Capital Cost	$9.43 Million
Operation and Maintenance	$1.03 Million (cumulative for 30 years)
Total Present Net Worth	$10.5 Million
Timeframe	<30 Years

Alternative 2B (MNA with in situ geochemical fixation as the Contingency Remedy)	
Total Capital Cost	$6.74 Million
Operation and Maintenance	$1.03 Million (cumulative for 30 years)
Total Present Net Worth	$7.8 Million
Timeframe	<30 Years

Alternative 3 – *In-Situ* Treatment/MNA/Institutional Controls

In this alternative, an *in-situ* treatment zone would be created using reducing agents in selected areas either downgradient of or within the plume area. The chemical agents would reduce hexavalent chromium to trivalent chromium in the Middle aquifer, Intermediate Sand and Lower aquifer. Depending on the *in-situ* treatment approach, either PRB (Alternative 3A), or geochemical fixation (Alternative 3B and 3C) would be selected.

The PRB and geochemical fixation differ not only on the typical treatment agents used, but also in how they are applied. In geochemical fixation the treatment reagents are injected directly into the groundwater plume. PRBs are areas of chemical reagents injected in a barrier along the route of the groundwater's travel. The groundwater is treated as it passes through the barrier.

Alternatives 3A and 3B would target the portion of the chromium plume greater than 1,000 ppb, leaving the remainder of the plume to be reduced through natural process. Alternative 3C would treat the entire chromium plume that is above the 70 ppb total chromium cleanup goal. The 70 ppb chromium groundwater plume is roughly 3 to 4 times larger in area than portion of the plume characterized by 1,000 ppb of chromium.

Alternatives 3A and 3B would include contaminated groundwater that does not undergo *in-situ* treatment. In those untreated areas, hexavalent chromium would be reduced to trivalent chromium by the natural reducing capacity of the aquifer. Alternative 3C would directly treat all groundwater that has a chromium concentration greater than the NJ Groundwater Quality Standards.

Groundwater monitoring and institutional controls, such as the establishment of a groundwater CEA, would be implemented to prevent exposure to contaminated groundwater.

Alternative 3A (PRB>1,000 ppb)	
Total Capital Cost	$13.6 Million
Operation and Maintenance	$838,000 (cumulative for 30 years)
Total Present Net Worth	$14.5 Million
Timeframe	<30 Years

Alternative 3B (in situ geochemical fixation>1000ppb)	
Total Capital Cost	$11.1 Million
Operation and Maintenance	$838,000 (cumulative for 30 years)
Total Present Net Worth	$12.0 Million
Timeframe	<30 Years

Alternative 3C (in situ geochemical fixation>70 ppb)	
Total Capital Cost	$16.7 Million
Operation and Maintenance	$838,000 (cumulative for 30 years)

Total Present Net Worth	$17.6 Million
Timeframe	5 – 10 Years

Alternative 4 – Groundwater Extraction/Treatment/Off-Site Disposal/Long-Term Groundwater Monitoring/ Institutional Controls

In this alternative, contaminated groundwater would be extracted from the aquifer and treated "*ex-situ*", meaning in a newly constructed water treatment facility. Treatment of extracted groundwater would include inorganic removal using chemical reduction and precipitation with ferrous iron as a reducing agent, and VOC removal using air stripping. Treated water would be re-injected into the aquifer through injection wells. Excess groundwater would be discharged to off-site surface water. Groundwater monitoring would be performed to evaluate changes in contaminant concentrations and distributions over time. Institutional controls, such as the establishment of a groundwater classification exception area (CEA), would be implemented to prevent exposure to contaminated groundwater

Total Capital Cost	$13.6 Million
Operation and Maintenance	$18.1 Million (cumulative for 30 yrs)
Total Present Net Worth	$32.1 Million
Timeframe	>30 Years

Evaluation of Remedial Alternatives

The groundwater alternatives were evaluated according to the following criteria:

Overall Protection of Human Health and the Environment

Alternative 1 would not provide protection of human health, since contamination would persist in groundwater, and potential exposure to contaminated groundwater would not be restricted. There is no mechanism to monitor the migration of the contaminant. Alternatives 2 through 4 are equally protective of human health by implementation of institutional controls restricting the future use of contaminated groundwater. Alternative 2 would utilize the natural reductive capacity of the aquifer to reduce and fixate the hexavalent chromium.

A limited number of groundwater samples has shown that hexavalent chromium concentrations have been attenuated by more than 50 percent between 1998 and 2000. A bench scale study has shown that the aquifer sediment has an adequate reductive capacity to reduce the hexavalent chromium plume. Alternative 2 also includes *in-situ* treatment as a contingency remedy should any part of the chromium plume migrate past an established compliance zone. Alternatives 3 and 4 would utilize active treatment processes to reduce the toxicity, mobility and volume of the contaminants.

Alternative 1 would not be protective of the environment. Alternatives 2 through 4 would provide protection of the environment as the contaminant migration would be restricted by natural attenuation or active treatment, and would not migrate to other media.

Compliance with Applicable or relevant and Appropriate Requirements (ARARs)

Alternative 1 would not comply with chemical-specific ARARs (i.e., the 70 ppb chromium clean-up goal), while Alternative 2 through 4 would comply with chemical-specific ARARs and achieve remedial goals in the long-term. Long-term groundwater monitoring is a component of Alternatives 2 through 4 to assess the degree of compliance achieved over time. All alternatives would comply with location- and action-specific ARARs.

Long-Term Effectiveness and Permanence

Alternative 1 would not be effective or permanent, since the contaminants would not be monitored and there would be no mechanism to prevent future exposure to contaminated groundwater. Alternatives 2 through 4 would be effective when combined with institutional controls. Alternative 2 would rely on natural mechanisms to reduce contaminant levels. The results from groundwater sampling and a bench scale study have demonstrated this would be a viable approach. Alternative 2 also includes active *in-situ* treatment as a contingency remedy should the chromium plume migrate past a compliance zone. Alternatives 3 and 4 would actively treat contaminants. The effectiveness of these alternatives would be assessed through periodic groundwater monitoring and five-year reviews. The relative degrees of effectiveness and permanence associated with Alternatives 2, 3, and 4 are generally comparable, however it is expected that Alternatives 3 would meet the cleanup goals more quickly than Alternative 2. It is believed that Alternative 3C, which addresses the entire chromium plume, would meet the cleanup goals in the shortest timeframe.

The *in-situ* treatment technologies under Alternatives 2 and 3 have been implemented at other Superfund sites. Additional bench scale studies and a pilot scale treatability study would be required to develop design parameters.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternative 1 would not reduce the toxicity, mobility, and volume (TMV) through treatment as no active treatment of contaminated groundwater occurs. The toxicity and volume would eventually be reduced for Alternatives 1 and 2 by the natural reduction capacity of the aquifer sediment. Alternative 2 would reduce the TMV through treatment if the *in-situ* treatment were implemented. It is expected that Alternatives 3 and 4 would significantly reduce the TMV of the contaminated groundwater through treatment in a quicker time frame than Alternative 2. These alternatives involve reduction and immobilization of contaminants in the groundwater, thereby reducing toxicity. It is anticipated that Alternative 3 would achieve the most reduction in TMV in the shortest duration. Alternatives 2 and 4 would achieve reduction of toxicity and volume in the long-term.

Short-Term Effectiveness

For Alternative 1, protection of the community and workers during remedial activities would not be applicable as no remedial action is occurring. Air monitoring, engineering controls and appropriate worker personal protective equipment (PPE) would be used to protect the community and workers for Alternatives 2 through 4.

There are no potential adverse impacts associated with construction and implementation of Alternative 1. Construction of the injection wells under Alternative 2 (if required as a contingency remedy) would have temporary negative impacts on the commercial, business and the residences located near the proposed installation location. Alternative 3 would also have temporary impact to the commercial business and residences due to installation and operation of injection wells.

Alternative 4 would have the greatest short term impacts to the community. The pump and treat system would be operated for approximately 30 years in commercial, business and residential areas. This would entail significant construction, including installation of pipes to carry water from recovery wells to a treatment plant, and then the treated water back to re-injection wells.

Alternative 3C – *In-Situ* Geochemical Fixation would achieve the cleanup goals in the shortest duration, expected to be in the five- to ten-year range. A definitive timeframe to meet the cleanup goals for Alternatives 2, 3A, 3B and 4 is unknown, but would be significantly longer (at least twice as long) than Alternative 3C. It is expected that Alternative 4 would take the longest of the action Alternatives.

Implementability

Alternative 1 would be easiest both technically and administratively to implement. Alternatives 2 and 3 would be moderately difficult to implement. Alternative 4 is the most difficult to implement as there is limited space available to lay the necessary piping and to build the treatment facility. Also significant uncertainties remain on how effectively the treated water can be re-injected into the aquifer, a potentially more costly and logistically difficult alternative for the excess treated water may have to be found if this Alternative were to be selected. Alternatives 2, 3 and 4 would require access agreements from the neighboring properties. Alternative 4 may also require the government to lease or purchase properties for the treatment facility.

Cost

Alternative 1 incurs no cost but also provides no protection to human health or the environment. Alternative 2 costs are low unless the *in-situ* treatment contingency remedy is required. Alternative 3 costs are higher than Alternative 2, and Alternative 4 is by far the most expensive.

The cost estimates for the *in-situ* treatment technologies under Alternatives 2 and 3 are highly dependent on the effective radius of treatment. The cost estimates could vary significantly should the site conditions differ from the cost assumptions. Cost sensitivity analyses were performed for Alternatives 3A, 3B, and the 3C. Cost increases up to 71 percent were experienced if the injection point spacing was reduced by half. Other factors that could have significant effect on the cost estimates may include the injection duration at each location and the number of injection events.

State/Support Agency Acceptance

The State of New Jersey is still evaluating EPA's Preferred Alternative in this Proposed Plan.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for this site. The Record of Decision is the document that formalizes the selection of the remedy for a site.

SUMMARY OF THE PREFERRED ALTERNATIVE

The Preferred Alternative for cleanup of the groundwater at the Puchack Well Field Site is Alternative 3C, *In-Situ* Treatment/MNA/Institutional Controls, hereafter referred to as the Preferred OU1 Alternative.

In the Preferred OU1 Alternative, an *in-situ* treatment zone would be created using reducing agents within the contaminated plume area. The chemical agents would reduce hexavalent chromium to trivalent chromium in the contaminated aquifers. Geochemical fixation would be used to treat the entire area of groundwater that contains chromium above the cleanup goal of 70 ppb.

While the financial costs of this alternative are relatively high, those costs are outweighed by the clear benefits of the remedy. Unlike Alternative 4, the Preferred OU1 Alternative has relatively few impacts to the local community during construction and operation of the action. This alternative would also remediate the chromium plume significantly more quickly, perhaps two or three times faster, than any of the other actions.

Because an estimated 5 to 10 years would be required before restoration of the groundwater is achieved from the initiation of the remedy, the Preferred OU1 Alternative includes groundwater monitoring to ensure that human health and the environment are protected, and institutional controls such as a Classification Exception Area, and well restrictions. Also, as per EPA policy, 5 Year Reviews will be performed until remedial goals are achieved

COMMUNITY PARTICIPATION

EPA provided information regarding the cleanup of the Puchack Well Field Superfund Site to the public through meetings, the Administrative Record file for the site and announcements published in the Courier-Post. EPA encourages the public to gain a more comprehensive understanding of the Site and the Superfund activities that have been conducted there.

The dates for the public comment period, the date, the location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan. EPA Region 2 has designated a public liaison as a point-of-contact for the community concerns and questions about the federal Superfund program in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. To support this effort, the Agency has established a 24-hour, toll-free number that the public can call to request information, express concerns or register complaints about the Superfund program.

George H. Zachos
Toll-free (888) 283-7626
(732) 321-6621
U.S. EPA Region 2
2890 Woodbridge Avenue, MS-211
Edison, New Jersey 08837

For further information on EPA's preferred alternative for the Puchack Well Field Superfund Site:

Jon Gorin	Natalie Loney
Remedial Project Manager	Community Relations
(212) 637-4361	(212) 637-3639

U.S. EPA
290 Broadway 19th Floor
New York, New York 10007-1866

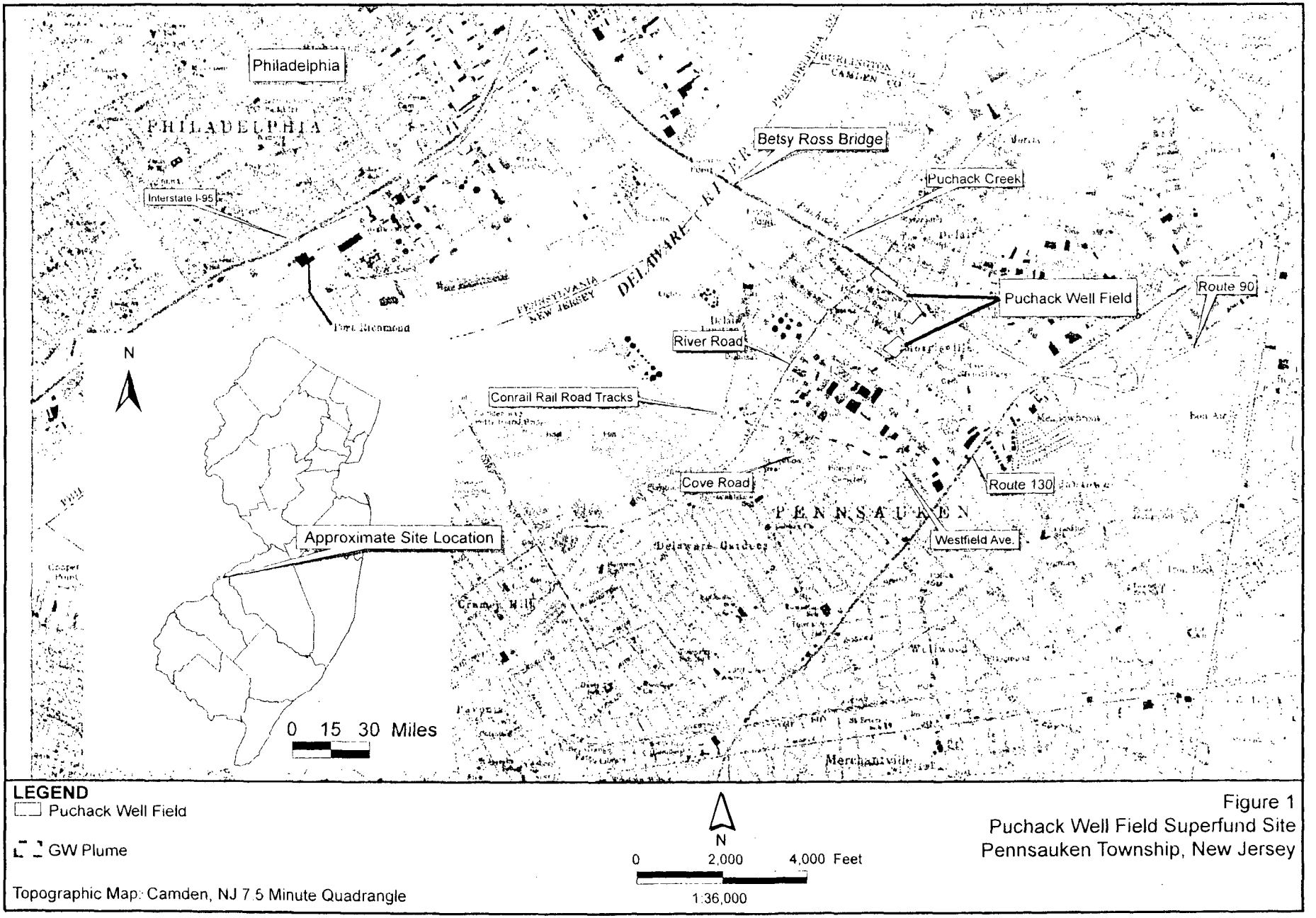

Figure 1
Puchack Well Field Superfund Site
Pennsauken Township, New Jersey

ATTACHMENT B

PUBLIC NOTICE

Proposed Cleanup for the Puchack Well Field Superfund Site Pennsauken Township, Camden County, New Jersey

The United States Environmental Protection Agency (EPA) announces the opening of a 30-day public comment period on a Proposed Plan which addresses the cleanup of chromium contaminated groundwater at the Puchack Well Field Superfund Site in Pennsauken Township, Camden County, New Jersey. As part of the public comment period, EPA will hold a public meeting on **Wednesday, July 26, 2006, at 7:00 p.m.** in the **Fine Arts Building, 314 Linden St., Room 116, at Rutgers University Camden Campus - parking available in Lot 13.** The meeting, which will address the proposed cleanup, will allow community members to comment on the Proposed Plan to EPA officials. A final copy of the Remedial Investigation and Feasibility Study (RI/FS) for the chromium contaminated groundwater and the Proposed Plan may be reviewed in the Pennsauken Free Public Library, 5605 Crescent Boulevard, Pennsauken, NJ and at the EPA Region 2 Records Center located at 290 Broadway, 18th Floor in New York City.

EPA has divided the site into two Operable Units (OUs). The first operable unit (OU1), which is the focus of the Proposed Plan, addresses chromium contaminated groundwater. The second operable unit (OU2) will address the potential sources of the chromium contamination.

Based upon the results of the OU1 RI/FS, EPA prepared a Proposed Plan that describes the cleanup alternatives developed and EPA's rationale for recommending a Preferred Alternative. EPA developed and evaluated the following four alternatives:

Alternative 1:	**No Action**
Alternative 2:	**Monitored Natural Attenuation/In-Situ Treatment (Contingency Remedy)/Institutional Controls**
Alternative 3:	**In-Situ Treatment/Monitored Natural Attenuation/Institutional Controls**
Alternative 4:	**Groundwater Extraction/Treatment/Off-Site Disposal/ Long Term Monitoring/Institutional Controls**

EPA recommends Alternative 3C for the Preferred Alternative in the Proposed Plan. Alternative 3C specifies using geochemical fixation in-situ for the entire area of the plume that contravenes applicable groundwater standards for chromium.

Before selecting a final remedy, EPA and the New Jersey Department of Environmental Protection will consider all written and oral comments on this preferred remedy. All comments must be received on or before August 7, 2006. The final decision document, or Record of Decision, will include a summary of public comments and EPA's responses.

Comments will be accepted in person at the public meeting and/or in written form through August 7, 2006. Please address all written comments to:

Jon Corin
Remedial Project Manager
U.S. Environmental Protection Agency
290 Broadway, 19th Floor
New York, New York 10007-1866

corin.jonathan@epamail.epa.gov

Natalie Loney
Community Involvement Coordinator
U.S. Environmental Protection Agency
290 Broadway, 26th Floor
New York, New York 10007-1866
loney.natalie@epamail.epa.gov
(800) 346-5009

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 2 INVITES PUBLIC COMMENT

U.S. ENVIRONMENTAL PROTECTION AGENCY ANNOUNCES AN EXTENSION OF THE 30-DAY PUBLIC COMMENT PERIOD FOR THE PROPOSED REMEDY FOR THE PUCHACK WELL FIELD SUPERFUND SITE'S OPERABLE UNIT ONE PENNSAUKEN, CAMDEN COUNTY, NEW JERSEY

The U.S. Environmental Protection Agency (EPA) announces an extension of the 30-day public comment period for the Operable Unit One of the Puchack Well Field Superfund Site's Proposed Remedy.

The comment period was originally scheduled to run from July 7, 2006 through August 7, 2006. At a public meeting held at the Rutgers University Camden Campus on July 26, 2006, a comment period extension was requested to give interested parties additional time to study and comment on EPA's preferred alternative.

The close of the public comment period is now September 6, 2006.

Before selecting a final remedy, EPA and the New Jersey Department of Environmental Protection will consider all written and oral comments on the preferred remedy submitted within the extended comment period. All comments must be received on or before September 6, 2006. The final decision document, or Record of Decision, will include a summary of public comments and EPA's responses.

Please address all written comments to:

Jon Gorin
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290 Broadway, 19th Floor
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ATTACHMENT

D WRITTEN COMMENTS

SIEMENS Water Technologies

Environmental Services – 2430 Rose Place – Roseville, MN 55113

Telephone 651-638-1325
Cellular 612-308-9243
email timothy.peschman@siemens.com

August 4, 2006

Mr. Jon Gorin
Remedial Project Manager – Puchak Well Field Superfund Site
United States Environmental Protection Agency
290 Broadway – 19th Floor
New York, New York 10007-1866

Re: Record of Decision – Operable Unit 1 – Puchak Well Field Superfund Site, Pennsauken Township, NJ

Dear Mr. Gorin:

I represent Siemens Water Technologies Corp, a global water treatment firm that provides considerable remediation alternatives for various organics and inorganics in contaminated groundwater, allowing the contaminated groundwater to be used for potable purposes. Corporately, the Siemens Water Technologies Corp division is based out of Warrendale, PA with corporate headquarters for the parent company (Siemens AG) located in Munich, Germany. My office is based out of Roseville (Minneapolis), Minnesota. I am the Product Manager for Remediation for Siemens Water Technologies Corp, and work directly with regulators, PRP's, insurance firms, and/or water purveyors to provide potable water from contaminated groundwater sources.

We have reviewed the Proposed Plan for the Puchak Well Field Superfund site and the associated monetary data developed as costing for the treatment alternatives within the plan. We have a number of concerns which, we believe, should be addressed prior to any selection of technology:

1. The in situ effort for the reduction of hexavalent chromium to trivalent chromium can not be guaranteed based upon the hydrogeological occludes and non-homogeneity of the soils - the mixing of materials added by injection to provide an in situ reducing environment within the groundwater for the reduction of Cr^{6+} to Cr^{3+} is, at best, an art, and can not, given the non-homogeneity of the soils, be expected to be thoroughly mixed and/or dispersed throughout the extent of the aquifer. We have seen numerous attempts at in situ treatment that have failed, with the residues of the materials injected still present when another (non in-situ) treatment is tried for

the cleanup after the failure of the in situ treatment, making another attempt at treatment more difficult (i.e. adding to the problem instead of eliminating it).

2. The reduction of Cr^{6+} to Cr^{3+} does not eliminate the problem, it only masks it – changing the chromium to a different oxidized state does not eliminate the need to maintain the total chromium standard as set forth by the State of New Jersey (70 ppb). In those areas of the plume where the chromium concentrations exceed the total chromium level of 70 ppb, treatment will still be required to reduce the total chromium levels. A natural attenuation of the chromium within the aquifer will not mitigate this problem.

3. The reduction of Cr^{6+} to Cr^{3+}, if treatment is required, will make this treatment much more costly – by reducing the Cr^{6+} to Cr^{3+}, if treatment is required, the removal of Cr^{3+} can only be removed by precipitation technologies. A less expensive, ion exchange alternative, would not be available for this, as Cr^{3+} is not well ionized nor well attracted to ion exchange medias. For this reason also, we question the EPA's statements that "Trivalent chromium is relatively non-toxic, not mobile (precipitated out from water and fixated to soil particles), and extremely stable." Cr^{3+} is not well ionized, as we indicated earlier, and thus is not attracted to ion exchange sites within soils. As such, therefore, unless the Cr^{3+} is precipitated as a sulfate, it is very mobile within the aquifer. The only way to prevent the mobility would be to precipitate the Cr^{3+} (generally as a sulfate). Ferrous sulfate is normally used for this, in wastewater applications, but the resultant effluent stream has significant pH swings based upon water chemistry and could require significant secondary in situ treatment of the aquifer to bring these levels to within potable limits. We don't believe that these costs, nor the inherent mixing risks we discussed earlier have been considered in the costing for this alternative.

4. The EPA did not consider a much less costly ex situ treatment technology (once through ion exchange) in their costing for alternatives and have thus not truly represented ex situ treatment costs – Siemens Water Technologies Corp, as well as others, are participating in a large EPA study at the Glendale/Burbank (CA) Chromium Superfund Site for the removal of hexavalent chromium in potable water. Chromium, in the hexavalent state, though more toxic, as the EPA indicates, is much more readily (inexpensively) removed by ion exchange, as the Cr^{6+} is fully ionized and removed by ion exchange mediums. The ion exchange resins then accumulate the hexavalent chromium and are then disposed of in accordance with EPA procedures. A number of technologies have been (and are being) evaluated by the EPA's contractor, McGuire Malcolm Pirnie, for the removal of the hexavalent chromium. We have developed an ion exchange resin that is significantly more efficient and less costly to operate for the removal of hexavalent chromium and we think this technology is probably much more economical and certainly more predictable and reliable than an in situ method that is fraught with unknowns. At the EPA's request, we would like the ability to demonstrate this technology, either in a bench scale or pilot scale form to prove this point.

We appreciate the opportunity to provide comments to the EPA's Puchak Well Field Superfund Site. I am available at the phone numbers below, if the EPA would like to discuss these comments further.

Very truly yours;

Tim Peschman
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NJ ENVIRONMENTAL FEDERATION
Working Everyday to Prevent Harm to the Environment, Public Health & Our Communities

Comments on Puchak Well Field Superfund Site July 2006 EPA Proposed Plan
Submitted July 26, 2006
Updated August 31, 2006

Please consider these comments on the proposed cleanup plan for the Puchak Well Field Superfund Site. The NJ Environmental Federation asks that EPA keep the record open on this matter beyond the Sept. 7th, 2006 deadline for comments, because a full public process with informed testimony bolstered by a technical consultant to the community has not transpired in the short amount of time from the public meeting to the close of comments. A TAG grant has been applied for but not yet received, therefore the benefit of a fully vetted discussion on remedial alternatives has not been adequately provided. NJEF and the South Jersey Justice Alliance have asked for a 90 day extension, but that was denied. A 30 day extension was granted, but even that has proven to be too short a time to develop an adequate public record on this massive contamination at the Puchak Well Field.

Additional questions and comments:

1. Does the EPA regard the plume as fully characterized as far as scope and contaminants?
2. Why are the VOC'x not considered as part of the clean up plan. It is not satisfactory to limit the scope of the cleanup to one chemical of concern, Chromium, when volatile organics in excess of groundwater standards have been identified at the site. In fact, the health risk assessment states the excess lifetime cancer risk from residential use, well in excess of the target range of 1 in a million, had the most contribution from TCE, PCE and 1,1-DCE, all volatile organics. In addition, the Hazard Index for180 in the Middle Aquifer, and 60 in the Lower Aquifer, well over the acceptable level of 1, and the factors contributing most significantly were chromium, AS WELL AS TCE and MANGANESE.
3. The remedial action objectives will not be met by the proposed cleanup, because the cleanup fails to contain and restore the groundwater to drinking level standards for all the contaminants found in the aquifer. VOC's are not addressed. The groundwater will not be available for future drinking water. It will have an "institutional control', which means a Classification Exception Area and well restrictions. "Restoration of groundwater" is predicted within 5- 10 years, but only for the chromium levels. VOC"s will not be addressed in the remedy at all.
4. What efforts are being made to make the responsible parties pay for the clean up of the plume? Does EPA have in process a legal strategy to name the responsible parties?
5. The Puchak wells should be closed and decommissioned permanently. What are EPA's plans for the wells?

Because the remedy does not clean up all the contaminants at the site, and does not restore the aquifer to drinking water quality, it fails to meet 8 of the 9 Superfund Evaluation Criteria. Only Criteria 4, Reduction of toxicity, mobility or volume of contaminants through treatment is partially met, but only partially, because VOC's volume or toxicity will not be reduced, only Chromium 6.

NJ Environmental Federation appreciates the efforts EPA has made to characterize the site and explore alternatives, and to be creative about addressing a widespread chromium contamination through use of innovative technologies. But we do not accept the proposed remedy as being protective of human health or the environment. It is a partial abatement of just one contaminant, chromium, and is in no way a permanent, health based remedy

that restores the groundwater to unrestricted use. We propose a new alternative, #4, which reduces all the contaminants in the plume to drinking water and groundwater standards. That is the only remedy that meets the Superfund law criteria, and the only remedy that protects human health and the environment. **We reject all the alternatives put forth by the EPA as unacceptable to the community. The Camden area has suffered too long from a burden of pollution that affects disproportionately urban residents who are black, Hispanic, or Asian, and low income. The health effects of cancer and asthma are felt across the population, but especially among the youth and elderly of the city and near suburbs. The EPA must go back to the drawing board and design a cleanup remedy that protects the most vulnerable, not the pocketbooks of the polluters.**

Jane Nogaki
Board Secretary

Mr. Jonathon Gorin, Remedial Project Manager
290 Broadway – 19th Floor
New York, NY 10007-1866 MS-211

August 3, 2006

Re: Puchack Well Field – Superfund Site
Preferred Alternative Support

Mr. Gorin,

The Merchantville-Pennsauken Water Commission wishes to offer comment during the public comment period on EPA's preferred alternative for the Puchack Well Field Superfund Site. As a purveyor of safe drinking water, we have long recognized the threats to groundwater, particularly chromium contaminates. The Puchack Well Fields are within the geographic confines of Pennsauken Township; however, we do not own or operate any wells within this well field. As a result of our ongoing vigilance, we continue to remain fully compliant with all safe drinking water standards.

We recognize that the scope and complexity of this project warrants critical research and will carry significant remediation costs. As a public water utility, we will endorse any initiative, without reservation, that reduces or eliminates this threat to our raw water. Preferred OU1 Alternative appears to speak directly towards continued and ongoing monitoring and is driven by protection to human health and environment. Upon formulation of strategies to aggressively treat actual sources of contamination, the problem could conceivably be brought under control. (OU2)

The MPWC wishes to go on record endorsing the U.S. Environmental Protection Agency's Preferred Alternative and stands ready to support the initiative. We would hope that upon issuance of the Record of Decision, the designated remediation will begin in an expeditious manner.

Very truly yours,

Michael A. Saraceni
Chief Operating Officer

cc: Board of Commissioners
File

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COMMENTS ON THE PROPOSED PLAN AND PREFERRED ALTERNATIVE FOR THE PUCHACK WELL FIELD SUPERFUND SITE

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Submitted to South Jersey Environmental Justice Alliance and South Jersey Legal Services, Inc.

September 6, 2006

The following comments on the Proposed Remedy for Operable Unit 1 of the Puchack Well Field Superfund Site were written by Henry S. Cole, Ph.D. at the request of South Jersey Legal Services, Inc. (SJLS) and South Jersey Environmental Justice Alliance (SJEJA). In preparing these comments I reviewed the following documents:

- Proposed Plan, Puchak Well Field Superfund Site, July 2006.
- Final Operable Unit 1 Remedial Investigation Report Puchack Well Field Superfund Site Remedial Investigation/ Feasibility Study. Pennsauken Township, New Jersey, June 22, 2005.
- Final Human Health Risk Assessment, Puchack Well Field Site OU1, Remedial Investigation/ Focused Feasibility Study, Pennsauken, New Jersey, March 23, 2003.
- Final Human Health Risk Assessment Puchack Well Field Site OU1, Remedial Investigation/ Focused Feasibility Study Pennsauken, New Jersey, March 2003.
- Draft Groundwater Feasibility Study Report Puchack Well Field Site OU1

I am grateful to Jon Gorin, U.S. EPA (Region 2) Project Manager for the Puchack Well Field Site for providing these documents and further information on a short time frame.

1.0 Failure to address VOCs and Cancer Risks

The Proposed Plan (p. 4) includes the following remedial action objective:

- *Prevent or minimize potential current and future human exposures including groundwater ingestion and dermal contact with groundwater that presents a significant risk to public health and the environment.*

- *Minimize the potential for migration of chromium contaminated groundwater plume.*

- *Restore the chromium contaminated groundwater to drinking water standards within a reasonable timeframe.*

Clearly, these Remedial Action Objectives are critical to reduce the risks and potential drinking water supply problems associated with hexavalent chromium. However, the remedial action objectives fail to include protection against the risks associated with ingestion and inhalation of volatile organic compounds (VOCs) associated with contaminated groundwater in and near the Puchack Well Field. Failure to include VOC objectives represents a major deficiency in the Proposed Plan since the Remedial Investigation (RI), the Human Health Risk Assessment (HHRA) and the Feasibility Study (FS) for the site all acknowledge that **the total estimated cancer risks are driven by VOCs rather than chromium.** Note the following quote from p. 6-2 of the HHRA describing the "Reasonable Maximum Exposure" cancer risk assessments:

> "Total excess lifetime cancer risks from residential use of Middle Aquifer groundwater as drinking water were above the range of 10-6 to 10-4 due to the presence of VOCs. The total excess lifetime cancer risk for adult residents is 4.7 x 10-3, primarily from inhalation of volatile chemicals from groundwater while showering (4.5 x 10-3) and from water ingestion (1.7 x 10-4). As shown in Table 9.1a, four VOCs accounted for 99% of the total inhalation cancer risks for adult residents: TCE (4.3 x 10-3), benzene (1.0 x 10-4), PCE (5.7 x 10-5), and 1,1-DCE (5.6 x 10-5). The same four VOCs accounted for over 99% of the total ingestion cancer risks for adult residents: PCE (5.7 x 10-5), benzene (4.3 x 10-5), 1,1-DCE (3.8 x10-5), and TCE (2.9 x 10-5).
>
> Child resident cancer risks are higher than the adult cancer risks. For child residents, risks from inhalation exposures are about 160 times higher than risks from groundwater ingestion and 1600 times higher than risks from dermal contact. The total excess lifetime cancer risk for child residents is 1.6 x 10-2, primarily from inhalation of TCE from groundwater while bathing (1.5 x 10-2). As shown in Table *9.2a, other chemicals that contribute to the inhalation risks for child residents* include benzene (3.7 x 10-4), PCE (2.1 x 10-4), and 1,1-DCE (2.0 x 10-4). Four VOCs accounted for over 99% of the total ingestion cancer risks: PCE (3.3 x 10-5), benzene (2.5 x 10-5), 1,1-DCE (2.2 x 10-5), and TCE (1.7 x 10-5)."

Even the less conservative "Central Tendency" cancer risk estimates are significantly higher than EPA's acceptable risk range.

> "The total excess lifetime CT cancer risk for adult residents was 4.1 x 10-4, and for child residents was 2.2 x 10-3, primarily from inhalation of volatile chemicals from groundwater while showering or bathing water and from water ingestion. The total cancer risks for residents when the adult and child risks are combined (i.e., ages 0-30 years) under the CT exposure scenario is 2.6 x 10-3, above the EPA threshold range of 10-6 to 10-4." (HHRA, p. 6-6).

The Proposed Plan's preferred remedy (Alternative 3c) is also fails to meet those ARARs (Applicable or Relevant and Appropriate Requirements) associated with the drinking water standards (MCLs) for volatile organic compounds including TCE, PCE, and benzene. Furthermore, with regard to its failure to address VOCs, the Preferred Alternative fails to meet the community acceptance criteria. (E.g., See comments from South Jersey Environmental Justice Alliance and the New Jersey Environmental Federation regarding VOCs).

Finally, neither the Proposed Plan nor the Human Health Risk Assessment fail to evaluate an additional pathway of exposure – that associated with the potential inhalation of VOCs in indoor air resulting from vapor intrusion into buildings from soil and groundwater into buildings. Please note:

- Consideration of this exposure pathway and associated risks is an established part of risk assessment where there are VOCs in soil and/or groundwater. EPA documents contain abundant guidance on estimation of risks associated with vapor intrusion.

- Vapor intrusion may result in a completed pathway at present and does not depend on current or future use of contaminated drinking water.

- This pathway is most likely to present a problem where (a) Volatile carcinogens are elevated (b) where homes and buildings are located in and adjacent to the site and probable sites for future buildings (c) where the contamination is relatively shallow and/or (d) where soils are relatively permeable.

- In estimating the cumulative/additive risks associated with volatile carcinogens, EPA should add the inhalation risks associated with vapor intrusion to those associated with inhalation of VOCs originating from drinking water. Adding vapor intrusion-related inhalation risks is likely to show even higher exceedances of EPA's acceptable cancer risks and non-cancer hazard index.

- EPA should conduct an analysis to determine areas most vulnerable to vapor intrusion and develop an Addendum to the Proposed Plan that includes: (a) a soil vapor survey to better delineate the distribution of VOCs (b) an estimate cancer risk associated with vapor intrusion and an estimate of total cancer risk associated with all potential

pathways of exposure including vapor intrusion and drinking water (c) a evaluation of the remedial technologies / alternatives necessary to reduce risks associated with soil vapor and (d) selection of remedy.

- The soil vapor survey is necessary to ensure that significant hot spots are determined. Moreover, soil vapor surveys can be accomplished quickly and cost-effectively using real time analytical methods (e.g. Membrane Interface Probes [MIPs], Field GC and automated methods that optimize the location of sampling [Triad Approach has been used in NJ].

EPA gives several rationales for not addressing VOCs in groundwater as part of the Operable Unit 1 Groundwater Cleanup.

> *"There is a wide variety of VOCs found commingled with the Site's chromium contaminated groundwater. The VOC contamination also extends well beyond the boundaries of the chromium plume. These (VOC) sources are being addressed individually under State authority and are not addressed as part of this Superfund action."* (Proposed Plan, p.3)

> *"The groundwater at the Puchack Site is also contaminated with VOCs. The RI results show that VOC contamination is scattered in and around the Puchack Site; VOC contamination is therefore a regional problem rather than specific to the Puchack Site. Municipal wells in the area have existing treatment facilities to remove VOCs from the extracted groundwater. In the PE report, remedial options for treatment of VOC contamination have also been evaluated, in addition to the treatment for chromium contamination. The evaluation results indicate that an additional large quantity of groundwater would need to be pumped in order to capture the VOC plumes. It therefore increases substantially the technical complexity and cost to the remedy. Given the above, this FS will only consider treatment of extracted VOCs together with the chromium. VOC contamination will not be targeted for in situ treatment nor specifically extracted for treatment."* (Draft Groundwater Feasibility Study, p. 2-2)

<u>None of the reasons cited are individually or collectively sufficient to exclude the consideration of VOCs which account for nearly all of the estimated cancer risks associated with the site</u>:

- The fact that the VOC plume appears to have more sources and extends beyond the chromium plume is not a valid excuse for excluding VOCs from the remedial process. The site is a well field with multiple sources, contaminants and risks.

- The Proposed Plan neglects to describe and evaluate in situ technologies that could be used to address groundwater that is contaminated both with chlorinated VOCs and hexavalent chromium. Consider for example, EPA's

case study entitled, An In Situ Permeable Reactive Barrier for the Treatment of Hexavalent Chromium and Trichloroethylene in Ground Water (Environmental Protection Agency, EPA/600/R-99/095a September 1999). Either the Permeable Reactive Barrier approach or an in situ geochemical approach using a similar chemical mechanism could be considered.[1] Why not include in the Record of Decision (ROD) bench scale and/or pilot tests on in-situ technologies that attempt to simultaneously reduce hexavalent chromium and VOCs?

- The Proposed Plan doesn't identify or evaluate technologies that would be effective in preventing vapor intrusion. There are many approaches that can be considered especially for treating hot spots. These include soil vapor extraction (for VOCs in zone of aeration) and two-phase vacuum extraction (removes VOC in vapor, aqueous and product phases).

- Statements that local public water treatment can remove VOCs with well-head technologies (e.g. using air strippers, etc.) are problematic. The Preferred Alternative as currently written (a) provides no assurance that local jurisdictions will actually install the technology and (b) places an unfair burden on the local jurisdictions that operate the well fields and (c) doesn't address the vapor intrusion / indoor air issue. In essence the Proposed Plan represents a de facto "No-Action" alternative for VOCs. The proposed remedy is flawed in that the costs and risks to the public associated with this alternative have not been evaluated or included in the decision-making.

- That (VOC) sources are being addressed individually under State authority and are not addressed as part of this Superfund action provides neither specificity nor assurance to the public. If the NJ DEP has specific measures that would address the VOC problem, they should be described in the Preferred Alternative and Record of Decision as a formal part of the remedial plan. What is needed is a holistic, well-integrated cleanup plan that effectively marshals state and federal resources to protect public health and critical groundwater resources.

2.0 Chromium-related Issues. As stated in Section 3.0, EPA should attempt to limit both total chromium and hexavalent chromium. This is necessary to prevent the migration of chromium to operating well fields, which may increase their pumping rates in the future to satisfy growing demand. However, as EPA acknowledges there are a number of hydrological and geochemical uncertainties associated with in-situ technologies. For example:

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[1] The reactive medium was composed entirely of granular iron, with an average grain size of 0.4 mm. The reactive medium was selected from various mixtures on the basis of reaction rates with Cr(VI), TCE and degradation products.
http://www.epa.gov/ada/download/reports/prbdesign_v1.pdf#search=%22in%20situ%20treatment%20of%20chromium%20VOCs%22

- It is not certain that such technologies will actually be capable of delivering chemical reducing agents to all areas of contamination.

- Despite a cleanup standard of 70 ug/L for total chromium, the in-situ chemical reduction approach is not specifically designed to remove total chromium. There is no assurance that some portion of chromium (VI) converted to chromium (III) will not revert to chromium (VI). Similarly, not all chromium (III) is necessarily immobilized (e.g. adsorbed and removed from solution); this process is also reversible under certain conditions.

Moreover, there is considerable uncertainty regarding the protectiveness of the 70 ug/L cleanup standard. Reconsideration of all standards and decisions regarding chromium is necessary given recent evidence that industry consultants manipulated evidence and in doing so may have weakened a number of chromium-related regulatory decisions, i.e.:

- A Washington Post article (February 24, 2006) describes a George Washington University / Public Citizen journal article documenting that scientists working for the chromium industry failed to report inhalation studies showing fivefold increase in lung cancer deaths from moderate exposures to chromium. The Post article states that, "Company-sponsored scientists later reworked the data in a way that made the risk disappear." The apparent twisting of the science occurred at the same time that the chromium industry lobbied to block strict new OSHA limits for hexavalent chromium in workplace air.

- The *Journal of Occupational and Environmental* Medicine recently took the highly unusual step of retracting a 1997 article stating that the "financial and intellectual input to the paper by outside parties was not disclosed." The outside parties refer to consultants for PG&E who, according to investigative reports by the Wall Street Journal and the Environmental Working Group, manipulated data in the article in order to obscure a link between exposure to contaminated well water and cancer death rate found by a Chinese scientist.

We are aware that state agencies such as New Jersey and California are now re-examining regulatory decisions based on data provided by various chromium interests. The public must be reassured that chromium cleanup standards are protective. Moreover, reevaluation of the chromium cleanup standard should include consideration of recent evidence that ingestion of chromium-contaminated drinking water may be associated with certain forms of cancer.[2]

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[2] Costa M; Klein CB, "Toxicity and carcinogenicity of chromium compounds in humans" *Critical reviews in toxicology*, 2006 Feb;36(2):155-63. **Abstract:** Chromium is a human carcinogen primarily by inhalation exposure in occupational settings. Although lung cancer has been established as a consequence of hexavalent chromium exposure in smokers and nonsmokers, some cancers of other tissues of the gastrointestinal and central nervous systems have also been noted. Except for a few reports from China, little is known about the health risks of environmental exposures to chromium. Likewise, there has been a lack of epidemiological studies of human exposure to hexavalent Cr by drinking water or ingestion, and it has been suggested that humans can perhaps tolerate hexavalent Cr at higher levels than the current drinking water standard of 50 ppb. This review highlights the most recent data on the induction of skin tumors in mice by chronic drinking-water exposure to hexavalent chromium in combination with solar ultraviolet light. This experimental system represents an important new animal model for chromate-induced cancers by ingestion of drinking water, and it suggests by extrapolation that chromate can likely be considered a human carcinogen by ingestion as well.

For these reasons, I would strongly recommend a buffer (compliance) zone that uses significant exceedance of background chromium concentration (on the order of 10 ug/L) as a trigger to take further measures to protect active well fields in the area. (See recommendations for additional points).

3.0 Community Involvement. I would strongly support SJLS calls for an extension of the comment period. The extension should be of sufficient length to allow SJEJA to obtain its TAG advisor. This would provide an opportunity for a more detailed technical review and to facilitate communication between the community organizations, the TAG advisor and officials from EPA and NJ DEP prior to the issuance of the Record of Decision. In my judgment, based on several decades in working with the public on cleanup issues, I believe that there is a definite need to build a more trusting relationship with the community in this case. Providing an extended comment period and creating a more in depth technical dialogue will help to increase the level of trust.

4.0 Conclusions and Recommendations:

In order to address the concerns and problems described above, I would recommend the following revisions in the Remedial Action Objectives:

1. **Permanently close and decommission the Puchack Well Field in order to ensure that the public is not exposed to VOCs and chromium in their drinking water.** EPA should restrict future use of the site so as to not allow reuse of the well field as a drinking water source. According to the South Jersey Legal Services Inc., the community including the South Jersey Environmental Justice Alliance is strongly opposed to reopening the Puchack Wellfield as a public water source. Similarly, the NJ Environmental Federation has urged that the former Puchack supply wells be permanently closed and decommissioned. I agree with these positions given the past history of the site, the contamination found in the area, and the uncertainties and potential time associated with remediation.

2. **Place Operable Unit 2 [control of sources] on a fast track. Take timely and effective measures to reduce the levels of <u>both</u> VOC and chromium contamination in source regions in order to prevent the continued release and migration of contaminants. potential exposures.**

3. **Fully delineate the distribution of VOCs in the Puchack Field Site and its environs. Evaluate and select remedial options that address VOC contamination at the site as well as chromium. Identify areas with the potential for vapor intrusion of VOCs and take effective and timely measures to prevent exposure to indoor air resulting from vapor intrusion.** (See previous discussion).

4. **To the maximum extent feasible, undertake remedial actions designed to reduce the concentrations of all contaminants in Puchack Well Field groundwater including chromium as well as VOCs.** (See previous discussion).

5. **Reconsider the quantitative remedial goal for chromium-contaminated groundwater for the Puchak Site as follows: (a) numerical cleanup standards should be set for both total chromium and hexavalent chromium. The standards should be based on a scientifically valid review of scientific data. The total chromium standard should be reduced substantially below the current 70 ug/L in order to incorporate an adequate margin of safety**. Please note that both California and the World Health Organization uses 50 ug/L total chromium as for drinking water standard. [3]

6. **Establish a compliance zone around the Puchack Well field site. The compliance levels for groundwater should be set as background concentrations for chromium and risk levels of 10^{-6} and QI of 1 (for cancer and non-cancer risks respectively).**

7. **Take necessary, timely and effective measures to protect (a) currently operating well fields in the area and (b) portions of aquifers that are clean and potentially usable for water supply in the future. Significant exceedances of compliance zone standards will trigger additional efforts to reduce the potential for migration (including source reduction measures, hydraulic barriers and additional treatment measures).**

8. **The Record of Decision should include a coordinated plan for cooperation between NJ DEP and Region 2 EPA. This plan should detail efforts aimed to address all source areas and contaminants including VOCs.**

9. **Extend the comment period and facilitate technical dialogue prior to the issuance of a Record of Decision.**

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[3] California Department of Health Services, Chromium 6 in Drinking Water, Background Information, Dec. 2004. http://www.dhs.ca.gov/ps/ddwem/chemicals/chromium6/Cr+6backgroundinfo.htm

ENVIRON

September 6, 2006

Electronic Mail

Mr. George H. Zachos
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MS-211
Edison, NJ 08837

Re: July 2006 Superfund Program *Proposed Plan*
Puchack Well Field Superfund Site
Pennsauken, Camden County, New Jersey

Dear Mr. Zachos:

On behalf of SL Industries, Inc. (SL), ENVIRON International Corporation (ENVIRON) is submitting comments on the U.S. Environmental Protection Agency's (USEPA) proposed plan for remediation of chromium-contaminated ground water at and near the Puchack Well Field (Operable Unit 1 [OU1]).[1] We are submitting these comments because there are a number of serious problems with the conclusions reached by USEPA, the factual basis for USEPA's decisions, the proposed remedy selected, and the technical basis for selection of that approach as the Preferred Alternative. In addition, ENVIRON and SL are offering comments that refute the USEPA's recent identification of SL as a potentially responsible party (PRP) for the chromium contamination at the Puchack Well Field and the USEPA's contention that a likely source of that contamination is the former SGL Modern Hard Chrome facility located at 482-484 Cove Road in Pennsauken Township, Camden County, New Jersey, which was operated by SL Industries (the "SL Site").

As discussed in further detail below, the evidence in the Administrative Record does not support USEPA's selection of a remedial alternative or justify its focus on SL. Moreover, the relevant data indicates that remedy selection and identification of the source of the chromium contamination are premature. USEPA needs to generate additional data and more carefully consider the existing scientific and factual evidence before any remedy can be properly evaluated or selected. In addition, USEPA is required to select a remedy that comports with its legal obligations under 40 CFR 300 *et. seq.* The proposed remedial alternative fails to do so because it is not cost-effective, protective of human health and the environment or complete.

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[1] These comments are made as fully as possible, despite incomplete documentation in the Administrative Record, particularly regarding the recent remedial investigation and risk assessment.

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The proposed remediation plan is based on USEPA's delineation of what it believes to be the chromium plume impacting the Puchack well field and the New Jersey Department of Environmental Protection (NJDEP) Ground Water Quality Standard (GWQS) for total chromium. However, the record evidence indicates that the "plume" described by USEPA is not properly delineated or identified and the NJDEP chromium groundwater cleanup standard is in flux. Only when the plume is accurately delineated and a pertinent cleanup standard is in place can an adequate remedy be selected. Any remedy selected without the most appropriate cleanup standard or based on an inaccurate concept of the "plume" will be inherently flawed. This is another reason why the remedy selection is premature.

USEPA's proposed cleanup plan and unwarranted focus on SL ignores the relevant evidence of historic chromium groundwater contamination in the area, time and velocity calculations and the regional hydrogeology and pumping conditions. It also completely avoids the issue of the VOC contamination and the implications that has for remedy selection. These facts must all be properly considered before any conclusions can be reached about remedial alternatives or sources of contamination impacting the Puchack well field.

It is evident that selection of a remedy at this time is premature. The natural attenuation capacity of the aquifer needs to be better understood, the "plume" better defined, the historic VOC problem better accounted for and regional data properly analyzed. However, if USEPA elects to proceed in the face of these problems, it should implement a version of Alternative 2, which should consist of only monitored natural attenuation at a cost of $308,000.

I. Comments Regarding the *Proposed Plan* and Preferred Alternative for OU1

In its July 2006 announcement of the *Proposed Plan*, USEPA selected as the Preferred Alternative for OU1 Alternative 3C, the *in-situ* geochemical fixation of hexavalent chromium concentrations above 70 µg/l at an estimated cost of $17.6 million. The USEPA selected this remedial action goal, based on the NJDEP GWQS for total chromium. However, there is ongoing work within the NJDEP to develop a new chromium GWQS based on recent NJDEP-mandated remedial actions at sites with hexavalent chromium contamination. ENVIRON and SL believe that the remedial action goal in the final *Proposed Plan* should incorporate current NJDEP research on its GWQS.

The USEPA estimated that the recommended remedy would achieve the identified remedial goal within 5 to 10 years. Other remedies considered included: (1) Alternative 1, no action with no associated costs; (2) Alternative 2, monitored natural attenuation (MNA) at a cost of $308,000, with two active contingency remedies with a maximum estimated cost of $10.5 million; (3) Alternatives 3A and 3B, active remediation of the portion of the plume with chromium concentrations above 1,000 µg/l, with residual contamination to be remediated via natural attenuation, at costs of $12.0 to $14.5 million; and (4) Alternative 4, ground water extraction and treatment, off-site disposal and institutional controls, at an estimated cost of $32.1 million.

ENVIRON and SL believe that selection of a remedy at this time is premature. If a remedy must be selected at this time, ENVIRON and SL believe that the second most costly remedial alternative evaluated by USEPA is not justified in light of the available ground water data (and USEPA's own description of the significance of those results) and the results of the human health risk assessment completed for the Puchack Well Field Superfund Site, which indicate that

implementation of the proposed remedy will not materially reduce human health risks. Rather, ENVIRON and SL believe that the most reasonable and appropriate remedy is the monitored natural attenuation proposed in Alternative 2. That remedy is supported by the USEPA's own analysis in the *Proposed Plan* documents and by the facts in the Administrative Record. Specific comments in support of this opinion are provided below.

A. Definition of OU1 and The Remedial Goal

In its *Proposed Plan*, USEPA indicated that OU1 encompasses remediation of chromium-contaminated ground water at the Puchack Well Field Superfund Site. Regarding the coincident volatile organic compound (VOC) contamination that has also impacted the Puchack Well Field, the *Proposed Plan* indicated that the VOCs are a regional issue derived from multiple sources, which "are being addressed individually (and at a later undefined time) under State authority and are not addressed as part of this Superfund action." This is, however, markedly different than the scope of OU1 described in other recent USEPA documents, particularly the June 2005 *Final Operable Unit 1 Remedial Investigation Report* (the "June 2005 RIR") prepared by CDM Federal Programs Corporation (CDM) under authorization by USEPA. Specifically, CDM indicated that OU1 includes the investigation and remediation of chromium, VOC and semi-VOC compounds contaminating the ground water, and affirmed the USEPA's intent to include treatment of VOC contamination that coincides with the chromium plume. The inclusive remedial approach to OU1 is also reflected in earlier documentation in the Administrative Record.

As is discussed in the comments that immediately follow, the bifurcated remedial approach USEPA advocated in the *Proposed Plan* through its selection of the Preferred Alternative will not restore the ground water resource nor mitigate human health risks posed by the contamination to acceptable levels. Therefore, it is not reasonable. Furthermore, the USEPA's Preferred Alternative is not justified based on the collective information available regarding the nature of the chromium contamination and the hydrogeological conditions, including the data presented in the *Proposed Plan*. Last, the separation of the remedial action into two components is in violation of regulations which USEPA is obligated to follow. Specifically, the National Contingency Plan (the "NCP") (40 CFR 300) directs the USEPA to select remedial strategies that are cost-effective (300.430 f(ii)(D) and 300.430 e(7)(iii)) and further, that to be eligible for selection, remedies must ensure overall protection of human health and the environment, as well as complying with ARARs (300.430f(i)(A)). Under the current proposal, the bifurcated remedy does not comply with these regulatory requirements as it is neither cost-effective nor fully protective of human health and the environment.

B. Attenuation of Chromium Contamination in the Lower Aquifer

In its announcement of the *Proposed Plan* (as well as in other documents in the Administrative Record), the USEPA provided ample justification for selection of a remedial alternative other than, and ultimately far less costly than, the Preferred Alternative selected. The evidence simply does not support USEPA's decision to base its remedy selection primarily on expediency without regard to cost effectiveness, especially since there is no

pathway for human exposure to the water.[2] Additionally, in its own documentation, USEPA admits that the remedy will not address VOC contamination in the near term, thereby providing no rationale for selecting a remedy for chromium contamination that is based primarily on expediency.

Significantly, the USEPA stated in the *Proposed Plan* that the hexavalent chromium plume has an estimated contaminant transport velocity of only 5 to 12 feet per year and that due to the reduction and retardation properties of the Lower Aquifer (in which all of the Puchack wells are screened), the chromium plume is not expected to migrate far. The relatively slow chromium transport velocity, which the USEPA admits will result in only limited additional migration of the plume, is sufficient evidence standing alone for selection of a remedial alternative that is not based primarily on expediency without regard to cost effectiveness.

The inappropriateness of the Preferred Alternative is further evidenced by the fact that the USEPA itself indicated that hexavalent chromium concentrations have decreased more than 50% between 1998 and 2000. Those data alone are a compelling indication that, at a minimum, the natural attenuation capacity of the Lower Aquifer should be fully understood through additional periodic monitoring before a Preferred Alternative can reasonably be selected. The USEPA has, in fact, recognized the strength of these natural attenuation data, indicating in its discussion of MNA (Alternative 2) that "(t)he results from ground water sampling and a bench scale study have demonstrated this would be a viable approach." Given the acknowledged significance of these data, periodic ground water monitoring is certainly warranted. Absent this more thorough evaluation and consideration of the recognized natural attenuation capacity of the Lower Aquifer, selection of an active remedial approach, targeting the entire chromium plume, is premature at best. In light of the technical arguments USEPA has put forth in support of Alternative 2, and other factors, ENVIRON and SL do not believe that the Agency has justified its selection (and the associated cost) of Alternative 3C as the preferred remedial approach.

C. OU1 Risks and the Human Health Risk Assessment Findings

The USEPA presented its human health risk calculations in the March 2003 *Final Human Health Risk Assessment, Puchack Well Field Site OU1, Remedial Investigation/Focus Feasibility Study, Pennsauken, New Jersey* (the "HHRA") prepared by CDM[3]. As explained in greater detail below, ENVIRON and SL believe that the risk evaluation presented therein does not justify the bifurcated and costly active remediation proposed under the Preferred Alternative as it will not produce the required human health risk reduction mandated by the Superfund program or enable ground water in the Lower Aquifer to be used for potable purposes.

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2 The insistence on the most expedient and costly remedy to address chromium contamination is also questionable because even if the chromium was completely removed from the groundwater, other contaminants would prohibit use of the groundwater for potable use. Moreover, the contamination and knowledge of its existence has been present since the early 1970s without remedial action being taken.

3 The copy of this report, housed in the Pennsauken Free Public Library as part of the document repository required by the Superfund regulations is incomplete and does not include any tables, figures or appendices. Additional comments may therefore be appropriate to the risk assessment but cannot be made at this time.

The HHRA notes that carcinogenic risks and noncarcinogenic hazards for future ground water exposures at the Puchack Well Field are above USEPA's target cancer risk range of 10^{-6} to 10^{-4} and hazard index (HI) threshold of 1. The estimated reasonable maximum carcinogenic residential risks are approximately 20 to 200 times greater than the upper bound of USEPA's target cancer risk range[4] and according to the HHRA, are entirely due to the presence of VOCs (e.g., trichloroethylene [TCE], tetrachloroethylene [PCE], 1,1-dichloroethene and benzene). The total estimated reasonable maximum residential noncarcinogenic HI ranges from 120 to 420 for exposure to ground water in the Middle Aquifer and 42 to 120 for exposure to ground water in the Lower Aquifer due to the presence of considerable VOC contamination in addition to chromium concentrations. When considering exposure to the Middle Aquifer, only 50% of this total HI is attributable to the presence of chromium. The remaining 50% is due to TCE, benzene, manganese and other constituents. When considering exposure to the Lower Aquifer, 80% of this total HI is attributable to the presence of chromium. The remaining 20% is due to TCE, manganese, chloroform and other constituents.

USEPA indicated in the *Proposed Plan* that there is no known human exposure to the chromium contaminated ground water (and therefore, there is no current adverse human health risk), but that such risks would be significant if chromium-contaminated ground water were to be used for potable use (drinking and showering) in the future. Without commenting on the inherent circular nature of this argument (i.e., that if ground water was unfit for consumption such that the Puchack wells could not be used for public water supply, the wells would not be reactivated with the contamination still in place), remediation of only the chromium contamination would not appreciably reduce human health risks, and certainly not to the extent mandated by the Superfund program, or enable ground water in the Lower Aquifer to be used again for potable purposes. Remediation of chromium concentrations alone will not: (1) alter in any way the significant carcinogenic risks identified by USEPA; or (2) reduce the total noncarcinogenic HI to an acceptable level. In light of the above, in concert with the USEPA's definition of OU1 as encompassing all contamination in the plume impacting the Puchack Well Field, ENVIRON and SL do not believe that the USEPA can support selection of the Preferred Alternative at significantly greater cost, which would target only a portion of the contamination, ignoring a significant suite of other constituents.

Consistent with requirements of the Superfund program, a remedial strategy must be selected that comprehensively addresses contamination and results in reduced risks below applicable thresholds. Implementation of Alternative 3C will not accomplish those goals. In summary, even following the implementation of the USEPA's proposed remedy, the carcinogenic risk as reflected in the HHRA would be 10^{-2} in the Middle Aquifer and 10^{-3} in the Lower Aquifer compared to an acceptable range of 10^{-4} to 10^{-6}, and the HIs would be approximately 90 and 12 for the Middle and Lower Aquifers versus an acceptable threshold of 1. Consequently, in the absence of risk reductions below the acceptable thresholds, there is no basis for selection of the Alternative 3C remedy or reasons of expediency.

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[4] Total excess cancer risks for residential exposure to ground water in the middle aquifer when adult and child risks are combined were estimated to be 2.1×10^{-2}. Total excess cancer risks for residential exposure to ground water in the lower aquifer when adult and child risks are combined were estimated to be 2.3×10^{-3}.

II. Comments Regarding the Source of Chromium Ground Water Contamination in OU1

ENVIRON and SL have reviewed various documents in the Administrative Record prepared for the Puchack Well Field Superfund Site and have noted that for some inexplicable reason, SL is specifically singled out as a likely source, and in at least one recent document (the June 2005 RIR) as the likely source of chromium ground water contamination at Puchack. It is troubling that USEPA makes such statements in light of its own relevant data to the contrary regarding the location of the hexavalent chromium plume and timing of release calculations and the fact that USEPA's own documents state that the source(s) of the chromium ground water contamination have not been conclusively determined, and in fact, might never be so identified. In fact, USEPA has designated Operable Unit 2 as the investigation necessary to complete the source identification, making it premature and unjust for USEPA to suggest that SL is the most likely source for the hexavalent chromium contamination.

ENVIRON and SL firmly believe that the USEPA has not fully justified in the Administrative Record its focus on the SL Site as the likely source of hexavalent chromium contamination. Indeed, USEPA's premature focus on SL is not supported by the information contained in the Administrative Record and is contrary to the facts discovered during detailed investigations undertaken by the USGS and the NJDEP. SL and ENVIRON therefore believe that the USEPA should ensure that the final *Proposed Plan* contains no references to the SL Site being the likely source for the hexavalent chromium contamination at the Puchack Well Field.

A. Plume Delineation/Definition

USEPA has defined an irregularly shaped boundary for OU1 that encompasses hexavalent chromium concentrations detected above New Jersey's GWQS of 70 µg/l for total chromium. The OU1 boundary (presented by USEPA most recently in figures prepared for the July 26, 2006 Puchack Well Field Superfund Site Public Meeting), is the USEPA's interpreted aggregate of the incidence of hexavalent chromium concentrations above the GWQS in the Middle Aquifer, Intermediate Sand and Lower Aquifer. This depiction is, however, markedly inconsistent with the analytical results available for the three saturated intervals in which ground water monitoring has been conducted.

Most notably, USEPA has gathered no data indicating that there is hexavalent chromium contamination in the Intermediate Sand or Lower Aquifer ground water at the SL Site, nor in the immediately surrounding areas, as shown on chromium data summary Figures 1-9 and 1-10 provided by the USEPA at the July 2006 public meeting. Further, as shown on USEPA's Figure 1-8 presented at the recent Public Meeting, there is no Middle Aquifer chromium contamination between the SL Site and the Puchack Well Field. In fact, the SL Site is the only location shown within the OU1 boundary at which Middle Aquifer chromium contamination has been detected. The presence of multiple monitoring wells between the SL Site and the depicted plumes where no chromium was detected in these two intervals (e.g., at wells P MW-23, P MW-26, P MW-27 and/or CC MW-1) indicates that it is inappropriate to conclude that the SL Site is the most likely source, or for that matter a source at all, of the identified chromium contamination[5].

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[5] Regarding the more recent sampling results, ENVIRON and SL relied primarily upon summarized data included in the Public Meeting presentation because the version of the June 2005 RIR in the Pennsauken Free Public Library document repository is lacking the figures showing sampling locations and summarized data.

Historical ground water data are also relevant in this regard. As the USEPA is aware, ground water sampling was initially conducted at the SL Site in 1982 pursuant to an NJDEP-related investigation of a former septic system. Monitoring wells were installed in both the Upper Aquifer (MW-1 and MW-3), which is only intermittently saturated in the site vicinity, and the Middle Aquifer (MW-1A and MW-4A), with ground water samples periodically collected from those wells in 1982 and 1983 for chromium analyses. During this time period, hexavalent chromium was present at MW-1 but was not detected in well MW-3 (except for one anomalous detection of 250 µg/l that was not confirmed in the five subsequent monitoring events). Hexavalent chromium was also not detected in any of the monitoring rounds at wells MW-1A and MW-4A, completed in the Middle Aquifer. Based on these data, the NJDEP did not require further ground water monitoring and the investigation was terminated.

These data, and subsequent ground water monitoring completed through 1994 pursuant to a NJPDES permit, indicate that hexavalent chromium was not detected in MWs 1A and 4A. These data demonstrate that even in the final years of SL's operations at the SL Site, as well as in the years thereafter, SL's industrial operations had not adversely affected ground water in the Middle Aquifer. At a minimum, this information has to be accounted for in identifying and delineating the plume and to date, USEPA has not done so. In the absence of Middle Aquifer contamination, there is simply no basis to identify SL as the likely source for the hexavalent chromium impacts in the Lower Aquifer at the Puchack Well Field or elsewhere within the OU1 boundary.

Given the lateral and vertical profile of hexavalent chromium concentrations, the USEPA's depiction of the OU1 boundary is without technical merit as it incorporates locations merely based on the presence of regional chromium contamination, not on the more appropriate basis of contribution to the contamination at the Puchack Well Field. ENVIRON and SL submit that there are no data currently available which support the inclusion of the SL Site in OU1 or the USEPA's depiction thereof. Even if it could be argued that the SI Site is a source for the hexavalent chromium at the Puchack Well Field (which the existing data demonstrate is not the case), ground water and contaminant transport modeling related to the Puchack Well Field belie that contention and support the conclusion that any impacts prior to approximately 1989 are not attributable to the SL Site.

B. Timing of Impacts and Capture Zone Analyses for the Puchack Well Field

In its documentation, USEPA has indicated that hexavalent chromium was initially detected in the Puchack Well Field in the early 1970s at Well No. 6. Chromium contamination was subsequently detected at Well No. 5 in 1978 and in the other four wells (Nos. 1, 2, 3 and 7) by 1981 or 1982. Given the presence of chromium contamination in all of these wells, the Puchack Well Field was taken offline in 1984, except for limited pumping of Well No. 1 for hydraulic control purposes until 1998. The well field has not operated since that time. The Administrative Record has also established that SL initiated industrial operations at the SL Site in 1969. ENVIRON and SL do not believe that the USEPA has fully considered the available information regarding the timing of impacts to the Puchack Well Field in performing the quantitative analyses the Agency has undertaken and in focusing on SL as a PRP. Without a full and fair consideration of all the relevant data, any conclusions about the Puchack well field or sources of chromium contamination are flawed and unreasonable.

As part of the investigation into the Puchack well field contamination, several ground water models have been developed to estimate the capture zones for the Puchack supply wells, estimate the ground water flow regime, and calculate ground water and chromium transport velocities. These models provide important information in the assessment of potential sources and in fact, indicate that it is inappropriate to singularly identify the SL Site as the likely source for chromium contamination.

For example, a ground water model was developed by the NJDEP in 1991 by its Bureau of Ground Water Pollution Assessment to assist in the identification of potential responsible parties for contamination at the Puchack Well Field. For reference, the NJDEP's 1991 memorandum discussing this model is included herein as Attachment 1. In its model, the NJDEP evaluated the capture zone of the Puchack Well Field and estimated a chromium transport velocity from the SL Site to the well field. The model results, summarized in an August 28, 1991 NJDEP memorandum, indicate that, even assuming that chromium at the SL Site resulted in contamination of the Lower Aquifer (which has not been demonstrated), the SL Site cannot be the source of hexavalent chromium contamination initially detected at the Puchack Well Field in the early 1970s or the source of the hexavalent chromium impacts that cased the closure of the Puchack Well Field in 1984. Specifically, the NJDEP calculated a chromium transport velocity of 20 years between the SL Site and the Puchack Well Field. NJDEP concluded that the very earliest any chromium released at the SL Site in 1969 could possibly have reached the Puchack Well Field was in 1989. Since hexavalent chromium was initially detected at the Puchack Well Field in 1971, that chromium groundwater contamination is clearly not attributable to SL. Consequently, the NJDEP's ground water modeling efforts clearly indicate that the SL Site is not the most likely source of the identified chromium contamination at the Puchack Well Field.

Moreover, the NJDEP model implicitly assumed that any chromium releases in 1969 instantaneously impacted the Lower Aquifer. This is an unrealistic assumption that shortens the chromium transport timeframe and which also is, in fact, not supported by the data collected to date. Therefore, the chromium transport time is even longer than the 20-year estimate proffered by NJDEP, making the singular focus on SL even more unreasonable and lacking in technical basis.

The NJDEP's modeling follows work previously completed by CDM for USEPA, as presented in CDM's 1985 report. ENVIRON and SL are providing comments on this modeling effort to identify errors which the USPEA might not be aware. In the 1985 report, CDM calculated a hexavalent chromium transport duration of 8 years from the SL Site to the Puchack Well Field and concluded that chromium from the SL Site would have impacted the Puchack Well Field by 1973-1975. CDM used, however, several flawed assumptions in deriving its results, particularly: (1) hexavalent chromium migrates at the same rate as ground water (i.e., is a non-attenuated contaminant), which is inconsistent with data more recently applied to this matter and the likely behavior of hexavalent chromium in ground water; and (2) all chromium releases began in 1965, even though SL did not begin industrial operations at the SL Site until 1969, with any such releases not immediately affecting the Lower Aquifer.

More recently, the USGS developed a ground water model in 2005 to delineate the contributing area of the Puchack Well Field pursuant to New Jersey Department of Environmental Protection (NJDEP) regulations regarding wellhead protection areas. Using actual water level measurements and assumed pumping rates for the Puchack wells, USGS ran the model, as well as 36 sensitivity runs which varied certain input parameters, to simulate an aggregate area that contributes flow to the Puchack Well Field. These contribution areas were simulated in several time steps, including three steps to define areas contributing flow in 12 years or less, as well as outlying areas which contribute ground water to the well field in more than 12 years. Based on the depiction of the aggregate contribution area (Figure 14 to the 2005 USGS study, provided herein as Attachment 2), the SL Site is located within the area which contributes ground water in more than 12 years (the location of the SL Site has been added to the USGS figure for reference). As such, the model results indicate that even under assumed pumping conditions, ground water from the SL Site would not reach the Puchack Well Field in 12 years.

Notably, the USGS model does not simulate contaminant migration or estimate the transport velocity of hexavalent chromium. Given its retardation in aquifer materials, hexavalent chromium would migrate at a significantly lower velocity than ground water, as the USEPA indicated in the *Proposed Plan*. Nonetheless, the contribution areas simulated by USGS are used herein to demonstrate that even under conservative flow velocity assumptions, the SL Site could not have been the source of contamination which was first detected in Puchack Well No. 6 in the early 1970s, and subsequently in other wells in later years. In fact, the results of the USGS modeling indicate that the SL Site is not a likely source of hexavalent chromium impacts to other Puchack Wells.

As noted above, chromium contamination was initially detected in the Puchack Well Field in the early 1970s, within only 2 to 3 years of SL acquiring and initiating operations at the SL Site. The USGS modeling results, as well as all other transport modeling in the Administrative Record, indicate that the SL Site could not have been the source of those initial impacts. Further, other chromium impacts were evident in the Puchack Well Field from 1978 to 1981 or 1982. These later impacts, generally occurred within 12 years after SL initiated its industrial operations at the SL Site. If it were assumed, even in the absence of demonstrable supporting data, that there were releases of hexavalent chromium-bearing materials at the SL Site immediately upon initiation of industrial activities which resulted in an instantaneous impact to the Lower Aquifer (a clearly unrealistic assumption used for illustrative purposes only), the SL Site could still not have impacted the Puchack Well Field by 1981 or 1982. Rather, the chronology of the well field impacts by chromium, which began only two or three years after SL began operating the SL Site, strongly indicates that other sources of hexavalent chromium were more likely sources of that contamination.

C. Other Potential Sources

Although the identification of the source(s) for the hexavalent chromium detected at the Puchack Well Field is the ultimate responsibility of the regulatory authorities, ENVIRON and SL believe that the USEPA is overlooking other key information in the Administrative Record regarding regional industrial activity and is instead unfairly focusing on the SL Site. For example, in its *Summary of Conclusions and Recommendations of Chromium Contamination Analyses at Puchack Well Field* (December 1985), CDM indicated that

recent investigations by the NJDEP Enforcement Element identified several electroplating and metal finishing operations in the area, which CDM concluded could have contributed to the chromium contamination. In fact, given the number of potential sources for the contamination detected in the Puchack Well Field, CDM concluded that the contaminant sources might never be conclusively identified. This position is echoed in more recent documentation, including the June 2005 RIR in which CDM indicates that all potential sources of chromium contamination may not have been identified. Furthermore, there is substantial evidence gathered by NJDEP in its Puchack Directive investigations and through on-going litigation in Camden County which point to more likely sources of the Puchack chromium contamination. ENVIRON and SL strongly believe that additional actions should be undertaken by the USEPA to thoroughly evaluate other, more viable sources. Such actions are necessary to correctly delineate the plume and fairly handle its regulatory obligations.

Sincerely,

William A. Stone, Jr.
Principal

William D. Kraft, III, P.G.
Manager

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cc: A. Lipuma, Esq.
S. Picco, Esq.

ATTACHMENT 1

August 28, 1991 Internal Memorandum
New Jersey Department of Environmental Protection –
Bureau of Ground Water Pollution Assessment

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS SITE MITIGATION
CN 413, Trenton, N.J. 08625-0413
(609) 984-2902
Fax # (609) 633-2360

Anthony J. Farro
Director

MEMORANDUM

AUG 28 1991

TO: Edward Post, Chief
Southern Bureau of Regional Enforcement

THROUGH: Thomas F. Seckler and John Preczewski, Chief
Bureau of Well Field Remediation

FROM: Robert A. Gallagher
Bureau of Ground-Water Pollution Assessment

SUBJECT: Puchack Well Field, Pennsauken Township, Camden County
Potential Responsible Party Determination
SL Modern Hard Chrome, Inc.

Summary

Discharges at the SL Modern Hard Chrome site, located at Cove and River Roads in Pennsauken Township, Camden County, are potentially responsible for pollution of Puchack well field by chromium. Puchack well field is operated by the city of Camden for the production of potable water for public supply purposes. Ground water from this well field is polluted by chromium and volatile organic chemicals. The SL Modern Hard Chrome site is located approximately 3700 feet southwest of Puchack well 6 and within the estimated capture zone of the well field for the period 1973 to 1981. Elevated levels of chromium are present in soils and ground water at the SL Modern Hard Chrome site. Pollution at Puchack well field has caused the removal of several wells from service and reduced production capacity.

Background

SL Modern Hard Chrome initiated operations at the facility (the site)located at Cove and River Road in Pennsauken Township (Figure 1) in 1969. Chrome and nickel plating was performed at the facility. As part of operations at the site wastewater containing chromium and other pollutants was discharged to septic systems and the ground. Enforcement actions started after an inspection conducted by NJDEP personnel on June 17, 1981 revealed the waste disposal practices used at the site. Sampling conducted

during this inspection confirmed the presence of high concentrations of chromium in soils and wastewater. A Complaint, Compliance Order and Notice of Opportunity for Hearing was issued to SL Modern Hard Chrome on August 17, 1981 by the USEPA. This Order required the cessation of the disposal and storage of hazardous waste at the facility, and sampling and remediation of the site. On August 21, 1981 the facility was issued an Administrative Order and Notice of Civil Administrative Penalty Assessment by NJDEP. This Order had similar requirements to the one issued by the USEPA. On January 22, 1982 SL Modern Hard Chrome and NJDEP signed an Administrative Consent Order requiring the installation of monitor wells. On July 23, 1983 the facility received a New Jersey Pollutant Discharge Elimination System (NJPDES) Discharge to Ground Water (DGW) permit. Four monitor wells were installed initially at the site. However, two of these wells were dry and could not be sampled. Later three of the wells were sealed and two deeper replacement wells drilled. Parts of the site where soil contamination was present were partially remediated by paving with asphalt in 1984. In October 1984 the SL Modern Hard Chrome site became an Environmental Cleanup Responsibility Act (ECRA) case due to the pending cessation of operations. In January 1985 operations at the site ceased. In July 1985 SL Modern Hard Chrome requested that the site be withdrawn from ECRA. On May 27, 1987 a fire partially destroyed the building on site. Ground-water monitoring at the site continues.

Chromium was detected in ground-water samples from the Puchack well field (fig. 2) in 1971. Puchack well 6, the first well affected, was removed from service in 1971. Subsequently, chromium was detected in ground-water from Puchack wells 5 and 7. These wells were shut down by 1983. Chromium pollution has since spread to the remaining wells in Puchack well field (wells 1, 2, and 3). In addition, volatile organic pollutants have been detected in all wells currently in use, at concentrations exceeding Maximum Contaminant Levels (MCL's). To meet MCL's, treatment to remove both chromium and volatile organics is needed at Puchack well field. Pumping continues at Puchack well field, but at significantly reduced rates. In 1975 ground-water withdrawals from the Puchack well field totaled approximately 2.39 billion gallons. In 1989 total ground-water withdrawals from Puchack were only about 518 million gallons. During the period from April 1990 to March 1991 625 million gallons were withdrawn. A pilot project to remove chrome from ground water at Puchack is scheduled for start up in summer 1991. The project is funded by a grant from the U.S. Environmental Protection Agency to the city of Camden.

Discharges

The discharge of pollutants to ground water at the site is assumed to have started at the time operations by SL were begun. No data concerning discharges at the site prior to commencement of SL's operations is available. The site was purchased by SL Modern Hard Chrome on January 15, 1969. In calculations in this

report the date of the first discharge of pollutants is assumed to be June 1, 1969. An inspection of the facility conducted by NJDEP personnel on June 17, 1981 revealed four separate discharges. Wastewater from both chrome and nickel plating operations at the site was discharging to a septic system, cooling water was discharging to the ground, chromium plating waste was discharging to the septic system via shallow ditches, and stained soil indicated that an overflow pipe from the chrome plating operation discharged to the ground. A copy of a sketch attached to a memo (A. Arcenal to File, July 30, 1981) describing inspection is attached. The Actual quantities discharged are unknown. Chromium was detected in wastewater discharges at concentrations up to 1214 parts per billion (ppb), and in a standing puddle (sampled during the inspection) at 127 parts per million (ppm). Pollutants detected in soils at the site include chromium at concentrations up to 37,000 ppm and petroleum hydrocarbons concentrations up to 13,000 ppm.

Hydrogeologic Setting

The study area is located in northwestern Camden county near the Delaware River and is part of the Coastal Plain physiographic province. The New Jersey Coastal Plain may be characterized as a sequence of layered unconsolidated sediments that dip and thicken to the southeast. These sediments overlie an irregular bedrock surface that also dips southeast. In the study area bedrock is present at depths ranging from 125 to 250 feet. The area is drained by the Delaware River.

The study area lies on the outcrop of the Potomac-Raritan-Magothy aquifer system (PRM). The PRM is the most heavily used aquifer in the Coastal Plain of New Jersey. Pumpage from the PRM accounted for approximately 68.5 percent of all ground-water withdrawals in the Coastal Plain in 1980 for which data are available (Volwinkel, 1984, "Ground - Water Withdrawals from the Coastal Plain of New Jersey", United States Geological Survey (USGS) Open File Report 84-226). The PRM has been divided into three aquifers composed mainly of sand and gravel, termed upper, middle, and lower, that are separated by two confining units composed mainly of silt and clay (Zapecza, 1984, "Hydrogeologic Framework of the New Jersey Coastal Plain", USGS Open File Report 84-730). Based on available data it appears that only the middle and lower aquifers are saturated in this area. The lower aquifer directly overlies the bedrock surface and is 78 feet thick at Puchack well 2 (Zapecza, 1984). The thickness of the confining unit between the middle and lower aquifers is reported (Zapecza, 1984) as 18 feet at Puchack well 2. However, Navoy (1986, " The Potomac-Raritan-Magothy Aquifer System in the Camden Metropolitan Area: Cultural Impact on an Outcrop Area", in Geological Investigations of the Coastal Plain of Southern New Jersey, Geological Association of New Jersey) reports that the confining units in the PRM become discontinuous in the outcrop area. Epstein (1990, "Geological History of New Jersey's Coastal Plain Aquifers" in Aspects of Ground-Water in New Jersey, Field Guide and Proceedings of the Seventh Annual Meeting of the Geological

Association of New Jersey) also reports that the confining units in the PRM are discontinuous. Zapecza (1984) reports a thickness of 29 feet for the middle aquifer of the PRM at Puchack well 2. All wells in the Puchack well field are screened in and withdraw water from the lower aquifer of the PRM. The bedrock is not used as a source of water in the area.

The water table at the SL Modern Hard Chrome site occurs in the middle aquifer of the PRM at elevations less than about 15 feet below sea level. In this area in general, ground-water elevations are highest adjacent the to Delaware River and drop off away from the river. This indicates that the Delaware River acts as a source of recharge to the middle aquifer. Precipitation also acts to recharge the middle aquifer of the PRM in this area.

Ground-Water Flow

Data regarding ground-water flow were obtained from published sources and NJDEP files. Ground-water contour maps prepared using water-table elevations obtained from both on and off-site monitor wells completed in the middle aquifer show ground-water flow to the east (see Figure 6). The regional hydraulic gradient in the middle aquifer based on these elevations is approximately 0.00075.

The USGS has prepared regional ground-water contour maps for aquifers within the PRM for the years 1978 and 1983 (USGS Water Resource Investigation Reports 82-4077 and 86-4028). The contour maps depict ground-water flow under static (non-pumping) conditions. In general, these maps show regional ground-water flow to the south-southeast in both the lower (fig. 3) and middle aquifers of the PRM, controlled by a large cone of depression formed by pumping under confined conditions in central Camden County approximately eight miles southeast of the study area. The data shown also suggest that the Delaware River does not act as a hydraulic barrier to ground-water flow in the lower aquifer. The non-pumping hydraulic gradients in the study area range from about 0.002 to 0.0025. Water level elevations given are higher in the middle aquifer than the lower aquifer. This indicates that a downward component of flow exists in the middle aquifer, and that leakage from the middle aquifer serves to recharge the lower aquifer. In addition, significant recharge to the PRM is derived from leakage from the Delaware River. The percentage of water that a well derives from leakage from the Delaware River generally increases as the distance to the river decreases.

Data obtained from the hydrogeologic investigation at the Pennsauken Landfill (fig. 4) indicates that ground water in the lower aquifer of the PRM flows to the southwest under a hydraulic gradient of 0.002 at that location. Ground-water flow directions in the middle aquifer of the PRM at the Pennsauken Landfill ranged from southwest to southeast, depending on location at the site. Ground-water elevations at the site were higher in the middle aquifer of the PRM than in the lower aquifer.

A hydraulic connection between the middle and upper aquifers of the PRM was demonstrated during the hydrogeologic investigation at the Aluminum Shapes site. Continuous monitoring of water levels at this site revealed a reversal in the ground-water flow direction in the middle aquifer of the PRM. The ground-water flow direction changed from southeast to west over a three day period.

Consultants for Aluminum Shapes ruled out tidal effects and recharge as possible causes for the change in flow direction and attributed it to pumping effects at the Morris well field (BCM Engineers, Hydrogeologic Investigation Report, 24 January 1989). The pumping may also account for the varying flow directions on different dates. The nearest wells in the Morris well field are located about 2000 feet away from the site. They all pump from the lower aquifer of the PRM or zones where the lower and middle aquifers cannot be differentiated. The influence pumping these wells has on water levels in the middle aquifer shows the lack of continuity in the confining unit in this area.

A hydrogeologic investigation conducted at the Swope Oil site (fig. 4) examined the effects of pumping in the lower aquifer on ground-water flow in the middle aquifer of the PRM (Remedial Investigation and Feasibility Study, NUS Corporation, May 1985). A production well screened in the lower aquifer (Merchantville-Pennsauken Water Commission, National Highway well 1) was pumped for a 24-hour period at a rate of 1000 gallons per minute (gpm). Ground-water elevations in monitor wells completed in the middle aquifer were measured prior to and during the period of pumping. The monitor wells were located about 300 to 500 feet away from the pumping well. As a result of pumping approximately 0.5 feet of drawdown was noted in the monitor wells. The hydraulic gradient in the middle aquifer increased from 0.001 to 0.0015, and the flow direction shifted from southwest to south-southwest.

These investigations, along with the presence of downward hydraulic gradients in the middle aquifer, the large amount of ground water pumped from the lower aquifer, and the presence of pollutants in wells completed in the lower aquifer at Puchack demonstrate that pollutants introduced into the middle aquifer of the PRM in this area have migrated to the lower aquifer. The absence of these pollutants in wells completed in the lower aquifer in the Morris and Delair well fields also suggests that the pollutants at Puchack are derived from sources located east of the Delaware River.

Ground-Water Quality

Pollutants detected in concentrations exceeding MCL's in ground water at the Puchack well field are chromium, selenium, mercury, trichloroethene (TCE), tetrachloroethene (PCE), trans-1,2-dichloroethene (1,2-DCE), vinyl chloride, 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), and benzene. Chromium, TCE, and PCE are the pollutants most commonly found. Total volatile organic concentrations range up to 186 parts per billion (ppb). Chromium concentrations range up to 4,180 ppb and selenium

up to 25 ppb. Mercury was reported in a sample from Puchack well 3 at 2,000 ppb. However, because of the much lower mercury concentrations detected in other samples from Puchack well field it is believed that this value represents a typographical error and that the true value is 2 ppb.

Pollutants detected at concentrations exceeding MCL's in ground-water samples from monitor wells at the SL Modern Hard Chrome site include chromium, cadmium, TCE, PCE, benzene, 1,1,1-trichloroethane, 1,2-DCE, and methylene chloride. Chromium was detected at concentrations up to 5.5 ppm, cadmium up to 210 ppb, TCE up to 510 ppb, PCE up to 170 ppb, benzene up to 80 ppb, 1,1,1-trichloroethane up to 220 ppb, methylene chloride up to 40 ppb, and 1,2-DCE up to 110 ppb in monitor well 1. This well was screened in a zone of perched water and was later sealed and replaced by monitor well 1A. These samples were collected in 1982 and pollutant concentrations in middle aquifer wells have not been as high. In monitor wells screened in the middle aquifer of the PRM chromium was detected at concentrations up to 1.0 ppm, cadmium up to 20 ppb, TCE up to 20 ppb, PCE up to 3 ppb, 1,1,1-trichloroethane up to 2.7 ppb, and methylene chloride up to 320 ppb. Benzene and 1,2-DCE were not detected in ground-water samples from the middle aquifer.

Capture Zone

Pumping at individual supply wells results in the creation of a cone of depression in the water table or potentiometric surface around the well. Consequently, ground water flows toward the well from all directions in its immediate vicinity. The area contributing water to the pumping well or well field is known as the capture zone. The size of the capture zone varies with changes in the pumping rate, duration of pumping, aquifer characteristics, recharge and boundary conditions, such as the presence of rivers or other hydraulic barriers and other competing pumping centers, and tidal or barometric pressure effects. The precise size of the capture zone for Puchack well field will vary with changes in pumping at it or other nearby well fields and/or with changes in the other conditions listed above.

In order to define an area within which discharges could have contributed pollutants to Puchack well field, BWR delineated a capture zone by assuming simplified conditions and interpolating boundaries between competing pumping centers where necessary. Available hydrogeologic data, from both published sources and NJDEP files were also considered in the delineation. CDM, Inc. as consultant to NJDEP, modeled ground-water flow in the vicinity of Puchack well field in order to evaluate possible sources of pollution (CDM, 1986, "Summary of Conclusions and Recommendations of Chromium Contamination Analyses at Puchack Well Field, Camden, New Jersey"). CDM (1986) concluded that "The localized cone of depression around Puchack well field is significant enough so that it could capture soluble contaminants introduced at the ground-water table at Swope Oil, SGL Chrome, Pennsauken Landfill,

and the high leakage area of the Pennsauken Sewerage Authority's sewer system." The locations of these sites are shown in Figure 4, and provide an indication of the minimum size of the capture zone produced by pumping at Puchack well field under the conditions modeled by CDM. These data and ground-water contour maps produced by the model simulations were used in delineating the capture zone.

In order to estimate the downgradient extent of the capture zone BWR used the uniform flow equations given by Todd (1980, "Groundwater Hydrology", p. 122-123). This method assumes a homogeneous, isotropic, and confined aquifer. The downgradient extent of the capture zone may be calculated using:

$$X = Q / 2 \pi T i$$

where: X = downgradient distance to stagnation point (ft)
Q = pumping rate (ft^3/d)
T = aquifer transmissivity (ft^2/d)
i = hydraulic gradient.

The aquifer transmissivity (T) was calculated using:

$$T = Kb$$

where: k = aquifer hydraulic conductivity (ft/d)
b = aquifer thickness (ft).

The hydraulic conductivity was estimated from single well tests performed on wells in the Puchack well field by a method described by Pucci, and others (1989, "Hydraulic Properties of the Middle and Upper Aquifers of the Potomac-Raritan-Magothy Aquifer System in the Northern Coastal Plain of New Jersey", New Jersey Geological Survey, Geological Survey Report No. 18) using:

$$K = 1.1Q / s\ l$$

where: s = drawdown (ft)
l = screen length (ft).

The hydraulic conductivity values determined from wells within the Puchack well field ranged from 84 to 296 ft/d, with a mean of 167 ft/d. The mean was the value used in subsequent calculations.

The aquifer thickness, 78 ft, was taken from Zapecza, (1984, USGS Open File Report 84-730).

The hydraulic gradient, 0.002, was taken from Eckel and Walker (1986, USGS Water Resources Report 86-4028).

The pumping rate, 4017 gpm or 773,300 ft^3/d (amounting to 2.1 billion gallons per year in withdrawals) was determined by calculating the mean pumping rate for total withdrawals from Puchack well field for the years 1973 through 1981 (excluding

1974 for which no data were available). All withdrawals were modeled as occurring at Puchack well 3.

The calculated downgradient extent of the capture zone was 4,724 feet. The capture zone boundaries were delineated by using this distance as the downgradient extent measured from Puchack well 3. Boundaries were drawn by using ground-water contours presented in CDM's report to identify ground-water divides between competing pumping centers and interpolating where necessary. In addition, modifications were made where warranted by new or improved data and to reflect pumping at National Highway well 1. The capture zone thus delineated is shown in Figure 5.

Pollutant Travel Times

As a result of the relatively low velocities typical of most ground-water flow systems, a pollutant introduced into ground water at a given site may take years to migrate to nearby wells. In addition, a pollutant in a ground-water system may move at a different velocity than the ground water itself. Consequently, the time required for a pollutant discharged at a given site to travel to Puchack well field is an item needed for consideration in a responsible party determination. The velocity of a pollutant (V_{pt}) in a ground-water system may be calculated using:

$$V_{pt} = K\ i\ /\ R_d\ n_e$$

where: K = hydraulic conductivity (ft/day)
i = hydraulic gradient
R_d = retardation factor
n_e = effective porosity.

The retardation factor (R_d) may be calculated using:

$$R_d = 1 + k_d\ pb\ /\ n_e$$

where k_d = distribution coefficient (cm^3/g)
pb = aquifer bulk density (g/cm^3).

A hydraulic conductivity value of 167 ft/d (see previous section) and a pumping hydraulic gradient of 0.007, taken from ground-water contour maps from CDM (1986) were used in calculations. The fraction of organic carbon in aquifer sediments was assumed to equal 0.001. The bulk density, 1.67, of the aquifer sediments was taken from Stearns, (1927) "Laboratory Tests on Physical Properties of Water - Bearing Materials", USGS , Water Supply Paper 596-F. Samples analyzed for this report were obtained from Puchack well 2. The effective porosity, 0.25, taken from Stearns (1927), is a value commonly assumed for aquifers of this nature. The distribution coefficient, 1.2, was taken from Dragun, (1988, "The Fate of Hazardous Materials in Soil", Hazardous Materials Control, vol. 1, no. 3, p. 59). The retardation factor, pollutant transport velocity, and time of travel from SL Modern Hard Chrome to Puchack well field for chromium follow.

Compound	K_d	R_d	V_{pt}(ft/d)	T_{ot}(d)
chromium	1.20	9.02	0.52	7116

Conclusions

1. Discharges of pollutants including, but not limited to, chromium, occurred at the SL Modern Hard Chrome site.

2. Analyses of ground-water samples from the monitor wells at the SL Modern Hard Chrome site showed concentrations of chromium which exceed MCL's.

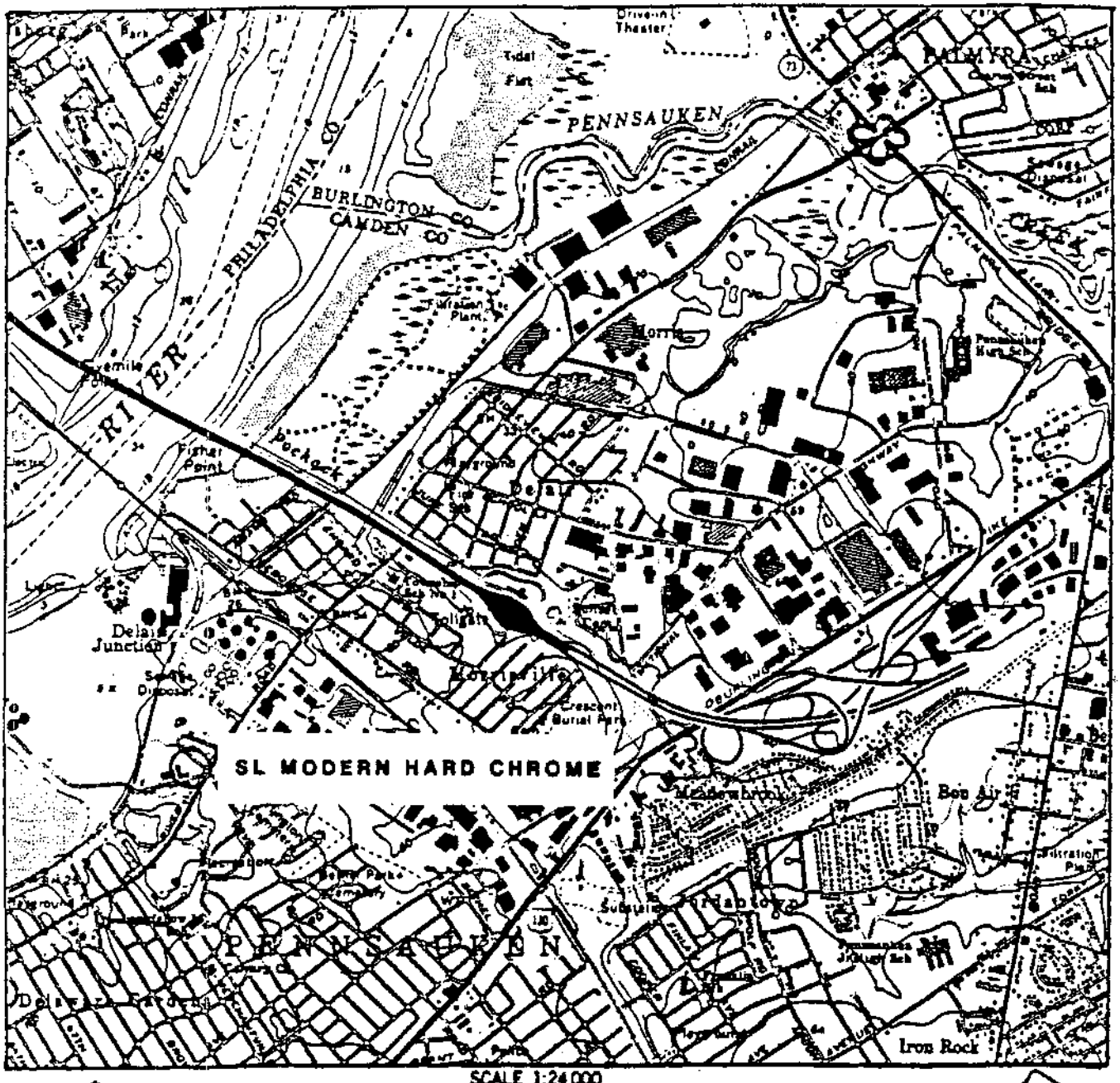
3. Analyses of ground-water samples obtained from the public supply wells at the Puchack well field have shown concentrations of chromium that exceed MCL's.

4. The SL Modern Hard Chrome site lies within the estimated capture zone for Puchack well field at the time when the discharge was assumed to have occurred.

5. The calculated pollutant transport velocity would allow chromium discharged at the SL Modern Hard Chrome site to reach the Puchack well field in 7308 days. Assuming the discharge started in 1969 pollutants discharged at the site could have reached the Puchack Well Field in 1989.

6. A reasonable technical basis has been developed to conclude that discharges of chromium that occurred at the SL Modern Hard Chrome site are potentially responsible for pollution of ground-water and wells at the Puchack well field.

FIGURE 1
LOCATION MAP

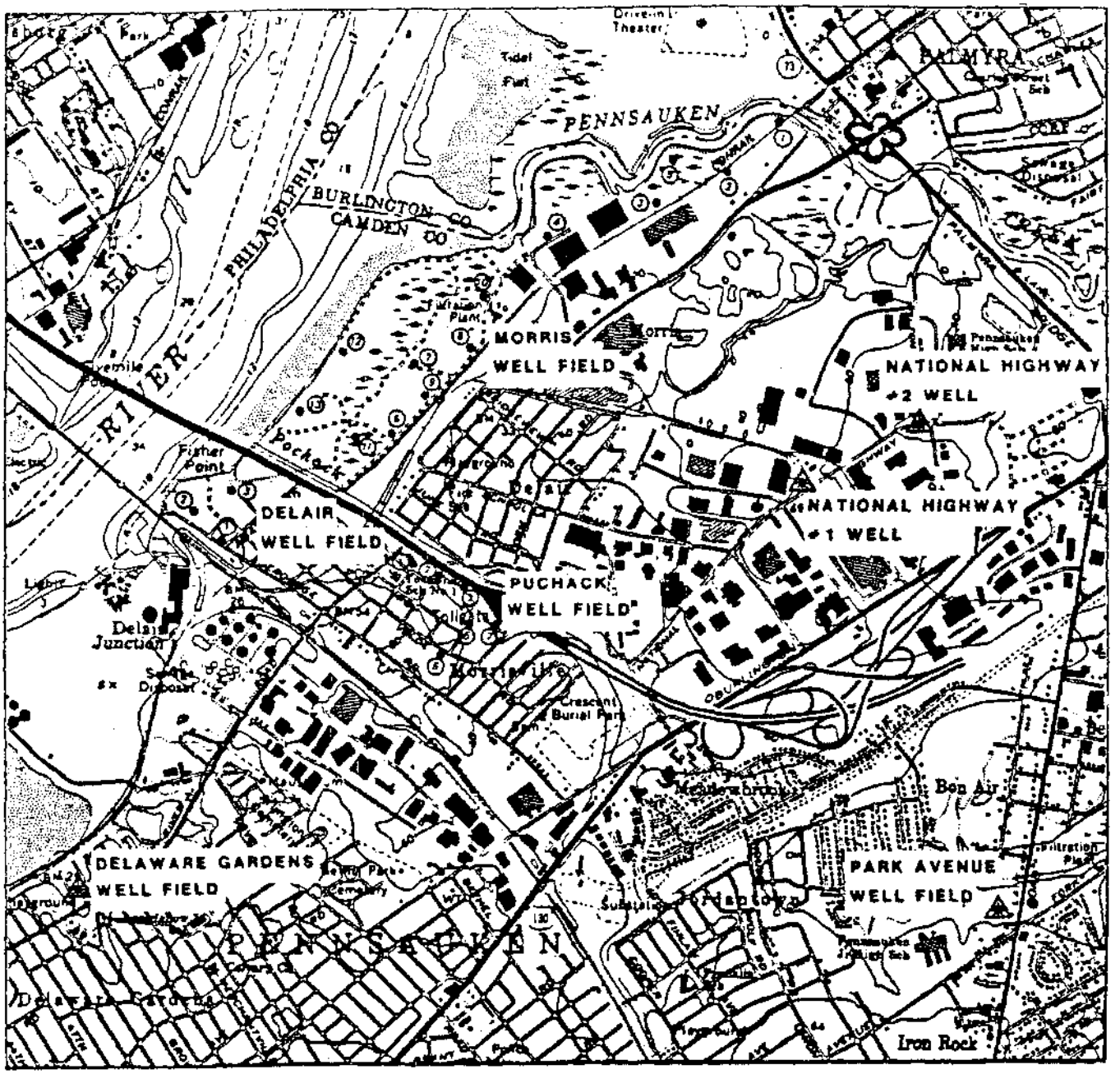


CONTOUR INTERVAL 20 FEET
DASHED LINES REPRESENT 10-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

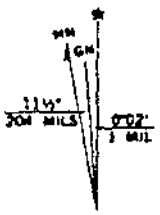
SOURCE:
U.S.G.S

CAMDEN, N. J.–PA.

FIGURE 2
PUBLIC SUPPLY WELL LOCATIONS



SCALE 1:24 000



LEGEND

PUCHACK WELL FIELD -- site location

• -- municipal well location

① -- municipal well number

▲ -- additional well field

January 1980

BGWPA

FIGURE 3

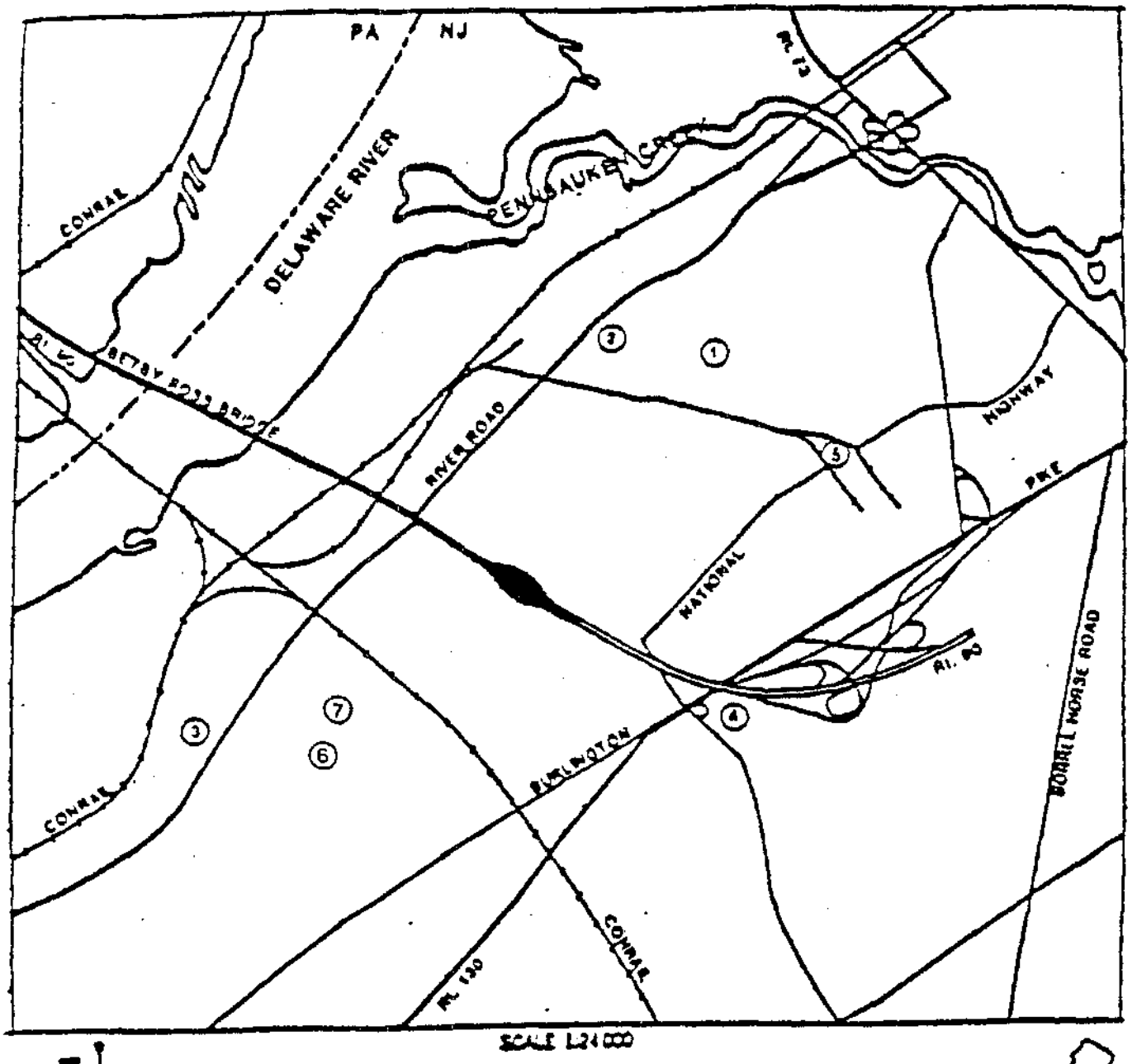
STATIC WATER LEVELS LOWER AQUIFER PRM

POTENTIOMETRIC SURFACE ELEVATION CONTOUR (MSL)
NON-PUMPING CONDITIONS

After Eckel and Walker, 1986, USGS WRI 86-4028

FIGURE 4

REFERENCED LOCATIONS



① PENNSAUKEN LANDFILL
② ALUMINUM SHAPES
③ SGL MODERN HARD CHROME
④ SEWER LINE LEAKAGE
⑤ SWOPE OIL
⑥ KING ARTHUR
⑦ DAVIDSON PWP

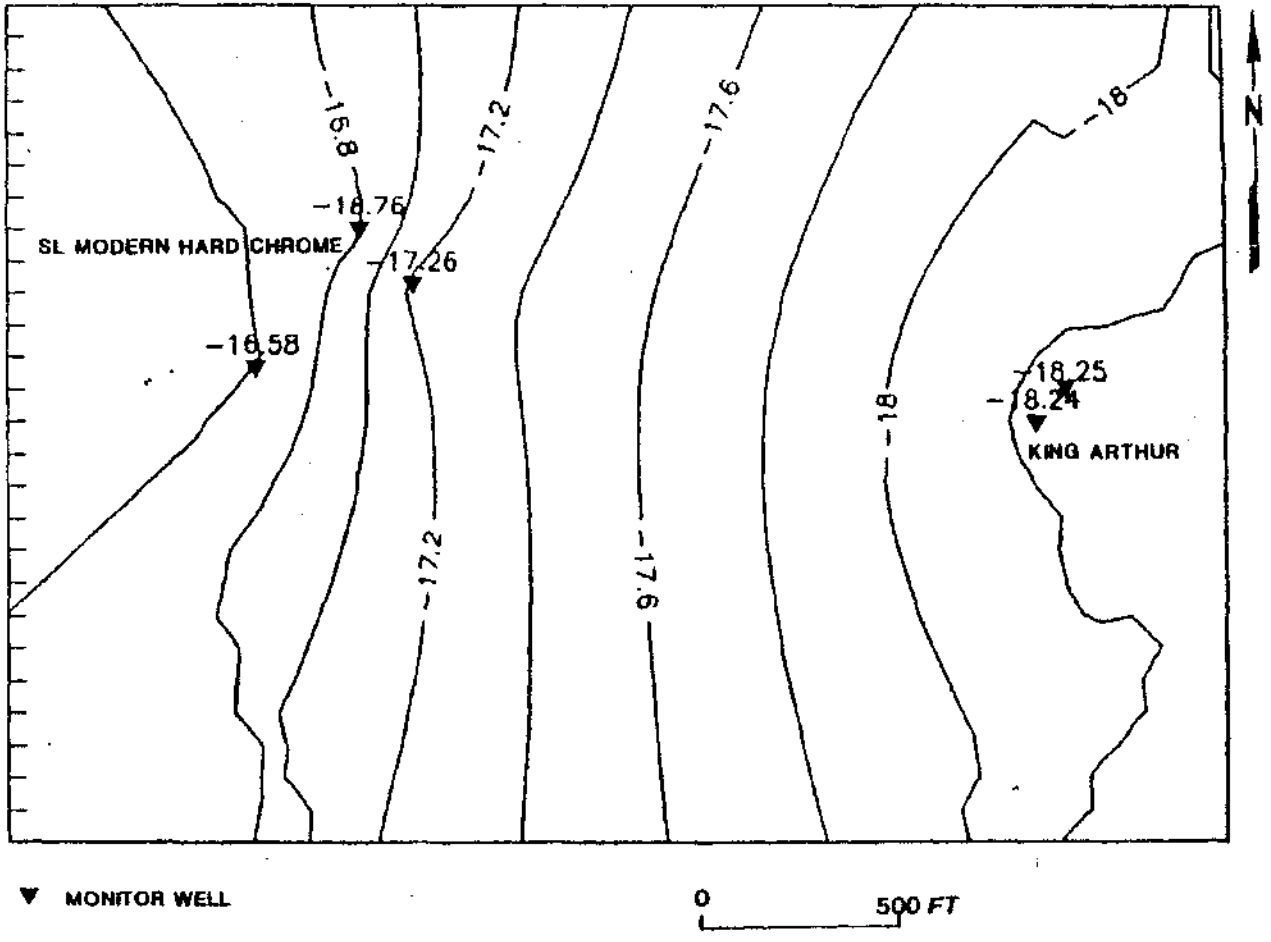
FIGURE 5

ESTIMATED CAPTURE ZONE, PUCHACK WELL FIELD, LOWER PRM

1973 - 1981

FIGURE 6

GROUND-WATER ELEVATIONS 3-22-90, MIDDLE PRM



ATTACHMENT 2

Figure 14 from the "Use of a Ground Water Flow Model to Delineate Contributing Areas to the Puchack Well Field" Prepared by the United States Geologic Survey (2005)

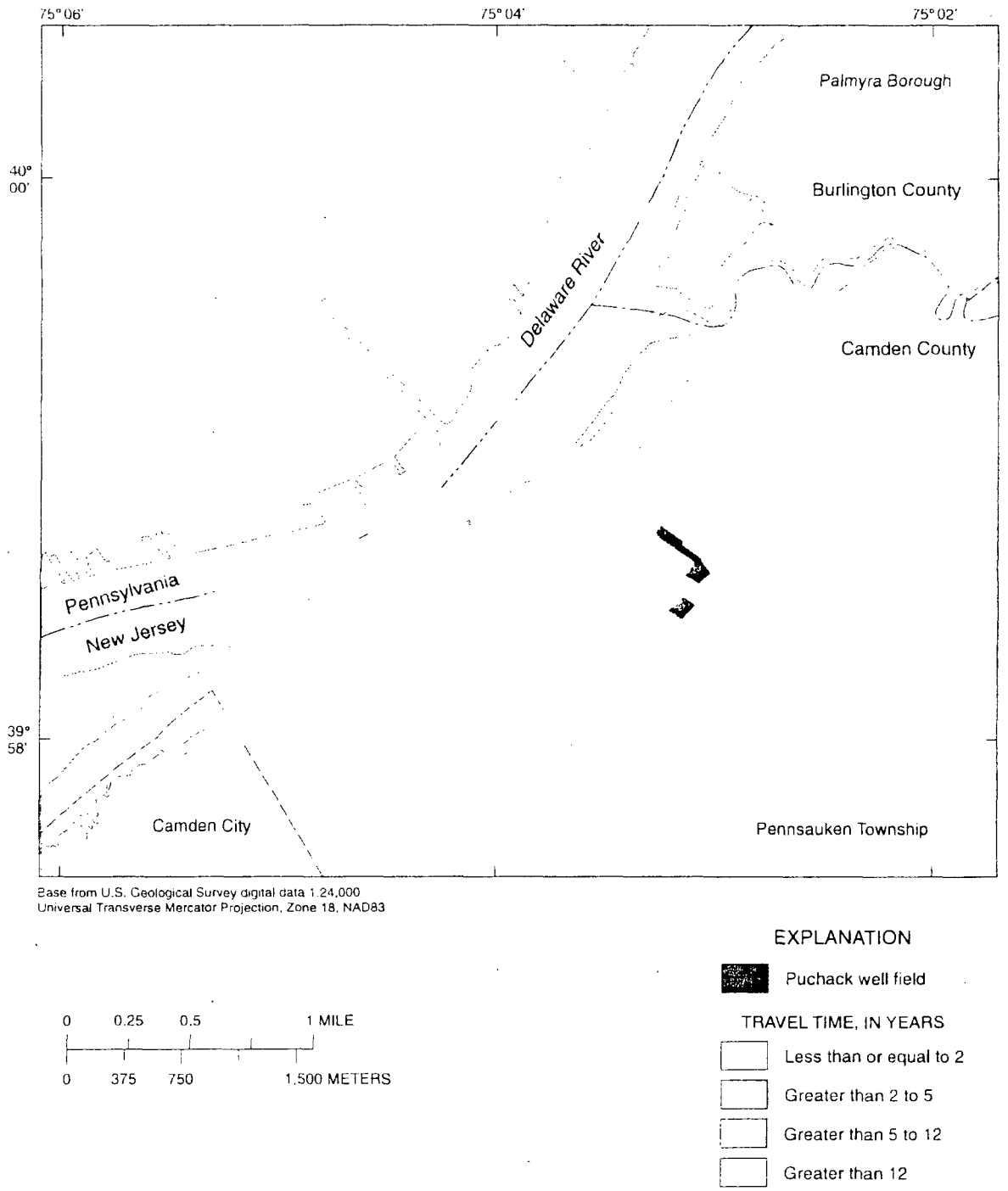


Figure 14. Simulated contributing area to the Puchack well field in the delineation simulation, Pennsauken Township and vicinity, Camden County, New Jersey.

Sharon Finlayson
218 Volan Street
Merchantville, NJ 08109
856-663-9188

September 3, 2006

Jon Gorin
Remedial Project Manager
USEPA, Region 2
290 Broadway, 19th Floor
New York, NY 10007

RE: Puchack Well Field Superfund Site
CERCLIS Number: NJD981084767

Dear Mr. Gorin:

Please accept my comments as part of the public record for the above referenced site.

First, because the Technical Assistance Grant for the Puchack Environmental Coalition, Inc. (PEC) has not been finalized and awarded by USEPA, the group that was organized to oversee the remediation of the site has been unable to obtain a professional analysis of the remediation plans set forth by you and Region 2. Therefore, be advised that I, as a Board Member of PEC, consider the public record incomplete. As a citizen of the area impacted by the past and future of the Puchack Well Fields, I request that the comment period be extended until November 6, 2006 so that PEC can receive and utilize the grant for which it has applied, and submit informed comments and recommendations as provided for by Superfund law.

Preliminarily, and without professional assistance, my comments are outlined below. At such time that EPA allows for an additional comment period, I will submit further comments:

- The Puchack Well Fields should be permanently closed because the contamination is so extensive, varied and widespread, and because the source(s) of the pollution will not be remediated until some undetermined time in the future.
- The proposed clean-up plan is inadequate. It addresses only one contaminant of concern, specifically hexavalent chromium.
- The proposed plan to treat in-situ is unacceptable. The proposed plan does not remove hexavalent chromium (Cr6) but seeks to reduce its toxicity by altering it from a toxic, highly mobile state to Trivalent Chromium (Cr3) considered "not

toxic and is not mobile" and the conversion from Cr6 to Cr3 is "is not reversible under normal environmental conditions." (material from public meeting, July 26, 2006)

- Due to their range of adverse health effects and high levels of contamination, Volatile Organic Compounds and Mercury must be removed from the Puchack Well Fields Superfund Site. VOCs and Mercury will remain a threat as long as they are present in the wells. A clean-up plan that lacks remediation of these very dangerous contaminants is incomplete.

Please provide answers to the following questions:

* What reactive agent will be used in the in-situ Geo Chemical Fixation treatment process for Cr(VI)?
* In that the in-situ treatment process is fairly young, please provide a history of the chosen treatment.
- How many injection areas will be involved in the in-situ treatment?
- Will there be any filtration of contaminants or of the converted chromium?
- What conditions might cause the reduced Trivalent Chromium to re-convert to Hexavalent Chromium?
- Are there any conditions under which Trivalent Chromium is harmful to health or the environment?
- Is any other form of chromium present in the contaminated well fields?
- What will happen to the Volatile Organic Compounds present in the Puchack Well Field Superfund Site?
- What will happen to the Mercury present at the site?
- What are the average levels of VOCs and mercury in wells that are used for public distribution in New Jersey?
- Will the contaminated plume continue to migrate during and after treatment?
- Are any public drinking water wells in the area susceptible to contamination from the site, either now or in the future?
- What is the anticipated future of the Puchack Superfund Site?
- Have there been any discussions, formal or informal, about utilizing the Puchack Wells for public distribution following the remediation process?

I have been a customer of the Merchantville Pennsauken Water Commission (MPWC) since 1981. MPWC recently entered into a contract with the City of Camden to purchase water for its service area. Camden City has a history of water contamination problems and recently supplied their residents with water that exceeded the MCL for TCE. The Review Worksheet for the above-mentioned contract notes that "written approval from the Department is required prior to placing Puchack wells into service." I am very concerned about the quality of our drinking water now and into the future.

Decisions relative to Superfund clean-ups should be predicated upon protecting the health of citizens above all else. That protection must consider future impact of the remediated site. The failure of USEPA to institute the most complete and comprehensive

remediation of the contaminated site could impact water supplies and public health for years to come.

I respectfully request that USEPA remediate the Puchack Well Superfund Site to the highest standard, using a pump and treat system, or other technology that would permanently remove all contamination from the water and soil. Additionally, I ask that you permanently close the Puchack Site so that it cannot be used for public consumption in the future.

Thank you for your consideration.

Very truly yours,

Sharon Finlayson
Puchack Environmental Coalition, Inc.
Board Chair, NJ Environmental Federation
Pennsauken/Merchantville resident since 1981

CC: Natalie Loney

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Sept. 6, 2004

Mr. Jon Gorin, Remedial Project Manager
U.S. EPA
290 Broadway
New York, NY 10007

Re: Puchack Well Field remediation plan – public comments

Dear Mr. Gorin:

Please accept these comments submitted on behalf of the South Jersey Environmental Justice Alliance, Inc. and the Puchack Environmental Coalition, Inc., as a written summary of the testimony presented at the public hearing of July 26, 2006 and to supplement the technical comments of Dr. Henry Cole.

1. PROCEDURAL AND PUBLIC PROCESS PROBLEMS SHOULD BE REMEDIED

- The time period for public comments should be extended. The time period allowed for the community to submit comments regarding this critical decision to be made by the EPA – the choice of remedy for clean up - was grossly inadequate, and the EPA has subverted the process for public participation by denying the community's request for an additional 90 day extension of the comment period. The EPA has been conducting investigations and preparing its RI/FS for several years, but released the draft report only in July, and allowed only 30 days for comments (subsequently extended for an additional 30 days). The processing of the TAG grant was delayed due to a lapse in communication with the EPA, but has been put back on track. The community should be given the opportunity to obtain independent expert review prior to the deadline for comments.
- EPA did not facilitate opportunity for public comments at hearing. EPA did not properly explain at the public hearing that the public hearing was for purpose of receiving comments and objections to EPA's proposed plan, but instead opened up a discussion for "questions". Community representatives were not informed that the hearing constituted the only opportunity to provide input and criticism of the proposed clean up plan. This is further reason for providing additional opportunity to submit written comments.

2. THE DIVISION OF SITE INTO 2 OPERATIONAL UNITS AND REMEDIATION OF GROUNDWATER BEFORE REMEDIATING SOURCES CREATES RISK OF CONTINUING SPREAD OF CONTAMINATION

- EPA's approach allows continuing contamination of groundwater. It is a major problem that while the groundwater is being treated, the source contamination remains in place and continues to pollute the groundwater. Community members questioned whether it is effective to remediate the groundwater before addressing the sources.
- EPA must prioritize clean up of sources (OU2). EPA needs to prioritize and speed up its proposed process for remediation of the sources (OU2). A delay of 2 years before a RI/FS is even proposed is unacceptable.

3. EPA MUST ADDRESS RISK OF CONTAMINATION OF WATER SUPPLY SYSTEMS PENDING REMEDIATION OF SITE

- Site creates danger of contamination of drinking water supply. As the EPA is aware, there are numerous active well fields in very close proximity to the site. Community members are very concerned about the spread of the contamination plume to drinking water sources. They question whether it is really safe to assume that the plume is not spreading contamination to the Morris-Delair well fields which are currently being used as Camden City's major water source, or other nearby well fields.
- EPA must closely monitor all nearby drinking water sources. As part of the remediation plan, the EPA needs to actively test and monitor nearby water sources to make sure that the contamination is not spreading to other wells and develop a plan for action if it is discovered that wells are or may be soon contaminated.
- EPA must plan for any unexpected spread of plume. Residents are concerned that if it is possible that the remediation activities, changes in use of the well, weather conditions such as droughts, or other factors could cause a change in the direction or speed of the migration of the plume, that EPA must have a way of monitoring for such changes and a plan to address them.

4. EPA'S PLAN FAILS TO REMEDIATE ALL CONTAMINATION AT SITE, ESPECIALLY VOCS

- VOCs are a dangerous known carcinogen that must be removed from site. The EPA's proposal to address only the chromium at the site is completely unacceptable to the community. VOCs are also a dangerous toxin that are responsible for creating an elevated cancer risk associated with that site, and were found to be present at dangerously high levels.

Presence of VOCs in area is not a basis for failing to remediate for VOCs. The EPA states that VOCs will not be remediated because they are found to be prevalent in the area and are not necessarily related to the Puchack site. The prevalence of VOC contamination in New Jersey

is not grounds to ignore them when remediating a Superfund site. Many Superfund sites are primarily contaminated with VOCs, and the fact that VOCs may also be found elsewhere in the region should not affect plans to remove them from the Superfund site. The remedial plan for this site should provide for removal of VOCs from the VOC plume related to the Puchack wellfield.

- Independent activities by NJ DEP is not a basis for failing to remediate VOCs. EPA also informed the community that the DEP was taking some measures to address VOCs in the area. If DEP's activities could be incorporated into a comprehensive remediation plan that would result in full remediation of VOC contamination, that could be an acceptable alternative. The EPA has not developed such a comprehensive plan, however. DEP's independent activities to remediate nearby contaminated sites is not a reason to exclude VOCs from the EPA's remediation plan for the Puchack Well Field. .
- Use of air strippers and similar methods to eliminate VOCs at the source is not an acceptable substitute for remediation. EPA has suggested that VOC contamination is not a problem because air strippers can remove VOCs before they enter the drinking water distribution system. This is not a basis for refusing to remediate the VOCs. The contamination left in the groundwater would continue to spread, and therefore poses a danger of exposure either through vapors from the groundwater or from exposure to contaminated soil, as well as the risk of contaminating nearby drinking water sources. The Morris Delair Well Field, Camden City's principal water source, has not had a VOC removal system, and even though there have been plans made to upgrade the system, it is not known whether the VOC air strippers are in place and proven to be fully operable. The stripper systems are known to fail occasionally and expose consumers to contaminated water, which has happened at other Camden well fields.
- EPA has rejected the only alternative that would remediate at least those VOCs which are contained within the groundwater contaminated with chromium. Only alternative 4 would simultaneously remove VOCs, but EPA rejected use of that alternative.
- EPA has failed to address manganese and mercury. Manganese and mercury were also found at the site, but the remediation plan does not address remediation of these contaminants.
- EPA's proposed plan fails to meet remedial objectives. Because the EPA has not developed a remediation plan that will address all known contaminants, the clean up will not achieve remedial action objectives, as the groundwater will not be remediated to drinking water standards

5. REMOVAL OF CHROMIUM IS PREFERABLE TO CONVERSION OF CHROMIUM VI TO CHROMIUM III.

- Chromium III is a known toxin. Although the EPA documents occasionally, and misleadingly, refer to chromium III as "non-toxic", chromium III is a contaminant and while considerably less toxic than chromium VI, it is not benign.

- EPA's remediation plan does not protect against conversion of chromium III back to chromium VI. The EPA documents state that chromium III does not under ordinary circumstances convert back to the more toxic form of chromium VI, but do not discuss the possible scenarios under which such a conversion could occur, or how to address it if it does.
- Remediation should provide for removal of chromium. The proposed remediation alternative converts chromium VI to the less toxic form but does not remove it from the site. Removal would be far more protective to health.

6. EPA'S PROPOSED CHROMIUM STANDARDS TO BE USED AT SITE ARE NOT SUFFICIENTLY PROTECTIVE OF HEALTH

- The EPA documents are not clear as to what is standard being used. At the public hearing, the EPA representatives stated that the groundwater would be remediated to a standard of 70 ppb, and that the remaining chromium would all be chromium III. The RI, however, refers to a standard of 100 ppb, and does not seem to specify whether remediation would be considered complete if the maximum total chromium would be at that 100 ppb level, i.e. that most of the remaining chromium were still chromium VI.
- Even the proposed level of 70 ppb is not established to be sufficiently protective of health; a stricter standard must be used. There is a great deal of uncertainty about the current chromium standards. The EPA standard does not distinguish between the highly toxic chromium VI and chromium III, and has recently raised the total chromium standard from 50 to 100. Community members question the validity of this approach to regulating chromium and the basis for raising the standard. They are also concerned about use of this total chromium standard in the unusual situation presented at this site, where over 90% of the chromium is hexavalent. The New Jersey state chromium standards have been shown to have been developed by industry scientists and to be based on junk science, which has led to them being reexamined by the DEP. A more stringent and protective standard is therefore called for at this site.

7. ALL FEASIBLE ALTERNATIVES MUST BE CONSIDERED

- The EPA's chosen remedy should have a demonstrated record of success. At the public hearing, community members questioned the EPA as to where the alternative proposed by EPA been used and with what results. They did not receive any information. The RI does mention some sites where certain technology has been used, but the EPA should evaluate and provide information to the community about the demonstrated success rate of these proposed methods of clean up.
- The EPA must consider all viable alternatives and all combinations of alternatives. The community members also questioned whether EPA considered all possible alternatives and combinations of alternatives. The EPA has justified its selection by presenting

information that shows that the remedy selected is both reasonable in cost and one of the quickest methods, but

- has not explained whether there could be some combination of treatments that would result in more complete remediation, such as combining the in situ treatment with some elements of the pump and treat method.
- The alternative selected must remediate all contaminants and result in full clean up of the site. EPA needs to develop another alternative which provides for remediation of ALL contaminants to drinking water and groundwater standards that are fully protective of health

8. POTENTIALLY RESPONSIBLE PARTIES MUST BE REQUIRED TO PAY FOR CLEAN UP.

- The EPA should develop and present to the community their strategy for securing funding from PRP's. The community representatives questioned the EPA about their plans for securing funding, and encouraging EPA to hold the polluters responsible. EPA should present their strategy to the public.

9. ENVIRONMENTAL JUSTICE MANDATES PROMPT AND COMPLETE REMEDIATION OF THE SITE

- Camden City is a low income, predominately African-American and Hispanic community. Census data shows that Camden City is the poorest city of its size in the country, with a poverty rate of more than 1/3 of the population, and that less than 10% of its residents are non-Hispanic whites.
- Camden residents have suffered from disproportionate environmental burdens. Camden City has served as a dumping ground for undesirable polluting facilities such as the regional incinerator, regional sewage treatment plant, numerous hazardous waste and scrap recyclers, a cement grinding plant, and a gypsum plant. It also contains over 100 known contaminated sites.
- Camden residents have health conditions linked to environmental contamination. Camden residents already are exposed to numerous dangerous toxins, as reflected in elevated cancer and asthma rates.
- The EPA has failed to properly protect the health and safety of Camden residents. The EPA's record (as well that of other governmental agencies) with regard to enforcement and clean up at Superfund sites in Camden has been very poor.
    - The Welsbach/General Gas Mantle site, situated partly in South Camden and partly in Gloucester City, was completely ignored for 10 years after radiation was discovered in the early 1980's, even though there were workers at the Camden factory site, being exposed to radiation and continuing to track contamination. Eventually, workers and some residents were relocated and some remediation was

- performed at both locations. The EPA spent $165-170 million at the Gloucester City portion of the site and only $1 million in Camden to date. The EPA has removed the top soil at the former factory in South Camden but still has not cleaned up the hot spots found in the residential area of the neighborhood.
- The Martin Aaron site was contaminated by continuing illegal dumping and burial of hazardous waste done while under the watch of the EPA and DEP. After the company went bankrupt and the site was put on the NPL, the EPA selected a clean up remedy which calls for some soil removal, but also for capping and restricted use of the site in lieu of full remediation.

- The area surrounding the Puchack Superfund site is a predominately lower income area and also bears a high level of environmental contamination. Pennsauken, while not as impoverished an area as Camden City, is a lower to middle income community with a significant African-American and Hispanic population. There are a significant number of homes near the Puchack site. The area contains other contaminated sites, including the Pennsauken Landfill, and various industrial uses.
- Concerns for environmental justice mandate that the EPA give special priority and consideration to conducting a prompt and thorough remediation of this site. EPA should begin the remedy the disparity in treatment of Camden residents by giving special priority in remediating this third, and hopefully last, Superfund site affecting Camden City.

10. THE PUCHACK WELL FIELD SHOULD NOT BE USED AGAIN AS A DRINKING WATER

- EPA should restrict future use of the site so as to not allow reuse of the well field as a drinking water source. The community finds it completely unacceptable to use the Puchack Wellfield as a water source, given the past history of the site, the contamination found in the area, and the uncertainties associated with remediation. The wells must be permanently closed and decommissioned.

Thank you for your consideration of these comments.

Very truly yours,

Olga D. Pomar, Esq.
SOUTH JERSEY LEGAL SERVICES

SENT BY E-MAIL Gorin.Jonathan@epamail.epa.gov AND REGULAR MAIL

cc: South Jersey Environmental Justice Alliance, Inc.
Puchack Environmental Coalition, Inc.

U.S. ENVIRONMENTAL PROTECTION AGENCY REGION 2

INVITES PUBLIC COMMENT

Proposed Cleanup for the

Puchack Well Field Superfund Site

Pennsauken Township, Camden County, New Jersey

July 26, 2006

7:00 p.m.

the Fine Arts Building

Room 110

Rutgers University, Camden Campus

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A P P E A R A N C E S :

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JOHN DOUGHERTY - Hydro Geologist

BETH ELTON - DEP Environmental Specialist,
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AKSHAY PARIKH - Site Manager for the DEP

CHUCK NACE - Risk Assessor/Env. Toxicologist Emergency and Remedial Response Division

DARYLL POPE - Groundwater Specialist

KAREN KLOO - Community Relations Coordinator,
Office of Community Relations

MS. LONEY: This is a public comment period headed by the Environmental Protection Agency. And the purpose of this meeting tonight is to present the proposed remedial plan for the Puchack Well Field Superfund Site.

If you haven't done so already, at an opportune moment, I would ask that you sign in on the sign-in sheet and get a copy in both the proposed plan, which is what we will be going over in detail and the agenda. We ask that you hold all questions until the end of the presentation and that you turn off all cell phones.

I'm going to turn over the meeting to the two presenters, but first I would like to introduce them. This is Jon Gorin (indicating). Jon Gorin is with the EPA. He is the Remedial Project Manager for the site. And next to Jon is "Frank" Tsang and "Frank" Tsang is the Contractor Support for the site.

In the front row, there are additional representatives from EPA and from the contractor, CDM. Here we have John Dougherty. He is a Geologist with CDM. We have Kim O'Connell. Kim is the Supervisor with the New Jersey Superfund Branch at EPA. Next to Kim is Chuck Nace. Chuck is a toxicologist with the EPA. In addition, we have some representatives from NJDEP who will be helping to field some of the questions at the end the meeting; both Akshay Parikh who is the Project Manager for the site and Karen Kloo who is a Community Relations coordinator for the site.

I am going to turn over the meeting to Jon. At the end of the presentation I will come back up and I will ask that we open the floor for questions. We do have a stenographer here and so I ask that when you do ask your question, please state your name clearly for the record.

Thank you.

MR. GORIN: Thank you, Natalie.

Before I begin, I just want to explain something about the site. A lot of Superfund Sites we break them up into separate components. And the term of art we use is Operable Unit. This site itself has been broken up into two operable units. One dealing with source areas and one dealing with contamination in the groundwater.

The remedy is solely for the groundwater contamination, which would be Operable Unit 1. So again tonight, as Natalie said during her introduction, I'm going to give a quick overview of the Superfund process in general, a little bit about the site history. I will present the alternatives we looked at to remedy this site. I will show you the preferred alternative for EPA for the site. And then "Frank" who works for CDM, he is our consultant for the site, will give a more in-depth-type of discussions on the investigations that

were done and the feasibility study that looked at each one of the alternatives. And then we will go on to questions and answers.

Again, this is just a real general outline on how Superfund process typically works. A site is discovered or presented to EPA. We look at the existing date, maybe go out and collect a little more data and then we score it using something called a Hazard Ranking System. And depending on the score, it could be nominated and eventually added the National Priority List, which is a list of abandoned or uncontrolled hazardous waste sites that EPA is considering doing some king of long-term remedy. In other words, it becomes a Superfund site.

The first process of the Superfund program is we do a renew investigation. We go out and we gather data, determine the extent of the contamination. We assess the hazards to human health and sometimes the ecology.

We develop criteria for cleanup and then we enter the next phase, which is the feasibility study. And there we look at some alternatives or options to remedy the site and assess those options against EPA's non-criteria, which I will just run through really quickly so that you can have an idea of what we do.

The first one is, you know, we try to answer the question: Does the alternative use treatment, engineering or institutional controls to protect human health from the environment? Does it apply with ARARs, which is Applicable or Relevant and Appropriate Requirements or more simply put, basically. Federal and State Law and Regulations? Will it be long-term effective and a permanent remedy? Does it reduce toxicity, mobility and volume of the contaminants and concern? Will it be effective in a short term? About how long will it take to implement the remedy? And during that implementation, will it put workers and the community at any kind of risk?

Can we do it? Is it implementable – that will be No. 6. Cost is obvious. 8, does it have State and Federal agency acceptance and support? And, then, finally, which is after the feasibility set of costs, is community acceptance and tonight this is part of that process.

So after the feasibility study is done, EPA selects a preferred alternative. We proposed -- and we do have by putting together a proposed plan, which each of you should have a copy of. We open to a public comment period which for this site began on July 7th and it ends in a couple of weeks, on August 7th. And we have a public meeting, like tonight, where we gather comments from the public.

And after the public comment period is over, we begin preparing our record of decision, which we address comments received from the public. And that's our selected remedy. Again, it is a part of something we call the

Record of Decision, which is a term you will hear a lot if you are doing anything with Superfund. After that, we begin or remedial design, which is based on the Record of Decision. Once that's done, we move into Remedial Action, which is the remedy we perform based on the design. I guess it sounds really simple like that, but it is not.

I will just run through the site history briefly and then I will move on. In the late '70s and early '80s contamination began to be discovered in he well fields. As each well was found to be contaminated it was terminated for use. Except for — I believe all the wells were terminated by 1984 except for one, which is Puchack 1. And they continued to pump in that in an attempt to control the chromium plume and that continued on until 1998 when the pumping was completely discontinued. Right now, the well field is not being used at all.

In 1997 the U.S. Geological

Survey with NJDEP began a field investigation. In that investigation we found a rather limited area of very high chromium contamination, as high as 10,000 parts per billion, I believe. If you compare that to the State criteria of 70 part per billion you will understand that's fairly high.

We also found a lot of organic contamination. However, it wasn't in just the area around the chromium, but it was throughout the region and it seemed to have been caused by several different courses. So it was about this time, based on this data and data that we collected later we determined that the chromium plume was a distinct plume and the organic problems weren't regional problems. That's caused by a lot of different source areas. So that's why this site cleanup, this groundwater cleanup is strictly for the chromium. And that's an important distinction for all of you to understand.

Back to the history, in 1998 the Puchack Well Field was placed on the NPL. It became a Superfund site. The remedial investigations continued with NJDEP, USGS. we got involved and so did our consultant, CDM. We finished our investigation of the groundwater in January 2006 when we issued our remedial investigation report.

Then we began -- well, actually, even during the remedial investigation when we were looking at alternatives, we assessed each of the alternatives using EPA's non- criteria, which I discussed before. I have the feasibility study. We completed that in June.

And we looked at four different alternatives. One is No Action, which is just what it sounds like, ho action. We pull up stakes. We leave the site. Nothing further gets done. The second one was Monitored Natural Attenuation. And this is when you allowed the national capacity to the

groundwater to actually reduce the chromium.

We actually decided to keep this one in because we did some treatability studies of the actually sediments and they seem to have a pretty high capacity to reduce Chromium VI. So we thought this could have been a feasible way to address this site. We also added a contingency remedy if the natural attenuation — if the monitoring during natural attenuation showed it wasn't working. And in a contingency remedy with two parts either we put in something called a Permeable Reactive Barrier, which is simply, would inject the reagent into the ground and wait for the chromium plume to pass through that reagent and get reduced and the chromium would be reduced.

We also considered taking a different type of reagent and injecting directly into the hot spots of the plume reducing it that way and letting natural attenuation take over for the rest. And

that kind of leads into the third option we looked at, which was instead of allowing monitoring natural attenuations to continue before we consider doing any kind of contingency remedy, we would start from the beginning. Meaning, we would address it with chemical reagents from the start.

This time we looked at three different options. One was the permeable barrier, again. This time a little closer to where we believe the plume is. The second one was, again, hitting the hot spots with reagent. And the third one we looked at was hitting the entire plume, anything that contravenes New Jersey's groundwater criteria for chromium.

The last action we looked at was pump and treat, which is just like it sounds. We put in wells throughout the plume. We pump it, run it through a treatment facility and then either inject it into the ground or possibly the surface water.

The one we selected was Alternative 3C, which is in your proposed plan, In- Situ Geochemical Fixation of groundwater that has greater than 70 parts per billion of chromium. Some of this were a number of reasons. It clearly wasn't achieved. This, I believe, was the second most expensive in cost. It was the most aggressive. It was by far the quickest remedy. Meaning, we believe it would get rid of the chromium problem in the shortest amount of time. And it also gives a lot of flexibility during the design and actually during the action where if the plume seems to be moving or if our data shows the plume is in a little different spot than we thought, we can adjust to that right in the field.

So we felt like this, while not the cheapest, it was clearly the fastest. It allowed us to be aggressive. It allowed us to move quickly and hopefully get ride of this problem.

I'm going to turn it over to "Frank." And he is going to run through some of the technical studies. And then we will go to Q and A.

MR. TSANG: Good evening, everybody.

CDM and the United States Geological Survey started an investigation in 1999 and continued through 2001. We installed 64 monitoring wells to collect groundwater samples from 88 monitoring wells for a total of 135 groundwater samples. In those results we found chromium contamination on site.

In three of the four aquifers -- the top, the upper-most one, we call it Upper aquifer, which pretty much was dry. And so we didn't install any monitoring wells there. We didn't collect samples from there.

The next one down is called Middle aquifer. It is about 70 feet below the ground surface. And the next one down we all Intermediate Sand, which

is about 150 feet below ground surface. And the last one that we sampled is called Lower aquifer. It is about 180 feet below the ground surface.

I superimposed the chromium plume that we found on site on this area photograph of Puchack, Pennsauken Township area. Puchack Well Field is right here (indicating), just for your reference. Groundwater is flowing toward east, southeast at about 300 feet per year.

SQL monitoring hot plume is located here (indicating). And we found the highest contamination at the former facility -- I will show you the result a little bit later. This is one of the suspected source area for the chromium plume.

This slide shows the chromium result in the Middle aquifer. Please ignore the difference shades of the background. They just show the different geologic formation. It is not about a contamination.

As I mentioned, we collected 135 samples from 88 monitoring wells throughout this area. Only the wells with detection are shown on this figure. This is our result for the total chromium, but for our purpose we assume they are a hundred percent Hexavalent Chromium -- I will talk about the different kinds of chromium later on.

In the Middle aquifer we found high concentrations of chromium at two locations. One is at this monitoring well up here (indicating) near Pennsauken Landfill. We determined that this is not related to the Puchack Well Field Superfund site. This is completely separate from the site. Another location we found with high levels of concentrated chromium is at the former SGL facility. This was found to have the highest chromium concentration during the investigation, about 8,000 parts per billion.

This slide shows the chromium contamination in the Intermediate Sand

aquifer. We found a pretty large plume that measures about several thousand feet wide and a couple thousand feet long. Looking at the shape of the plume it has kind of migrated away from the Puchack Well Field. Right now this is just a little bit of residual contamination at the well field area (indicating).

Again, this is the chromium contamination in the Lower aquifer (indicating). It is a pretty large plume, again, but the concentration is slightly less than what's in the Intermediate Sand aquifer. Besides chromium contamination, we also detected Volatiles Organic Compound contamination in the groundwater in area -- in the general area around the site.

This total volatile organic compound concentration that we show here (indicating), this is for selected number of compounds. It is about five compound that -- we add them. Only the ones that exceeds MCL we include on here

(indicating). The ones that are not exceeding MCL we are not showing on this figure.

I superimposed the chromium plume from the Intermediate Sand and also the Lower aquifer on this figure. As you can see, the volatile organic compound contaminant is more widespread than the chromium contamination and it is from multiple sources. And definitely it is a regional problem rather than localized related to the chromium problem.

The multiple sources, as I mentioned earlier, the source, the VOC contamination is being addressed by New Jersey DEP under the State authorize. And we are not going to be addressing the volatile organic contamination under this remedy.

This is going to show you the VOC contamination in the Intermediate Sand (indicating). The contamination is, again, is widespread as compared to the chromium plume in the middle. It

definitely shows multiple sources and a regional contamination rather related to the site. Again, this is the VOC contamination in the Lower aquifer. It is more widespread than the chromium plume.

The very first step in the feasibility study is to develop the Remedial Action Objectives which meets the specific goals for the protection of human health and their environment. The EPA has established three remedial action objectives sites. The firth objective is to prevent or minimize potential human exposure from contaminated groundwater. As Jon mentioned earlier, Puchack Well Field has been shutdown. Nobody is using the contaminated groundwater at this time. So there are no exposures.

In our alternatives, most all of the alternatives, except No Action Alternative, include institutional controls to restrict the use of contaminated groundwater in the future

to prevent future exposures.

The second objective for the site is to minimize the migration of the chromium plume and then the third objective is to restore the chromium contaminated groundwater to the cleanup level within a reasonable time frame.

In order to achieve the Remedial Action Objective, we have developed cleanup goals. We call it Preliminary Remediation Goals. EPA has selected a New Jersey groundwater quality standard for chromium as the cleanup level, which is more conservative than the drinking water standard. The drinking water standard is at 100 parts per billion or 100 micrograms a liter.

Before I talk about the various Remedial Action Alternatives, I would like to discuss a little bit about the characteristics of the chromium. Chromium is a metal. We cannot destroy it. So we had to find a way to remediate it. There are several forms

of chromium. Two of the more common ones are the Hexavalent Chromium. We generally refer to it as Chrome VI. And another Trivalent Chromium. We generally refer to it as Chrome III.

Chrome VI is toxic and it is mobile because it dissolves in water. It flows in water, groundwater. Chrome III is not toxic and is not mobile. It doesn't dissolve in water and it can absorb into the soil matrix easily.

Another characteristic of Chrome VI is that it is unstable. It can be reduced to Chrome III easily. Chrome III is very stable, on the other hand. The reaction is not reversible under normal and remedial conditions. This is very important, you understand. We don't want Chrome VI. We want Chrome III. We don't want it to go back to Chrome VI.

I call it an EPA guidance. We have not observed any reversals from Chrome III to Chrome VI in the environment. We can create the

condition in the lab, but in the environment we have not observed the oxidizing from Chrome III to Chrome VI yet.

That comes to the way that we remediate Chrome VI. We can convert all of Chrome VI to Chrome III in the plume. As the chromium gets converted to Chrome III, it precipitates out of the groundwater. It absorbs into the soil matrix and is no longer available for the direct contact or ingestion to either humans or by odor.

EPA has contracted Pacific Northwest and National Laboratory to conduct some treatability studies. I listed three of the findings from the treatment study. The first one is the aquifer sediment outside of the plume has natural reduction capacity to reduce Chrome VI to Chrome III. And the second finding is that this reduction capacity can be enhanced by injecting reducing agents.

Now you are going to ask the

question: If that is the case, how come the plume has not been remediated? My answer to that is that, okay, it is probably happening now. We just don't have enough data to present to you that it is happening on a large scale and we cannot tell you the rate of reduction, but we do have limited reduction. It reduced.

Another thing we were suspecting is that the aquifer sediment within the plume has exhausted reduction capacity. So for the reduction reaction to happen, the plume would have to migrate out of the existing location, move to a near location and then get reduced.

That brings me to the third finding that we have from the study which the soil particles have absorption capacity. We call it, to retard the migration of Chromium VI; very much like a sponge absorbs water and then gradually releases it back later on. The CDM estimates the migration is no

more than 20 feet per year as compared to the groundwater velocity of 300 feet per year; therefore, the chromium migration is very slow.

CDM developed four alternatives for the site. The first alternative is No Action. This is required by circa process. Mainly for the purpose of comparing the other alternatives to this No Action Alternative.

Alternative 2, Alternative 3 and 4, they have common elements. One of them is Institutional of Control. We will implement Institutional Control. Under New Jersey DEP there is a program called Classification Exception Area that will restrict the use of contaminant groundwater. As long as the groundwater is contamination, you cannot use the groundwater. You cannot draw a well there to extract the contaminated water out for consumption purposes.

Another common element is long-term monitoring. We will implement

long-term monitoring under Alternative 2,3 and 4 to monitor the effectiveness of the remedy and also the migration of the chromium plume.

Under Alternative 2 we would rely on the natural reduction capacity of the aquifer sediment to reduce the chromium plume from Chrome VI to Chrome III. We also include a contingency remedy. Under Option 2A we would use a term called Permeable Reaction Barrier. I need to clarify that a little bit. Even though we call it a barrier, this may be a misnomer. And the correct term I would use is probably a Reactive Zone. Basically, we inject the reducing chemical into the aquifer and create a reduction zone. As the groundwater flows through the zone, it gets reduced from Chrome VI to Chrome III and precipitate out of the water. We use the industrial term called Permeable Reactive Barrier.

Option 2B, we will use In-Situ Geochemical Fixation which is very

similar to -- actually in term of the reaction -- very similar to Permeable Reactive Barrier. We will inject reducing agents into the aquifer, but instead of one localized area we inject it throughout the plume to pursue the chromium plume more aggressively and reduce it in a much shorter time.

Under Alternative 3, instead of waiting for the plume to migrate and trigger contingency remedy, we will pursue the plume at the beginning, very beginning, of the remedy. From day one we will go out there and implement the treatment technology. We have three options under Alternative 3.

Option A and B we target hot spots. Basically, anything about 1,000 micrograms per liter. Option 3A will install PRB right below the area that is about 1,000 micrograms per liter. While Option 3B will inject the reducing agent into the area, which is about 1,000 micrograms per liter. And under Option 3C we will just use technology to

institute the chemical fixation to target the whole plume. We will inject the chemical into the whole plume.

Then under Alternative 4 we will put in an extraction well to pump the water up to the surface, treat it and we will inject into the ground -- by the way, the treatment includes both treating the chromium and also any of the Volatile Organic Compound that we pump out together with chromium. So we treat both. We are not just treating one contaminant.

This is a conceptual sign layout for Alternative 2A. As I mentioned earlier, Alternative 2 relies on the Natural Reduction Capacity of the aquifer sediment to reduce the chromium plume. We monitor the effectiveness of the remedy as well as the migration, a potential migration of the plume, even though earlier I mentioned that they only migrate about 20 feet per year, but we put in a contingency remedy in case some part of it does migrate down to a

zone we call a Compliant Zone.

Actually, there is a line, a monitoring well here (indicating). If we detect the plume migrating towards that line, monitoring well, we would install the Permeable Reactive Barrier along this line here (indicating). And then when the plume migrates past the Permeable Reactive Barrier, then it will get reduced and won't pass that line. So we basically stop the migration of the contaminate.

The time frame for these alternatives is about 30 years. As we gain more data as we -- when we implement the alternatives, then we will have a better estimate for the duration of the remedy.

This slide shows the conceptual layout of Alternative 2B. Alternative 2B actually is quite similar to 2A using the same principal. But instead of installing a line of Permeable Reactive Barrier here, (indicating), we would create a

treatment zone here (indicating). We assume, let's say, if the plume migrate down this area (indicating), we would create a treatment zone here (indicating) and we will inject the reducing agent into the whole area to pursue the chromium plume and reduce it in a much shorter time.

The time frame for this alternative, again, is an estimate of about 30 years, but as we implement it we will get more results, more data. Then we can have a better estimate of the duration.

This is a conceptual site layout for Alternative 3A (indicating). As I mentioned earlier, for Alternative 3, we would implement the treatment technology from day one of the remedy. We would install the Permeable Reactive Barrier up front closer to the target treatment area so that we will have a faster remediation time.

For areas outside of the target area, then we will, again, we are

relying on the natural reduction capacity of the sediment to reduce the Chromium VI to Chromium III. The time frame for this alternative, again, is an estimate of about 30 years. As we get more results, we will be able to give you a more definitive estimate on the duration.

This is the conceptual site layout for Alternative 3B (indicating). It is very much similar to Alternative 2B except that we target the hot spot. And we will inject chemicals throughout the hot spot that I presented here (indicating). We will treat the hot spot quickly. And the time frame to treat the hot spot is an estimate of five to ten years. And then for areas outside of the treatment zone, we will rely on the national reduction process to take place. We estimate about 30 years.

Alternative 3C is very similar to Alternative 3B except that we are -- not right now -- we are targeting the

entire plume. We will inject chemicals throughout the plume. We will treat the plume much faster. We estimate it will take about five to ten years to treat the entire plume.

Alternative 4, as I mentioned earlier, we will put in extraction wells, represent by the red dots here (indicating). We treat the plume. We will extract the contaminated groundwater, treat it on site. Again, as I mentioned earlier, we are going to treat both chromium and VOC, any VOCs that would be extracted out together with the chromium. We will treat it and then re-inject into of aquifer. The time frame to remediate the entire plume will be much longer than 30 years.

This slide shows the cost estimate for various alternatives as far as options. It ranges from $1.2 million for Alternative 2 using the Monitoring Natural Attenuation to over $32 million for Alternative 4 using the pump and treat. Alternative 3C, which is the

preferred alternative, using the in-situ geochemical fixation to treat the entire plume has the cost estimate of $16.7 million.

That is it for my presentation. I will turn this meeting back to Jon.

Thank you.

MR. GORIN: Thanks, "Frank."

I just want to run through again now that you hopefully understand a little bit more about the proposed alternatives we are coming in with. We like it because, again, it was the second most expensive proposal, but it is flexible. It gives us a lot of control. It let's us be very aggressive and it is going to be long-term effect than any other remedies. It won't disturb the community any more than any other remedies and it is by far the quickest. And it can get rid of this problem faster than any other remedy quite a bit.

MS. LONEY: We are opening

the floor up for questions. Again, we just ask if you have a question, raise your hand. I will point to you. State your name for the record. Speak lowly and clearly and we will try and answer it as best we can.

MR. DAVIS: My name is Mongaliso Davis, M—O-N-A-G-A-L-I-S-O.

Okay. The presentation. It would be good if somebody is going to be around here for 30 years to see what the outcome will be. Where is just a sense of a track record where you have tried this at before and it has been successful? There is a lot of contingents on 30 years to be able to use that facility. At the same token, we are having spikes in the well over at Morris Delair. So as that moves into the area it is becoming more contaminated. When you are talking about 30 years of establishing this here wall to capture the moving contamination, where has this process been done before or is in existence or

is it this just theory?

MR. GORIN: I will answer the first half.

Again, as we explained this remedy most likely isn't one of the 30-year remedies. This remedy, hopefully, once the action begins, once we finish the design and go into action, we can take care of the chromium plume in five to ten years. And if natural attenuation has been occurring over the last few years, the process will be even quicker. Hopefully, I will still be around in 30 years.

Yes, about the Delair facility, I don't believe — and you tell me if I'm wrong. I'm asking DEP – they haven't found Chromium in the Delair...

I don't know what spikes you are referring to, but this is strictly for chromium. So it hasn't entered the Delair. Again, the chromium plume doesn't move very quickly. We don't expect it to get to the Delair, but part

of the remedy we are going to put in place we will have long-term monitoring. Meaning, the monitoring will continue until the chromium problem is gone.

We will be able to pick it up before it gets to the Delair facility and then they do monitoring themselves in that facility.

MR. DAVIS: Let me followup on that. There is conflicting reports about the quality of the water at the Morris Delair. The City seems to think there is a problem. And the Feds seems to think there is some drinking problems there, but I won't dwell on that but going back to the causes: You are talking about cleanup, but there hasn't been talk about removing those causes. Have all the causes that we are looking at have been removed now that you were moving forward treating?

MR. GORIN: That's a good question. What you are asking is, are we going after the source area. We are

treating groundwater. Are we going after the sources area that caused our problem?

MR. DAVIS: Uh-huh.

MR. GORIN: That was the other part of the Operable Unit. That's Operable Unit 2. And you are right and generally you would think and I think typically we go after the source areas first and then go on to groundwaters. Since it was affecting the well field and since there is a chance it will affect other well fields, we are attacking the chromium problems first. We are putting together a work plan right now. And we hopefully will collect some data where we can begin. Hopefully we will be back in a couple years with the decision or at least an alternative. We want to do the source areas of it. So we are looking into that. For right now, we are going after the chromium plume. That's a good question.

I think the other part of your

question was, "Has this been used at other sites"?

MR. TSANG: Yes. It has been used at other sites. This is from an EPA guidance document that they developed on these alternatives (indicating). And I don't remember the names of the site, but this is not brand new even though we call it Innovative Technology, but it's not brand new. It has been proven to work at other sites. I kind of remember one site in Texas. I just don't remember the name. There are many other sites. Several sites have used these kinds of technologies and treat it. This is accepted by EPA. It has a guidance of how to discuss this alternative.

MR. GORIN: Again, if I may, every site is different and your concerns they are good concerns in that what may work for one site may not work for another site. That's why we are going to have the long-term monitoring; that's why we are going to keep an eye

on it. And if it is not working, there are things we can do. We can modify the rod and come in with a different remedy.

MR. POPE: Hi. I am Daryll Pope with the U.S. Geological Survey. Just to your first part of your question about the Morris Delair Well Field. If you remember they were pumping the Puchack 1 Well a month from 1997 and they stopped pumping it. At the point when they stopped, DEP and USGS worked together to see what the affects of that would be and we did a study where we measured water levels. We turned off the water for 30 days, measured the water levels to see what the affect would be. To make sure that the chromium plume wouldn't move back out towards Morris and Delair. We saw that the water levels would move the way they have been and continued to move in the same direction. So we felt confident and we have see that through time. So that was something that we

looked at that wasn't going to be a threat to Morris and Delair of chrome.

MR. NOGAKI: My name is Roger Nogaki, N–0-G-A-K-I. I'm from Marlton, New Jersey. I'm the Chairman of the L Site Task Force, which is a community group which has been recognized by our local municipal government to represent the community in evaluating a Superfund site that we have in our community.

Our group formed back in 1983. So it is right in about the same time you are talking about, you know, you folks kind of like found this problem down here in the 1970s, 1980s. We formed our committee and we tried to have a session with the EPA and the DEP about our particular problem. It is kind of like this kind of informational-type setting.

And some of the things that we found was that we get a lot of technical jargon from the scientist from the DEP and the EPA. And the common person, the common citizen, does not understand what

you are talking about. And I look around in this room here and I dear say there are not too many people from this community that are actually here at this meeting.

Some of our friends, some of my friends from South Jersey Environmental Justice coalition asked me to come down here and just speak a little bit about some of the things that we encountered, what we dealt with DEP and the EPA. And I must tell you that one of the wonderful things about the American form of democracy is, is that we have the right to question what or government is going.

And when the Government doesn't really give you an opportunity to question, then we have lost our democracy. And it seems to me here I'm hearing things that really bother me because it seems to me that you have already made the decision on what you are going to do for the folks in this area without giving the folks in this

area an opportunity to really understand what all of these problems mean.

When you start talking about saying things like, you are going to take this Cr(VI) and you are going to put it into a nontoxic form, Cr(III), you know, people don't understand what you are talking about. And the other thing is, is that, you know, how does this stuff affect other contaminants that may be in the groundwater? And how is it going to affect other sources of water in the area?

Now, as an example, some of the things that I just wrote down here as I was listening to you, you talked about these various aquifers, Middle aquifer, Shallow aquifer, you know, how deep are these of aquifers that you are talking about?

If you have large contamination in the certain area, have there been other things that you have looked at? Have you looked at digging these sources out, the heavy

contamination sources out? When you talk about volatile organics, what volatile organics? Are we talking about things like perchloroethylene, trichloroethylene, these kinds of things? Is that what we are talking about? And if so, have you done any studies to determine if there are any DNAPLS, Dense Non-Aqueous Phase Liquids? These things could have a serious affect on drinking water in your wells in this area and if it migrates into a potable aquifer, it could have affect on other surrounding communities.

So if you say that, you know, this thing is only moving at the rate of 300 feet a year or so, it doesn't sound like a lot. In. ten years that's 3,000 feet. That's over a half a mile. You are talking about in 30 years, you are talking about, what, a mile and-a-half or more that this stuff will have migrated. So these are some of the things that I thought about when I was listening.

The other thing I was saying is, you talked about you are going to use some kind of chemicals to convert the Cr(VI) to the Cr(III). What chemical? How is this going to affect other contaminants that are in the groundwater and in the surrounding areas where you may be using this water? I live kind of look south and east of this flow and I think about my aquifer, which is the Kirkwood Cohancy aquifer. Is it going to affect that or is it going to affect the Mount Laurel? Is it going to affect the PRM? Or is it already affecting these other aquifers in this area? So these are some of the kind of things that, you know, I think we should really be looking at -- you should be looking at. You should be identifying these things and telling us about them.

When we ask you "Where have you used these other systems for treatment that have been successful" and you can't even name one. You can't name one. This is astounding. This is

something you should have at the tip of your finger. You should be about to say, here is our experience. Here is what we have done. Here is how it has worked. Here is how long it has taken to work.

You talk about pump and treat. We put a pump-and-treat system in our Superfund site for groundwater cleanup. That thing didn't work. This was -- in the year 2000 they turned the pump on. In the year 1990 we were saying, the pump-and-treat system is not going to work. It's old technology. It is not going to work. Although standard pump-and-treat system is a technology that they first come out with to try and treat this stuff. You are going to go a hundred years and you are not going to address the problems. We have gone 30 years and we haven't done anything except that we find that the pump-and-treat system is not working for a number of different reason: Because you done get enough water flow. The

system is constantly clogging up. It is breaking down. You have all kinds of problems.

So, you know, these are some of the things that I think that citizens in this area have a right to know. And you know what, our Government has failed our people and I for one am really upset about it. I think it is unfair that you wait from 1970 or 1980 to the year 2006 before you say you are going to address this problem. It is unfair. And you know why you were doing it? Because the people here are poor; they are black; they are Asians; they are Hispanic people. And, you know, they don't have the voting franchise that the white community has. So there is a racial thing that is going on here. I'm upset about it and I am sick and tired of hearing about this stuff.

I think you people should get off your high horse, stop all of this muckedy-muck with all of this baloney that you are coming out with and let's

really get serious. If you are going to do something serious, let's work with the locate community. Let's be forthright and tell the people here exactly what's going on and how it is going to affective them.

These costs that you are coming out with, I can throw numbers up there, too. And I have seen it done. DEP and the EPA has done it to us before. I've seen it personally. I've dealt with it since 1983 and we are still fighting with EPA and the DEP to correct the problem. We have gotten most of it corrected in our community, but I would sure like to see it happen here, too.

Thank you.

MR. GORIN: I guess the first question, "Frank," the depths of the aquifers?

MR. TSANG: The Middle aquifer is about 70 feet below the ground surface. The Intermediate Sand is about 150 feet below the ground

surface. And the Lower aquifer is about 180 feet below the ground surface.

MR. NACE: These are all considered part of the PRM aquifer system.

MR. NOGAKI: That is astounding. The PRM is the major drinking aquifer in South Jersey. This is a major problem. You can't just say that you are going to do something just to correct a little bit of it because it is a whole lot that could be affected by what you do. And if SGL or whoever it was that was the person responsible, the company that was responsible for this thing, why haven't you gone after them to clean this thing up or to help finance the cleanup of this? That's a shame. That's astounding.

MR. GORIN: Well, okay. There are some more questions. You also asked about other sources. Again, we are looking at as a second operable

unit, we are going to go after the sources or what we believe are the sources and collect data. Again, we are -- and, yes, there are volatiles near the plume, within the plume, outside the plume. In fact, in the whole region, as you well know. But the chromium plume itself is very specific and it is something, you know, I think I agree with you. I think something should be done and something should be done fast. I would like to do that and I believe we can do that with the chromium. And I believe we can do an effective, rapid treatment of the chromium plume and that's what we want to do and then discuss how quickly it moves.

It actually moves at 20 -- chromium plume itself, it is a little confusing because the groundwater moves at 300 feet per year, but the chromium moves at about 20 feet per year.

MR. TSANG: Less than 20 feet.

MR. GORIN: Less than 20. It is in the PRM as we heard. And you discussed pump and treat. I don't necessarily disagree with what you said of pump and treat, but I should point out that's not their remedy selected here. We are going with something maybe a little more innovative, but I think it is something, again, that we believe is going to work. And —

MR. NOGAKI: Well, if you address things like your volatile organics, then things like — you should be looking at things like maybe a dual-face extraction system. That's what we are using in Marlton.

MR. GORIN: Right; but 18 again - -

MR. NOGAKI: We are going to put in.

MR. GORIN: Right; but, again, we are just going after the limited chromium plume not the pump and treat of the entire regional problem of the volatiles.

MR. NOGAKI: That's the problem. You are only looking at one item when there is a whole multitude of things have to be addressed.

You are not going to do anything unless you are going to look at the whole problem. You are talking about the basic element of life and that's water.

MR. GORIN: I understand that, but we are -- again, I understand. The reason we are going after the chromium plume, again, it is a distinct plume. It is something that is very difficult to treat, particularly the wellhead. It is the reason why the Puchack Well Field was closed and Chromium VI is a highly toxic chemical. And we feel like that is something that is small. It is discreet. It is something we can address.

MS. LONEY: Let me just address one more thing that Mr. Nogaki mentioned.

One of the things that Jon and I did with regard to the Puchack site is that we met with representatives of the community, many of them are here today, and we sat down and had a relativity long and somewhat detailed conversation about the site about the concerns about some of the issues that we have with the site and some of the issues that the community has with the site. And, as a matter of fact, the mere fact that we are meeting in this room was something that came about through our conversations with the community.

The community recommended the location for this meeting. So Jon and I have been, I think, open to working with the community on this site. Mr. Jones and I have been in contact for quite a while on issues with regard to Puchack. There is a technical assistance grant in process for the site. So we have been involved. We have tried to work with the community to address the concerns with regard to the site.

MR. NOGAKI: You know, I might want to also tell you that in our particular instance, what we did was we got a nationally recognized scientist to work with us and went to work with the DEP and the EPA to correct our environmental disaster that we had in Marlton. And as a result of bringing in Dr. Cole, who was a former EPA senior scientist, to helps out, we have been able to get a lot of things done. And one of the things that he has done is that he has set the basis for changing over the technology that had been originally proposed to us and which we were told, "This is what you are going to get," to the point now where the EPA and the DEP – I shouldn't say the EPA -- the DEP has been cooperating with us and we have had the change in their criteria for cleanup. And we are going into the dual-face extraction system because it will work much better. And we have, like, a number of different places

where we know that this thing has worked, similar ground characteristics as we have in Evesham.

Now, this is a, you know, if I were in this community and I knew about this -- it was just brought to my attention recently because of my wife and my friends -- I would suggest that, you know, if you are really going to do something, if the Government is going to do something, it should help these people have their own representative evaluate these things and so that they can come here and represent the community in talking to other scientists because the average person is not a scientist and the average person is not an engineer. So when you talk about how you are going to make all of these corrections and such, people don't know what you are talking about.

MS. LONEY: That is one of the reasons that we meet with the community.

MR. JONES: Roy Jones. I am

the cochair of the South Jersey Environmental Justice alliance.

Roger is making some great points about the science of this and the real problems associated with this site. And Natalie is correct. We have met in a informal group, smaller group, but there is a need to really bring the community up to speed on all off this. The first thing I want to say is that we need more time because there is a time frame to respond to all of this. And for us to really respond in a responsible way and in an educated way, we need our scientists, including Roger and other people look at this so that we can really give you guys some recommendations.

And so we are working on the tag grant. We are going to get that done. We will be able to translate this to the community because they need to know the implications of this. The developers need to know and we have been trying the sound the alarm to everybody

about development in the City. We have been doing this for 30 year. So we need 90 days because we will not be able to respond to this in 30 days. We don't have the scientists yet onboard to do all of this.

And the other thing, the most important thing is that whatever the cleanup of this site should be, it should be cleaned up to the highest possible standard no matter what the cost is. No matter what the cost is because this is a long-standing problem. Since 1972 this problem has existed. It is not corrected to this day. So that's a long period of time for people to have -- and by the way, for 26 years people drank that water from that well. For 26 years the City sold, knowingly sold with the acquiescence of the State, knowingly sold this water, this contaminated water to the homeowners, parents, teachers, pregnant women, children in this city. They allowed this water to go into our homes and into

our bodies. People here have been affected by. And now we are trying to tell you that we have to correct this problem and you cannot piecemeal it the way it has been approached tonight in terms of well, we are going to do this, without considering the overall the picture.

So we really need more time to really get this together. We can get the community out, but we can't get them out under these circumstances because this is something, as we shared with you guys, we do not support this. We absolutely do not support a piecemeal approach to the remediation of this site.

It is a Superfund site. It is not a ground Field. You follow me? It is not a junkyard with, you know, contaminated water. This is a Superfund site. So because you are dealing with human beings this site has to be absolutely completely cleaned up.

As we are trying to say to

you, this thing has regional implications. So once we sound the alarm to all of these suburban communities around here, what do you think is going to happen? They need to be in this room hearing all of this stuff, too, as well as us in the community. And hopefully it is going to raise some other issues about moving chromium VI to III and what that means because it absolutely means nothing. We need know that. So, we need more time. We have to get these technical experts on the table with the community and to really give you back our view of what we believe should be done with that site in terms of cleanup.

MS. O'CONNELL: I just want to make one comment just to be clear: This remedy is a proposed remedy. We are explaining to you why we are proposing it, what we considered given the boundaries,- all the criteria we considered, why we came to the this remedy and we are within public comment

period. So this is a public process. All comments received in this meeting, in writing, during the public comment period are going to be considered and responded to formally on record prior to the final decision being made. We are anxious to proceed. It has been a long time. We are here. We will stay here as late as we need to stay to answer as many questions as we can.

We generally extend public comment period to a limited extent based on requests. So if you are requesting a extension of the public comment period, yes, we will consider a 30-day extension beyond the comment period. If you are referring to getting a tag expert on, that could take quite a bit longer. The public participation doesn't end with remedy decision. This is formal public meeting during the comment period. The public process continues and we work with the public kind of as needed. Some communities want to check in with us on some basis. Some communities want

regular public meetings.

MR. JONES: Mis. My point is this: If you go forward and you commit "X" amount of dollars to this, that's going to be sealed. You are not going to say, well, you know, okay. We decided upon this procedure and then we are going to change the procedure and spent, like, 30 million more dollars to clean it up. You are not going to do that. So it is at this time that we have to get this thing solidified in terms of what is the best approach. So just because it is a public comment period doesn't mean that stuff is not going to be happening by the EPA.

MS. O'CONNELL: I'm sorry?

MR. JONES: Just because this is a public comment period thing that you are going to be doing is going to go forward.

MS. O'CONNELL: We take public comment and hear them --

MR. JONES: We are not interested in just talking. We are

interested in getting something done from the standpoint of what it should be in terms of what this community really needs. Just talking back to you, communicating with you, which is what we think, while you are actually moving forward doing things is not going get this thing done.

In other words, the train could leave the station and we could still be talking to people in the station. You follow me?

MS. O'CONNELL: Yes. I do.

When we select the remedy, then we proceed to implement the remedy. That is the way is goes, but implementing the remedy doesn't preclude public input. Correct, that once we implement the remedy is implemented unless information is presented that shows that it is no longer good remedy and then we change the remedy. And that may have been alluded to before that the remedy needed to be modified. That's usually based on gathering new

information that shows --

MR. JONES: So Roger said that you had some scientists sent to his community, this is the best approach.

MS. O'CONNELL: Uh-huh.

MR. JONES: Then you had a new scientist come along and say, Hell, no. That is not the best approach. And that is what we are trying to tell you. We need the gather up national scientist on this question and not just seek EPA scientists. The difference between an EPA scientist and somebody not connected to getting paid by the EPA, there is a difference in --

MS. O'CONNELL: We understand that. That's why we issued tag grants.

MS. LONEY: Roy and I actually spoke today about. There is a tag application in. And we are actually scheduled to have a meeting next week on it. When I get back to the office, I will contact our tag grant officer and we can look at how

far along -- because he has already submitted an application. We have gotten comments back. We just need to tidy it all.

MR. GORIN: If I can say something. I mean, it might have been that slide where I went through the Superfund process. That was a very cartoonish kind of presentation in a way in that we went from record of decisions to design. I wish things happen that quickly, but you can probably contend it doesn't. It takes a long time to get a contract done. A design could take years. And we do change records and decisions based on new information we have if the explanations are significantly differences. I worked on one site that had three of them. It does happen.

There is another thing Natalie asked me to do. If we could have that map, the aerial photograph. Now, again this is where we know the chromium is (indicating). That's the highest area

of the chromium (indicating) and that is where the chromium problem is (indicating) and you are asking us to go after the volatiles. I'm sure we have volatiles here.

MR. TSANG: Right.

MR. GORIN: We have the highest volatile of contamination is down here (indicating). We have other volatiles here (indicating). I believe there are volatiles up here (indicating). I believe there is -- I mean, again, I don't know how to stress this any other way. The volatiles are a regional problems. In some of the highest points, in fact, most of the highest points we found are away from -- nothing to do with the chromium plume and have different sources in the chromium plume. And DP is looking at the various sources. I believe they had some actions. They have looked at some sources and they said they are not going to have any further actions. Then there are some source areas that

are under investigation right now. I also believe that all the well fields --

MS. ELTON: Do you want me to talk about it?

MR. GORIN: Would you like to do that?

MS. ELTON: Yes.

MR. GORIN: Sure. Alright. I am going to let DEP talk about their groundwater problem.

MS. ELTON: My name is Beth Elton. I am the regional manager. I with the Bureau of Safety Drinking Water with DEP. And I am the regional manager for all of Camden County. And I can tell you that volatile organic compound are pervasive throughout all of South Jersey. This is not something that is specific to Pennsauken. It is not something that is specific to Camden in and of itself. They can be caused by a variety of different things. For instance, if there was a gas station and they had a storage tank

and the storage tank leaked but that happened in a very rural community where you would never expect to find a volatile organic compound.

So when he is speaking about this being a regional problem, it is regional, not just in Camden County, but it is also in all of the surrounding counties. I also manager Atlantic and Cape May. So they also have volatile organic compound issues. You can see Woodbine, Marion, Park Avenue, National Highway and Browning, those are the well fields for Merchantville/Pennsauken water supply. Each one of those well fields is equipped with a pack tower aerator and that's for the volatile organic compound removal.

And basically what a pack tower aerator is, is a huge column filled with things that look like whiffle balls, essentially, and they take the water and they pump it up to the top and they let it trickle down. As it trickles down, it breaks the water

apart. It is a volatile compound. You can see it when you go -- gasoline is a perfect example -- you can actually see the gas volatizing off. If you look at gas, you can see it coming off as you put it into your car. When it hits the air, it volatizes off and it leaves the water.

So what this aerators essentially does is it breaks the water apart and it splashes it and it breaks it apart into smaller and smaller pieces until the volatile organic compounds that are in the water are no longer there. At the top there are various filter and blowers and things to ensure this is all done properly and that it is not being discharged into the air and causing air pollution conditions.

So when the water is tested before it enters the pack tower aerator, it may have extremely high levels of volatile organics. I have seen -- we call that Raw Water because it is untreated. I have seen levels of VOCs

that are very, very high. They exceed the maximum contaminant level for New Jersey and the Federal Government by two or three times. By the time they leave the pack tower aerator, they are non-detect.

There is technology to treat these volatile organic compounds and they are being treated. I know you guys are concerned about the VOCs and they are most certainly something to be concerned about, but I want it to be clear that the wells in Pennsauken that are there are being treated for VOCs and that the State routinely monitors to make sure that volatile organic compounds stay below the maximum contaminant level.

And New Jersey has stated that any type of treatment that's put on requires quarterly monitoring, which means once every three months at a minimum. At a minimum once every three months a sample needs to be taken and submitted to the State for compliance

review and that's what I do. I review all of the data and make sure that everything that's coming out is meeting State and Federal standards.

MR. NOGAKI: The trouble is State and Federal standards are always changing because of people complaining about problems that they are encountering with their water system.

Volatile organics, you know, you have many different types of chemicals. And what is the synergistic affect between all of these chemicals on the human body? And you talk about non-detect, that's baloney. That's baloney science because we all know that if the equipment can only detect down to a certain level, it does not mean that it is still not there.

MS. ELTON: That is true. There is a limitation to the equipment. I don't want to complicate matters too much, but if a maximum contaminant level is 70 parts per billion a detection is point 5. So the EPA and

the State of New Jersey have done extensive studies to determine at what level these contaminants become harmful. And like you say, there is a cumulative track. And as we learn more and as we have more scientific data and there is more happening, we see the standards dropping lower and lower and lower. The State of New Jersey has much lower -- I don't want to say lower standards — they have higher standards, which means lower numbers in terms of compliance versus what is done in the Federal Government. So something that could be a maximum contaminant level in New Jersey may not be in Pennsylvania.

Does that answer your question?

MR. NOGAKI: You might as well move on because I have heard this before.

MS. ELTON: I am not a physician. I can't tell you what the cumulative affects are on the human

body, but there are scientists who have done these studies in order to -- I mean, these numbers aren't arbitrary.

MR. GORIN: There are two points -- thanks, Beth -- well, one point I want to make is that the treatment that Beth was discussing, the air strippers, do nothing to the chromium. The chromium is treated in a different way. I can see nods. Again, conceptually this is what it sounds like you are asking: Okay. You know where the chromium problem is. You have an idea to go in and treat it. We are not sure that is the best approach. As Mr. Jones said, "We would like our scientists to look at that." I agree with that. I'm saying, there is going to be a time period between record and decision and, unfortunately, it would probably be quite a bit of time before we are actually out in the field and doing something before we even begin a pilot's test. And that's something your scientist will be heavily involved

with.

But, again, the other thing that I feel like you are saying is, okay. You know where this chromium plume is. You are coming here with an idea to treat, but we don't want you to do that right now. We want you to hold off until you or the State comes up with an idea to treat this problem, this problem, this problem, this problem, this problem; that problem, that problem even though they have nothing to do with it and they are not a source of this plume. I'm not saying you are saying that, but that's kind of the way I feel.

MS. POMAR: No. That's not what we are saying.

MR. GORIN: We don't want you to go after this because there is volatiles all through this area and we don't want you to come up with a plan to do that.

MS. POMAR: No. That's not what we are saying.

MR. GORIN: Okay. Then I

need some help.

MS. POMAR: My name is Olga Pomar, P-0-M—A-R. I work at South Jersey Legal Services and I am here on behalf of the South Jersey Environmental Justice Alliance.

I want to start first just by saying a couple of things about process I think that your opening of this discussion is a bit misleading because you ask people for questions, but in reality this is our opportunity to present our objections and our statements and summaries on this record

MS. LONEY: Correct.

MS. POMAR: So I think that needs to be clarified. It is, like, this is the one opportunity that is being given and while in exchange of a ideas in a question/answer format may be nice and informal, I think it is very important that you make sure that people understand and know that this is their chance to voice their objections.

MS. LONEY: Correct.

MS. POMAR: Also, on the possess issue I think that it is really important that the EPA do the 90-day extension that Mr. Jones requested. You folks have sat on this site for God knows how many decades; an extra 60 days is not going to slow down the process. Giving us another 30 days isn't adequate because the time period started running on July 7. That means if you extended it another 30 days, that would only give us until September 7. That really isn't good enough.

And yes, we fully understand that the process is going to continue for years and there will be opportunity for input, but the record and decision is legally and procedurally a really critical stage. And it's probably the most significant decision that the EPA is going to make in the foreseeable future. So for the community to be denied an opportunity to get expert opinion and review and submit true

comments, which we can't do tonight because we are not prepared with our scientific data, I think would be really perverting the whole public process to not give people that opportunity. So really think it is critical that we get the 90 days.

Because this isn't supposed to be a scientific explanation, I am going to keep my comments and questions to a very general theme. But I think we have a real concern about the adequacy of this plan because of its phasing. I mean, I understand you can't do everything at once, but cleaning up groundwater in one area while the sources are continuing presumably to add to the pollution and telling us you will be back within two years is not comforting. It really is something that needs to be done either simultaneously or at least very close in time and you putting off going after the sources, I think is a real problem.

I almost seems that it is

going to be defeating the purpose because what you are cleaning will be continued to be contaminated. You have heard from everybody who have spoken that we think it is really -- that EPA is totally shirking its responsibility for not dealing with the VOCs.

And to answer your point, no. That does not mean that we think you shouldn't do the chromium. We think you should do the chromium and you should do it as quickly as possible, but we think that it totally makes no sense to have a contaminated site that you know is contaminated and not deal with all the contaminants.

VOCs are a prevalent problem, but they are also frequently the subject of Superfund cleanups. The Morton Aaron Superfund site is dealing with a lot of VOCs here in Camden. It happens all the time when Superfund sites are contaminate with VOCs.

One of the main reasons why the Puchack wells were shut down was

because of the VOC contamination. VOCs, mercury and chromium were the three things found. Actually, there are all of those contaminants that need to be addressed. And sites are listed on a National Priority List precisely because they are complicated because they require extensive cleanup because they require more scientific expertise because they are the ones that really need that attention.

So to say, oh, no. It is too complicated for us, we will pass it back the DEP and we won't deal with the VOCs just because they are everywhere. Well, we might get to the point in New Jersey where all the chemicals are everywhere. Is that a reason not to clean them up from a particular site?

The standard that you are using, this 70 micrograms per cubit liter, is the standard for total chromium; therefore, it seems it's a very worrisome standard to use if 90 percent of the chromium is actually the

real toxic kind. I know there is no separate standard for Hexavalent Chromium, which I think is a real problem. I think the chromium standards are a real problem and that's one reason why you don't create much of a comfort level to say you are meeting chromium standard because the chromium standards don't seem to be intelligently designed and they don't seem to be protective.

EPA actually upped its chromium standard from 50 to 100 a one point, I think, or 75 to 100, which make no sense and doesn't seem protective of human health at all. So we think that a standard needs to be use that isn't based on a total chromium standard, which may assume that the large part of it is Chromium III but something that specifically deals with the toxic level of Chromium VI.

At the same times, it is worrisome to hear you say that all you are going to do is convert the chromium from Chromium VI to Chromium III because

if Chromium III is so safe and not toxic, why isn't there a chromium standard? Why is there a standard at all that people have live with Chromium III. I think the scientific literature shows that Chromium III clearly is less toxic, much less toxic than Hexavalent Chromium, but there still are health affects or it wouldn't be regulated. And just to say that you are converting it from one form to another just doesn't seem like a real adequate solution.

Another major issue -- another question that I have, and this is something we really need independent scientific advice on, is did EPA really consider all the possible alternatives? I mean, you laid out certain alternatives. You certainly started with a baseline of zero, but did you really consider all the combinations of treatments? Could there be a combination of injecting chemicals and doing some other kind of other remediation at the same time? You know,

from the way you present the alternatives, it makes sense how you pick the one you did, but was every combination really considered?

The institutional controls, one major worry for anybody living anywhere in this region is whether the Puchack Wells are ever going to be reopened? And we want to see institutional controls that would guarantee that they won't be.

MR. GORIN: No.

MS. POMAR: And your language on that was just hard to follow and wasn't clear. You said, "you are going to have institutional controls to protect against exposure to groundwater." What exactly does that mean? As the wells tap the Inner aquifer is that covered by your institutional controls or would this allowed the Puchack Wells to be used again?

MS. LONEY: When you say Inner aquifer, I'm not sure exactly

what you mean.

MS. POMAR: Middle aquifer. In other words, the Puchack Wells isn't just the surface water. So, is your institutional control mean that Puchack, in fact, is going to be permanently decommissioned? We would like to see these wells gone, out of there so we know they are not going to be used again.

And I guess my last point is just that, you know, in my experience in working with Camden, the EPA's performance here has been, to put it politely, very bad. We have the wells, Gas General, Gas Natural site. Everybody knew there was radioactivity in that site. It took 20 years before anything was done at that site to take people out of the way of harm. People continued living with radioactive backyards for another ten years after that. It is just shocking to me that $65 to $70 million of Superfund money was spent in Gloucester City for its

portion of that Superfund site, which is a shared site, and $1.5 million of EPA money was spent in Waterfront South in the City of Camden and an additional $3 million that was fronted by the New Jersey DEP. That disparity is really outrageous and it is impossible not to notice that Gloucester City is somewhat wealthier and almost exclusively white as opposed Camden City, which extremely low income and Waterfront South is almost exclusively African American and Hispanic. And Waterfront South is still awaiting final cleanup and we still don't know if the money is out there or whether all the money has been spent on Gloucester City.

And in the Morton Aaron site, which is our second Superfund site, an action was proposed that involved capping the site and removing some of the soil, but certainly not removing all of the soil so it also is not a total cleanup. It is, you know, it is kind of a partway cleanup with capping with

limiting the site to industrial uses. So that really is not a great answer for that community either. So, of course, remediation on that site hasn't even started.

So given that tract record, we would real ask that the EPA to consider doing something better on this third and hopefully last Superfund site that affect Camden City.

MR. GORIN: Okay. Yes. We are going to have to -- about the extension -- I mean, a 30 day, I don't think --

MS. O'CONNELL: Yeah. What we will do, you know, we will guarantee you a 30-day extension and we will take your requests back to the office and consider as we go over all of the comments of the meeting and we will have to get back to you on that. Okay?

MR. GORIN: Yes -- I am just trying to go through the ones -- if I miss one, just let me know. Yes, about the converting it from Chrome VI to

Chrome III. You said, well, you know, we don't want Chrome III in the water, which is a good point although it is less toxic, but the thing you also have to recognize is that Chrome III is not only being less toxic, it is far less soluble. In fact, you can say it is insoluble. So actually, we are still using the same total chromium even if we assume it is all Chrome III, which we wouldn't. It is an insoluble, so. The contamination in the groundwater has to be below 70. So that's what we are really shooting for. It is not, hey, we are going to shoot for Trivalent Chrome, from Chrome VI to Chrome III. If it's in your water, it's in your water. It's Chrome III. That's not what we are saying. We are saying we are converting it to Chrome III. It's got to be the lowest standard and then we consider the site cleanup.

I'm going to ask Chuck just we quickly when I finish to talk to talk

about the chromium standard.

And, again, you said that we have taken a long time, 30 years, to come in with a remedy. We have only had that site since 1998, but it is a few years. We come in here with the remedy with the chromium cleanup -- and you are right. We do have Superfund sites to deal with volatiles. I have Superfund site myself near the volatiles. That's when we say, hey, we got the source area. We know we have a plume. Let's go in and take care of it.

That's not what we have here with volatiles. We have a regional problem. I wouldn't know where to put the edge of the decipher. We have what we consider a source area here (indicating). And we have some other potential source areas in this area of the chrome (indicating). That's not necessarily and we don't believe it is where -- certainly not the volatile issues down here (indicating) have anything to do with that.

So, that's a problem. Okay. And we spent a lot of time discussing it and, you know, especially after discussing it in New Jersey and finding out there is some actions being taking. We said, well, we can go in and take care of this chromium problem. Particularly and especially since it is so difficult to treat at the wellhead. It seemed to us like a practical solution and a solution that we can do quite rapidly and a highly toxic chemical.

So that's, again, I don't know how else to say it. That's why we are sticking -- deciding to decide on a chromium site. Again, you asked some questions about the standard on chrome, if you could repeat that for Chuck?

MS. POMAR: Well, I said that I thought the chromium standard was a very troublesome standard. It doesn't distinguish between Chromium III and Chromium VI. You are using a standard that's designed for chromium, for total

chromium, even though here the majority for chromium -- almost all the chromium -- is Hexavalent. So it is not comforting to think that you are converting the chromium to Chromium III if it is still a toxic substance. And I am questioning whether the 70, the use of the 70 micrograms, is really adequate given that this is also a toxic chemical?

MR. NACE: Well, first of all, the 70 that we are injecting, proposing to inject, the reducing agent, to reduce it to Chromium III, we are using a standard of 70 for that. As to define the area where we will be injecting into. Once we do that, we except that within five to ten years that Chromium VI will be converted into Chromium III.

It is no longer that we think that there is Chromium VI in there and it is all Chromium VI at 70 so it is fine to drink it; that is not what we are proposing here. What it should be

is, by the time we are done we may have Chromium III in the water at some concentration of less than 70 which will meet the MCL of 100 micrograms of cubic liter, which, yes. It could change --

MS. POMAR: Unfortunately, you wouldn't meet the criteria if you had total chromium 90 percent of which it was Chromium VI and it met that standard.

MR. NACE: That's correct.

MS. POMAR: That's the problem with the standard.

MR. NACE: Right. And, unfortunately, we have to go with what the Federal and State standard are. We that opted to go with the State standard, which was lower. That is what we are legally bound to make sure that we are below that. That doesn't mean that --

MS. POMAR: You are not allowed to using the more protective standards?

MR. NACE: It is not that we

are not using a more protected -- we are not saying that as soon as we reach 70 it will continue to go down as we have natural attenuation that binds to the soil. I would love to say yes, we are doing as go. We are going to have zone. We can take it down to zero. We can't.

I would love to see all of our water have zero everything in it. I get my safe drinking water at the requirements of my water company where I live. It is not non-detect for everything. It is not zero for everything. There is things in our water and we try to do the best we can to reduce the groundwater to what we currently feel are safe levels. And, unfortunately, we do live in a world where chemicals are everywhere. We use chemicals. It is a give and take. We have to live with it. We are doing the best we can to get it down to where we feel it is a safe level.

MS. POMAR: My only comment

is that I don't think the current chromium standard is adequately protective and I think you should consider using something more protective than what the regulations require. That's my comment.

MR. NACE: Okay. Noted.

MS. NOGAKI: My name is Jane Nogaki, N–O-G-A-K-I, and I'm representing New Jersey Environmental Federation. I actually wrote some comments on this proposal.

The very first question I have is you didn't answer Roger's question of what you are going do inject into the plume to reduce the Chrome VI?

MR. GORIN: That's a good question. We actually had a list of chemicals that came up, but I think some of them are food.

MR. TSANG: One of them is food-grade and being used by one of the Well Fields to treat the drinking water to remove the chlorine. It is called Sodium Metabisulfite. It is used in

the food industries and for treating drinking water.

MS. NOGAKI: What is the mechanism of action that it changes the form of chrome?

MR. TSANG: It will reduce the chromium because Metabisulfite will have a reaction with the chromium and reduce it from chromium VI to chromium III. It is a complexing reaction. It can direct reaction of the chromium and also it can react with the iron in the sediment aquifer, convert the iron from Iron III to Iron II and then the Iron II react to the chromium and reduce the chromium.

MS. NOGAKI: I have another question and it comes from page 3 of the handout, the lower left column, the last sentence. It talks about a concept that I really can't understand. It is about "Chromium plume and that areas where the VOCs and chromium occur together. They will compete for the natural substrate's capacity to

chemically reduce contamination."

Does that mean that the chrome grabs onto the substrate at the expense of the VOCs not being able to?

MR. GORIN: Yeah. I mean, not so much grab on, but the chemical -- the components of the substrate will be used up reducing Chromium VI to Chromium III or it could also be used up by the volatile for a chemical reaction. That is a problem in areas where we do have some volatiles and we do have have some levels of chrome, is that what we inject in there is going to reduce the VOCs and then use up that chemical. So that is another thing we will have to address during the -- get some pilot studies to say, well, we do have some areas of volatiles in there. How is that going to affect the chemical reagent we inject to treat the chromium? Does it mean that we have to put more in?

That's a good point. And that

is one of the problems with VOCs. It is going to have to be an actual remedy.

MS. O'CONNELL: I just want to make it clear that we haven't determined the final agent, reducing agent. We have some that we have considered and used at other sites, but the final agent that will be used will be determined during remedial design. We have a number of options.

MR. GORIN: Okay. That's it. Thanks, guys. I kind of got off track.

We were looking at a couple like that in New Jersey and said, "Hey. We had some sodium issues in the water down there. And one of the residuals of this chemical was some sodium in the water."

And they said, "We don't want you to add to any of our sodium counts."

I said, "Okay. There are other chemicals that we have."

Again, especially, particular if you have a tag grand scientist out there, that was something we looked to

and we would come in and say, "Here is the list of chemicals we are considering. And we would like to know what you think."

MR. TSANG: Yeah. Many criteria to consider. One of the criteria is effectiveness and one is safety.

MS. NOGAKI: You don't want to put something in and then there is going to be remediating the drinking water.

MR. TSANG: Right.

MS. NOGAKI: My second question and point was to emphasize what Olga was saying to the Puchack wells. Are they considered, the wells themself, are they considered part of the site?

MR. GORIN: Well, the Well Field is considered part of the site, so...

MS. NOGAKI: What is the cleanup plan for Well Field itself? I see your contaminated plume and the

chromium there, but what is your specific cleanup remedy for the wells?

MR. GORIN: The groundwater. I mean, the site is the groundwater, for at least this operable unit. So any part of the groundwater that's under the well field, the groundwater under the well field is considered part of the site.

MS. NOGAKI: Does the plume extend right under the well field?

MR. GORIN: Yeah. It does. It goes to -- I believe --

MR. TSANG: Just a little bit. Here (indicating). You can see that? See that little...

MS. NOGAKI: So that circle around the site, does that mean that all of those wells will be closed and decommissioned?

MR. TSANG: It is not being used.

MS. NOGAKI: But it isn't in your plans to decommission those wells, to make them inoperable?

MR. GORIN: No.

MS. NOGAKI: Okay. That would be my suggestion; that those wells should be closed permanently and decommissioned so that they are not a potential future source of drawing up contamination again.

My first question -- and boy, it's the $64,000 question. Does the EPA regard the plume as fully characterized as far as the scope and contaminants? And you have already answered my question and that's no because you said you have delineated the plume for chrome but you haven't delineated the plume for volatile organics, which are one of the components of the groundwater contamination.

MR. GORIN: Well, I think that's what we keep saying is -- Can you go to the VOCs.

MR. TSANG: Sure.

MR. GORIN: Right. You hit it on the -- first of all, you said, do we feel like we fully delineated the

plume. That's one of the -- when we go into design, we are going to go out and collect some more samples and get a better idea of where the plumes are. You know what's going on with the plume right now after a couple years. So we are going to do some further delineations, but as far as the volatile, you are saying that you haven't fully delineated the volatile plume. Well, here is an example. This is in the Middle aquifer. Here is the plume (indicating). Or is this the plume? We are finding volatiles here (indicating). We are finding volatiles here (indicating). We are finding a huge amount here (indicating).

MS. NOGAKI: Well, you might have hot spots that you have to identify, but certainly --

MR. GORIN: That's what I was actually saying. There is hot spots all through here (indicating). And, again, New Jersey does have a program and they have been active looking at

those hot spots. They have been active in doing investigations. I believe they have done a few cleanups. And they are active in something with treating contaminated wells at the wellhead for volatiles.

MS. O'CONNELL: The State has a remediation program. They have some actions going on at a number of the sites that are contributing to the regional problems. There is an action at Pennsauken Landfill. There is a number of sources here which are contributing to the regional groundwater problem and they are being handled under the State authority.

MS. NOGAKI: Right. 9,000 or 12,000 groundwater contaminated site.

MS. O'CONNELL: That's feasible, but --

MS. NOGAKI: There has to be some ability to identify within the plume that you are talking about high levels of volatiles because there can be health assessment, the risk

assessment that was done to the site, some numbers must have been used to make this characterization.

MR. GORIN: Oh, yeah. Let's go to the Intermediate aquifer.

And now we go here (indicating), again, this is the Intermediate. So now we are finding volatiles mixed with chrome plume. That's exactly where we had -- where it comes up in the human health risk assessment, but we are also finding volatiles up here (indicating) and, again, we are finding volatiles down here (indicating) and we are finding volatiles down here (indicating). And if you continue on, it continue on unevolved, which I think Chuck actually came by and he pointed out something.

Maybe you should explain.

You know I think you are talking about the chromium plume. Well, that's a limited source area and maybe a couple other source areas and this was something we were about to get a handle

on. This line (indicating), this cartoon we drew here, is strictly for chromium. To draw something around here (indicating), around the volatile plume, I don't know. Would' it go here (indicating), here (indicating)? Would it include this (indicating)? And would it include the ones here (indicating)? Would it include the ones up by the landfill?

That's what I'm saying, this is distinct plume from one or maybe a few distinct chromium sources. The volatile problem is a regional in a South Jersey problem.

MS. NOGAKI: We have a suggest ion.

MR. GORIN: Okay.

MS. NOGAKI: We have a suggestion, that is just look at the discreet area that contributed to the contamination of the Puchack Well. This is called Puchack Well Superfund Site. Identify the sources of volatiles that were drawn into the

Puchack Well and that should be a discreet area. If they are other sources, you know, outlining there, those sources should be able to be identified. And if there are actions going on through the DEP, those sources have been addressed.

But in that zone that starts at that chrome plate that goes up to Puchack Wells, that's your area of concern because my thinking on this is that if the volatiles aren't considered part of the cleanup plan, how can you even characterize this as a Superfund site cleanup that meets the nine criteria? The criteria is going to say that when your cleanup is complete, your groundwater meets all appropriate arars (phonic) or whatever they are.

And it won't. It will for one technical, Chromium. For volatiles you have the TCE the PCE the 11-DCE that the Health Risk Assessment said were the highest risks for cancer. The highest cites were not from the chromium but

from the TCE, PCE and DCE. The HI hazard for the Middle aquifer, the hazard risk of a 180 as opposed to 1, which is what it is supposed to be, was for chromium as well as TCE and manganese. So to say that this cleanup is going to meet the Superfund criteria, it's not. It doesn't meet -- of any of the nine criteria Superfund site requires you to meet, maybe it will meet No. 4, which is you are going to reduce, you know, some levels of contaminants for one chemical.

And I understand that it is an important effort and it is an aggressive effort to do the chromium cleanup, but to ignore the volatiles and assume that, oh, they will be remediating at somebody's public water supply through a stripper. I am sorry. That's not an acceptable Superfund cleanup to say that our drinking water companies will be our remediation experts.

I don't know how American Water would feel about, you know,

casting off groundwater and say, well the drinking water company will take care of it.

It is not acceptable and it doesn't meet the nine criteria of the Superfund cleanup. You will not be able to at the end of this cleanup to say that the groundwater meets all acceptable standards because it won't, except for chromium. I can see this being, you know, one little paragraph of the Superfund cleanup. As far as that Puchack Well Superfund site cleanup, this cleanup remedy just does not address maybe three quarters of the problems, three quarters of the health risk.

My other point was that the point of cleaning up groundwater is to make it available for future drinking water. The PRM aquifer, which you never once mentioned the name of the aquifer in this ten-page document. The word PRM is not even mentioned. It is the major drinking water aquifer, the river town.

So the goal of the cleanup is to make that water drinkable. So that's the standard that has to be measured so that we can do this cleanup.

We asked about your efforts to make the responsible party pay for the cleanup. Do you have a legal strategy ongoing, you know, to rope in that responsible party and make them pay? I know this is cost driven, but part of the Superfund law was to require the EPA to go after the responsible parties and make them pay. And if there are other responsible parties in the area, then they need to be forced as well.

So my basic conclusion here is that the cleanup fails to restore the groundwater and the drinking water standards for all relevant contaminants. And we commend the EPA for being creative about addressing the chromium problem in an aggressive way in stead of just waiting 30 years for a pump and treat system to work. But we would propose an additional alternative for B,

I guess it would be which -- and I'm not sure what the remedy is -- but it would be to address all the relative contaminants that are contained in that plume that was withdrawn from the Puchack Well.

We reject the alternatives put forth by the EPA as -- I'm calling it unacceptable. Unacceptable in that maybe it is not that your chromium treatment is wrong, it is just that it doesn't fulfill the needs of the community to have a safe drinking water supply. It is a partial answer, but it doesn't address too many major contaminants.

And, again, I will emphasize that it is ironic that this is happening in an area that has been heavily industrialized. It is extremely heavily populated at this point as well. It is, your know, children, the elderly, people of low income. These aren't people who can go out and buy bottles of water or have expensive filters on their water.

They depend on their groundwater and their drinking water to be safe and it is not.

And the Merchantvi1le/Pennsauken well are not safe either. They are the second highest drinking water system in New Jersey for tentatively identified compounds of ticks. The most number of ticks found in the entire state, second only to a North Jersey company. So, you know, yes. There are a lot of strange chemicals in our groundwater, but if EPA isn't going to cleanup these chemicals through their Superfund program, who is?

That's what the law was designed to do. And we are asking you to do your job, not just a partial job for one chemical, but for the entire scope of chemicals tested for in our drinking water.

MR. GORIN: Okay. We have your comments. I hope you are not asking us with this remedy to cleanup the PRM. I think I understand what you

are asking more specific.

MS. ELTON: I just want to make sure I am understanding this correctly. So if EPA does clean the Puchack site up to the Superfund standard, which is means they meet all the groundwater standards, would you then say that that water is acceptable as drinking water?

MS. POMAR: Well, it would meet the legal requirements of the Superfund law. We still have concerns that too many chemicals don't have drinking water standards like this tentatively identified compound. And we don't think the standards are strict enough, but it would at least meet the legal requirements of the law. Right now this cleanup does not.

MS. ELTON: I understand that what you are saying about Superfund and meeting legal requirements. I just want to make sure of what your opinions were as to whether or not that water would be considered potable if it meet

all Federal and State standards.

MS. POMAR: We don't think the standards go far enough. That's why we are proposing for companies like Pennsauken/Merchantville to have charcoal filters put on to treat ticks with families of chemicals that aren't regulated. We think additional treatment needs to be put on drinking water sources that are contaminated. But ideally, the cleanup of the groundwater itself, we know is the source reduction, is the primary measure of control. These backup controls, you know, putting systems on wells is a redundancy measure, you know, it is an after the fact measure. The primary prevention is where the focus needs to be, on the Superfund program, not just a suppression of risk reduction. It has to be the full megillah.

MS. ELTON: I just want to be clear. Thank you.

MS. O'CONNELL: Just to let

you know, what we have done with regards to the investigation, there is another party that we have requested information from regarding Hess Disposable. Those are ongoing. We are looking at those. When we identify the name of the responsible party, we will pursue that party to implement the remedy in order to get them to pay. So we have begun our investigation and they are ongoing and they will be ongoing as we continue to collect more data.

MS. POMAR: Is this at this point considered a publicaly funded site or a private site?

MS. O'CONNELL: This is publically funded.

MR. GORIN: Let me explain that.

MS. POMAR: Until you find the responsibility part?

MS. O'CONNELL: Yes.

MR. GORIN: There are two ways the Superfund site gets paid, but

one is through Superfund, which more simply put is publically funded, and the other one is we find the responsible parties, which we call PRPs, People Responsible. We prefer to have the people responsible for the contamination pay for the cleanup. We are legal mandated to look for those peoples. We are right now in the process of looking for it. I believe we are going to have some notice letters going out pretty soon, so.

MR. DAVIS: The fines should fit the crime.

MS. LONEY: Are there any other comments?

MR. MARTIN: Fred Martin, 2760 North Congress Road, Camden.

A couple of quick things: One, went you did you monitoring investigation, did you test for the whole range of priority of plumes? Is there any other exceedances, regular chemicals beyond the VOCs and the chrome that you came up with in your

monitoring?

MR. TSANG: Yes. We test for a full sweep of chemicals under the Superfund program. We test for volatiles, semi-volatiles and metals, a whole list of about 20 - something, 28 metals.

MR. MARTIN: I'm just wondering were there any other hit?

MR. TSANG: We had a few other his, but not much. We can't say they are... We have a few mercury hits, maybe four or five mercury hits in individual wells. And we have maybe one or two led, but they are not -- we can't really pinpoint our finger to those hits because they are so isolated and they are not high.

MS. ELTON: I am sorry. I don't mean to interrupt you. When you say "hits," do you mean that you had a detection or you had a detection above the state maximum contaminant level?

MR. TSANG: We have a detection above the MCL.

MS. ELTON: You had detections above the MCL?

MR. TSANG: Right.

MR. MARTIN: Has there been any attempt to characterize what the sources of those other hits for the MCL are?

MR. TSANG: They are so isolated that you can't really characterize the source. You have a hit here, you know, and then you can't reproduce it.

MR. MARTIN: The question was already asked about the issue of the reagent to be used and it was noted that it needs to be investigated further.

I understand that we are dealing with the chrome. My concern is if there was other things out there that you are seeing as part of you monitoring. I know there's been hits of mercury. I think it shows up in some of our early test in the city on those wells. I was trying to find out if it

was a mercury plume with it, near it? Has anything been done to look at that?

MR. TSANG: We did analyze for mercury. That's one of the components. We can't really call it the mercury plume. There were only a few hits.

MR. MARTIN: I am here as a private citizen, not as a representative of the City. I know the City will comment during the comment period. On a larger scale, the issue of the VOC is something that is particularly troubling because we have seen the VOC characterization of the raw water has changed over the past 12 years, becoming more intense. There has been some concern that it might be originating on the outcrop of the PRM. The Lower aquifer of the PRM happens in Philadelphia and then travels under river and if whether our significant draw of water on our side goes to all the groundwater sources in South Jersey are effectively drawing over those

volatiles that have a much faster migration rate than chrome? I don't know if anything has been done to look at this by USGS if they started monitoring the VOCS?

Have you guys made a determination that there is no significant new contribution to the plume happening? In other words, is the plume staying with what it has been since the initial contamination happened or is the chrome being replenished in the plume at some point from one of its sources? Have you looked at that at all?

MR. TSANG: As far as we know there are no more new sources being discharged through the ground. The existing -- the few known potential sources, we have collect soil samples. We went into the facility to look at that. We didn't see any new discharges and we didn't find any significant chrome contamination in the soil expect SQL. SGLs are no longer there.

We also investigate Mercon and we didn't find any chromium contamination in Middle aquifer.

MR. NACE: I would like to answer a couple questions. The first on was about the change in chromium contamination at the site. In the early work we did with DEP we sampled in '97 and '98 and then EPA, we came back and sampled some of the sites in 2001. While the plume did move a little bit down radiant there were actually many sites where we saw the chromium concentration decrease from '98 to 2001 at the same well, showing that the natural processes are working. So it is not getting larger. It indicates it went up in some places and it went down in some places. It was really showing that there are natural processes taking place and really didn't see a lot of movement in that time period.

MR. MARTIN: I trust you reviewed the CM study that was done.

MR. NACE: The second question was about the potential for VOCs coming from Pennsylvania. We did some work and we delineated, as part of another study that USGS did, delineated the contributing area for the Puchack Well Field using a model and the reason that the Puchack Well Fields and Morris Delair Well Fields are so good is because they are right next to the Delaware River. And the Lower aquifer actually had dugout underneath where it is very disconnected. It doesn't take outcrops on the other side, but it is connected to the Delaware River underneath it.

So, most of the water from those well fields, yes. They are pumping groundwater, but most of the water is really coming from the Delaware River. We are trying to a model a more specific problem of this site, for Puchack, and delineated the contributing area. And 90 percent of the water from Puchack was coming from the Delaware

River. Morris Delair at 90 percent; Puchack was, like, 75 percent coining from the river, but none of it was coming from the other side of the river. It is all coming from New Jersey sources.

MR. MARTIN: To go to Morris Station, that's why it is so problematic to see the VOC levels increase in the river edge at Morris Station which we have seen recently.

And the question is, if the general flow of groundwater is from West Camden to East and we are at the south, then where are the volatiles entering into the system we have seen on the most western edge and northern edge? And so, I just throw that out. It is a different issue all together, but gets to the issue of what USGS is modeling and what you are talking about when you start talking about remediation of VOCs in the aquifer how to start getting to that if there are sources that were not previously considered by the direction

of flow that seems to be now in the picture. Isn't there a Superfund site right on the other side of the river from us, Allied Chemical?

MR. NACE: Again, the model that we have done shows Morris Delair was getting most of their water from the river and not from the other side of the river. That's all I can clearly say.

MS. LONEY: Any other comments?

MS. POMAR: Is anything being done now, any kind of pumping to contain the plume?

MR. GORIN: No.

MS. POMAR: Are you concerned that the Merchantville/Pennsauken wells are starting to draw the plume toward them?

MR. GORIN: You mind going back to that photograph?

MR. TSANG: Sure.

MS. POMAR: You were pointing down to other things there before. I

can't really place it. Somebody is going to say where they are.

MR. GORIN: Woodbine, Marion, Park Avenue.

MS. ELTON: Yes. Browning, Woodbine, Marion, Park Avenue, National Highway, Delaware Gardens. If you look Delaware Gardens is over here (indicating). This is inactive (indicating). This is one of the well fields, Merchantville/Pennsauken, here (indicating), but this is inactive. So your well field is actually over here (indicating) for Browning, Woodbine is right around here (indicating). These two wells are the Marion Avenue Plant (indicating). There is a field here (indicating). This is Park Avenue and then National Highway is flipped a little bit above (indicating).

MS. POMAR: So, knowing that Puchack Wells over a period of 20 years made this plume travel a half a mile, a mile, is there any concern that these Merchantville Wells are drawing the

plume over forward them?

MR. GORIN: Of course.

MR. TSANG: The answer, there is probably two parts to your question.

MS. POMAR: Because you are considering now your leading edge —

MR. TSANG: Right.

MS. POMAR: -- appears to be, you know, in that southeastern edge.

MR. TSANG: We collected samples in 2000, 2001 period so it is only a few years from 2000, 2001 to 2006. The follow-up projection is only migrating less than 20 feet per year. So in five years, less than 100 feet.

MS. POMAR: Is it going in that direction, though?

MR. TSANG: No. It is going towards -- this is the groundwater flow direction (indicating), the east, southeast direction. And if the plumes only migrate 20 feet per year so, in theory, they can only migrating about 100 feet in five years. Actually, in 2004 we installed one well here

(indicating) and one well here (indicating) and we collected groundwater samples there (indicating). This is within the plume (indicating), this well here. Within the plume we found about two parts per million of chromium which is very close to the concentration that we sampled before in another well about maybe 50 feet away. Then we collected samples from this well here (indicating) and we deemed -- we found very little, maybe a couple parts per million which represent background concentration of plume.

MS. POMAR: So you don't think that there is significant migration?

MR. GORIN: Right. Based on those we saw, we don't think it migrates that much during those few years.

MR. NACE: It was lot. The chromium was a lot slower than the groundwater. The modeling we did showed that if it had move with the

groundwater, it would have already hit those well fields within 20 years. It would have already hit there.

MS. POMAR: What about for volatile organics?

MR. TSANG: In 2004 we didn't analyze for volatile organic.

MS. ELTON: Browning, Woodbine, Marion, Park Avenue and National Highway already had a treatment for volatile organics. So they have been found there and there are being treated for that. They do meet all EP standards and State and Federal standards. 16 MS. LONEY: Any further comments?

MR. IANNUCCI: Mike Iannucci, I-A-N–N–U-C-C-I. I was just wondering, and I call it a stupid question. Is there anyway to ascertain a copy of this presentation or the power point?

MS. LONEY: Sure. Not a problem.

MR. GORIN: You want the

overheads?

MS. LONEY: The power point.

You signed in?

MR. IANNUCCI: Yes.

MS. LONEY: I will just put a star next to your name and we will get a copy to you.

MR. IANNUCCI: Thanks so much.

MS. O'CONNELL: Also recognize that all the background documents, the technical documents and the investigation report, they are all available for public viewing at the information repository which is in there is library.

MR. GORIN: Pennsauken Free Public Library.

MS. LONEY: You will see it on your proposed plan.

Any further comments?

All right. We are going to close this session. The comment period, to my understanding, the comment period has been extended 30 days.

Didn't you say that?

MS. O'CONNELL: Yes.

MS. LONEY: So the comment period is not ending August 7th, but 30 days after that which I guess is around September 7th.

What we will do is we need to run a display add in the local paper announcing the extension of a comment period. So there will be a formal notification for the community that the comment period has been extend.

MR. GORIN: We will get back to your request about the 90 days.

MS. LONEY: Thank you very much and drive safely.

(The meeting adjourned at 9:40 p. m.)

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C E R T I F I C A T I O N

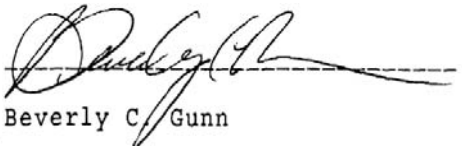
STATE OF NEW JERSEY

SS.

COUNTY OF BURLINGTON

I, Beverly C. Gunn, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, do hereby certify that I reported the deposition in the above - captioned matter; that the said witness was duly sworn by me; that the reading and signing of the deposition were waived by said witness and by counsel for the respective parties; that the foregoing is a true and correct transcript of the stenographic notes of testimony taken by me in the above - captioned matter.

I further certify that I am not an attorney or counsel for any of the parties, nor a relative or employee of any attorney or counsel connected with the action, nor financially interested in the action.



Beverly C. Gunn

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