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Agency

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Remedial Response

EPA/ROD/R03-91/131
September 1991

EPA

Superfund Record of Decision:

Havertown PCP, PA

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R03-91/131	2.	3. Recipient's Accession No.
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12. Sponsoring Organization Name and Address U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460			13. Type of Report & Period Covered 800/000 14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 12- to 15-acre Havertown PCP site consists of a former wood treatment facility and an adjacent industrial facility in Haverford Township, Delaware County, Pennsylvania. Land use in the area is mixed residential and industrial. Naylors Run, a creek that drains the entire site, flows into Cobbs Creek, which joins Darby Creek before entering the Delaware River. Only three families who reside more than one mile from the site use the ground water as their drinking water supply. From 1947 to 1991, National Wood Preservers (NWP) used the site for treating wood. Treated wood was air dried on drip racks in dirt areas around the site and stored in a dirt-covered storage yard. Chemicals were stored in several tanks adjacent to the facility. It has been estimated that up to 1 million gallons of spent wood preservatives were dumped into a nearby drip well. This disposal practice is believed to be a primary source of contamination to ground water and, ultimately, Naylors Run. From 1962 through 1989 the State conducted a number of investigations, which revealed PCP, oils, PAHs, dioxin, heavy metals, VOCs, and phenols in ground and surface water. In 1976, EPA initiated a response action, which included ground water pumping and treatment, installing filter fences, sealing a sanitary sewer, and an

(See Attached Page)

17. Document Analysis a. Descriptors

Record of Decision - Havertown PCP, PA
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Contaminated Medium: gw
Key Contaminants: VOCs (benzene, TCE, toluene, xylenes), other organics (dioxin, PAHs, PCP, phenols), metals (arsenic) oils

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 120
	20. Security Class (This Page) None	22. Price

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Second Remedial Action

Abstract (Continued)

attempt to grout two sewer pipes which discharged into Naylors Run. Currently, contaminated ground water still discharges into Naylors Run from a storm sewer pipe. A 1989 Record of Decision (ROD) addressed Operable Unit 1 (OU1), the cleanup of wastes staged onsite from previous investigative actions, and the interim remedial measure of designing and installing an oil/water separator at the storm drain outlet along Naylors Run. This ROD addresses an interim remedy for shallow ground water contamination, as OU2. A subsequent ROD will address sediment contamination in Naylors Run, soil contamination onsite, potential deep ground water contamination from onsite soil, and surface water and sediment contamination due to runoff from onsite soil, as OU3. The primary contaminants of concern affecting the ground water are VOCs including benzene, TCE, toluene, and xylenes; other organics including dioxin, oils, PAHs, PCP, and phenols; and metals including arsenic.

The selected remedial action for this interim remedy includes installing two free product recovery wells with floating free product skimmers onsite; installing a shallow ground water collection drain and pumping station, as well as additional ground water wells to monitor shallow ground water; rehabilitating the existing storm sewer to reduce infiltration by lining the sewer, followed by directing all shallow ground water collected to the existing oil/water separator; constructing an onsite ground water treatment plant, which will include chemical precipitation to remove inorganic compounds, with either a powdered activated carbon treatment (PACT) system or an advanced oxidation process (AOP), and granular activated carbon treatment as a reinforcement for the PACT or AOP to remove organics and destroy dioxins; treating effluent from the oil/water separator using the new treatment plant; discharging the effluent from the treatment plant onsite to surface water; treating and disposing of any residuals offsite; and ground water monitoring. The estimated present worth cost for this remedial action ranges from $10,036,000 to $12,177,000, which includes an annual O&M cost ranging from $485,500 to $595,000 for 30 years.

PERFORMANCE STANDARDS OR GOALS: Chemical-specific ground water clean-up goals are based on background levels, the more stringent of SDWA MCLs or MCLGs, or new limits set forth in the final remedial action. Ground water clean-up goals include benzene 5 ug/l (MCL), PCP 1 ug/l (MCL), TCE 5 ug/l (MCL), toluene 1,000 ug/l (MCL), xylenes 10,000 ug/l (MCL), and arsenic 50 ug/l (MCL).

RECORD OF DECISION
HAVERTOWN PCP

DECLARATION

SITE NAME AND LOCATION

Havertown PCP (Pentachlorophenol)
Haverford Township
Delaware County, Pennsylvania

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial action for Operable Unit Two (2) at the site, which addresses the existing shallow ground water aquifer at the Havertown PCP site in Haverford Township, Pennsylvania. The remedy was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision document explains the factual and legal basis for selecting the remedy for this site.

The Pennsylvania Department of Environmental Resources concurs with the selected remedy. This remedial action decision is based upon and documented in the contents of the Administrative Record for the site. The attached index identifies the items which comprise the Administrative Record.

ASSESSMENT OF THE SITE

Pursuant to duly delegated authority, I hereby determine, pursuant to Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act, that actual or threatened releases of hazardous substances from this site, as discussed in the summary of site risks in the Record of Decision (ROD), 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.

DESCRIPTION OF THE REMEDY

The principal threat at the site is the ground water contamination which has slowly migrated into the shallow ground water aquifer. Very significant concentrations of PCP and other chemicals of concern remain in the ground water. Natural flushing and attenuation of the contamination has been ineffective in removing the contaminants to low residual levels.

This phase of work or operable unit is the second of three planned operable units for the site. The First Operable Unit

removed existing hazardous waste from the site and installed an oil/water separator as a first step in removing some contaminants from Naylors Run, a creek that drains the site area. The Second Operable Unit will collect and treat the shallow ground water aquifer, which flows into Naylors Run. This action will initiate the remediation of the shallow ground water aquifer, in conjunction with the next planned operable unit, and will act as the initial step in remediating the sediment contamination in Naylors Run. It will protect human health and the environment, principally children playing in Naylors Run. This action is considered an interim action for ground water because it addresses only the remediation of the shallow ground water aquifer and is not the permanent remedy for ground water. The Third Operable Unit, which is planned, will address sediment contamination in Naylors Run, potential deep ground water contamination from soils onsite, and surface water and sediment contamination due to runoff from onsite soils.

The Second Operable Unit will require long-term management including a projected 30 year operation of a treatment plant and the disposal of wastes generated by that plant. The major components of the selected remedy include the following:

Installation of free product recovery wells on the National Wood Preservers (NWP) property.

Rehabilitation of the existing storm sewer line to reduce infiltration of contaminants from the ground water to the storm sewer.

Installation of a ground water collection drain adjacent to the existing storm sewer line under the backyards of residential properties to collect ground water for treatment at a treatment plant.

Installation of a ground water treatment plant at NWP to perform chemical precipitation, either powdered activated carbon treatment or an advanced oxidation treatment and finally granulated activated carbon treatment. These processes should fully treat the ground water prior to discharge back to Naylors Run.

DECLARATION OF STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment, complies with Federal and State Applicable or Relevant and Appropriate Requirements directly associated with this limited scope action, and is cost effective. Although this interim action is not intended to fully address the statutory mandate for permanence and treatment to the maximum extent practicable, given its limited scope, this interim action does utilize treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for the Havertown PCP site, the statutory preference for

remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the principal threats posed by conditions at this site. Because this remedy will result in hazardous substances remaining on site above health based levels, a review will be conducted to ensure that the remedy continues to provide adequate protection of human health and the environment within 5 years after commencement of the remedial action. Because this is an interim action ROD, review of this site and of this remedy will be ongoing as EPA continues to develop final remedial alternatives for the Havertown PCP site.

W Kennedy

Edwin B. Erickson
for Regional Administrator
Region III

9-30-91
Date

HAVERTOWN PCP SITE
REMOVAL ADMINISTRATIVE RECORD FILE *
INDEX OF DOCUMENTS

I. FACTUAL INFORMATION

1. Report: Remedial Action Master Plan, Havertown PCP Site, prepared by NUS Corporation, 12/83. P. 100001-100075.

2. Memorandum to Dr. J. Winston Porter, U.S. EPA, from Mr. James M. Seif, U.S. EPA, re: Justification for approval of a removal action, 12/11/87. P. 100076-100086.

3. Letter to Mr. Bob Caron, U.S. EPA, from Ms. M. Joyce McCurdy, Agency for Toxic Substances and Disease Registry (ATSDR), re: Review of data to determine the existence of a public health threat, 12/16/87. P. 100087-100087.

4. U.S. EPA Incident Notification Report, Havertown PCP Site, 12/18/87. P. 100088-100089. A handwritten notation to question #76 regarding the cause of the incident is attached.

5. U.S. EPA Incident Notification Report, Havertown PCP Site, 1/9/89. P. 100090-100090.

* Administrative Record File available 7/16/91.

HAVERTOWN PCP OU1
ADMINISTRATIVE RECORD FILE *
INDEX OF DOCUMENTS

III. REMEDIAL RESPONSE PLANNING

1. Report: Final Remedial Investigation Report, Havertown PCP Site, Volume 1, Chapters 1-4, prepared by R.E. Wright Associates, Inc., 9/88. P. 300001-3000139.

2. Report: Final Remedial Investigation Report, Havertown PCP Site, Volume 2, Chapters 5-10, prepared by R.E. Wright Associates, Inc., 9/88. P. 300140-300415.

3. Report: Appendices, Final Remedial Investigation Report, Havertown PCP Site, prepared by R.E. Wright Associates, Inc., 9/88. P. 300416-300707.

4. Report: Havertown PCP Site, Risk Assessment, prepared by R.E. Wright Associates, Inc., 6/30/89. P. 300708-300808.

5. Proposed Plan, Havertown PCP Site, 7/89. P. 300809-300833.

6. Report: Results of Borehole Geophysical Testing at the Havertown PCP Site, prepared by R.E. Wright Associates, Inc., 8/89. P. 300834-300867.

7. Report: Final Focused Feasibility Study, Havertown PCP Site, prepared by R.E. Wright Associates, Inc. and Lawler, Matusky & Skelly Engineers, 8/89. P. 300868-300963.

8. Letter to Mr. Thomas J. Banner, Township of Haverford, from Mr. J. Thomas Leaver, Commonwealth of Pennsylvania Department of Environmental Resources (PADER), re: Transmittal of the risk assessment, 8/25/89. P. 300964-300964.

9. Letter to Mr. Thomas J. Banner, Township of Haverford, from Mr. J. Thomas Leaver, PADER, re: Transmittal of reports relating to Havertown PCP, 8/28/89. P. 300965-300965.

10. Record of Decision, Havertown PCP Site, 9/11/89. P. 300966-301021.

* Administrative Record File available 7/11/91.

11. Letter to Mr. Thomas J. Banner, Township of Haverford, from Mr. J. Thomas Leaver, PADER, re: Transmittal of reports relating to Havertown PCP Site, 5/10/90. P. 301022-301041. A report entitled Results of an Oil Recovery Testing Program at the Havertown PCP Site is attached.

HAVERTOWN PCP OU2
ADMINISTRATIVE RECORD FILE * **
INDEX OF DOCUMENTS

III. REMEDIAL RESPONSE PLANNING

1. Report: Field Sampling Plan, Remedial Investigation/Feasibility Study, Havertown PCP Site, prepared by Tetra Tech, Inc., 8/90. P. 300001-300112.

2. Report: Work Plan, Volume I (Technical), Remedial Investigation/Feasibility Study, Havertown PCP Site, prepared by Tetra Tech, Inc., 10/90. P. 300113-300217. A letter of transmittal is attached.

3. Dioxin Data Validation for the Havertown PCP Site, SAS 5663C, 2/15/91. P. 300218-300289. A transmittal memorandum is attached.

4. Data Validation for SAS 5742C, Dioxin/Furan, Site: Havertown PCP, 4/3/91. P. 300290-300546.

5. Report: Final Baseline Risk Assessment, Havertown PCP (RI/FS) Site, Haverford Township, Pennsylvania, prepared by Tetra Tech, Inc., 6/91. P. 300547-300781.

6. Notification of Federal Natural Resources Trustees, Havertown PCP Site, Operable Unit #2, 6/21/91. P. 300782-300782.

7. Letter to Mr. Jerome M. Curtin, U.S. EPA, from Mr. Don Henne, U.S. Department of the Interior, re: Lack of necessary documents for preparing the Preliminary Natural Resources Survey, 6/20/91. P. 300783-300783.

8. Letter to Mr. Jerry Curtin, U.S. EPA, from Mr. David C. Kennedy, Pennsylvania Department of Environmental Resources (PADER), re: Comments on the proposed plan, 6/26/91. P. 300784-300784.

* Administrative Record File available 7/11/91, updated 9/23/91.

** Further information pertaining to Havertown PCP OU2 can be found in the Havertown PCP OU1 Administrative Record File.

9. Report: Remedial Investigation Report, Havertown PCP Site, Havertown, PA, prepared by Tetra Tech, Inc., 6/24/91. P. 300785-301058.

10. Report: Feasibility Study, Havertown PCP Site, Havertown, PA, prepared by Tetra Tech, Inc., 6/28/91. P. 301059-301239.

11. U.S. EPA Proposed Plan, Havertown PCP, 7/91. P. 301240-301259.

12. Letter to Mr. Jerry Curtin, U.S.EPA, from Mr. David Kennedy, PADER, re: Comments on the draft Remedial Investigation Report, 5/13/91. P. 301260-301260.

13. Letter to Mr. Jerry Curtin, U.S. EPA, from Mr. David Kennedy, PADER, re: Comments on the draft Risk Assessment Report, 5/17/91. P. 301261-301262.

14. Letter to Mr. Jerry Curtin, U.S. EPA, from Mr. David C. Kennedy, PADER, re: Comments on the draft Feasibility Study, 5/24/91. P. 301263-301266.

15. Letter to Mr. Jerry Curtin, U.S. EPA, from Mr. David C. Kennedy, PADER, re: Comments on the Proposed Plan, 6/26/91. P. 301267-301282. The Proposed Plan with comments is attached.

16. Letter to Mr. Jerry Curtin, U.S. EPA, from Mr. Ralph W. Siskind, Wolf, Block, Schorr and Solis-Cohen, re: Comments filed on behalf of Philadelphia Chewing Gum Corporation concerning the Remedial Investigation/Feasibility Study and proposed option for Operable Unit #2, 8/8/91. P. 301283-301286.

17. Partial letter to Mr. Thomas Banner, Township Manager, from U.S. EPA, re: Posting of signs in Bailey Park concerning exposure of contaminates from Naylor's Run and the installation of a foot brdge to minimize contact to Naylor's Run, 8/12/91. P. 301287-301287.

18. Letter to Mr. Jerry Curtin, U.S. EPA, from Mr. David C. Kennedy, PADER, re: Comments on the draft Record of Decision, 9/6/91. P. 301288-301288.

V. COMMUNITY INVOLVEMENT/CONGRESSIONAL CORRESPONDENCE/ IMAGERY

1. Community Relations Plan for Remedial Investigation/Feasibility Study, Remedial Design/Remedial Action, Havertown PCP Site, 1/91. P. 500001-500033.

2. U.S. EPA Public Meeting, re: Havertown PCB Site Proposed Plan, 7/30/91. P. 500034-500145.

3. Letter to Mr. Jerry Curtain [sic], U.S. EPA, from Mr. Wayne L. Zimmermann, re: Comments on the July 30, 1991 meeting, 7/31/91. P. 500146-500146.

4. Letter to Ms. Carrie Clain Dietzel, U.S. EPA, from Mr. Joseph Solderitsch and Ms. Margaret Solderitsch, re: Comments on the July 30, 1991 meeting, 8/2/91. P. 500147-500147.

5. Letter to Mr. Jerry Curtin, U.S. EPA , from Mr. and Mrs. J. Sabatini, re: Endorsement of the proposed plan alternative GW-4 option in cleaning the site, 8/2/91. P. 500148-500148.

6. Letter from Mr. Andrew M. Hachadorian, re: Comments on the proposed clean up alternative, 8/5/91. P. 500149-500149.

7. Handwritten letter to Mr. Jerry Curtin, U.S. EPA, from Ms. Betty J. Haitz, re: Request for sampling in resident's area, 8/6/91. P. 500150-500150.

8. Handwritten letter to Mr. Jerry Curtin, U.S. EPA, from Ms. Jane Thorn and Ms. Deborah Albrecht, re: Support of clean up alternative, 8/7/91. P. 500151-500151.

9. Handwritten letter to Mr. Jerry Curtain [sic], U.S. EPA, from Ms. H.M. Marnie, re: Support of clean up alternative, 8/7/91. P. 500152-500152.

10. Handwritten letter to Mr. Jerry Curtin, U.S. EPA, from Mr. Bob Clark, re: Support for EPA's GW-4 clean up alternative, 8/7/91. P. 500153-500153.

11. Handwritten letter to Jerry Curtain [sic], U.S. EPA, from Ms. Judith Peters, re: Request for soil testing, 8/8/91. P. 500154-500155.

12. Letter to Mr. Jerry Curtin, U.S. EPA, from Ms. Patricia Jillard, The Manoa Civic Association, re: Response to EPA's proposed clean up alternative, 8/8/91. P. 500156-500156.

13. Letter to Mr. and Mrs. Joseph Solderitsch, from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 2, 1991 concerning the proposed plan, 8/14/91. P. 500157-500157.

14. Letter to Mr. David Manion from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter concerning the proposed plan, 8/14/91. P. 500158-500158.

15. Letter to Mr. Bob Clark from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 7, 1991 concerning the proposed plan, 8/14/91. P. 500159-500159.

16. Letter to Mr. and Mrs. J. Sabatini from Mr. Jerome M. Curtin, U.S. EPA re: Response to letter dated August 2, 1991 concerning the proposed plan and planned additional testing of Naylors Run, 8/14/91. P. 500160-500160.

17. Letter to Mrs. Judith Peters from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 8, 1991 concerning the proposed plan and additional soil testing, 8/14/91. P. 500161-500161.

18. Letter to Mr. Wayne L. Zimmermann from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated July 31, 1991 concerning the proposed plan and a third phase of investigation into possible contamination east of Naylors Run, 8/14/91. P. 500162-500163.

19. Letter to Ms. H.M. Marnie from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 7, 1991 concerning the proposed plan, 8/14/91. P. 500164-500164.

20. Letter to Mr. Robert Synder from Mr. Jerome M. Curtin, U.S. EPA, re: Response to resident's support of the proposed plan, 8/14/91. P. 500165-500165.

21. Letter to Ms. Patricia Jillard, The Manoa Civic Association, from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 8, 1991 concerning the proposed plan, 8/14/91. P. 500166-500166.

22. Letter to Ms. Jane Thorn and Ms. Deborah Albrecht from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 7, 1991 concerning the proposed plan, 8/14/91. P. 500167-500167.

23. Letter to Mr. John L. Rendemonti from Mr. Jerome M. Curtin, U.S. EPA, re: Response to inquiry concerning the proposed plan, 8/15/91. P. 500168-500168.

24. Letter to Mr. Jerry Curtain [sic], U.S. EPA, from Mr. Henry G. Meyer and Ms. Margaret C. Meyer, re: Concerns over the condition of Naylors Run, 8/15/91. P. 500169-500169.

25. Letter to Mr. and Mr. Henry Meyer from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 15, 1991 concerning the Havertown PCB Site, 8/19/91. P. 500170-500170.

26. Letter to Ms. Betty J. Haitz from Mr. Jerome M. Curtin, U.S. EPA, re: Response to letter dated August 6, 1991 concerning the proposed plan, 9/10/91. P. 500171-500171.

27. Letter to Mr. Joseph J. Di Biasi from Mr. Jerome M. Curtin, U.S. EPA, re: Response to inquiry concerning the proposed plan and the risk at Naylors Run, 9/10/91. P. 500172-500173.

28. Letter to Mr. Jerome M. Curtin, U.S. EPA, from Mr. David Manion, re: Comments regarding the public meeting, (undated). P. 500174-500174.

BIBLIOGRAPHY OF SITE SPECIFIC GUIDANCE DOCUMENTS

1. Information on Drinking Water Action Levels, prepared by T. Fields Jr., OSWER/ERD, April 19, 1988.
   Attachments:
   1. Memo: Releases from Lawfully Applied Pesticides
   2. Memo: DBOP Contamination
   3. Guidance for Ethylene Dibromide in Drinking Water

2. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, prepared by OSWER/OERR, October 1, 1988.
   OSWER #9355.3-01

3. Superfund Federal-Lead Remedial Project Management Handbook, prepared by OERR, December 1, 1986.
   OSWER #9355.1-1

4. Superfund Remedial Design and Remedial Action Guidance, prepared by OERR, June 1, 1986.
   OSWER #9355.0-4A

5. CERCLA Compliance with Other Laws Manual Draft Guidance, prepared by OERR, August 8, 1988.
   OSWER #9234.1-01

6. Superfund Exposure Assessment Manual, prepared by OERR, April 1, 1988.
   OSWER #9285.5-1

7. Superfund Public Health Evaluation Manual, prepared by OERR and OSWER, October 1, 1986.
   OSWER # 9285.4-1

DECISION SUMMARY FOR RECORD OF DECISION (ROD)

1. Site Name, Location & Description

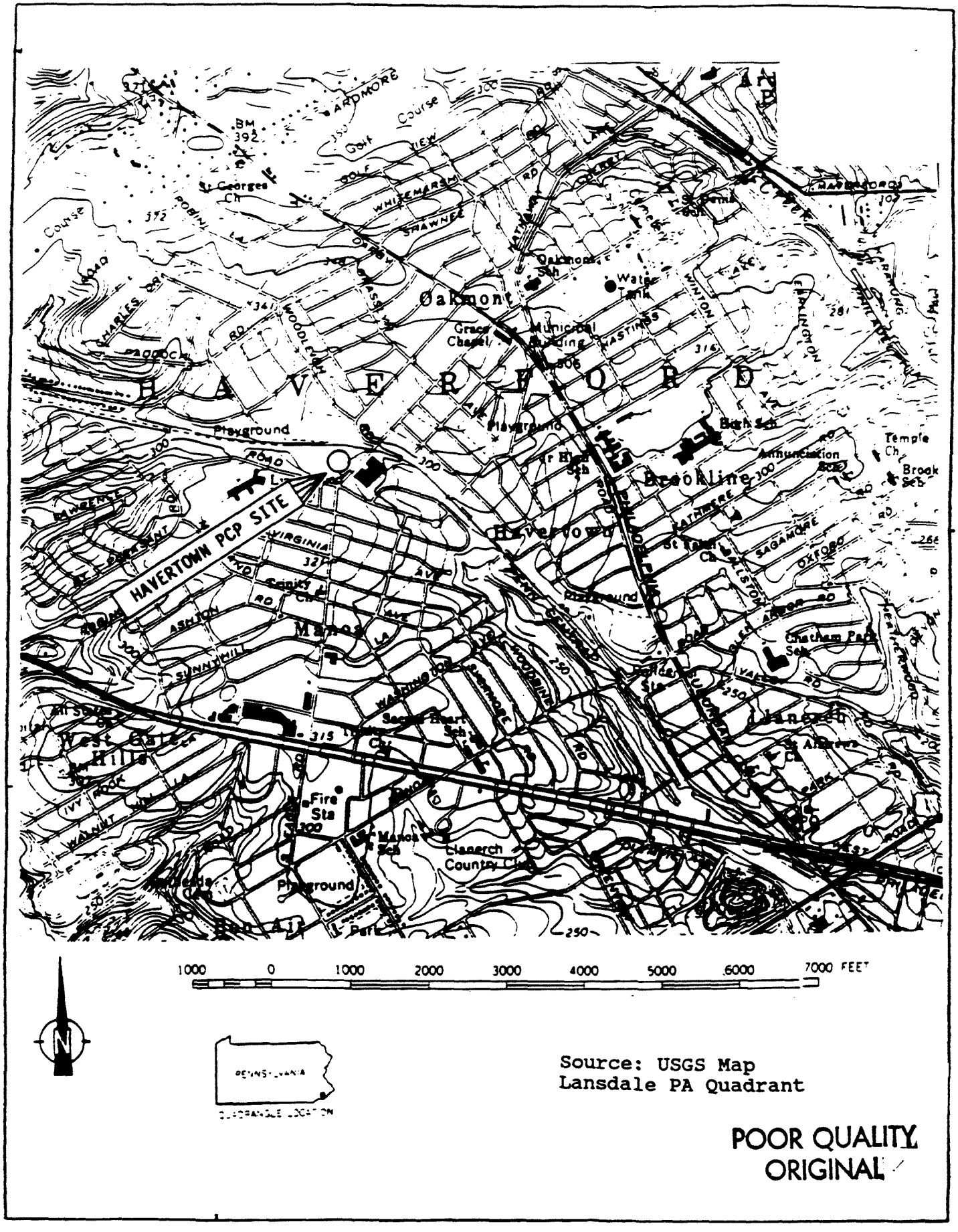
The Havertown PCP Site is located in Havertown, Haverford Township, Delaware County, in southeastern Pennsylvania. The site is located approximately 10 miles west of Philadelphia and is surrounded by a mixture of commercial establishments, industrial companies, parks, schools, and private homes. (see Figures 1 and 1A)

The Site is comprised of a wood-treatment facility operated by National Wood Preservers (NWP); the Philadelphia Chewing Gum Company (PCG) manufacturing plant adjacent to the wood-treatment facility; Naylors Run, a creek that drains the area; and neighboring residential and commercial properties (see Figure 2).

The entire Havertown PCP Site consists of approximately 12 to 15 acres, roughly delineated by Lawrence Road and Rittenhouse Circle to the south, the former Penn Central Railroad tracks to the west and north, and Continental Motors to the West. There is no distinct boundary to the East. NWP, the primary source of the contamination, is the focus of this investigation. Structures on the property include a sheet metal building with above ground chemical storage tanks situated on a 2-acre property just north of the intersection of Eagle and Lawrence Roads.

The Havertown PCP site lies approximately 300 feet above mean sea level. It ranges in elevation from 280 feet above sea level in the residential areas along Rittenhouse Circle, to 320 feet above sea level northwest of Young's Produce Store. The present site topography is a result of major cut and fill alterations to the land. The NWP property is relatively flat, and drains northward toward a drainage ditch that borders the abandoned railroad bed north of the property. The PCG property is also flat, except for a 12 to 15 foot embankment along its southeastern border which separates the PCG property from residential backyards along Rittenhouse Circle. The PCG property drains to the southwest and southeast toward residential areas.

The entire Havertown PCP site is drained by Naylors Run, a creek that flows in a southeasterly direction from the site. For the most part, surface runoff across the NWP site enters artificial drainage channels before discharging into Naylors Run. On the NWP property, a significant amount of water accumulates in the area of the gate for pedestrians near Continental Motors and in the vicinity of NWP's main gate near Eagle Road. Under storm event conditions, the large amount of flow that occurs on NWP property in the area of the main gate empties into the drainage ditch bordering the north edge of the property. Naylors Run flows through natural channels, concrete-lined channels, and a



POOR QUALITY ORIGINAL

Figure 1-General Location Map

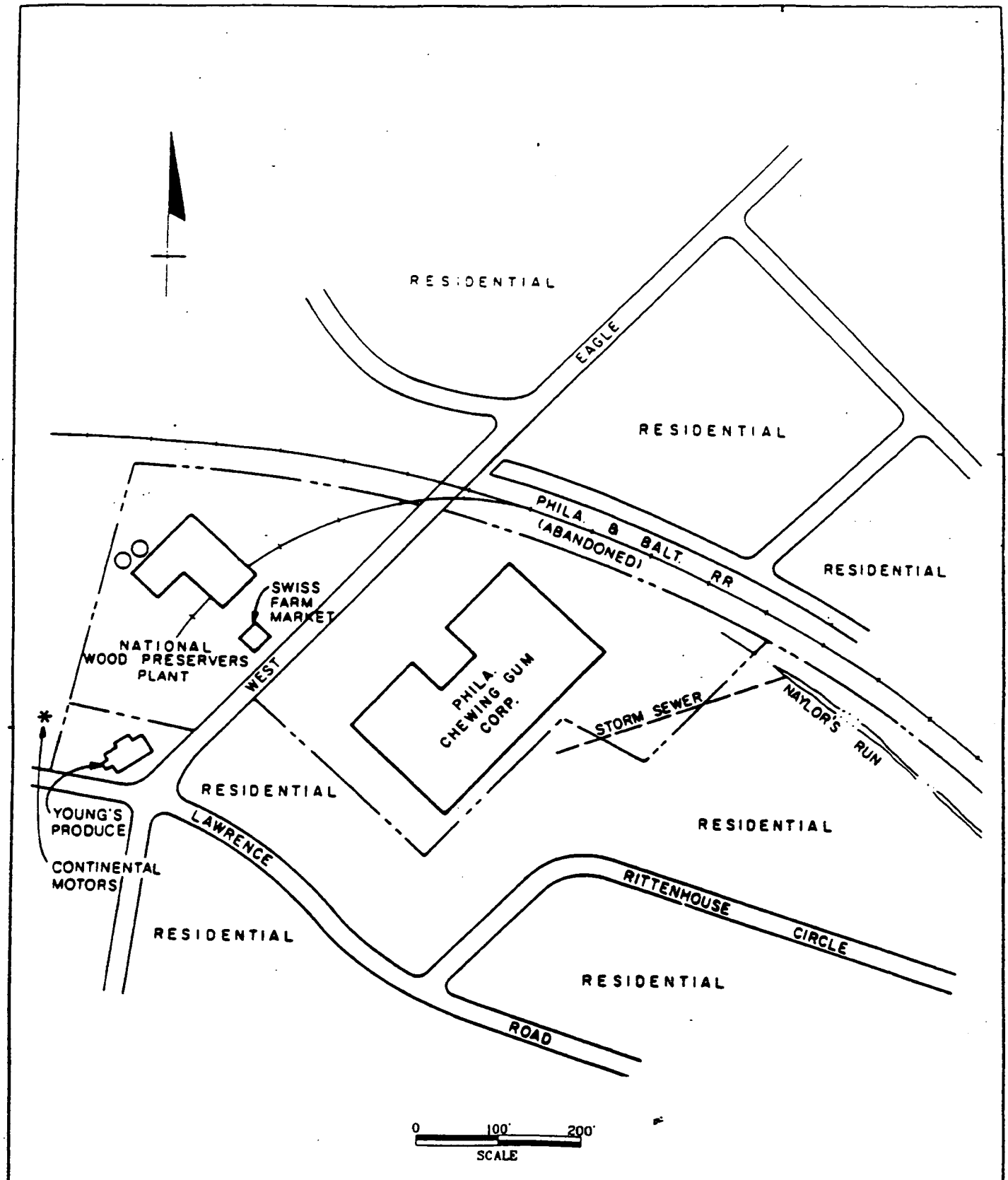


Figure 1A-Havertown PCP Site

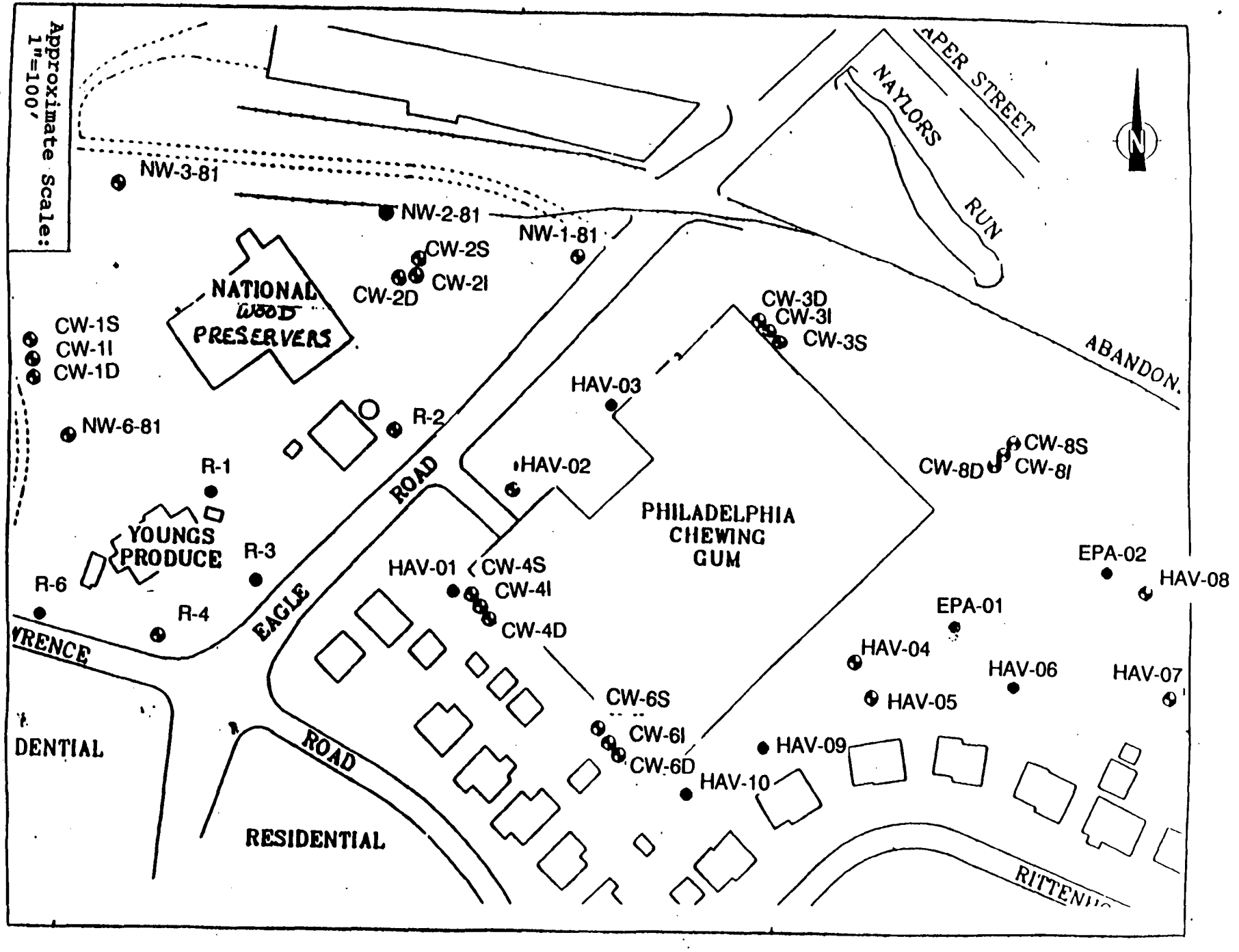


Figure 2 Surrounding Area and Monitoring Well Locations

variety of pipes before entering Cobbs Creek near East Lansdowne, approximately 4 miles southeast of the site. Cobbs Creek joins Darby Creek, which flows through the Tinicum National Environmental Center before entering the Delaware River.

2. Site History & Enforcement Activities

The NWP site was first developed as a railroad storage yard and later became a lumber yard. In 1947 the wood-preserving facility was constructed and operated by Mr. Samuel T. Jacoby. Also in 1947, NWP was incorporated by Jacoby. The property on which the plant operated was leased from Clifford and Virginia Rogers (Remedial Investigation Report, R.E. Wright Assoc., Inc., 1988 "Wright Report"). In 1963 the existing facility (NWP) was purchased by the Harris Goldstein family.

In 1962, the Pennsylvania State Department of Health became aware of contaminants in Naylors Run, and linked the source of contamination to National Wood Preservers waste disposal practices. Mr. Jacoby was brought to trial by the Commonwealth of Pennsylvania in 1964, for the disposal activities that occurred at the Site. He was found not guilty because the State had not complied with the provisions of Section 309 (Act 3, 1946) (Wright Report, Page 1-35). In 1967, Shell Oil Company obtained a leasehold interest for the portion of the Rogers' property located at the northwest corner of Eagle Road and Lawrence Road. Shell developed this portion of the Rogers' property and constructed a gasoline station at this location (Wright Report, page 1-35).

Many of the activities resulting in pollution to the water bearing aquifer beneath the site occurred during the years of 1947 to 1963. It was originally estimated that up to 1 million gallons of spent wood preservatives was dumped into a 15 to 25 foot deep well on property adjacent to the present Swiss Farms Market site. A ground water monitoring well, Well R-2, is located near this location. This disposal event appears to be a major source of contamination to Naylors Run.

In 1972, the Pennsylvania Department of Environmental Resources (PADER) identified contaminated ground water discharging from a storm sewer into Naylors Run. In 1973, PADER ordered NWP, Philadelphia Chewing Gum Company (which owns the property downgradient from NWP), Shell Oil Company, and Mr. Clifford Rogers (owner of property leased to NWP) to clean up Naylors Run, since they occupied land where contaminated ground water existed. The above parties appealed to the State Environmental Hearing Board, and later to the Commonwealth Court of Pennsylvania. In 1978, the Commonwealth Court sustained Philadelphia Chewing Gum and Shell Oil Company's appeals and ordered the cleanup to be executed by NWP and Mr. Rogers (Wright Report, page 1-41). In 1980, the Supreme Court of Pennsylvania affirmed the Commonwealth

Court's orders; the U.S. supreme Court refused to hear the appeal by NWP and the Rogers. Implementation and maintenance of the cleanup actions by NWP and Mr. Rogers were inadequate, however, and failed to address all of the environmental concerns, both onsite and off.

In response to a request from PADER in 1976, the United States Environmental Protection Agency (USEPA) initiated activities under Section 311 of the Clean Water Act. Cleanup activities occurred in two phases. The first phase established containment operations at Naylors Run. Filter fences were installed to remove PCP contaminated oil from the surface water. These fences were located just downstream from the outfall of the 36-inch storm sewer pipe and a 12-inch sanitary sewer pipe. The second phase was carried out by the Emergency Response Team from the USEPA. Ground water collection and treatment, and cement grouting of the two sewer pipes was attempted. The sanitary sewer was sealed; however, contaminated ground water still discharges into Naylors Run from the 30 inch storm sewer pipe.

In 1976, EPA commenced containment operations funded under Section 311 of the Clean Water Act. These operations were administered by the Coast Guard. As a result of negotiations following receipt of a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) notice letter dated December 18, 1981, NWP assumed responsibility for operation and maintenance of the containment operations in Naylors Run as of February 1, 1982.

In December of 1982, the Havertown PCP Site was placed on the NPL. Subsequent inspections throughout 1984, made by PADER and EPA, found many deficiencies with the containment operations. On October 10, 1984, a Unilateral Administrative Order was issued against NWP by EPA which required NWP to perform various abatement activities. These activities involved the adequate operation and periodic maintenance of the filter fences on Naylors Run.

In 1988, because of continuing releases of PCP-contaminated oil into Naylors Run, EPA's Emergency Response Team installed a catch basin in Naylors Run to trap the discharge from the storm pipe. EPA still maintains the catch basin.

In 1987, PADER initiated the RI/FS for Operable Unit One (OU1) which was completed in August 1989. A record of decision (ROD) for OU1 was issued for the Havertown PCP site by the EPA on Sept. 29, 1989, which addressed the cleanup of wastes currently staged on the site from previous investigative actions and the interim remedial measure of designing and installing an oil/water separator at the storm drain outlet along Naylors Run. On August 23, 1989, EPA sent a special notice letter to NWP to determine its interest in participating in the Remedial Design/Remedial

Action (RD/RA) for OU1. On September 6, 1989, EPA received a written response from NWP. NWP declined to participate. In order to address further problems at the site, EPA initiated an RI/FS for the site for Operable Unit 2 (OU2). Those documents were completed in June 1991.

The NWP facility has not changed significantly since its construction and today consists of a single metal-sheeted building, which contains the wood-treatment equipment, and several chemical storage tanks located immediately northwest of the building. The production facility is surrounded by a dirt-covered storage yard in which untreated and treated wood are stored. The entire NWP facility is enclosed by a chain-link fence, although this fence does not accurately delineate the boundary of either NWP or the adjacent Continental Motors. In 1963-1964 the Goldsteins made some basic chemical containment and chemical recycling modifications to the facility at the request of the State of Pennsylvania.

NWP custom-treated wood as requested by clients, who supplied the materials to be treated. Wood preservation was carried out to prevent decay or insect infestation of woods used for construction purposes where the wood will be constantly exposed to the environment. The type of wood treated at this facility was determined by the client, who supplied the material precut and dried, so that, other than loading, treating, unloading and storing wood, essentially no other tasks were performed at this facility. The present lack of activity at NWP seems to indicate that NWP is no longer operating as a wood treatment facility. Additionally, Alan Goldstein, one of the owners of NWP, did inform EPA's contractor on the site, Tetra Tech, in the spring of 1991, that he was operating the site as a lumber yard.

Two wood-treating processes have been used at this facility: the "empty cell pressure treatment process" and the "non-pressure treatment dip treatment". The facility has three pressure treatment cylinders: two inside the building and one outside. Pressure-treated wood was air dried on drip tracks located on dirt areas around the perimeter of the site. Wood that was dipped into treatment solutions was similarly dried and handled. This activity would account for the presence of PCP and heavy metals in both onsite and drainage area soils. According to the Remedial Investigation performed by PADER in 1988, at least six wood-treatment chemical solutions have been used at the NWP facility since its construction. From 1947 to 1977-1978 three chemicals were used: pentachlorophenol (PCP) in P-0 Type A oil (diesel fuel); PCP in P-9 Type C oil (mineral oils); and fluoro-chrome arsenate phenol (FCAP) in water solution. PCP in oil (both types) was used in both the pressure treatment and the dip treatment processes. FCAP was used only in the pressure treatment process.

Chromium copper arsenate (CCA) in a 0.4 or 0.6% water solution, first used at the facility in the mid-1970s, eventually replaced PCP and FCAP during 1977-1978. Other chemicals used on-site since the 1970s include chromated zinc chloride (CZC, a fire retardant) and tributyl tin oxide (TBTO), an antifouling compound). All three water-soluble chemicals were used in the pressure treatment process.

The primary contaminants of concern at the site are primarily the result of wood-treatment operations at NWP. These are PCP, polycyclic aromated hydrocarbons, dioxins and dibenzofurans (typical low-level contaminants in the manufacture of PCP), fuel oil and mineral spirits components, heavy metals, certain volatile organic compounds, and phenols.

3. Highlights of Community Participation

The Remedial Investigation, Risk Assessment, and Feasibility Study for the Havertown PCP site as well as the Proposed Plan and background documentation for the second operable unit for the Havertown PCP site were released to the public for comment on July 11, 1991. These documents were made available to the public in both the administrative record and information repository maintained at the EPA Docket Room in Region III and at the Haverford Township Building, Havertown, PA. The notice of availability for these documents was published in the News of Delaware County on July 10, 1991 and in the Philadelphia Inquirer on July 18 and 25, 1991.

A public comment period was held from July 11, 1991 to August 11, 1991. In addition, a public meeting was held on July 30, 1991. At this meeting, representatives from EPA and PADER answered questions about problems at the site and the remedial alternatives under consideration and solicited comments from the attendees. A transcript of the public meeting was maintained in accordance with Section 117(a)(2) of CERCLA, 42 U.S.C. § 9617(a)(2). A response to the comments received during this period is included in the Responsiveness Summary, which is an attachment to this ROD. The above actions satisfy the requirements of Sections 113(k)(2)(b) (i-v) and 117 of CERCLA, 42 U.S.C. Section §(k)(2)(i-v) and 9617. All documents that form the basis for the selection of the remedial action contained in this ROD are included in the administrative record for this site and can be reviewed or referred to for additional information.

4. Scope and Role of Operable Unit or Response Action Within Site Strategy

As with many Superfund sites, the problems at the Havertown PCP site are complex. As a result, EPA has organized the remedial work at the site into 3 operable units. This ROD addresses the second planned remedial action at the site.

The remedy for the First Operable Unit was documented in a 1989 ROD. It included the removal of existing waste from the site and treatment of effluent discharging from the existing storm sewer. This included installation of an oil/water separator and off-site disposal of generated wastes. This remedy was constructed in May 1991 & the results are being monitored under EPA's operation and maintenance of the site. To date, the results indicate that almost all of the oil and grease and most of the semi-volatile organics are being removed from the effluent. However, significant amounts of solubilized PCP still remain in it.

The principal threat addressed by this ROD is the ground water contamination, which originated at the NWP facility, and has slowly migrated to the southeast in the shallow aquifer and also lays directly under the NWP facility. Very significant concentrations of PCP and other chemicals of concern remain in the ground water. Natural flushing and attenuation of the contamination has been ineffective in removing the contaminants to low residual levels.

To address the principal threat, the Second Operable Unit encompasses the collection and treatment of contaminants in the shallow ground water aquifer and upon treatment, discharge effluent back into Naylors Run. As part of the investigation for this operable unit, an evaluation of the contamination of the sediments in Naylors Run was also made. While the actions of this operable unit will not remediate the sediment contamination, it will act as a first step in remediating the sediments by removing contaminants from the ground water, which is one of the media which transport contamination into the sediments. This action is considered an interim action for ground water, because it addresses only the remediation of the shallow ground water aquifer and is not the permanent remedy for ground water. The deep aquifer is not being remediated at this time due to the presence of PCP contamination in the soils underlying NWP. It was decided that any installed deep ground water extraction wells might draw ground water through the existing contaminated soil and thus further contaminate the existing aquifers. In the Third Operable Unit, the existing soil contamination will be further investigated to coordinate with deep ground water investigation.

The Third Operable Unit, which will be initiated in the next year, will evaluate the extent of soil contamination at NWP and the surrounding area, the potential impact on shallow and deep ground water aquifer contamination, and further evaluate the contamination of sediments in Naylors Run.

5. Summary of Site Characteristics

A. Nature and Extent of Contamination

Ground water at the Havertown site flows in an easterly direction

and occurs in two major zones. The upper zone consists of surficial soils and weathered schist saprolite. The movement of water in the saprolite zone is influenced by the degree of saprolite weathering, relict bedrock structures, compositional variations, and the thickness of the weathered zone. The lower zone consists of highly fractured and jointed schist bedrock, with water movement occurring along interconnected fractures. The bedrock aquifer receives some of its recharge from the downward flow through the overburden aquifer. Upward directed flow also occurs within the overburden aquifer and presumably provides base flow to Naylors Run. The depth to ground water below the site ranges from approximately 23 feet below ground surface in the vicinity of Young's Produce Store to approximately 0.5 feet below ground surface in the vicinity of Rittenhouse Circle. Until very recently, September 13, 1991, neither aquifer was thought to be used as a source of water supply in the vicinity, as public water is supplied by the Philadelphia Suburban Water Company. However, EPA was notified on September 13, 1991 that there are 3 families in Havertown who utilize ground water as a drinking source. These families are located more than 1 mile north and west of the site. An investigation is now underway to determine if the ground water being used was affected by the Havertown PCP site.

The present nature and extent of contamination at the Havertown PCP site is summarized below for ground water, surface water and sediments in Naylors Run, and water and sediment collected from several portions of the storm sewer feeding into Naylors Run.

Ground water was sampled at 16 different locations. The results are summarized in Table 1 and locations are shown on Figure 2. Surface water was sampled at 11 locations. The results are summarized in Table 2 and locations are shown on Figure 3. The storm sewer water was sampled at 3 locations. The results are summarized in Table 3 and locations are shown on Figure 3. The sediments were sampled at 11 locations and 2 locations in the storm sewer. The results are summarized in Tables 4 & 5 and locations are shown in Figure 4 & Figure 3, respectively. (Tables 1 through 5 include summaries of the major contaminants and their associated values but they do not include every individual contaminant. That information is available in the RIFS report.)

Ground Water

Volatile organic compounds (VOCs), semi-volatile organic compounds (predominantly pentachlorophenol), and dioxin isomers are the majority of the contaminants present in the ground water at the Havertown site. The shallow ground water is classified as

TABLE 1 - SUMMARY OF
GROUNDWATER SAMPLING RESULTS
Sampling Date: August and November 1990

WELL NUMBER	VOLATILE ORGANICS PPB	SEMI ORGANICS/ PESTICIDES PPB	DIOXIN ISOMER PPT	INORGANICS PPB
NW-3	-	SV-212 PAH-212	0.032	Cobalt-97.7 Manganese-4,620
CW-1 (3 WELLS)	1,2 Dichloroethene-270 Trichloroethene-630	SV-1,213 PCP-250 Dieldrin-.12	0	Cobalt-206 Manganese 9,960
NW-6	-	SV-2,800 PCP-2,800	0.008	Arsenic-13.6 Cobalt-89.6 Manganese-8,800
R-4	-	Dieldrin-.61	0.007	Aluminum-45.8 Manganese-28.5
HAV-02	Total Xylenes-240	SV-2,934 PCP-1,900 PAH-1,034	23.136	Arsenic-8 Cobalt-146 Manganese-19,200
CW-2	Total Xylenes-110	SV-11,558 PCP-6,800 PAH-4,719	4.464 shallow	Aluminum-2,390 Arsenic-2.3 Cobalt-413 Manganese-9,350
NW-1	-	SV-4,491 PAH-4,405	9.976	Cobalt-9.5 Manganese-561
CW-4 (3 wells)	Benzene-270 Total Xylenes-540	SV-4,160 PCP-3,700 PAH-760	0.776	Aluminum-31.4 Arsenic-26.1 Cobalt-69.3 Manganese-9,120
R-2	-	SV-147,340 PCP-80,000 PAH-66,040 Endosulfan-3.5	29.39	Arsenic-22.7 Cobalt-91.7 Manganese-17,300
CW-3 (3 wells)	-	SV-560 PCP-560 Only deep	0.001	Aluminum-40.2 Cobalt-34 Manganese-6,860
CW-6 (3 wells)	-	SV-3,965 PCP-3,500 PAH-465 Only deep	0.012	Aluminum-48.5 Arsenic-2.8 Cobalt-41.8 Manganese-8,790
CW-5 (3 wells)	Total Xylenes-390 Ethyl Benzene-160	SV-201 PCP-140	0.084	Aluminum-42.8 Arsenic-28 Cobalt-16.2 Manganese-8,700
HAV-04	Total Xylenes-1,300 Benzene-230	SV-90,820 PCP-63,000 PAH-27,190	173.739 (2,2,7,8 TCDD)	Aluminum-35.1 Cobalt-179 Mnganese-22,600
HAV-05	Total Xylenes 1,700	SV-3,774 PCP-3,300 PAH-444	3.599	Aluminum-55.6 Cobalt-65.5 Manganese-9,630
HAV-08	-	SV-2,739 PCP-1900 PAH-839	0.052	Aluminum-38.4 Cobalt-41.7 Manganese-3,350
HAV-07	-	-	0.212	Aluminum-61.1 Arsenic-2.7 Cobalt-8.5 Manganese-951

Table 2-Naylor's Run/Cobbs Creek Surface Water Sampling
Sampling Dates: September 1990 and January 1991

Location	VOC's (ppb)	Semi-Volatiles/ Pesticides (ppb)	Dioxin Isomers (ppt)	Inorganics (ppb)
Nay 06	-	Lindane-.054	-	Aluminum-147 Lead-12.9 Manganese-228 Thallium-3.3
Nay-05	*no sample taken*	*no sample taken*	*none taken*	*no sample taken*
Nay-03	Xylenes-160 Benzene-31	SV-1,204 (PCP-1,200) Heptachlor - .77 4-4 DDD - .38	0.299	Aluminum 113 Lead 8 Manganese-10,000 Thallium-3
Nay 04	Xylenes-27 Trichloroethene-7 Benzene-28 Ethylbenzene-6	SV-382 (PCP-380) 4-4 DDD-.38	0.004	Aluminum-53.5 Lead-3.6 Manganese-7,430 Thallium-2.2
Nay 02	Xylenes-46 Trichloroethene-4 Benzene-11 Ethylbenzene-6	SV-580 (PCP-580) Dieldrin-.12	-	Lead 7.4 Manganese-8,220 Thallium-2
Nay 01	-	Dieldrin-.34	-	Lead-2.4 Manganese-686 Thallium-2
Nay 08	not taken	SV-140 (PCP-140)	not taken	not taken
Nay 09	not taken	-	not taken	not taken
Nay 10	not taken	-	not taken	not taken
Cob 01	not taken	-	not taken	not taken
Cob 02	not taken	-	not taken	not taken

Table 3 - Storm Sewer water Sampling Sampling Date: September 1990				
Location	Voc (ppb)	Semi-Volatiles Pesticides (ppb)	Dioxin (ppt)	Inorganics (ppb)
SS 01	no samples taken	no samples taken	no samples taken	no samples taken
SS 02	Xylenes-3	-	-	Aluminum-236 Barium-30 Cobalt-2 Manganese-77
SS 02A	Ethylbenzene-110 Xylenes-500 Benzene-120 2-Butanone-80 Trichloroe- thene-16	SV-2,229 (PCP-2,100 PAH- 127)	0.703	Aluminum-148 Barium-38 Cobalt-60 Lead 6 Manganese- 14,300
SS 03	no samples taken	no samples taken	no samples taken	no samples taken
SS 04	-	SV-8,501 (PAH-8,172)	-	Aluminum-236 Arsenic-3 Barium-113 Cobalt-2.6 Manganese-1,500 Lead-3.2
SS 05	no samples taken	no samples taken	no samples taken	no samples taken

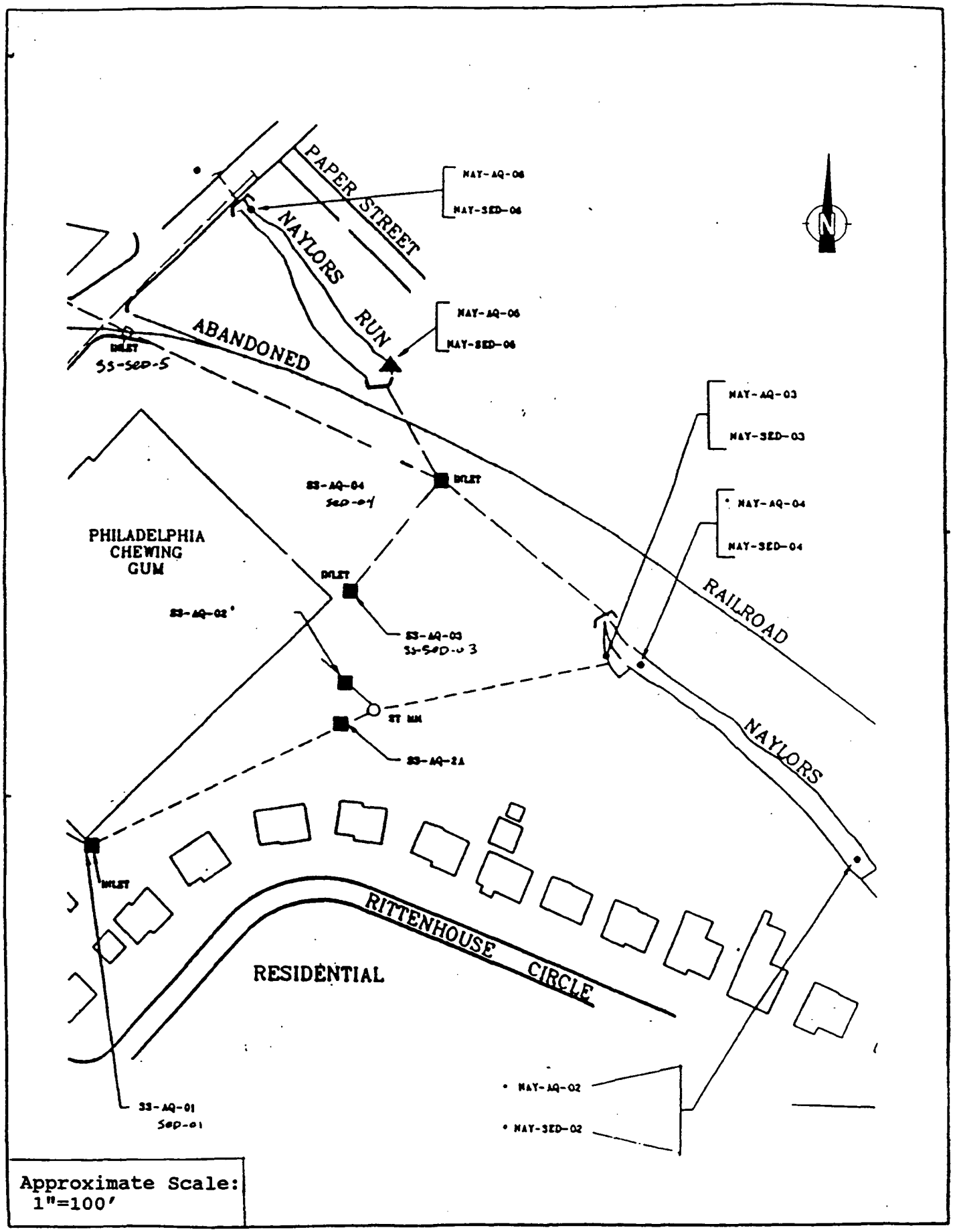


Figure 3 -Surface Water, Storm Sewer, and Sediment Sampling Locations near NWP

Table 4 - Naylor's Run/Cobbs Creek Sediment
Sampling Date: September 1990 and January 1991

Location	BOC's (ppb)	Semi-Volatiles/ Pesticides (ppb)	Dioxin Isomers (ppt)	Inorganics (ppb)
Nay 06		SV-120,680 (PCP-3,000 PAH-111,200) Endrin-43 Endosulfan-48	0.003	Aluminum-6,320 Lead-694 Managenese-3,800 Antimony-137 Arsenic-21.5 Barium-115 Chromium-532 Cobalt-29.9 Vandium-75.2
Nay-05		SV-45,990 (PAH-32,990)	0.041	Aluminum 7130 Arsenic-37.6 Barium-415 Chromium-34.6 Cobalt-12.8 Lead-232 Manganese-1,350 Vanadium-27
Nay 03		SV-117,160 (PAH-59,130) 4-4 DDD-43 beta-BHC-35 Alpha-chlordane-110 Gamma-Chlordane-130	0.118	Aluminum 3,950 Lead 2.6 Antimony-7.9 Arsenic-1.5 Barium-45.5 Chromium-31.4 Cobalt-12.8 Vanadium-27
Nay 04	Trichloroethane-7 Benzene 28 Ethylbenzene 27	SV-9140 (PCP-830 PAH-7040) Endosulfan-51	0.117	Aluminum-6,110 Lead-12 Manganese-4,750 Antimony-14.1 Arsenic-1.8 Barium-62.3 Chromium-426 Cobalt-7.1 Vanadium-118
Nay 02/07		SV-47,000 (PCP-1,800 PAH-41,320) beta BHC-28 Dieldrin-73 Aldrin-36	0.056	Lead 288 Manganese-399 Aluminum-4,350 Antimony-7.7 Arsenic-14.5 Barium-41.4 Chromium-42.7 Cobalt-7.7 Vanadium-20.7
Nay 01		SV-7640 (PCP-810 PAH-4,220) Dieldrin-75	0.011	Lead-32.4 Manganese-3,420 Aluminum-5,230 Antimony-7.2 Arsenic-1.1 Barium-113 Chromium-331 Cobalt-11.8 Vanadium-66.2
Nay 08	not taken	SV-43,206 (PCP-360 PAH-40,830)	not taken	not taken
Nay 09	not taken	SV-13,708 (PAH-40,830)	not taken	not taken
Nay 10	not taken	SV-84,634 (PAH-81,116)	not taken	not taken
Cob 01	not taken	SV-5,445 (PAH-5,296)	not taken	not taken
Cob 02	not taken	SV-1,817 (PAH-1,786)	not taken	not taken

Table 5 - Storm Sewer Sediment Sampling
Sampling Date: September 1990

Location	VOC (ppb)	Semi-Volatiles\ Pesticides (ppb)	Dioxin (ppt)	Inorganics (ppb)
SS 01	no samples taken	no samples taken	no samples taken	no samples taken
SS 02	no samples taken	no samples taken	no samples taken	no samples taken
SS 02A	no samples taken	no samples taken	no samples taken	no samples taken
SS 03	no samples taken	no samples taken	no samples taken	no samples taken
SS 04	Trichloroethene-8	SV-8,501 (PAH-8,172)	-	Aluminum-7,320 Arsenic-1.3 Chromium-100 Cobalt 5 Manganese-1,230 Lead-30 Vanadium-36 Zinc-102
SS 05	Trichloroethene-3	SV-37,400 (PCP-20,000 PAH-13,450)	0.041	Aluminum-12,900 Arsenic-425 Chromium-656 Cobalt-11 Lead 226 Manganese-373 Mercury-.23 Vanadium-48

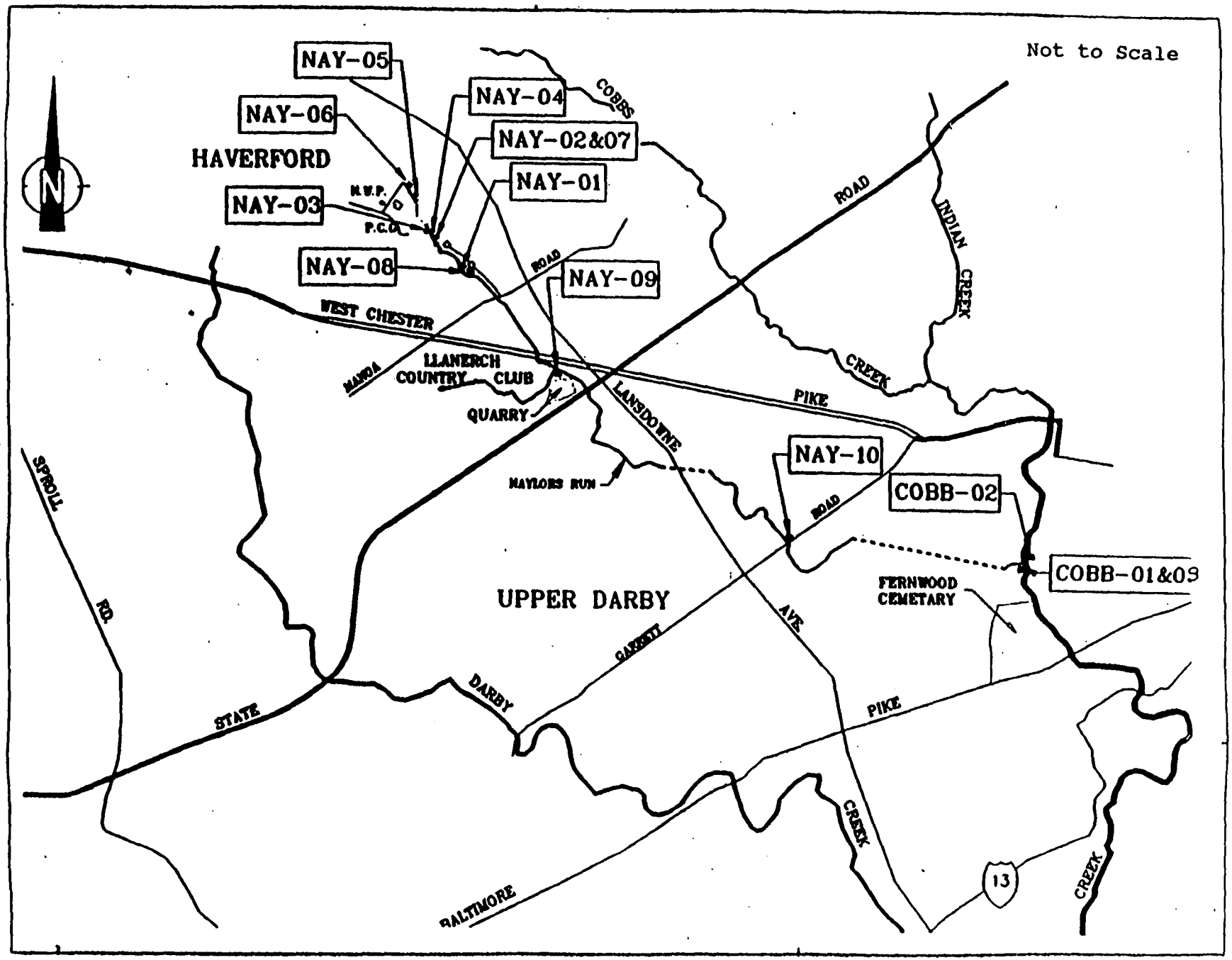


Figure 4 -Surface Water and Sediment Sampling Locations Downstream

a class IIB aquifer, capable of being used as a drinking source. The ground water is not being used by the adjacent populations (except for the three families previously mentioned) but it does empty into Naylors Run which eventually feeds Cobbs Creek. Its movement is discussed under the Fate and Transport Section of this ROD.

The volatile organic compounds trichloroethene and 1,2-dichloroethene are found in highest concentrations (630 and 270 µg/l, respectively) on the National Wood Preservers property and decrease from west to east across the site. Other prevalent VOCs, benzene and total xylenes, are found in highest concentrations on Philadelphia Chewing Gum property (270 and 1700 ug/l, respectively). In general, the concentration of all volatile organic compounds have decreased in most monitoring well locations since 1988.

Semi-volatile organic compounds have generally increased in concentration since 1988. Pentachlorophenol and polycyclic aromatic hydrocarbons (PAHs) make up the majority of the semi-volatile organic compounds present in the ground water. The highest levels of PCP were present in wells R-2, HAV-04, and HAV-02 (80000, 63000, and 1900 µg/l, respectively). Wells R-2 and HAV-02 presently contain floating free petroleum product. It is estimated that there now exists approximately 6000 gallons of free product in this area. PCP was found for the first time in the furthest downgradient shallow well, HAV-07. PCP is also present in the deep hydrologic zone, although in generally lower amounts than those observed for the shallow hydrologic zone.

There are numerous dioxin isomers, all of which vary in their potential toxicity. The isomer 2,3,7,8-TCDD is considered to be the most toxic of the isomers. To evaluate dioxin, concentrations of all isomers are converted to a toxicity equivalent for 2,3,7,8-TCDD. Although 2,3,7,8-TCDD was only present in 1 monitoring well, almost all monitoring points exceeded a 2,3,7,8 toxicity equivalent of zero. The 2,3,7,8-TCDD toxicity equivalent of the ground water has apparently increased dramatically since 1988, especially in wells that still contain free floating product. The characteristics of each contaminant, as it relates to human health are discussed in the Summary of Site Risks Section of this ROD.

Surface Water and Sediments in Naylors Run and Cobbs Creek

The surface water contained predominantly VOCs and PCP. Minor concentrations of pesticides and metals were also present. The surface water was generally absent of other semi-volatile organic compounds (besides PCP) and contained no dioxins. VOCs and PCP were not the dominant contaminants in the sediments. Instead, the PAH subgroup of semi-volatile organic compounds dominated.

As with ground water, the primary VOCs in the surface water were benzene, total xylenes, trichloroethene, as well as toluene and ethylbenzene. All VOCs decreased in concentration downstream. No VOCs were present in the furthest downstream location in Naylors Run (NAY-01). The total VOC concentration was 205 ug/1, immediately outside the catch basin.

The concentration of PCP in the surface water ranged from a maximum of 1200 µg/1, in water entering the catch basin (NAY-03), to 3 µg/1 at the furthest downstream location sampled, Cobbs Creek station 01. The maximum concentration of PCP and PAHs in the sediment were found at station 06 in concentrations of 3000 and 111,200 µg/kg, respectively. No PCP was found in the sediment downstream of station 08 (above quantification limits of 1000 µg/kg).

The pesticides gamma-BHC, 4.4'-DDD, heptachlor epoxide, and dieldrin were present in the surface water. At least one of these pesticides was present at every surface water station but no more than 2 pesticides were detected at any 1 station. The maximum concentration of any pesticide was 0.77 µg/1. Dieldrin, beta-BHC, heptachlor, aldrin, 4,4'-DDD, endosulfan sulfate, and endrin were all present in the sediment. Heptachlor represented the pesticide found in the highest concentration in the sediment at 160 µg/kg.

Aluminum, cobalt, lead, manganese, and thallium represented the metals of concern in the surface water. These metals, plus antimony, arsenic, barium, chromium, and vanadium were prevalent in the sediments. Only antimony, lead, and thallium were not found at every sample station.

All surface water samples located away from the immediate vicinity of the catch basin had a 2,3,7,8-TCDD toxicity equivalent of zero. All sediment samples collected in Naylors Run did contain dioxin isomers, although in low concentrations outside the immediate vicinity of the catch basin.

Storm Sewer

Volatile organic compounds, PCP and dioxin were found in water samples collected from station 02A. A TV inspection of the storm sewer indicated numerous points of ground water inflow and what appeared to be oil stains at pipe joints. The presence and concentration of these compounds, mentioned above, reflect the ground water contribution to the water in the storm sewer.

A sediment sample collected from the drainage swale located adjacent to NWP indicated the presence of PCP in a concentration of 20,000 µg/kg. The location of this sample supports the assertion that some of the sediment contamination in Naylors Run is a direct result of surface soil erosion from NWP.

B. Fate and Transport

Several contaminant migration pathways have been documented in this investigation. Contaminants were previously directly introduced into the ground water through an injection well. Evidence suggests that contaminated surface soil has been eroded from NWP and transported to Naylors Run via the storm sewer. Once contaminants have entered Naylors Run, they may be transported in the surface water, sediments, or through bioaccumulation processes.

Ground Water Pathway

Ground water from the shallow hydrologic zone is discharging into the reach of Naylors Run below the catch basin. The calculated flow velocity in the shallow hydrologic zone is approximately 85 feet per year. Based on the length of time NWP has been in operation, contaminants in the shallow hydrologic zone could have migrated approximately 3400 feet in the last 40 years. However, this investigation indicates that PCP has just reached well HAV-07, located only 800 feet from NWP. It is believed that the storm sewer behind the PCG building is intercepting some shallow ground water and acting as a conduit for transport of ground water into Naylors Run. Factors such as dilution, adsorption onto soil, biodegradation, and transformation could also be inhibiting further migration of contaminants in the ground water.

Ground water flows downward from the shallow hydrologic zone to the deep hydrologic zone on NWP but has an upward direction of flow in wells on PCG property. The deep hydrologic zone is therefore probably providing some recharge to the shallow hydrologic zone in the vicinity of Naylors Run. Some portion of the ground water in the deep hydrologic zone likely travels under Naylors Run via fractures and discharges further downgradient (to the southeast). Ground water flow velocity in the deep hydrologic zone, within fractured bedrock, is estimated to be 25 feet per year.

Free petroleum product was observed in wells R-2 and HAV-02. The product is considered a Light Non-Aqueous Phase Liquid (LNAPL). The lateral extent of the free product plume has apparently decreased with time. Because the LNAPL is by definition less dense than water, it will not directly affect the deep hydrologic zone. The decrease in lateral extent and thickness of free product may, however, be associated with a recent increase in the concentration of PCP in the shallow hydrologic zone.

Surface Water Runoff Pathway

To date, our investigation has determined that ground water is not providing any base flow to the reach of Naylors Run above the

catch basin. Contaminants that are found in this section of Naylors Run have likely travelled in surface water runoff from NWP property. A comparison of contaminants in the surface soil on NWP and contaminants found in the sediments of Naylors Run indicates many of the contaminants found in the soil are present in the sediment. Additionally, the presence of PCP at a concentration of 20,000 ug/kg and dioxin isomers, with a 2,3,7,8-TCDD toxicity equivalent of 20.8 ppt, in the drainage swale adjacent to NWP which drains directly to Naylors Run provides additional evidence for the viability of this pathway.

Transport in Naylors Run

The flow characteristics of Naylors Run, combined with grain size data indicate that the sediment is probably transported only during high flow storm events. Dilution, diffusion, photolysis, and biodegradation may act on contaminants dissolved in the surface water. However, a close match between the predicted and observed downstream decrease in PCP concentrations can be accounted for by dilution alone. Bioaccumulation of contaminants may also play a role in transport of contaminants in Naylors Run; however, its role is difficult to quantify.

6. Summary of Site Risks

A. Human Health Risks

Contaminant Identification

Table 6 lists the chemicals of potential concern for all media at the Havertown PCP site. Over forty chemicals were selected as chemicals of potential concern for the Havertown PCP site, including volatile organic compounds, PCP, PAHs, pesticides, dioxins and furans, and inorganics. Of these chemicals, PCP, PAHs, and dioxins appear to be the primary chemicals of potential concern in all media at the Havertown PCP site. Other chemicals selected as chemicals of potential concern in all media include: aluminum, arsenic, cobalt, and manganese. Several volatile organic compounds selected as chemicals of potential concern were detected only in ground water, including 1,2- dichloroethene, trichloroethene, and vinyl chloride. The exclusive presence of these chemicals in ground water may be due to their high water solubility, low affinity for binding to sediment particles, and potential volatilization from surface water to the air. The pesticides dieldrin and heptachlor epoxide were only detected in Naylors Run surface water. The majority of the PAHs were found only in sediment samples, probably due to their low water solubility and high affinity for binding to sediment particles.

Table 6

Summary of Chemicals of Potential Concern for the Havertown PCP Site

		Naylors Run		Storm Sewer	
	Ground-Water	Surface Water	Sedi-ment	Surface Water	Sedi-ment
Organics:					
acenaphthene	X		X		X
acenaphthylene	X				X
anthracene	X		X		X
benzene	X			X	
benzo(a)anthracene	X		X		X
benzo(a)pyrene			X		X
benzo(a)pyrene (Equivalent)	X	X	X		X
benzo(b)fluoranthene			X		X
benzo(g,h,i)perylene			X		X
benzo(k)fluoranthene			X		X
bis(2-ethylhexyl)phthalate	X				
chlordane(Total)			X		
chrysene	X		X		X
dibenzo(a,h)anthracene			X		X
dibenzofuran	X		X		X
1,2-dichloroethene	X				
dieldrin		X			
endosulfan sulfate			X		
fluoranthene	X		X		
heptachlor epoxide		X			
indeno(1,2,3-c,d)Pyrene			X		X
naphthalene	X				
2-methylnaphthalene	X			X	
pentachlorophenol	X	X	X	X	X
phenanthrene	X		X	X	X
pyrene	X	X	X		X
2,3,7,8-TCDD (Equivalent)	X	X	X	X	
trichloroethene	X				
vinyl chloride	X				
Inorganics:					
aluminum	X	X	X	X	X
antimony			X		
arsenic	X		X	X	X
barium			X	X	
chromium			X		X
cobalt	X	X	X	X	X
lead		X	X	X	X
manganese	X	X	X	X	X
mercury					X
nickel			X		
thallium		X	X		
vanadium			X		X
zinc					X

Several inorganic chemicals of potential concern, including antimony, nickel, thallium, vanadium, and zinc, were detected only in Naylors Run. It is uncertain whether some of these chemicals are actually associated with site-related disposal.

Exposure Assessment

The various pathways of exposure were evaluated as listed in Table 7. It was determined that the pathway of major concern was exposure to the surface water and sediments in Naylors Run (through dermal absorption and incidental ingestion) by children playing there. Also of current concern is bioaccumulation by fish caught in Cobbs Creek and subsequent ingestion by the general population and, more specifically, by mothers who are nursing infants. In future use scenarios, the use of ground water by residents for either ingestion or showering purposes was considered a pathway of concern.

The exposure point concentrations used for each contaminant of concern in each media are listed in Table 8. All exposure parameters used to evaluate risks for each scenario are listed in Table 9 and 10. The estimated chronic daily intakes of contaminants of concern for each of the scenarios listed above are provided in Tables 11 and 12.

Conservative assumptions were used to quantitatively estimate exposure for the various pathways evaluated in this report. The area in question is a stream (Naylors Run) running through residential and industrial areas. The stream is used to carry off storm water although industrial and residential contaminants also enter it. Under current land-use conditions, it was assumed that children would play in the more contaminated areas of the Naylors Run 125 days per year for 10 years and during these play activities, children would incidentally ingest 140 mg of sediment each day. In addition, children were assumed to contact surface water and sediments over one-third of the surface area of their hands, arms, and legs. These are conservative assumptions used to evaluate a reasonable maximum exposure case. The likelihood of children in the area actually engaging in such behavior is unknown.

For the fish ingestion pathway, recreational fishermen were assumed to ingest an average of 42 grams (1.5 oz.) per day of bottom feeding fish from Cobbs Creek. No data were available for game fish which are more likely to be ingested by recreational fishermen. Game fish may have much lower concentrations of organic contaminants in their tissue than bottom feeding fish given the differences in their foraging behavior. Therefore, potential exposure levels may be overestimated.

For a hypothetical future land-use exposure pathway, it was assumed that an individual would ingest 2 liters per day of

Table 7

Potential Human Exposure Pathways for the Havertown PCP Site
Under Current Land-Use Conditions

Exposure Media (a)	Exposure Point	Potential Receptor	Primary Exposure Routes	Exposure Pathway Complete?	Pathway Selected for Quantitative Evaluation?
Groundwater	No exposure point			No. There are no residential or industrial wells currently in use within the Havertown PCP study area.	No, pathway not complete.
Surface Water/ Sediments	Storm Sewer	Children playing; Workers Cleaning sumps	Dermal absorption and incidental ingestion of sediments and dermal absorption of chemicals in surface water	Yes. It is highly unlikely, however, that children would be exposed to storm sewer sediments to any significant extent. Worker exposure to storm sewer sediments would be very infrequent and contact minimized by protective clothing	No, due to low probability of significant exposure.
	Naylors Run	Children Playing	Dermal absorption and incidental ingestion of sediments and dermal absorption of chemicals in surface water	Yes, children may play in Naylors Run in the vicinity of the site	Yes
Air	On-site and in residential areas	Residents and workers	Inhalation of VOCs from groundwater seeps and storm sewer discharges (releases from soils evaluated in Phase I RI)(a)	Yes. It is unlikely, however, that significant releases of volatile would occur form surface water, given the minimal concentrations of VOCs in surface water. Dust would not be generated from contaminated sediments.	No, due to low probability of significant exposure.
Biota	Fish caught from Cobbs Creek	Recreational fisherman	Ingestion of contaminated fish tissue by fisherman and subsequent exposure to nursing infants via ingestion of breast milk from mothers that consume fish.	Yes. Chemicals of concern that may bioaccumulate to significant levels in fish tissue have been found. Fish tissue data from the NBS (EPA 1990b) were used in this assessment. Nursing infants also may be at risk if the mother consumes significant quantities of fish from Cobbs Creek.	Yes

(a) Soil related exposure routes were evaluated in the Phase I RI baseline risk assessment (Greeley-Polhemus Group, 1989).

Table 7 (cont)

Potential Human Exposure Pathways for the Havertown PCP Site
Under Future Land-Use Conditions

Exposure Media (a)	Exposure Point	Potential Receptor	Primary Exposure Routes	Exposure Pathway Complete?	Pathway Selected for Quantitative Evaluation?
Groundwater	Hypothetical Residential Well	Resident	Ingestion of groundwater and inhalation of VOCs while showering. Also, nursing infants may be exposed to significant levels of dioxin from mothers that ingest groundwater.	Yes. If a well were installed in the primary areas of concern at the site, then significant exposure to chemicals of concern may occur via direct use of groundwater and indirect exposure to nursing infants that ingest breast milk from exposed mothers. Although the probability of this pathway occurring is low, it is evaluated primarily to justify potential remediation of groundwater for the site.	Yes
Surface Water/ Sediments	same as current land-use of the Havertown PCP site				
Air	same as current land-use of the Havertown PCP site				
Biota	same as current land-use of the Havertown PCP site				

(a) Soil related exposure routes were evaluated in the Phase I RI baseline risk assessment (Greeley-Polhemus Group, 1989).

Table 8
Exposure Point Concentration for Chemicals of Concern

GROUNDWATER
(ug/l)

	EXPOSURE POINT CONCENTRATION
ORGANICS:	
Benzene	230.0
1,2-Dichloroethene (total) (d)	245.0
b's(2-ethylhexyl)phthalate (d)	180.0
Benzo(a) pyreme (Equivalent)	741.9
Fluoranthene	810.0
Naphthalene	24,000.0
Pentacnlorophenol	80,000.0
2,3,7,8-TCDD (Equivalent)	0.17
Trichloroethene (d)	465.0
Vinyl Chloride (d)	9.1
Inorganics:	
Arsenic	22.7
Manganese	22,600.0
Thallium (d)	1.7

SURFACE WATER
(ug/l)

	EXPOSURE POINT CONCENTRATION
Naylors Run Organics:	
Dieldrin	.3
Heptachlor Epoxide	.8
Benzo(a)pyrene (Equivalent)	.3
Pentachlorophenol	1,200.0
2,3,7,8-TCDD (Equivalent)	$3.0E^{-4}$
Inorganics:	
Manganese	10,100.0
Thallium	3.3

Fish Tissue Samples
From Cobbs Creek

Chemical (b)	Concentration in ug/kg Black Bullhead (c)	White Sucker (d)
Chlordane (total)	59.0	238
Dieldrin	63	450
Heptachlor Epoxide	8.6	37
2,3,7,8-TCDD (Equivalent)	0.0013	0.007

SEDIMENTS
(ug/kg)

	Exposure Point CONCENTRATION
Organics:	
Chlordane (total	230.0
Benzo(a)pyrene (Equivalent)	28,061.7
Fluoranthene	21,000.0
Pentacnlorophenol	3,000.0
2,3,7,8-TCDD (Equivalent	0.118
Inorganics:	
Anatomy	14.1
Arsenic	37.6
Barium	415.0
Chromium	532.0
Manganese	4,750.0
Nickel	33.0
Thallium	1.0
vanadium	118.0

Table 9
EXPOSURE PARAMETERS

PARAMETER	CHILDREN CONTACTING SURFACE WATER	CHILDREN INGESTING SEDIMENTS IN NAYLORS RUN	FISHERMAN INGESTING FISH	GROUND WATER INGESTION
Surface Area in contact (50th Percentive)	100 cm^2	----		----
Permeability	$8.4.10^{-4}$ cm/hr	----		----
Exposure Time	2.6 hrs./day	----		
Exposure Duration	10 years	10 years	30 years	30 years
Exposure Frequency	125 days/year	125 days/year	365 days/year	365 days/year
Averaging Time	25,550 days 3,650 days (non-carcingenic)	25,550 days 3,650 days	25,550 days 10,950 days	25,550 days 10,950 days
Mean Body Weight	25 kg	25 kg	70 kg	70 kg
Ingestion Rate	----	140 mg/day	41.7 g/day	2 l/day
Percent ingested	----	100%	100%	----
Relative Bioavailability Factor	----	.5 per SV 1 for VOC	----	---- ----

Table 10

Exposure Parameter To Nursing Infants

Description	Value
Kilograms of breast milk ingested by the infant per day. Proportion of maternal dioxin and furan in fat.	0.8 kg/day 51%
Proportion of maternal weight that is fat	0.3
Proportion of breast milk that is fat	0.036
Proportion of dioxin and furan absorbed	0.68
Maternal Exposure to Dioxin Equivalents	Pathway specific
Half-life of dioxin equivalents	1.825 days (i.e., 5 years)
Elimination rate constanct (c)	3.8E-4
Adjusted Elimination rate constant (e)	1.1E-3
Maternal weight	70 kg
Infant body weight at one year	8.3
Duration of lactation	730 days (i.e., 2 years)
Averaging time for evaluating noncarcinogenic effect. Averaging time to evaluating carcinogenic effects	1,825 days (i.e., 5 years) 27,375 days (i.e., 75 years)

Table 11
Chronic Daily Intakes (CDIs) Estimated for Direct Contact with Surface Water from Naylors Run by Children

Chemical (a)	RME Exposure Point Concentration (ug/L)	RME CDIs (mg/kg/day)	
		Carcinogens	Noncarcinogens
Organics:			
Dieldrin	0.3	1.3E-9	9.0E-9
Heptachlor Epoxide	0.8	3.4E-9	2.4E-8
Benzo(a)pyrene (Equivalent)	0.3	1.3E-9	9.0E-9
Pentachlorophenol	1.200	5.2E-6	3.6E-5
2,3,7,8-TCDD (Equivalent)	3.0E-4	1.2E-12	8.7E-12
Inorganics:			
Manganese	10.100	---	3.0E-4
Thallium	3.3	---	9.9E-8

Chronic Daily Intakes (CDIs) Estimated for Direct Contact with Sediments Naylors Run for Children Playing in Naylors Run

Chemical (a)	RME Exposure Point Concentration (Organics: ug/kg Inorganics: mg/kg).	RME CDIs for Incidential Ingestion (mg/kg/day)		RME CDIs for Dermal Absorption (mg/kg/day)	
		Carcinogens	Noncarcinogens	Carcinogens	Noncarcinogens
Organics:					
Benzo(a)pyrene (Equivalent)	28.000.0	3.9E-6	---	3.9E-6	---
Chlordane (total)	230.0	3.2E-8	2.2E-7	3.2E-8	2.3E-7
Fluoranthene	21.000.0	---	2.0E-5	---	2.1E-5
Pentachlorophenol	3.000.0	4.2E-7	2.9E-6	4.2E-7	3.0E-6
2,3,7,8-TCDD (Equivalent)	0.12	1.7E-11	1.2E-10	1.7E-11	1.2E-10
Inorganics (b):					
Antimony	14.1	---	2.1E-5		
Arsenic	37.6	8.3E-6	5.6E-5		
Barium	415.0	---	6.2E-4		
Chromium	532.0	---	8.0E-4		
Manganese	4,750.0	---	7.1E-3		
Nickel	33.0	---	5.0E-5		
Thallium	1.0	---	1.5E-6		
Vanadium	118.0	---	1.8E-4		

Table 11 (cont)
Chronic Daily Intakes (CDIs) Estimated for Ingestion of Fish Caught Downstream from the Havertown PCP Site in Cobbs Creek

Chemical	RME Exposure Point Concentration (Units: ug/kg)	RME CDI	
		Carcinogens	Noncarcinogens
Chlordane (total)	238	6.1E-5	1.4E-4
Dieldrin	450	1.2E-4	2.7E-4
Heptachlor Epoxide	37	9.5E-6	2.2E-5
2,3,7,8-TCDD (Equivalent)	0.007	[illegible]E-9	4.2E-9

Table 12

Chronic Daily Intakes (CDIs) Estimated for Ingestion of Groundwater from the Havertown PCP Site by Hypothetical Residents

Chemical	RME Exposure Point Concentration (ug/L)	RME CDIs (mg/kg/day)	
		Carcinogens	Noncarcinogens
Organics:			
Benzene	230	2.8E-3	6.6E-3
1.2-Dichloroethene (total)	245	---	7.1E-3
bis(2-Ethylhexyl)phthalate	180	2.2E-3	5.2E-3
Benzo(a)pyrene (Equivalent)	741.9	8.9E-3	2.2E-2
Fluoranthene	810	---	2.3E-2
Naphthalene	24,000	---	6.8E-1
Pentachlorophenol	80,000	9.6E-1	2.3E+0
Trichloroethene	465	5.6E-3	1.3E-2
Vinyl Chloride	9.1	1.1E-4	2.6E-4
2,3,7,8-TCDD (Equivalent)	0.174	2.1E-6	5.0E-6
Inorganics:			
Arsenic	22.7	2.7E-4	6.5E-4
Manganese	22,600	---	6.4E-1
Thallium	1.7	---	4.9E-5

Chronic Daily Intakes (CDIs) Estimated for Nursing Infants Exposed to 2.3.7.8-TCDD (Equivalent) via Ingestion of Contaminated Breast Milk

Maternal Exposure Pathway(a)	Maternal CDI (mg/kg/day)	Nursing Infant CDI	
		Carcinogens (b)	Noncarcinogens (c)
Current Land-Use:			
Ingestion of fish	4.2E-9	8.4E-10	3.3E-8
Future Land Use:			
Ingestion of groundwater	5.0E-6	1.0E-6	3.9E-5

ground water from more contaminated areas at the site over a 30 year period.

Toxicity Assessments

Cancer Potency Factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPFs. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. CPFs for chemicals of concern are listed in Table 13.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of daily exposure levels for humans, including sensitive individuals that are likely to be without an appreciable risk of adverse health effects. Estimated intakes of chemicals from environmental media (e.g., the amount of chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help insure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. The reference doses used for each chemical of concern are listed in Table 14. This information has been derived from IRIS or Heast data.

Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake levels by the cancer potency factor. These risks are estimates that are generally expressed in scientific notation e.g., $1x10^{-6}$ or 1E-6. An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has an additional one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under specific exposure conditions at the site.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard

Table 13

Chronic Carcinogenic Toxicity Criteria (SFs)
for Chemicals of Concern at the Havertown PCP Site

Route/Chemical	Slope Factor (SF) (mg/kg/day) (Potency Factor)
Oral Route	
Organics:	
Benzene	2.9E-2
Benzo(a)pyrene (Equivalent)	1.2E+1
Chlordane (total)	1.3E+0
Dieldrin	1.6E+1
bis(2-Ethyhexyl)phthalate	1.4E-2
Heptachlor Expoxide	9.1E+0
Pentachlorophenol	1.2E-1
2,3,7,8-TCDD (Equivalent)	1.5E+5
Trichloroethene	1.1E-2
Binyl Chloride	1.9E+0
Inorganics:	
Arsenic	1.7E+0
Inhalation Route	
Benzene	2.9E-2
Trichloroethene	1.7E-2
Vinyl Chloride	3.0E-1

Table 14

Chronic Noncarcinogenic Toxicity Criteria (RfDs)
for Chemicals of Concern at the Havertown PCP Site

Chemical	Chronic RfD (mg/kg/day) (oral route)
Organics:	
Chlordane (total)	6.0E-5
1,2-Dichloroethene (total)	2.0E-2
Dieldrin	5.0E-5
bis(2-Ethylhexyl)phthalate	2.0E-2
Fluoranthene	4.0E-2
Heptachlor Epoxide	1.3E-5
Naphthalene	4.0E-3
Pentachlorophenol	3.0E-2
2,3,7,8-TCDD (Equivalent)	1.0E-9
Inorganics:	
Antimony	4.0E-4
Arsenic	1.0E-3
Barium	7.0E-2
Chromium (hexavalent)	5.0E-3
Manganese	1.0E-1
Nickel	2.0E-2
Thallium	7.0E-5
Vanadium	7.0E-3

quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The (HI) provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The results of the Baseline Risk Assessment are included in Table 10 and are summarized as follows:

Carcinogenic contamination in sediments may present a potential human health impact from direct contact, particularly to children playing in Naylors Run. Chemicals of concern are arsenic and benzo(a)pyrene. The potential excess carcinogenic risk is calculated to be 1×10^{-4}, which translates to 1 additional cancer per 10,000 exposed individuals. This level of risk is considered to be marginally unacceptable to EPA as the range of acceptable risk is considered to be between 1 in 10,000 to 1 in 1,000,000. The actions of this operable unit will not remediate the sediments, but will act as a first step in remediating the sediments by removing contaminants from the ground water.

Pesticides and dioxin in surface water and sediments may also contribute to carcinogenic and noncarcinogenic health risks associated with the ingestion of fish further downstream and subsequent indirect exposure to nursing infants. It was calculated that an additional carcinogenic risk due to fish ingestion exists for 2 persons in 1000 and the additional noncarcinogenic risk is about 13 times higher than desirable. It was calculated that an additional carcinogenic risk to nursing infants whose mothers have ingested fish from Cobbs Creek exists for 1 in 10,000 persons and the additional noncarcinogenic risk is 33 times greater than desirable.

With the exception of the 3 recently discovered families who use ground water for drinking, no one currently uses the ground water in Havertown Township for drinking. Under a theoretical future use scenario of widescale use of ground water for drinking, elevated carcinogenic risks and noncarcinogenic risks associated with the ingestion of ground water may exist due to PAHs, PCP, and dioxin contamination. It was calculated that an additional future carcinogenic risk exists for 1 out of 2 persons who might regularly ingest ground water over a lifetime. It was also calculated that the future noncarcinogenic risk is 5000 times above desirable if ground water was regularly ingested. Concentrations of these chemicals in monitoring wells installed along the periphery of the study area may present risks of concern with respect to future residential use of ground water.

A summary of the potential carcinogenic and noncarcinogenic risks estimated for the exposure pathways quantitatively evaluated in the Havertown PCP baseline risk assessment are presented in Table 15 and discussed below.

Ecological Assessment

There is a significant body of documentation that identifies the Havertown PCP Site as a historical source of contamination of Naylors Run. PCP does not appear to be the single major factor, rather total semi-volatiles appear to be most important. Historically, ground water discharge was thought to be the major source of contamination in Naylors Run. This source has been partially addressed by the construction of the oil/water separator. Chemical data suggest that a present source of much of the contamination may be surface runoff from the Havertown PCP Site and the surrounding properties. Another source of potential contamination is urban run-off. During storm events, Naylors Run acts as a conduit for run-off. Significant concentrations of chemicals could potentially be introduced into Naylors Run in this fashion. In addition, high flow during storm events acts as a flushing mechanism, resulting in surges of particulate transport.

There were no Federal or State endangered or threatened species of special concern observed within the Naylors Run portion of Havertown PCP. There was no observed site related stress to terrestrial vegetation. Modeling has indicated the potential for toxicity to occur in terrestrial birds through surface water ingestion. Potential exposure of waterfowl exists for toxicity through ingesting contaminated water and food.

Conclusion

Although Naylors Run shows signs of impairment, there is evidence of improvement when compared to historical conditions. If point sources are eliminated in the vicinity of Havertown PCP, Naylors Run may further improve. However, due to channelization, severe flushing during storm events, and urban run-off, Naylors Run is not expected to be able to support a high quality aquatic community. The sediment contamination in Naylors Run will be addressed as part of OU3.

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

7. Description of Alternatives

The Superfund statute and regulations require that the alternative chosen to clean up a hazardous waste site meet several criteria. The alternative must protect human health and the environment, meet the requirements of environmental regulations, and be cost effective. Permanent solutions to contamination problems should be developed wherever possible. The solutions should reduce the volume, toxicity, or mobility of the contaminants. Emphasis is also placed on treating the waters at the site, whenever this is possible, and on applying innovative technologies to clean up the contaminants.

In accordance with 40 C.F.R. §300.430, a list of remedial response actions and representative technologies were identified and screened to meet the remedial action objectives at this site. The Feasibility Study (FS) investigated a variety of technologies to see if they were applicable for addressing the contamination at the site. The technologies determined to be most applicable to these materials were developed into remedial alternatives. These alternatives are presented & discussed below. All costs & time frames provided fcr the alternatives below are estimates.

Four alternatives for remediation of the ground water in the shallow aquifer were examined. The first required alternative is No Action (GW-1), which includes limited monitoring.

The second alternative (GW-2) is a Limited Action that includes institutional controls, deed restrictions, and monitoring.

The third alternative (GW-3) includes features from GW-2 plus Source Removal in the form of free product recovery from the shallow aquifer near NWP, treatment of the discharge from the existing oil/water separator, and disposal via discharge of treated water to Naylors Run.

The fourth alternative (GW-4) included features from GW-3, with the addition of collection via installation of a new collector drain, and containment using rehabilitation and lining of the existing storm sewer pipe.

A. Alternative GW-1-No Action

Description: The no action alternatives is the baseline ground water remediation alternative. The No Action alternative for ground water would not include any new remedial action, but would include limited monitoring activities.

Limited monitoring of the levels of contaminants in the ground water would continue up to a thirty year period, with an anticipated sampling frequency of two times per year for the first five years, and yearly sampling for the next twenty-five

Table

Conclusions of the Havertown PCP
Baseline Risk Assessment

Exposure Pathway	Potential Carcinogenic Risk	Potential Noncarcinogenic Risk (Hazard Index)(HI)	Comments
Current Land-Use Conditions			
Children Playing in Naylors Run	1E-4	<1(0.7)	Relatively low risk from direct contact with surface water. Majority of the potential carcinogenic risk associated with Benzo(a)pyrene (Equivalent) and arsenic in sediments. Highest levels of benzo(a)pyrene (Equivalent) and arsenic were found upstream of the catch basin. HI slightly below unity; therefore, noncarcinogenic risk may not occur.
Ingestion of Fish from Cobbs Creek	2E-3	13.6	Carcinogenic risk exceeds the upper-bound of NCP acceptable risk range (i.e., 10^{-4}). Majority of carcinogenic risk from dieldrin which was detected in surface water at Naylors Run. HI exceeds unity; therefore, recreational fishermen that ingest significant quantities of fish from Cobbs Creek may experience noncarcinogenic effects. Chlordane, dieldrin, heptachlor epoxide, and dioxin in fish all contributed significantly to risk. Unclear whether these chemicals are associated with the site.
Indirect Exposure to Nursing Infants (Maternal exposure from ingestion of fish)	1E-4	33	Increased carcinogenic risk from dioxin equals the upper-bound of the NCP acceptable risk range (i.e., 10^{-4}). Hazard quotient for dioxin exceeds unity for chronic exposure and 10-day health advisory. Therefore, nursing infants may experience adverse liver and developmental effects.

Table 15 (Cont.)
Conclusions of the Havertown PCP
Baseline Risk Assessment

Exposure Pathway	Potential Carcinogenic Risk	Potential Noncarcinogenic Risk (Hazard Index)(HI)	Comments
Future Land-Use Conditions			
Ingestion of Groundwater by Hypothetical Resident	5E-1	5E+3	Carcinogenic risk is 1,000,000 times higher than the the NCP point of departure (i.e., 10^{-6}) and 10,000 times higher than the upper-bound of the NCP acceptable risk range. The majority of the carcinogenic risk associated with benzo(a)pyrene (equivalent), PCP, and dioxin (See Figure 6-2 for spatial distribution of cancer risk). HI exceeds unity by a factor of 5000 (reproductive effects). The majority of the noncarcinogenic risk associated with dioxin. Exposure to dioxin also exceeds 1-day and 10-day health advisories (adverse liver effects).
Inhalation of VOCS in Groundwater by Hypothetical Residents while Showering	4E-2	<1(0.4)	Carcinogenic risk from benzene, TCE, and vinyl chloride exceeds upper-bound of the NCP acceptable risk range (i.e.,10^{-4}). The risk from showering, however, does not contribute significantly to risk from ingestion. Highest levels of VOCs in groundwater upgradient from PAH, PCP, and dioxin "hot spots." HI slightly exceeds unity, due to exposure to TCE.
Indirect Exposure to Nursing Infants (Maternal exposure from ingestion of groundwater)	1E-1	4E+4	Increased carcinogenic risk from dioxin exceeds the upper-bound of the NCP acceptable risk range (i.e., (i.e., 10^{-4}) by a factor of 1,000. Hazard quotient for dioxin exceeds unity by a factor of 39,000; as well as 1-day and 10-day health advisories by factors of 390 and 3,900 respectively. Therefore, nursing infants may experience developmental problems from chronic exposure and liver problems from subchronic and acute exposure.

years. The sampling would include sampling approximately three well clusters (nine wells) and two stream locations. The samples would be analyzed for the Target Analyte List (TAL), Target Compound List (TCL), and Dioxins.

Cost: There is no capital cost associated with the No Action alternative. There would be O&M costs for the limited monitoring program. The cost of monitoring the discharge from the existing oil/water separator (OWS) is included in the O&M costs for the Remedial Action initiated by the 1989 ROD.

A description of the estimated costs for this alternative are summarized as follows:

Capital Cost:	$	0	
Estimated O&M per Year:	$	80,000	(first five years)
	$	40,000	(next twenty-five years)
Present Worth:	$	715,000	(thirty year period)

Time to Implement: Immediate Implementation

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This ROD and its associated remedial action is considered to be an interim action. This action is not meant to achieve groundwater cleanup ARARs, which will be evaluated in connection with the final remedy for the site. The remedy selected will however, comply with ARARs directly associated with this limited scope action. This interim action is in furtherance of, and not inconsistent with, the planned final remedy which will finally evaluate, among other things, the clean up of ground water. When the final ROD for ground water is issued, ground water ARARs will have to be met or waived. However, this ROD will identify the ARARs, and all remedial actions taken will seek to comply with ARARs to the maximum extent possible or to make progress toward meeting all ARARs so that the final remedy can more easily and fully comply with ARARs.

The known ARARs for chemicals of concern are as follows:

Air Emissions

The National Emissions Standards for Hazardous Air Pollutants set forth in 40 C.F.R. §61.64(b) and promulgated under the Clean Air Act, 42 U.S.C. Section 7401.

PA Air Pollution Control Act and Air Discharge Regulations, 25 PA

Code, Sections 123.1, 123.2, and 127.12(a)(5)

Waste Management

Standards Applicable to Generators of Hazardous Waste (40 C.F.R. Part 262)

Standards Applicable to Transporters of Hazardous Waste (49 C.F.R. §171.1-171.16)

Regulations and Standards for owners and operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 C.F.R. Part 264)

Land Disposal Restrictions (LDR) Requirements (40 C.F.R. §268.1-268.50)

Dioxin Containing Waste (50 Fed. Reg. 1978)

PA Hazardous Management Regulations (25 PA Code Subchapter D, Sections 260.2 through 260.22, 261.1 through 261.34, 262.10 through 262.60, and 263.10 through 263.32 relating to the identification and determination of hazardous waste, generator and transporter rules and regulations.

Occupation Safety and Health Act (OSHA)

OSHA, 29 C.F.R. §1910.170

Surface Water

Clean Water Act, NPDES discharge regulations (40 C.F.R. §§122-124)

PA Clean Streams Law (PA Code Title 25, Chapter 5)

PA NPDES Regulations (PA Code Title 25, Chapter 93.1 through 93.9 and 16, 92, 95, and 101)

Ground Water

PA Hazardous Waste Management Regulations (25 PA Code Section 264.90 through 264.100)

The No Action alternative would involve only the monitoring of the existing ground water and would not remediate the ground water contamination. Therefore, it is believed that this alternative would be in compliance with air emissions, waste management, and OSHA ARARs. The air emission ARARs would be applicable to the possible volatilization of contaminants during monitoring. The waste management ARARs would be applicable to any wastes generated (such as contaminated ground water,

protective clothing, etc.) during monitoring and OSHA ARARs would apply to all work done during monitoring. While this is an interim ROD for ground water, the air emissions, waste management and OSHA standards identified above are ARARs for this interim action and would be met by this alternative.

This alternative would not meet any of the surface water ARARs as it does not provide any remediation of surface water. As noted above, ground water cleanup levels are not intended to be finally addressed in this remedial action and, therefore, ground water cleanup levels are not ARARs.

B. Alternative GW-2: Limited Remedial Action

Description: This alternative includes the elements listed in the No Action alternative as well as additional monitoring activities and institutional controls and deed restrictions. An estimated total of five clusters and two stream locations would be sampled. The samples would be analyzed for TAL, TCL, and Dioxins. Approximately two new monitoring well clusters would be installed to the east of Naylors Run.

Institutional controls would be geared toward limiting exposure to contaminants at this site, by restricting use of the ground water (e.g. deed restrictions), or limiting access to the contaminated surface water (e.g. fencing). There is no assurance that the institutional controls would be effective.

The additional well clusters would be used to better define the levels of contamination in the deep bedrock aquifer. This alternative could be implemented in a relatively short time frame. Various affected residents would be contacted by to initiate deed changes. The local governmental agency and community would be involved in implementing the necessary zoning changes. Deed and zoning changes are implementable, and this activity could provide the opportunity to increase community awareness and interest in the site. Additional resources would need to be committed to install the new wells and for the increased monitoring activities.

Cost: There is a capital cost associated with installing the two new well clusters, and processing the paperwork necessary for the deed and zoning changes for the Limited Action alternative. The O & M cost for limited monitoring of the levels of contaminants in the ground water would continue for up to a thirty year period, with an anticipated sampling frequency of two times per year. A description of the estimated costs for this alternative summarized as follows:

Capital Cost:	$ 198,000
O&M per year:	$ 162,000
Present Worth:	$1,900,000
Time to Implement:	Several months

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This ROD and its associated remedial action is considered to be an interim action. This action is not meant to achieve groundwater cleanup ARARs, which will be evaluated in connection with the final remedy for the site. The remedy selected will however, comply with ARARs directly associated with this limited scope action. This interim action is in furtherance of, and not inconsistent with, the planned final remedy which will finally evaluate, among other things, the clean up ofground water. When the final ROD for ground water is issued, ground water ARARs will have to be met or waived. However, this ROD will identify the ARARs, and all remedial actions taken will seek to comply with ARARs to the maximum extent possible or to make progress toward meeting all ARARs so that the final remedy can more easily and fully comply with ARARs.

The known ARARs for chemicals of concern are as follows:

Air Emissions

The National Emissions Standards for Hazardous Air Pollutants set forth in 40 C.F.R. §61.64(b) and promulgated under the Clean Air Act, 42 U.S.C. Section 7401.

PA Air Pollution Control Act and Air Discharge Regulations, 25 PA Code, Sections 123.1, 123.2, and 127.12(a)(5)

Waste Management

Standards Applicable to Generators of Hazardous Waste (40 C.F.R. Part 262)

Standards Applicable to Transporters of Hazardous Waste (49 C.F.R. §171.1-171.16)

Regulations and Standards for owners and operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 C.F.R. Part 264)

Land Disposal Restrictions (LDR) Requirements (40 C.F.R. §268.1-268.50)

Dioxin Containing Waste (50 Fed. Reg. 1978)

PA Hazardous Management Regulations (25 PA Code Subchapter D, Sections 260.2 through 260.22, 261.1 through 261.34, 262.10 through 262.60, and 263.10 through 263.32 relating to the identification and determination of hazardous waste, generator

and transporter rules and regulations.

Occupation Safety and Health Act (OSHA)
OSHA, 29 C.F.R. §1910.170

Surface Water
Clean Water Act, NPDES discharge regulations (40 C.F.R. §§122-124)

PA Clean Streams Law (PA Code Title 25, Chapter 5)

PA NPDES Regulations (PA Code Title 25, Chapter 93.1 through 93.9 and 16, 92, 95, and 101)

Ground Water

PA Hazardous Waste Management Regulations (25 PA Code Section 264.90 through 264.100)

The Limited Action alternative would involve only the monitoring of the existing ground water and would not remediate the ground water contamination. Therefore, it is believed that this alternative would be in compliance with air emissions, waste management, and OSHA ARARs. The air emission standards would be ARARs for the possible volatilization of contaminants during monitoring. The waste management standards would be ARARs for any wastes generated (such as contaminated ground water, protective clothing, etc) during monitoring and OSHA ARARs would arise in connection with all work done during monitoring. While this is an interim ROD for ground water, the air emissions, waste management and OSHA standards identified above would be ARARs for this interim action and would be met by this alternative.

This alternative would not meet any of the surface water ARARs as it does not provide any remediation of surface water. As noted above, ground water cleanup levels are not intended to be finally addressed in this remedial action and, therefore, ground water cleanup levels are not ARARs for this action.

C. Alternative GW-3: Source Removal, Treatment, & Disposal

Description: This alternative includes features which will actively treat the contaminated ground water presently infiltrating into the storm sewer at the site. This includes free-product recovery from the shallow aquifer in the vicinity of NWP; treatment by the existing oil/water separator (OWS); chemical precipitation; either of two treatment systems (Powdered Activated Carbon Treatment, PACT, or an Advanced Oxidation Process, AOP); granular activated carbon (GAC, as a polishing step); stream discharge; improved access to the OWS using an access route adjacent to the Philadelphia Chewing Gum property; disposal and treatment of residuals at appropriate

waste receiving facilities; and installation of additional monitoring wells at least one of which will be east of Naylors Run.

A Site Plan for GW-3, giving the locations of system components is shown in Figure 5. A Flow Diagram for GW-3, is shown in Figure 6, and is described below. The treatment plant with PACT is shown on Figure 7 and with AOP on Figure 8.

Free Product Recovery from the Shallow Aquifer

Two free product recovery wells will be installed on or adjacent to NWP property in the vicinity of the 'hot spot' at well R-2. Each of the free product recovery wells will include a free product skimmer.

A floating skimmer will be provided to remove any free product which accumulates in the well. The skimmer will operate whenever there is a significant accumulation of free product. The contaminated oil from the skimmer pump will discharge to a Free Product Storage tank at the NWP site. The Free Product Storage tank vent will be fitted with a disposable vapor phase carbon unit to control odors and air emissions from the tank.

Treatment by the Existing Oil/Water Separator (OWS)

The existing oil/water separator was sized to treat flows in the range of 0 to 100 gallons per minute. The flow from the storm sewer (in the shallow aquifer) will continue to be directed to the existing oil/water separator (OWS), prior to further treatment. The normal dry weather flow from the storm sewer has been determined to be less than approximately twenty-five gallons per minute (25 gpm).

The aqueous flow discharging from the OWS will then be pumped (using the 25 gpm aqueous phase pumping station) to a new treatment system, located on NWP property. Access to the OWS will be improved by obtaining access agreements to permit vehicular traffic or hand trucks. A gate would be provided at the entrance to the right-of-way to restrict use of the access road to authorized persons.

Free Product Recovery from the Existing Oil/Water Separator

Two free product skimmers will be installed in the OWS to remove free product from the OWS. The skimmer will operate whenever there is a significant accumulation of free product in the OWS. The skimmers will discharge to a small day tank located near the OWS.

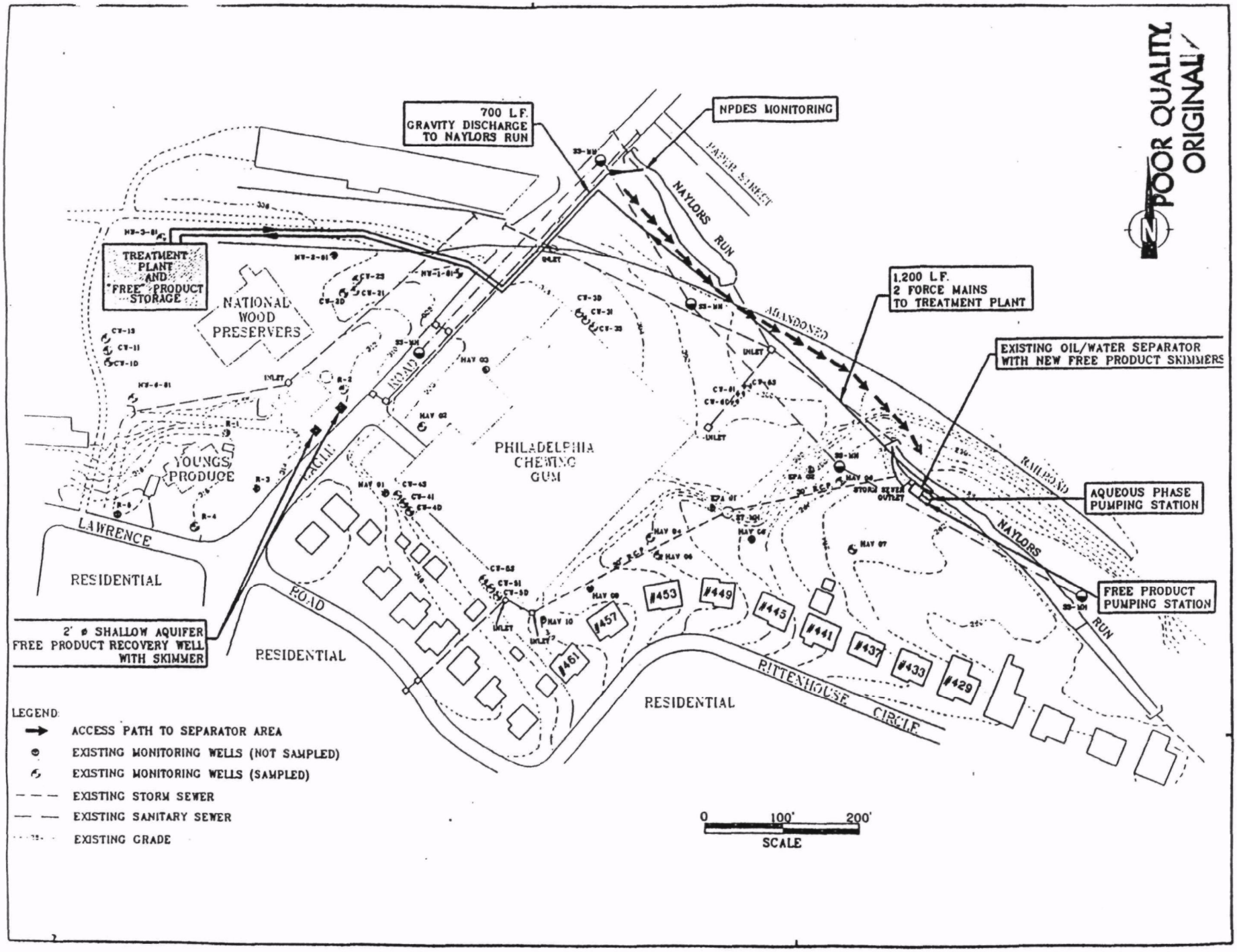


Figure 5- Alternative GW-3

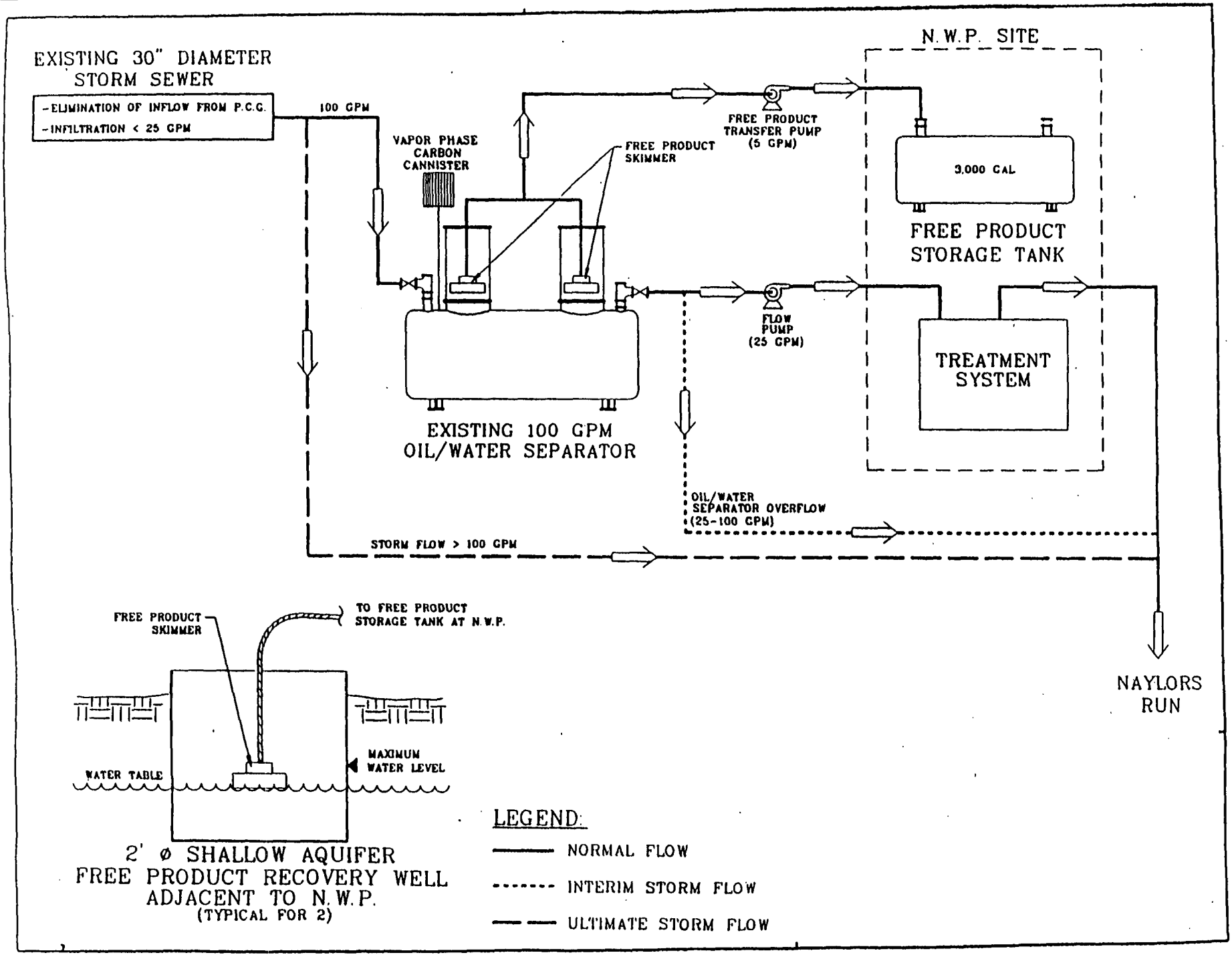


Figure 6- Flow Diagram for Alternative GW-3

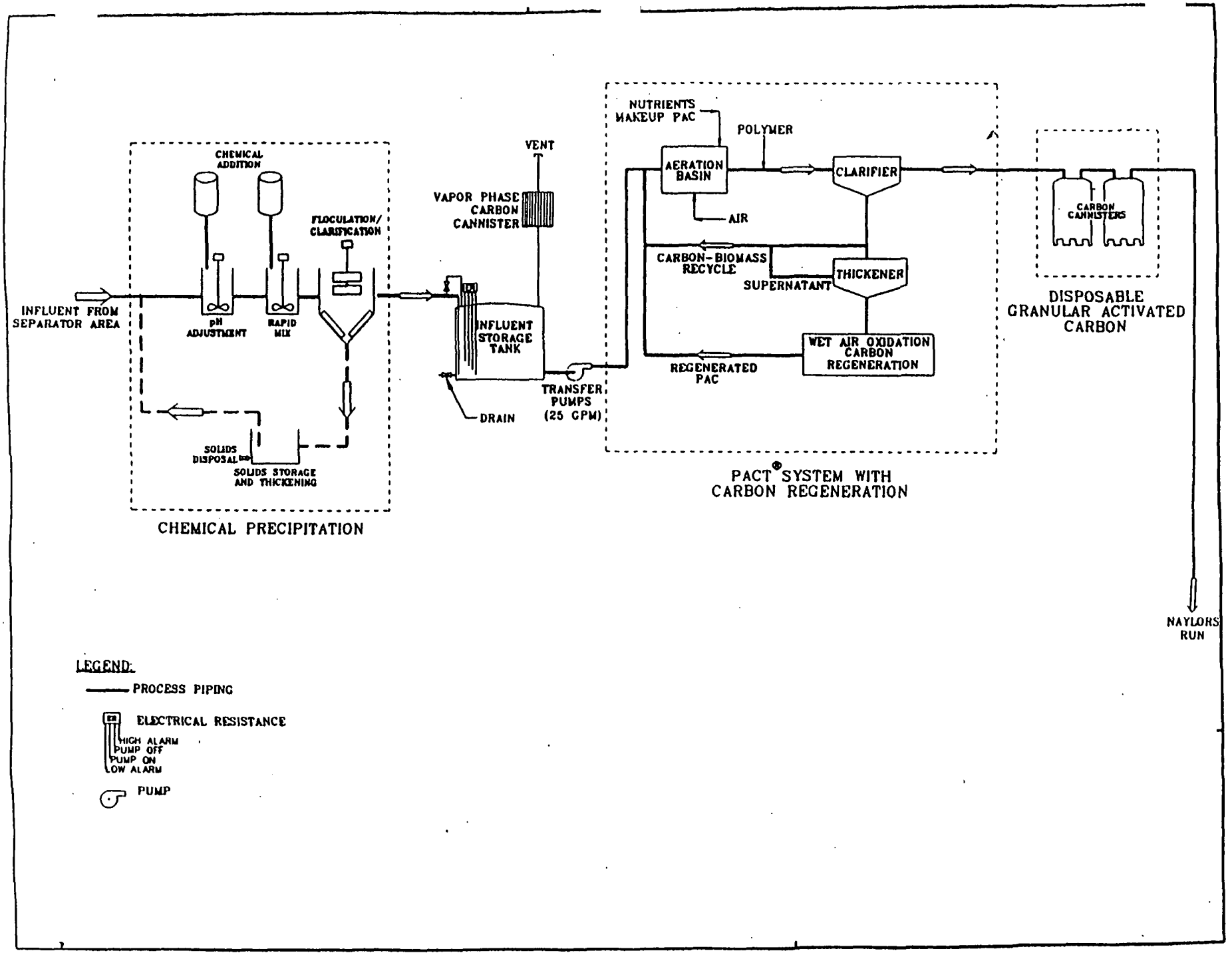


Figure 7- Powdered Activated Carbon Treatment (PACT) System

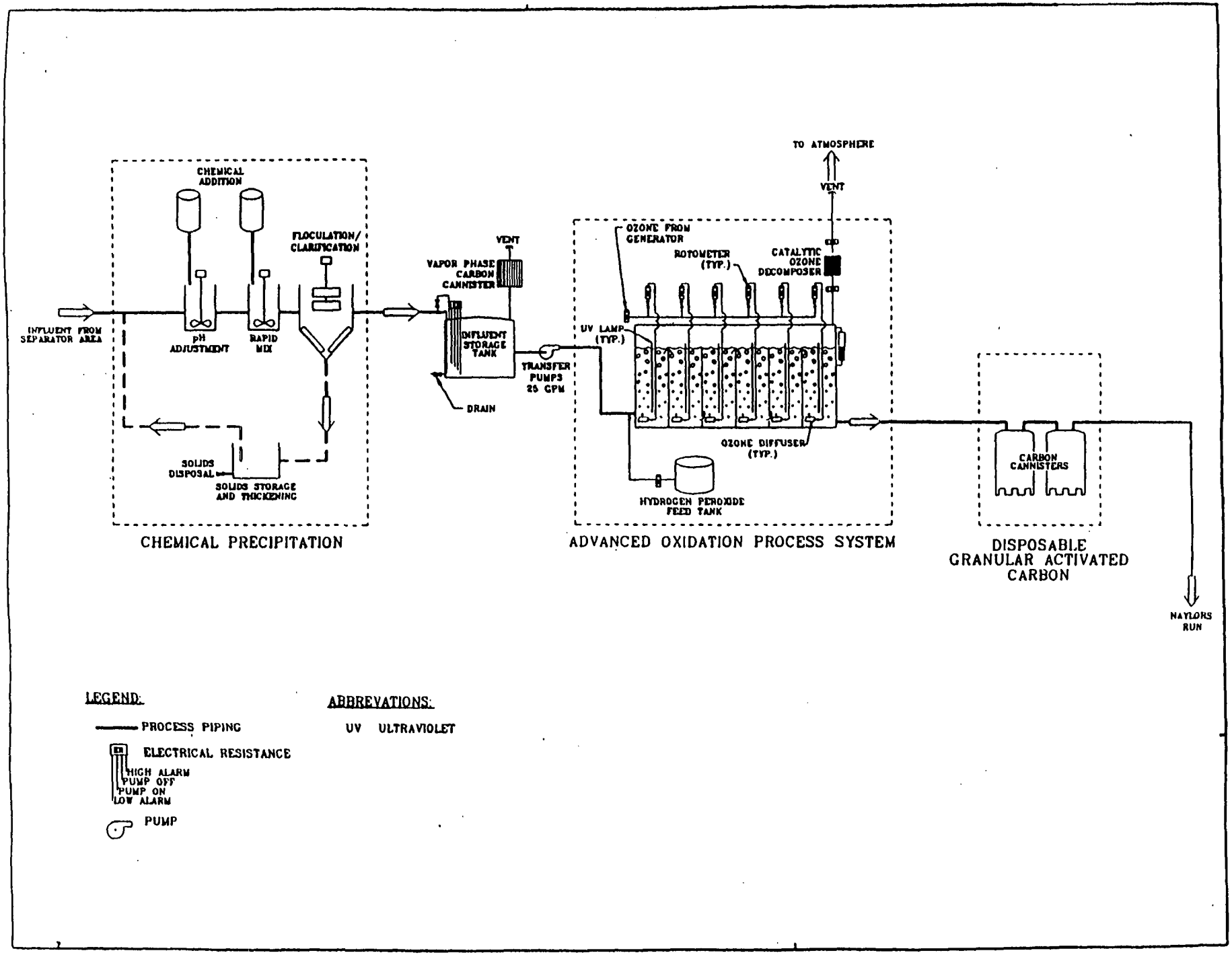


Figure 8- Advanced Oxidation System (AOP)

A free product transfer pump will pump the recovered oil to the Free Product Storage tank located at the NWP site. This approach will eliminate the need to move drums of recovered free product from the existing OWS through the residential neighborhood. The residual oils will be disposed of as K001 Wastes.

If necessary, appropriate chemicals (e.g. NaCl) can be metered into the day tank to break any emulsion in the free product. This may be necessary to allow pumping the recovered free product the 1,200 feet to the Free Product Storage tank.

The piping from the free product transfer pump to the Free Product Storage Tank will be double walled with provision for leak detection and periodic leak testing/monitoring.

Aqueous Phase Pumping Station

A submersible pumping station will be provided at the existing OWS to convey the collected ground water to a suitable treatment system. Installation of the pumping station will require extending an electrical service to power the pumps, system controls, and any desired alarm systems. Design pumping capacity depends on the actual dry weather flow of water in the storm sewer, and the instantaneous flow capacity of the selected treatment system. Each pump will have a capacity of approximately 25 gpm. Only one pump will be able to run at a time, i.e. the second pump will serve as a back-up. The system shall be provided with necessary features for explosion-proof operation.

Treatment Plant

The water treated by the OWS will be pumped to the treatment plant at the NWP site for removal of contaminants. The estimated chemical concentration for the treatment plant influent is shown on Table 16.

Chemical Precipitation (1st Stage of Treatment Plant)

The chemical precipitation system will treat the inorganics and will remove the settleable solids which will be present in the ground water. The system will effectively remove iron, calcium, manganese, arsenic as well as chromium, cadmium and zinc from the waste stream. Removal of the iron, calcium and manganese is necessary for optimum performance of subsequent treatment processes. The system will have provision to add polymer to enhance removal of solids, and a gravity settling tank where the metals and solids will accumulate. This solids fraction will be collected in drums for disposal at a suitable facility.

Depending on the rate of formation of the solids, it is possible that a dewatering device will be installed to reduce the volume of waste solids, and to possibly allow the waste to be considered

Table 16

HAVERTOWN PCP SITE
ESTIMATED CHEMICAL CONCENTRATION
EXISTING OIL/WATER SEPARATOR EFFLUENT
µg/L

ALLOCATED FLOW (gpm)	20
1,2 Dichloroethene	7
Vinyl Chloride	BDL
Trichloroethene	13
Benzene	35
Toluene	4
Ethyl Benzene	24
Xylenes	110
Naphthalene	BDL
2-Methylnapthalene	1
Pentachlorophenol	3,600
Total BNA	3,663

BDL = Below Detection Limits

as a solid (rather than a liquid) waste. This solids fraction will primarily be iron and manganese precipitants, but may require special handling for disposal, since the solids could include adsorbed dioxin or other significant contaminant concentrations.

Treatability studies will be performed during the remedial design phase of the project to adequately characterize the necessary size, features, and disposal options of the chemical precipitation system.

Removal of Organics

Following removal of metals using chemical precipitation, a system will be provided for removal of organic compounds. Two treatment alternatives for organic compounds have been selected for evaluation. The two options are Powdered Activated Carbon Treatment (PACT) as shown in Figure 3, or an Advanced Oxidation Process (AOP), as shown in Figure 4. Either process would be followed by a Granular Activated Carbon (GAC) polishing step.

The actual treatment system selection will be determined during treatability tests for a few representative treatment technologies. The treatment systems to be evaluated are described as follows:

Powdered Activated Carbon Treatment with On-Site Carbon Regeneration

A proprietary powdered activated carbon treatment system (PACT) is capable of effectively removing the organic compounds in the ground water at this site. The combination of the powdered carbon and activated sludge in a continuously stirred tank reactor (CSTR) effectively captures the volatile and semi-volatile organic compounds onto the carbon/biomass solids matrix.

The combined effect of the powdered carbon and activated sludge provides tolerance of shock-loads of any toxic organics. This will provide enhanced system performance with potential biodegradation of numerous organic compounds, after a period of accumulation to the influent organic compounds.

The PACT system will be tolerant of significant organics loadings, such as from any free product which is not captured by the oil/water separator. It is possible that a supplemental carbon source will be needed to provide an influent chemical oxygen demand of approximately 150 mg COD/l. Inexpensive molasses is a commonly used carbon source for the activated sludge, which permits co-metabolism of recalcitrant organics.

A single batch-mode PACT unit will be provided to treat the flow. A flow equalization tank will be provided for the batch unit, to

permit continuous operation of the collection system. Transfer pumps will be provided to fill the process tank in approximately 45 minutes.

If needed, on-site carbon regeneration can be provided by a wet air oxidation (WAO) system. On-site regeneration would be justified only if off-site disposal was not possible. The smallest WAO unit would be capable of treating a 5 gpm residual waste solids stream, and requires a thirty foot by forty foot utility building to house the unit.

The smallest WAO unit would have enough capacity to oxidize residuals from the PACT system, the GAC units, and the free product from the skimmers. The WAO process uses high pressure (2000 psi) and elevated temperature (540 °F) in a titanium reactor to regenerate the carbon, and can be operated to effectively destroy organic compounds such as PCP and dioxins. Treatability tests would determine whether the WAO system was needed at the NWP site.

Advanced Oxidation Process (AOP)

Advanced oxidation systems are a relatively new technology which have been shown to be capable of treating the volatile and semi-volatile compounds which are present in the ground water at the site. For instance, a system using UV light, combined with hydrogen peroxide and ozone will be able to destroy the compounds found in the ground water.

Ultraviolet oxidation is an advanced oxidation process that uses ultraviolet light with the addition of ozone and/or hydrogen peroxide. The resulting oxidative environment is significantly more destructive than the environment created with ozone or hydrogen peroxide by themselves or in combination.

An ultraviolet oxidation system consists of a stainless steel reactor with several stages, several UV lamps, an ozone generator, and a hydrogen peroxide feed system. The UV lamps are mounted vertically in the reactor and are enclosed in quartz tubes. Ozone enters each stage through a stainless steel diffuser. Hydrogen peroxide is metered into the reactor influent.

When the system is operated in the continuous mode, the contaminants in the water are oxidized to form carbon dioxide, and water. Any halogens are converted to inorganic halides. A fixed-bed catalytic ozone destroying unit is part of the UV oxidation process, producing oxygen and limiting ozone emissions to an instantaneous concentration of 0.1 ppm in air. Ozone emission rates would be negligible. Any volatilized organic compounds are also destroyed in the off-gas. The off-gas is then

vented to the atmosphere.

A Treatability Study is needed to verify performance and size the plant. The AOP process would need to be installed in a utility building, which would be located on the NWP property.

A consideration of any ultraviolet oxidation system is the amount of heat generated by the UV lamps used in the treatment process. This can cause scale formation on the quartz tubes. This scaling can reduce the effectiveness of UV radiation and the overall process. Some fouling would be stripped off by the ozone bubbles, but a problem may develop every 1 to 1/2 years unless a citric acid wash is used approximately every six months.

The discharge from the AOP system would be directed to granular activated carbon units.

Granular Activated Carbon (GAC)

Disposable granular activated carbon (GAC) units will be installed in series to polish the waste water prior to discharge to Naylors Run. These units are relatively inexpensive and can also provide effective back-up treatment (redundancy) at low cost, for when there is an upset in the PACT unit or AOP unit.

Each disposable carbon unit contains approximately 1,000 pounds of carbon, and can treat up to 30 gpm. For the anticipated flow of 25 gpm, there would be a minimum of two units installed in series. Periodic samples would be collected from the influent and effluent of the GAC units, to predict breakthrough times and to indicate how often the units would need to be replaced. Samples of the spent carbon would be taken to determine disposal options for the carbon.

The piping for the two units would permit any combination or sequence of flow. Operation of the units would be staggered so that the carbon units would not both reach breakthrough at the same time. Treatability studies will be performed during the remedial design phase of the project to adequately characterize the necessary size and features of the granular activated carbon treatment system.

Stream Discharge

The effluent from the treatment plant would be conveyed to Naylors Run in the vicinity of Eagle Road for discharge. Periodic samples would be collected in accordance with any discharge permit for the facility. Discharge monitoring reports would be submitted per any National Pollutant Discharge Elimination System (NPDES) requirements.

Waste Disposal or Discharge to Hazardous Waste Facilities

It is anticipated that the recovered free product from the oil/water separator and free product recovery wells, as well as the solids collected from the chemical precipitation, PACT process, and GAC units may contain hazardous compounds which will require special handling for disposal at an off-site facility. A secure storage area will be provided, located on the NWP site, to store the residuals until they can be removed or treated.

For instance, the residuals may be listed as K001 wastes. There are several off-site facilities which can accept the K001 wastes, subject to analysis and verification of the waste characteristics. K001 wastes are wastes from wood preservation processes as listed in 40 C.F.R. 261.32. A waste disposal firm was contacted to explore actual disposal alternatives. It was determined that K001 wastes could be incinerated at two of its facilities - one in New Jersey (drummed waste), or a facility in Texas (bulk roll-off trailers). On-site incineration of the solids is undesirable given the suburban location.

On-site treatment and destruction of organic residuals could be provided by the wet air oxidation (WAO) system, particularly with respect to residuals produced by the PACT process. Treatability studies would evaluate operational conditions and equipment sizes necessary to oxidize the spent carbon, recovered free product, and other similar materials to the required destruction and removal efficiency.

Cost: The capital cost for this alternative would include installation of the Shallow Aquifer Free Product Recovery Wells, the Skimmer systems, the Pumping Stations, the Chemical Precipitation system, and purchase and installation of the selected treatment system for organics. The cost of the PACT system would be significantly reduced if the WAO system was not needed for on-site residuals management. The capital and O&M costs for monitoring would be similar to Alternative 2.

A description of the estimated costs for this alternative summarized as follows:

	Using PACT System	Using AOP System
Capital Cost:	$ 5,018,000	2,577,000
O&M per Year: (first year)	$ 445,000	479,500
Present Worth:	$ 9,684,000	7,553,000
Time to Implement:	Approximately 36 Months	

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This ROD and its associated remedial action is considered to be an interim action. This action is not meant to achieve groundwater cleanup ARARs, which will be evaluated in connection with the final remedy for the site. The remedy selected will however, comply with ARARs directly associated with this limited scope action. This interim action is in furtherance of, and not inconsistent with, the planned final remedy which will finally evaluate, among other things, the clean up of ground water. When the final ROD for ground water is issued, ground water ARARs will have to be met or waived. However, this ROD will identify the ARARs, and all remedial actions taken will seek to comply with ARARs to the maximum extent possible or to make progress toward meeting all ARARs so that the final remedy can more easily and fully comply with ARARs.

The known ARARs for chemicals of concern are as follows:

Air Emissions

The National Emissions Standards for Hazardous Air Pollutants set forth in 40 C.F.R. §61.64(b) and promulgated under the Clean Air Act, 42 U.S.C. Section 7401.

PA Air Pollution Control Act and Air Discharge Regulations, 25 PA Code, Sections 123.1, 123.2, and 127.12(a)(5)

Waste Management

Standards Applicable to Generators of Hazardous Waste (40 C.F.R. Part 262)

Standards Applicable to Transporters of Hazardous Waste (49 C.F.R. §171.1-171.16)

Regulations and Standards for owners and operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 C.F.R. Part 264)

Land Disposal Restrictions (LDR) Requirements (40 C.F.R. §268.1-268.50)

Dioxin Containing Waste (50 Fed. Reg. 1978)

PA Hazardous Management Regulations (25 PA Code Subchapter D, Sections 260.2 through 260.22, 261.1 through 261.34, 262.10 through 262.60, and 263.10 through 263.32 relating to the identification and determination of hazardous waste, generator and transporter rules and regulations.

Occupation Safety and Health Act (OSHA)
OSHA, 29 C.F.R. §1910.170

Surface Water
Clean Water Act, NPDES discharge regulations (40 C.F.R. §§122-124)

PA Clean Streams Law (PA Code Title 25, Chapter 5)

PA NPDES Regulations (PA Code Title 25, Chapter 93.1 through 93.9 and 16, 92, 95, and 101)

Ground Water

PA Hazardous Waste Management Regulations (25 PA Code Section 264.90 through 264.100)

The Source Removal, Treatment, and Disposal Alternative (GW-3) would involve only the limited collection of ground water and would provide treatment of ground water collected in the catch basin area through a 3 step treatment process. It is believed that this alternative would be in compliance with the air emission and OSHA ARARs. The air emissions standards would be ARARs for any possible volatilization of contaminants during monitoring or construction or any off-gas venting from the treatment plant. The OSHA ARARs would arise in connection with work done during construction.

Although the disposal of generated wastes may present problems in meeting waste management ARARs, it is expected that all waste management ARARS can be met for wastes that were generated by construction of the treatment plant, any soil excavation, or residuals from the treatment process, such as oils and carbon. These wastes could alter disposal plans, depending on the level of dioxin in the wastes. If there are levels of dioxin less than 1 PPB, then the wastes could be disposed of at a RCRA Subtitle C facility. If the dioxin levels in the soils exceed 1 PPB, then the wastes would not be considered K001 wastes (wastes from a wood treatment site). As a result, the waste would have to be incinerated off site, if possible, or stored on site until another disposal method was arranged. However, it is anticipated that the proposed treatment plant process (AOP or PACT) will destroy dioxins to below the 1 PPB level. Additionally, if a WAO system is installed as part of the PACT system, on site destruction of organic wastes, including dioxin, could be provided. Installation of the WAO may be necessary in order to meet this ARAR.

While this is an interim ROD for ground water, the air emissions, waste management and OSHA standards are ARARs for this interim

action and will be met by this alternative. Surface water standards are ARARs for the treated ground water, discharged into Naylors Run, and such surface water ARARs would be met to the maximum extent possible, as the treatment being utilized is the best available technology. As noted above, ground water cleanup levels are not intended to be finally addressed in this remedial action and, therefore, ground water cleanup levels are not ARARs for this action.

D. Alternative GW-4 Source Removal, Containment, Collection, Treatment, and Disposal

Description: This multi-faceted alternative includes all of the features provided in Alternative 3 as well as a collection system (shallow ground water collector drain and pumping station), and Containment (rehabilitation and in-place lining of the existing storm sewer).

A Site Plan for Alternative 4, giving the locations of system components is shown in Figure 9. A Flow Diagram for Alternative 4 is shown in Figure 10, as described below. The PACT and AOP treatment systems are shown on Figures 7 & 8.

Ground Water Collector Drain

Installation of a collector drain near the existing storm sewer will provide controlled collection of the contaminated shallow ground water. The estimated chemical concentration of shallow ground water collected by the drain is given in Table 17. The drain is shown on Figure 11. The purpose of a collector drain is to effectively capture the plume of contaminated water in the shallow aquifer at the southern edge of the site. The contaminated water can then be sent to a treatment system for removal of the contaminants. System components are selected to be compatible with any free product which may be collected. Although not designed to act as an collector drain, the existing 30" storm sewer pipe has intercepted a portion of the flow of contaminated ground water. The storm sewer pipe is subject to periodic high storm water flows, which significantly restrict the utility of using the storm sewer to collect water for further treatment. Also, the storm sewer does not appear to be effective in capturing the plume along its entire length. This significantly limits the effectiveness of the storm sewer for capturing the plume of contaminants in the shallow ground water.

Installation of the collector drain will significantly improve capture of the plume, in comparison to the performance of the existing storm sewer. The collector trench will be installed to the depth of the fractured bedrock (significantly deeper than the storm sewer), to improve collection throughout the shallow aquifer. Also, the collector pipe will not be subject to periodic flow excursions and flooding during storm events. The periodic

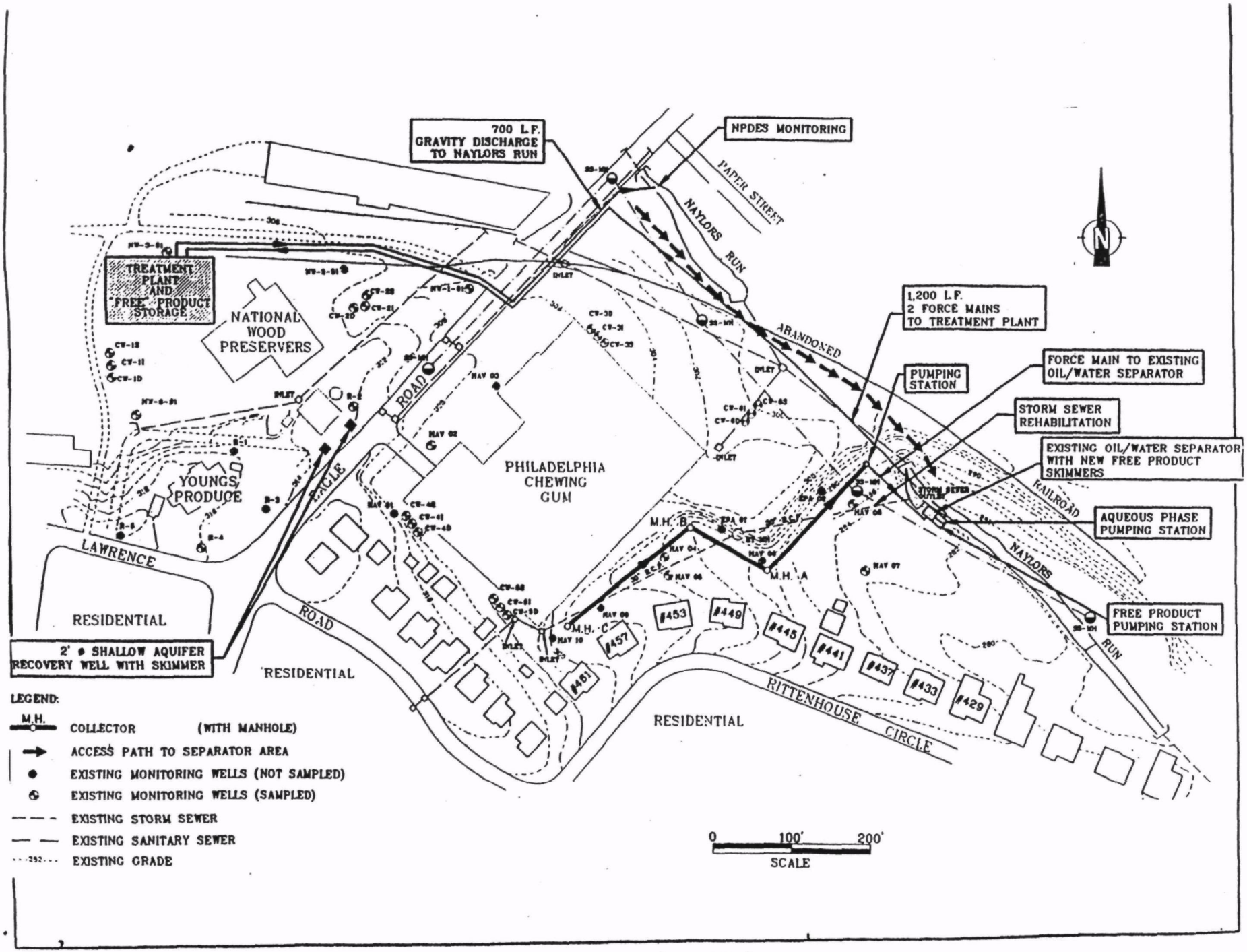


Figure 9- Alternative GW-4

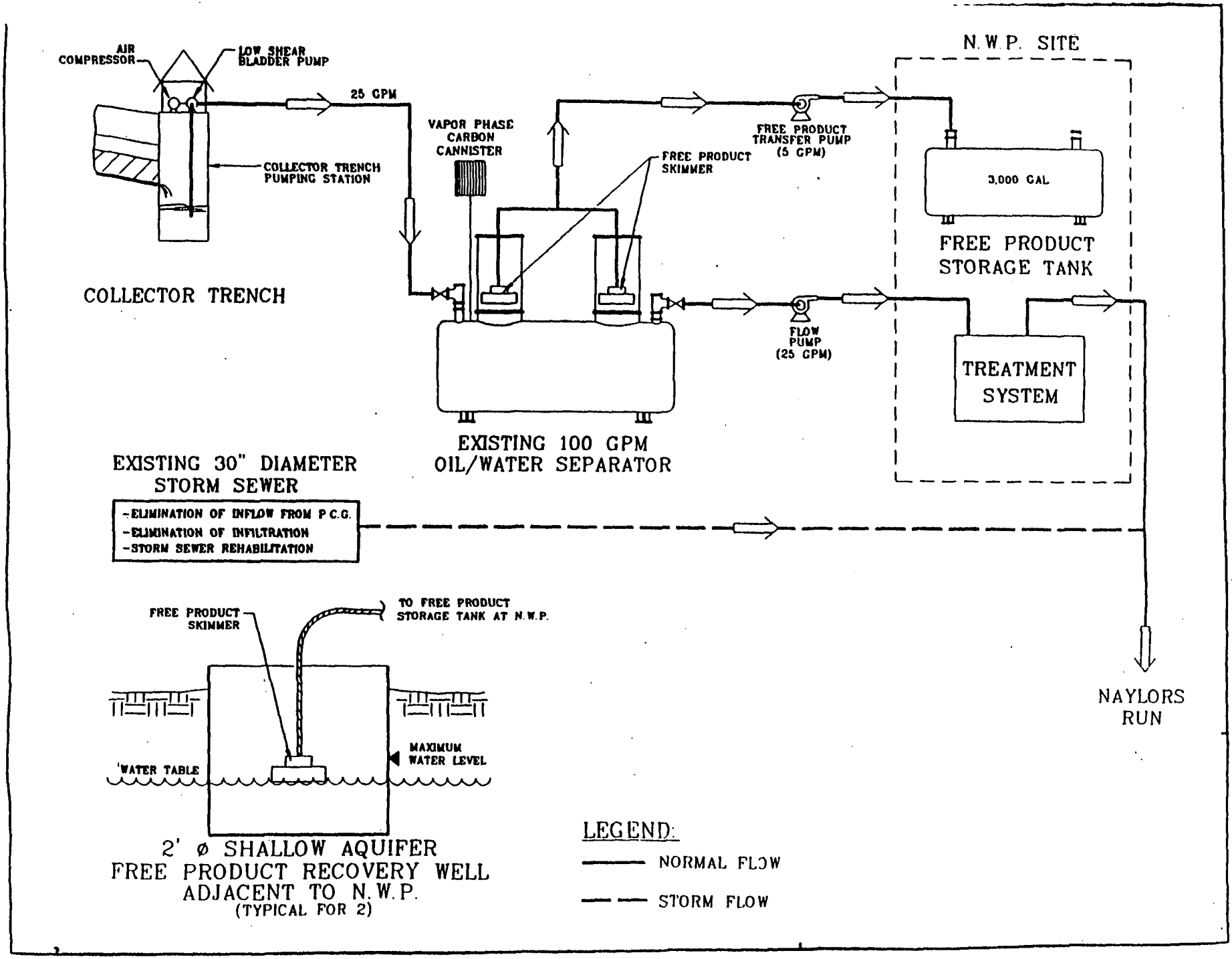
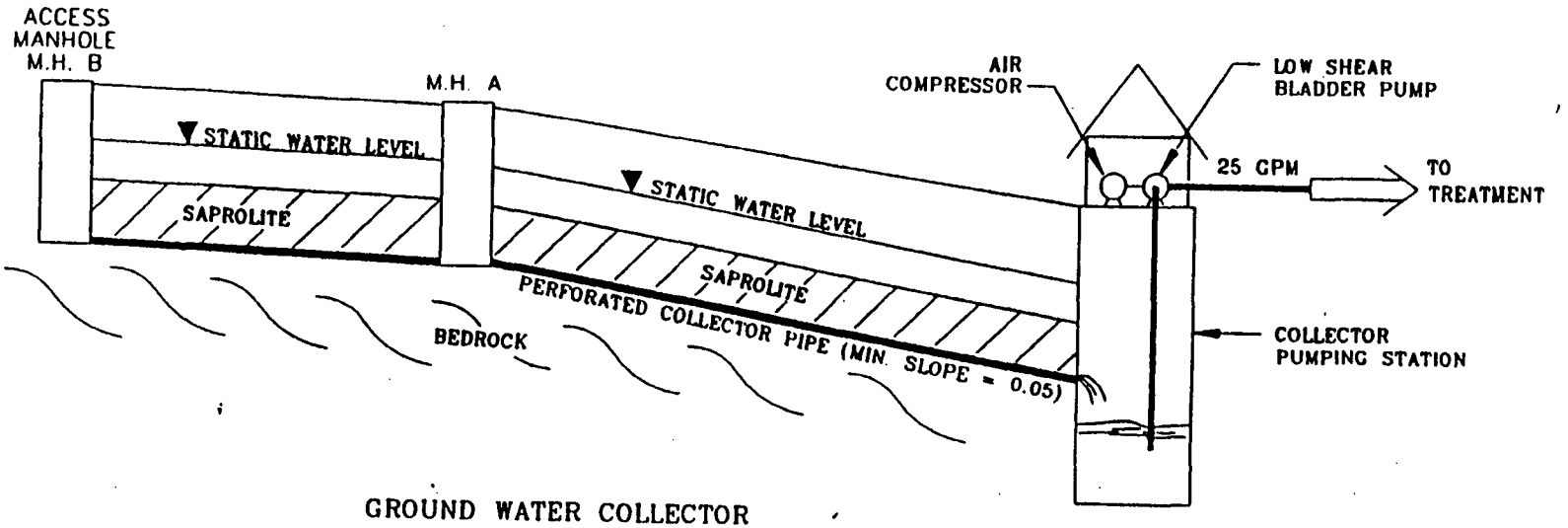


Figure 10- Flow Diagram for Alternative GW-4

Table 17

Estimated Chemical Concentration
Collector Drain
(PPB)

	COLLECTOR
FLOW (gpm)	20
1,2 Dichloroethene	22
Vinyl Chloride	2
Trichloroethene	23
Benzene	160
Toluene	40
Ethyl Benzene	27.2
Xylene	910
Naphthalene	400
2-Methylnaphthalene	5,300
Pentachlorophenol	42,000
Total BNA	61,000
Calcium	23,600
Iron	3,390
Magnesium	14,900
Manganese	16,600
Zinc	130
Dioxin (2,3,7,8-TCDD) TE	115 ppTr



GROUND WATER COLLECTOR

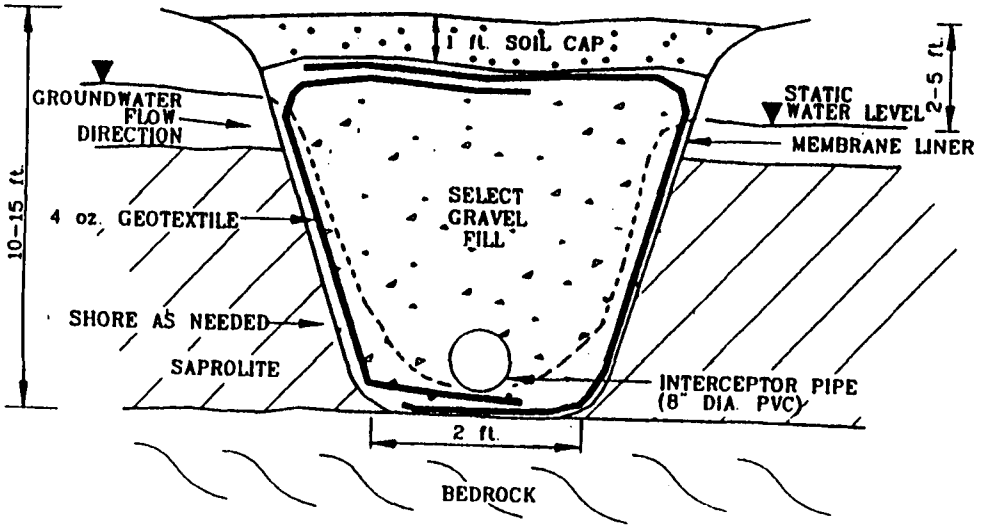


Figure 11- Collector Drain

high flows into the storm sewer make continuous treatment unrealistic for the storm sewer effluent.
Unless this action is taken, there is a significant concern that the plume of contaminated ground water will migrate beyond the storm sewer, and possibly into seeps in the back yards of residences along Rittenhouse Circle.

A collector drain will be installed, roughly in parallel with the existing storm sewer pipe. Unlike the storm sewer, however, the collector drain will be designed and installed to efficiently intercept the flow of contaminated ground water. The following factors have been identified concerning construction and placement of the drain:

Drain Excavation

The drain excavation should be extended to the approximate elevation of the fractured bedrock for maximum effect. This will require excavation to a depth of approximately fifteen to twenty feet. The base of the drain should be a minimum of two feet wide in section. Shoring of the drain trench will be needed during construction to minimize the quantity and cost of disposal of excavation material. Shoring is also necessary to prevent possible cave-ins and personal injury or property damage.

Interceptor Pipe

A perforated pipe will be placed at the bottom of the drain, which will serve to convey the ground water to a pumping station. The perforations will be oriented so that they are above the normal depth of water flowing in the pipe to minimize accumulation of debris.

The slope of the interceptor pipe will be designed so that a constantly descending gradient is maintained to the pumping station. Test pits will be excavated along the route of the interceptor pipe during the Remedial Design and Remedial Action (RD/RA) phase of the project, so that the interceptor pipe design invert elevations can be determined.

Samples would be collected at various depths in the test pits to determine the levels of contaminants and disposal options for the excavated materials. Depending on the contaminant levels, the soils could be used as clean fill, or if contamination is present, could be landfilled, incinerated, or other possible alternatives.

During installation, irregularities in the elevation of the fractured bedrock between test pits may require excavation of fractured bedrock where it extends above the interpolated bedrock elevations.

Access Manholes

Manholes will be provided every few hundred feet for access, and at any changes in pipe alignment. The access manholes should be vented to ensure free drainage of the interceptor pipe. The Remedial Design will evaluate the possible provision for retrofitting disposable vapor phase carbon units, if odors become a problem.

Selection of Materials of Construction

In many cases, there will be a choice of different possible materials of construction for a given system component. For instance, the interceptor pipe could be made of PVC or some other appropriate material. Costs have been estimated assuming that the major pieces of equipment will not require significant use of exotic materials of construction.

Drain Backfill Material

The drain will be appropriately graded and backfilled with a highly porous select gravel. The gravel will drain freely to the perforated interceptor pipe at the bottom of the drain.

The drain will be lined with a permeable geotextile fabric on the face of the trench which is upgradient to the collector pipe, to permit unimpeded flow while minimizing gradual plugging of the gravel with fine particles (fines).

To minimize entry of surface drainage and run-off into the collector drain, an impermeable membrane liner will be placed above the gravel layer. This membrane liner will be extended along the face of the trench which is downgradient to the collector pipe. Without this feature, where the collector drain crosses any buried utility lines, there would be the undesirable possibility of contaminated ground water flow entering the select backfill present in other utility trenches.

The impermeable membrane will minimize such flows wherever the collector drain encounters such potential conduits for the ground water to escape the collector trench. This key feature will minimize any communication between the ground water in the collector trench with permeable soil formations which are present.

The seams where two rolls of membrane adjoin will be sealed to be water tight. The liner thickness (and any necessary reinforcing) will be selected to withstand any hydraulic forces acting on the membrane due to the differential head across the membrane.

Collector Drain Pumping Station

A pumping station will be provided to convey the collected ground water to a suitable treatment system. Installation of the pumping station will require extending an electrical service to power the pumps, system controls, and any desired alarm systems. Pumping capacity will depend on the actual flow of water in the collector trench, and the instantaneous flow capacity of-the treatment system. Each pump will have a capacity of approximately 25 gpm.

The pump system shall be provided with necessary features for explosion-proof operation. Low shear diaphragm pumps will be provided to minimize emulsification of the oily water.

Monitoring Wells

Installation of the interceptor trench could potentially affect the performance of existing monitoring wells which are located in the vicinity of the drain. This will require careful attention to the design and installation of the drain, or possibly installation of new wells outside the drain area, so that representative samples can be collected.

Rehabilitation of the Existing 30-inch Storm Sewer

A recent closed circuit television surveillance of the storm sewer pipe indicates the presence of a small pipe discharging into a manhole located on the south side of the Philadelphia Chewing Gum property. This source of inflow is apparently an unpermitted connection to the storm sewer, which unnecessarily increases the dry weather flow of the storm sewer. It is anticipated that this source of inflow will be plugged, after USEPA notifies the affected property owners of the action to be taken.

The last section of storm sewer pipe (extending approximately 200 feet from the manhole south of PCG to the discharge point into Naylors Run) was observed to contribute noticeable infiltration into the storm sewer pipe during dry weather.

The storm sewer pipe will be lined in-place. The lining will virtually eliminate any infiltration into the storm sewer pipe. The contaminated water which is presently being collected by the storm sewer pipe will instead be collected in the interceptor drain, with the advantage that the flows in the interceptor drain won't be subject to radical flow increases during storm events.

Cost: The capital cost for this alternative would include installation of the items included in alternative 3 as well as the collector drain and pumping station, and rehabilitation (lining) of the existing storm sewer pipe. The capital and O&M costs for monitoring would be comparable to Alternative 2.

A description of the estimated costs for this alternative are summarized as follows:

	Using PACT System	Using AOP System
Capital Cost:	$ 7,437,000	$ 4,997,000
O&M per year: (first year)	$ 595,000	$ 485,500
Present Worth:	$ 12,177,000	$ 10,036,00

Time to Implement: Approximately 36 Months

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This ROD and its associated remedial action is considered to be an interim action. This action is not meant to achieve groundwater cleanup ARARs, which will be evaluated in connection with the final remedy for the site. The remedy selected will however, comply with ARARs directly associated with this limited scope action. This interim action is in furtherance of, and not inconsistent with, the planned final remedy which will finally evaluate, among other things, cleaning of the ground water. When the final ROD for ground water is issued, ground water ARARs will have to be met or waived. However, this ROD will identify the ARARs, and all remedial actions taken will seek to comply with ARARs to the maximum extent possible or to make progress toward meeting all ARARs so that the final remedy can more easily and fully comply with ARARs.

The known ARARs for chemicals of concern are as follows:

Air Emissions

The National Emissions Standards for Hazardous Air Pollutants set forth in 40 C.F.R. §61.64(b) and promulgated under the Clean Air Act, 42 U.S.C. Section 7401.

PA Air Pollution Control Act and Air Discharge Regulations, 25 PA Code, Sections 123.1, 123.2, and 127.12(a)(5)

Waste Management

Standards Applicable to Generators of Hazardous Waste (40 C.F.R. Part 262)

Standards Applicable to Transporters of Hazardous Waste (49

C.F.R. §171.1-171.16)

Regulations and Standards for owners and operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 C.F.R. Part 264)

Land Disposal Restrictions (LDR) Requirements (40 C.F.R. §268.1-268.50)

Dioxin Containing Waste (50 Fed. Reg. 1978)

PA Hazardous Management Regulations (25 PA Code Subchapter D, Sections 260.2 through 260.22, 261.1 through 261.34, 262.10 through 262.60, and 263.10 through 263.32 relating to the identification and determination of hazardous waste, generator and transporter rules and regulations.

Occupation Safety and Health Act (OSHA)

OSHA, 29 C.F.R. §1910.170

Surface Water

Clean Water Act, NPDES discharge regulations (40 C.F.R. §§122-124)

PA Clean Streams Law (PA Code Title 25, Chapter 5)

PA NPDES Regulations (PA Code Title 25, Chapter 93.1 through 93.9 and 16, 92, 95, and 101)

Ground Water

PA Hazardous Waste Management Regulations (25 PA Code Section 264.90 through 264.100)

The Source Removal, Containment, Collection, Treatment, and Disposal Alternative (GW-4) would provide extensive collection and treatment of ground water through an underground collection drain and through a 3 step treatment process. It is believed that this alternative would be in compliance with the air emission and OSHA ARARs. The air emissions standards would be ARARs for any possible volatilization of contaminants during monitoring or construction or any off-gas venting from the treatment plant. The OSHA standards would be ARARs for work done during construction.

Although the disposal of generated wastes may present problems in meeting waste management ARARs, it is expected that all waste management ARARS can be met for any wastes that were generated by construction of the treatment plant, any soil excavation, or

residuals from the treatment process such as oils and carbon. This waste could alter disposal plans, depending on the level of dioxin in the wastes. If there are levels of dioxin less than 1 PPB, then the wastes could be disposed of at a RCRA Subtitle C facility. If the dioxin levels in the soils exceed 1 PPB, then the wastes would not be considered K001 wastes (wastes from a wood treatment site). As a result, the waste would have to be incinerated off site, if possible, or stored on site until another disposal method was arranged. However, it is anticipated that the proposed treatment plant process (AOP or PACT) will destroy dioxins to below the 1 PPB level. Additionally, if a WAO system is installed as part of the PACT system, on site destruction of organic wastes, including dioxin, could be provided. Installation of the WAO may be necessary in order to meet this ARAR.

While this is an interim ROD for ground water, the air emissions, waste management and OSHA standards are ARARs for this interim action and will be met by this alternative. Surface water standards are ARARs for the treated ground water, discharged into Naylors Run, and such surface water ARARs would be met to the maximum extent possible, as the treatment being utilized is the best available technology. As noted above, ground water cleanup levels are not intended to be finally addressed in this remedial action, and, therefore, ground water cleanup levels are not ARARs for this action. (To the extent that ground water cleanup levels were to apply to this action, which EPA does not believe, such ARARs would be waived on the basis that this interim action is only a part of a total remedial action for the site that will attain such ARARs when completed or such ARARs would be waived under the other waiver criteria, pursuant to CERCLA Section 121 (d)(4)(A).

8. Summary of Comparative Analysis of Alternatives

A detailed analysis was performed on the four alternatives using the nine evaluation criteria specified in the NCP 40 C.F.R. Paragraph 300.430(e)(a) in order to select a final remedy for this Operable Unit (OU2). The following is a summary of the comparison of each alternative's strengths and weaknesses with respect to the nine evaluation criteria. These nine evaluation criteria can be categorized into 3 groups: Threshold criteria, primary balancing criteria, and modifying criteria.

Threshold Criterion

-Overall Protection of Human Health and the Environment

-Compliance with ARARs

Primary Balancing Criterion

-Long Term Effectiveness and Permanence

-Reduction of Toxicity, Mobility, or Volume through Treatment

-Short Term Effectiveness

-Implementability

-Cost

Modifying Criterion

-State Acceptance

-Community Acceptance

Tables 18 through 21 summarize the comparative analysis of each criterion and they are further defined in Table 22. These evaluation criteria relate directly to requirements in Section 121 of CERCLA, 42 U.S.C. Section 9621, which determines the overall feasibility and acceptability of the remedy. Threshold criteria must be satisfied in order for a remedy to be eligible for selection. Primary balancing criteria are used to weigh major trade-offs between remedies. State and community acceptance are modifying criteria that are formally taken into account after public comment is received on the Proposed Plan. The evaluations are as follows:

Protection of Human Health and Environment

The preferred alternative, GW-4, will provide the best available treatment of the contaminated ground water, prior to discharge to Naylors Run. Given the apparent presence of significant PCP and dioxin contamination in the ground water, it is prudent to install an effective collection and treatment system for the contaminated ground water, which this alternative does. GW-3 would provide only limited collection of contaminated water and hence would not be as protective. GW-2 would provide only minimal protection by use of deed restriction and fencing. GW-1 would provide no protection, therefore GW-1 is eliminated from consideration & won"t be evaluated any further in this analysis.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

CERCLA requires that remedial actions meet applicable or relevant and appropriate requirements (ARARs) of other Federal and State environmental laws, or that there are grounds for invoking a waiver. These laws may include, but are not limited to: The

Table 18

SUMMARY OF DETAILED EVALUATION OF REMEDIAL ALTERNATIVES
HAVERTOWN SITE

REMEDIAL ALTERNATIVE	PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	COMPLIANCE WITH ARARs	REDUCTION OF TOXICITY, MOBILITY, AND VOLUME	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	IMPLEMENTABILITY	COST (Present Worth)	STATE ACCEPTANCE	COMMUNITY ACCEPTANCE
GW-1 NO ACTION (Includes limited monitoring of the ground water and surface water.)	• Will not address further mitigation of the risks to human health and the environment. • Will not provide for protection to human health for future ground water use and for ingestion of fish and consumption pathways identified through nursing mother.	• No chemical-specific ARARs are applicable to sediment. • Will not meet potentially applicable ARARs for Class IIa ground water at the site. • Will likely not meet organic and inorganic surface water quality ARARs.	• No further reduction beyond those realized and expected associated with previous actions.	• No further impact on community or environmental quality. • The rate of site related contaminant reduction in the ground water will be slow as a result of natural attenuation.	• No further impact on community or environmental quality. • The rate of site related contaminant reduction in the ground water will be slow as a result of natural attenuation. • Limited reduction of the amount of contaminants reaching the surface water will be realized. • Migration of contaminants through ground water is possible.	• Technical and administrative implementability of previous remedial action is demonstrated. • No implementation issues other than determination of the locations of sampling are anticipated.	• $765,000 *Capital:* none *O&M/yr* *$99,000 1st five years* *$49,500 6th year on*	• Not preferred by State.	• Does not receive majority community acceptance.

Table 19

SUMMARY OF DETAILED EVALUATION OF REMEDIAL ALTERNATIVES
HAVERTOWN SITE

(continued)

REMEDIAL ALTERNATIVE	PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	COMPLIANCE WITH ARARs	REDUCTION OF TOXICITY, MOBILITY, AND VOLUME	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	IMPLEMENTABILITY	COST (Present Worth)	STATE ACCEPTANCE	COMMUNITY ACCEPTANCE
GW-2 LIMITED REMEDIAL ACTION (Includes all No Action elements, plus expanded ground water monitoring, Institutional Control, and Deed Restrictions)	• Will provide a limited degree of mitigation of the risks to human health and environment. • Will not provide protection for ingestion of fish and consumption pathways identified through nursing mother. • Complete protection of human health is not guaranteed through institutional control.	• No chemical-specific ARARs are applicable to sediment. • Will not meet potentially applicable ARARs for class IIa ground water at the site. • Will likely not meet organic and inorganic surface water quality ARARs.	• No further reduction beyond those realized and expected associated with previous actions.	• No further impact on community or environmental quality. • The rate of site related contaminant reduction in the ground water will be slow as a result of natural attenuation.	• No further impact on community or environmental quality. • The rate of site related contaminant reduction in the ground water will be slow as a result of natural attenuation. • Limited reduction of the amount of contaminants reaching the surface water will be realized. • Migration of contaminants through ground water is possible. • Institutional control will restrict future ground water use and therefore limits the exposure pathways.	• Technical and administrative implementability of previous remedial action is demonstrated. • No implementation issues other than determination of the locations of sampling are anticipated. • Potential difficulty in enforcing the institutional control on a long-term basis	• $1,900,000 Capital: $100,000 O&M for: $162,000	• Not preferred by State.	• Does not receive majority community acceptance.

Table 20

SUMMARY OF DETAILED EVALUATION OF REMEDIAL ALTERNATIVES
HAVERTOWN SITE

(continued)

REMEDIAL ALTERNATIVE	PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	COMPLIANCE WITH ARARs	REDUCTION OF TOXICITY, MOBILITY, AND VOLUME	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	IMPLEMENTABILITY	COST (Present Worth)	STATE ACCEPTANCE	COMMUNITY ACCEPTANCE
GW-3 SOURCE REMOVAL, TREATMENT, AND DISPOSAL (Includes all GW-2 plus free product recovery wells, pumping from oil water separator to treatment plant at NWP site.)	• Will greatly reduce the risk to human health and environment due to surface water discharge. • Complete protection of human health is not guaranteed but much reduced through institutional controls and active treatment.	• No chemical-specific ARARs are applicable to sediment. • May aid in attainment of potentially applicable ARARs for class IIa ground water at the site. • Will likely meet surface water quality ARARs.	• Significantly reduce the toxicity, mobility, and volume of contaminants discharged to Naylors Run. • Some reduction of the toxicity, viability, and volume of contaminants through removal of free products is anticipated.	• Short-term effectiveness on reduction of toxicity in surface water is excellent. • Limited site related contaminant reduction in the ground water will be realized as a result of natural attenuation and free product removal.	• Long-term effectiveness on reduction of toxicity in surface water is excellent. • Limited site related contaminant reduction in the ground water will be realized as a result of natural attenuation and free product removal. • Migration of contaminants through groundwater is possible.	• Technical and administrative implementability of previous remedial action is demonstrated. • No implementation issues other than determination of the locations of sampling are anticipated. • Potential difficulty in enforcing the institutional control on a long-term basis. • The selected treatment alternatives are straight forward technically. However, treatability study prior to RD is required. • Construction activities will have short-term impact on local residents.	• $7,553,000 to $9,684,000 Capital: $1,463,000 to $3,273,000 O&M/yr: $609,000 to $463,000	• Not preferred by State.	• Does not receive majority community acceptance.

Table 21

SUMMARY OF DETAILED EVALUATION OF REMEDIAL ALTERNATIVES HAVERTOWN SITE

(continued)

REMEDIAL ALTERNATIVE	PROTECTION OF HUMAN HEALTH AND ENVIRONMENT	COMPLIANCE WITH ARARs	REDUCTION OF TOXICITY, MOBILITY, AND VOLUME	SHORT-TERM EFFECTIVENESS	LONG-TERM EFFECTIVENESS AND PERMANENCE	IMPLEMENTABILITY	COST (Present Worth)	STATE ACCEPTANCE	COMMUNITY ACCEPTANCE
GW-4 SOURCE CONTROL, CONTAINMENT, COLLECTION, TREATMENT, AND DISPOSAL (Includes GW-3 alternative plus lining of storm sewer, and construction of collector trench and pumping station)	• Will greatly reduce the risk to human health and environment due to surface water discharge. • Complete protection of human health is not guaranteed but much reduced through institutional controls and treatment.	• No chemical-specific ARARs are applicable to sediment. • May aid attainment of ARARs applicable to class IIa ground water at the site. • Will likely meet surface water quality ARARs.	• Significantly reduce the toxicity, mobility, and volume of contaminants discharged to Naylors Run. • Significantly reduce the toxicity and mobility of the contaminants in shallow ground water.	• Short-term effective-ness on reduction of toxicity in surface water is excellent. • Site related contaminant reduction in the ground water will be realized as a result of natural attenuation, free product removal, and through the collection trench.	• Short-term effectiveness on reduction of toxicity in surface water is excellent. • Site related contaminant reduction in the ground water will be slow as a result of natural attenuation, free products removed, and through the collection trench. • Migration of contaminants through deep aquifer is possible.	• Technical and administrative implementability of previous remedial action is demonstrated. • No implementation issues other than determination of the locations of sampling. • Potential difficulty in enforcing the institutional control on a long-term basis. • The selected treatment alternatives are straight forward technically. However, treatability study prior to RD is required. • Construction activities will have short-term impact on local residents.	• $10,836,000 to $12,177,000 Capital: *$3,183,000 to $4,941,000* O&M/yr: *$483,000 to $451,000*	• Preferred by State.	• Received majority community acceptance.

Table 22

GLOSSARY OF EVALUATION CRITERIA

Threshold Criteria

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

- **Compliance with ARARs** - addresses whether a remedy will meet all of the applicable or relevant and appropriate requirements of environmental statutes.

Primary Balancing Criteria

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

- **Reduction of Toxicity, Mobility, or Volume Through Treatment** - is the anticipated performance of the treatment technologies a remedy may employ.

- **Short-Term Effectiveness** - addresses the period of time needed to achieve protection and any adverse impacts on human health and environment that may be posed during the construction and implementation period until cleanup goals are achieved.

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

- **Cost** - includes estimated capital, operation and maintenance costs.

Modifying Criteria

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

- **Community Acceptance** - will be assessed in the Record of Decision following a review of any public comments received on the RI/FS report and the Proposed Plan.

Toxic Substances Control Act, the Clean Water Act, the Safe Drinking Water Act, & the Resource Conservation and Recovery Act.

A "legally applicable" requirement is one which would legally apply to the response action if that action were not taken pursuant to Sections 104, 106, or 122 of CERCLA. A "relevant and appropriate" requirement is one that, while not "applicable", is designed to apply to problems sufficiently similar that their application is appropriate. Pursuant to CERCLA Section 121 (d)(4)(A), a remedial action that does not attain a level or standard of control at least equivalent to a legally applicable or relevant and appropriate standard may be selected if the remedial action is only part of a total remedial action for the site that will attain such level or standard of control when completed.

The Source Removal, Containment, Collection, Treatment, and Disposal Alternative (GW-4) would provide extensive collection and treatment of ground water through an underground collection drain and through a 3 step treatment process. It is believed that this alternative would be in compliance with the air emission and OSHA ARARs. The air emissions standards would be ARARs for any possible volatilization of contaminants during monitoring or construction or any off-gas venting from the treatment plant. The OSHA standards would be ARARs for work done during construction.

Although the disposal of generated wastes may present problems in meeting waste management ARARs, it is expected that all waste management ARARS can be met for any wastes that were generated by construction of the treatment plant, any soil excavation, or residuals from the treatment process such as oils and carbon. This waste could alter disposal plans, depending on the level of dioxin in the wastes. If there are levels of dioxin less than 1 PPB, then the wastes could be disposed of at a RCRA Subtitle C facility. If the dioxin levels in the soils exceed 1 PPB, then the wastes would not be considered K001 wastes (wastes from a wood treatment site). As a result, the waste would have to be incinerated off site, if possible, or stored on site until another disposal method was arranged. However, it is anticipated that the proposed treatment plant process (AOP or PACT) will destroy dioxins to below the 1 PPB level. Additionally, if a WAO system is installed as part of the PACT system, on site destruction of organic wastes, including dioxin, could be provided. Installation of the WAO may be necessary in order to meet this ARAR.

While this is an interim ROD for ground water, the air emissions, waste management and OSHA standards are ARARs for this interim action and will be met by this alternative. Surface water standards are ARARs for the treated ground water, discharged into Naylors Run, and such surface water ARARs would be met to the

maximum extent possible, as the treatment being utilized is the best available technology. As noted above, ground water cleanup levels are not intended to be finally addressed in this remedial action, and, therefore, ground water cleanup levels are not ARARs for this action. (To the extent that ground water cleanup levels were to apply to this action, which EPA does not believe, such ARARs would be waived on the basis that this interim action is only a part of a total remedial action for the site that will attain such ARAR when completed or such ARAR would be waived under the other waiver criteria, pursuant to CERCLA Section 121 (d)(4)(A). None of the other alternatives would provide remediation that could meet ARARs.

Reduction of Toxicity, Mobility, and Volume through Treatment

Alternative GW-4 will provide collection and treatment of the ground water and will provide the best possible reduction in effluent toxicity. Since there will be significant capture of contaminated residual materials, the effective volume of wastes being discharged to Naylors Run will be reduced. Alternative GW-3 would provide treatment of contaminants but only limited collection, hence the reduction in contaminants would not be as significant. GW-2 would not reduce contamination.

Short-term Effectiveness

Alternative GW-4 should produce a high quality effluent for discharge to Naylors Run immediately after operation of the treatment plant begins. This alternative should collect all available free product and contaminated ground water and should significantly reduce the contamination on site immediately. Including time needed for the treatability studies, it is possible that this alternative can be expedited and implemented in about a 36 month period. Construction itself should take an estimated 18 months. GW-3 would also provide short term effectiveness but it would not be actively collecting contaminated ground water and would be able to treat only a small portion of the existing contaminated ground water. GW-2 would provide negligible short-term effectiveness.

Long-term Effectiveness and Permanence

Since this is an interim action for ground water, long term effectiveness and permanence is not applicable here. However, installation of a collector drain and treatment system, as provided for in GW-4, will virtually eliminate the direct discharge of untreated ground water.

Implementability

Alternative GW-4 is straightforward with respect to the technical aspects of its implementation. Treatability tests will be

performed to evaluate the effectiveness of the selected treatment technology. Any construction activities will have a short-term impact on the daily lives of the local residents, which will include inconvenience and the general disruption associated with earth work in a well established and populated area. GW-3 would also be readily implementable and would be disruptive to residents but not as significantly since it would not involve the installation of the collection drain. GW-2 is easily implementable.

Cost

To an extent, the cost associated with cleaning-up the site is driven by the presence of dioxin isomers in the ground water, which is currently being discharged to Naylors Run. Disposal options for the process residuals can be better characterized as part of the treatability study. The cost of implementing the preferred ground water collection and treatment option, GW-4, is between about 10 and 12 million dollars (present worth). The cost of alternative GW-3 is $7.5 to $9.7 million dollars. The cost of alternative GW-2 is $1.9 million dollars.

State Acceptance

The Commonwealth of Pennsylanaia has been involved in the review of the Remedial Investigation and Feasibility Study and is supportive and concurs on the selection of the interim remedy, alternative GW-4. The position of the Commonwealth on alternative GW-3 is that they prefer GW-4 to GW-3 and the Commonwealth would not support GW-2.

Community Acceptance

Community acceptance is more fully addressed in the attached Responsiveness Summary. The Responsiveness Summary provides a thorough review of the public comments received on the RI/FS, the Proposed Plan, and EPA's response to the comments received.

9. Selected Remedy

After careful consideration, the selected remedy for remediating the ground water contamination in the shallow aquifer shall be the construction of a treatment plant, in conjunction with planned treatability studies to optimize the effectiveness of the advanced oxidation process or the powdered activated carbon treatment. Under this remedy, GW-4, 2 free product recovery wells shall be installed at NWP, and a treatment plant shall be constructed to treat ground water through chemical precipitation, granulated activated carbon treatment, and either PACT or AOP treatment. Also to be installed shall be an underground

interceptor drain behind PCG to collect ground water and direct it to the existing oil/water separator. The plant is expected to operated for 30 years. All effluent from the oil/water separator shall be pumped to the proposed treatment plant after which it shall be discharged to Naylors Run. Improved access to the OWS also will be implemented and additional ground water wells shall be installed north and south of the underground interceptor pipe. Also, the existing ground water wells will be sampled for contaminants of concern twice a year. This action is alternative GW-4 and details are provided under "Performance Standards".

Performance Standards

A. Free Product Recovery from the Shallow Aquifer

Two free product recovery wells will be installed on or adjacent to NWP property in the vicinity of the 'hot spot' at well R-2. Each of the free product recovery wells will include a free product skimmer.

A floating skimmer will be provided to remove any free product which accumulates in the well. The skimmer will operate whenever there is accumulation of free product. The contaminated oil from the skimmer pump will discharge to a Free Product Storage tank at the NWP site. The Free Product Storage tank vent will be fitted with a disposable vapor phase carbon unit to control odors and air emissions from the tank.

B. Treatment by the Existing Oil/Water Separator (OWS)

The existing oil/water separator was sized to treat flows in the range of 0 to 100 gallons per minute. The flow from the storm sewer (in the shallow aquifer) will continue to be directed to the existing oil/water separator (OWS), prior to further treatment. The normal dry weather flow from the storm sewer has been determined to be less than approximately twenty-five gallons per minute (25 gpm).

The aqueous flow discharging from the OWS will then be pumped (using the 25 gpm aqueous phase pumping station) to a new treatment system, located on NWP property. Access to the OWS will be improved by obtaining access agreements to permit vehicular traffic or hand trucks. A gate will be provided at the entrance to the right-of-way to restrict use of the access road to authorized persons.

C. Free Product Recovery from the Existing Oil/Water Separator

Two free product skimmers will be installed in the OWS to remove free product from the OWS. The skimmer will operate whenever there is accumulation of free product in the OWS. The skimmers will discharge to a small day tank located near the OWS.

A free product transfer pump will pump the recovered oil to the Free Product Storage tank located at the NWP site. This approach will eliminate the need to move drums of recovered free product from the existing OWS through the residential neighborhood. The residual oils will be disposed of as K001 Wastes.

If necessary, appropriate chemicals (e.g. NaCl) can be metered into the day tank to break any emulsion in the free product. This may be necessary to allow pumping the recovered free product the 1,200 feet to the Free Product Storage tank.

The piping from the free product transfer pump to the Free Product Storage Tank will be double walled with provision for leak detection and periodic leak testing/monitoring.

D. Aqueous Phase Pumping Station

A submersible pumping station will be provided at the existing OWS to convey the collected ground water to a suitable treatment system. Installation of the pumping station will require extending an electrical service to power the pumps, system controls, and any desired alarm systems. Design pumping capacity depends on the actual dry weather flow of water in the storm sewer, and the instantaneous flow capacity of the selected treatment system. Each pump will have a capacity of approximately 25 gpm. Only one pump will be able to run at a time, i.e. the second pump will serve as a back-up. The system shall be provided with necessary features for explosion-proof operation.

E. Treatment Plant

The water treated by the OWS will be pumped to the treatment plant at the NWP site for removal of contaminants. The estimated chemical concentration for the treatment plant influent is shown on Table 16.

F. Chemical Precipitation (1st Stage of Treatment Plant)

The chemical precipitation system will treat the inorganics and will remove the settleable solids which will be present in the ground water. The system will remove iron, calcium, manganese, arsenic as well as chromium, cadmium and zinc from the waste stream. Removal of the iron, calcium and manganese is necessary for optimum performance of subsequent treatment processes. The system will have provision to add polymer to enhance removal of solids, and a gravity settling tank where the metals and solids will accumulate. This solids fraction will be collected in drums for disposal at a suitable facility.

Depending on the rate of formation of the solids, it is possible that a dewatering device will be installed to reduce the volume of waste solids, and to possibly allow the waste to be considered as a solid (rather than a liquid) waste. This solids fraction will primarily be iron and manganese precipitants, but may require special handling for disposal, since the solids could include adsorbed dioxin or other significant contaminant concentrations.

Treatability studies will be performed during the remedial design phase of the project to adequately characterize the necessary size, features, and disposal options of the chemical precipitation system.

G. Removal of Organics

Following removal of metals using chemical precipitation, a system will be provided for removal of organic compounds. Two treatment alternatives for organic compounds have been selected for evaluation. The two options are Powdered Activated Carbon Treatment (PACT) as shown in Figure 3, or an Advanced Oxidation Process (AOP), as shown in Figure 4. Either process would be followed by a Granular Activated Carbon (GAC) polishing step.

The actual treatment system selection will be determined during treatability tests for a few representative treatment technologies. The treatment systems to be evaluated are described as follows:

H. Powdered Activated Carbon Treatment with On-Site Carbon Regeneration

A proprietary powdered activated carbon treatment system (PACT) is capable of effectively removing the organic compounds in the ground water at this site. The combination of the powdered carbon and activated sludge in a continuously stirred tank reactor (CSTR) effectively captures the volatile and semi-volatile organic compounds onto the carbon/biomass solids matrix.

The combined effect of the powdered carbon and activated sludge provides tolerance of shock-loads of any toxic organics. This will provide enhanced system performance with potential biodegradation of numerous organic compounds, after a period of accumulation to the influent organic compounds.

The PACT system will be tolerant of significant organics loadings, such as from any free product which is not captured by the oil/water separator. It is possible that a supplemental carbon source will be needed to provide an influent chemical

oxygen demand of approximately 150 mg COD/l. Inexpensive molasses is a commonly used carbon source for the activated sludge, which permits co-metabolism of recalcitrant organics.

A single batch-mode PACT unit will be provided to treat the flow. A flow equalization tank will be provided for the batch unit, to permit continuous operation of the collection system. Transfer pumps will be provided to fill the process tank in approximately 45 minutes.

If needed, on-site carbon regeneration can be provided by a wet air oxidation (WAO) system. On-site regeneration would be justified only if off-site disposal was not possible. The smallest WAO unit would be capable of treating a 5 gpm residual waste solids stream, and requires a thirty foot by forty foot utility building to house the unit.

The smallest WAO unit would have enough capacity to oxidize residuals from the PACT system, the GAC units, and the free product from the skimmers. The WAO process uses high pressure (2000 psi) and elevated temperature (540 °F) in a titanium reactor to regenerate the carbon, and can be operated to effectively destroy organic compounds such as PCP and dioxins. Treatability tests will determine whether the WAO system was needed at the NWP site.

I. Advanced Oxidation Process (AOP)

Advanced oxidation systems are a relatively new technology which have been shown to be capable of treating the volatile and semi-volatile compounds which are present in the ground water at the site. For instance, a system using UV light, combined with hydrogen peroxide and ozone will be able to destroy the compounds found in the ground water.

Ultraviolet oxidation is an advanced oxidation process that uses ultraviolet light with the addition of ozone and/or hydrogen peroxide. The resulting oxidative environment is significantly more destructive than the environment created with ozone or hydrogen peroxide by themselves or in combination.

An ultraviolet oxidation system consists of a stainless steel reactor with several stages, several UV lamps, an ozone generator, and a hydrogen peroxide feed system. The UV lamps are mounted vertically in the reactor and are enclosed in quartz tubes. Ozone enters each stage through a stainless steel diffuser. Hydrogen peroxide is metered into the reactor influent.

When the system is operated in the continuous mode, the

contaminants in the water are oxidized to form carbon dioxide, and water. Any halogens are converted to inorganic halides. A fixed-bed catalytic ozone destroying unit is part of the UV oxidation process, producing oxygen and limiting ozone emissions to an instantaneous concentration of 0.1 ppm in air. Ozone emission rates would be negligible. Any volatilized organic compounds are also destroyed in the off-gas. The offgas is then vented to the atmosphere.

A Treatability Study will be needed to verify performance and size the plant. The AOP process will need to be installed in a utility building, which would be located on the NWP property.

A consideration of any ultraviolet oxidation system is the amount of heat generated by the UV lamps used in the treatment process. This can cause scale formation on the quartz tubes. This scaling can reduce the effectiveness of UV radiation and the overall process. Some fouling would be stripped off by the ozone bubbles, but a problem may develop every 1 to 1/2 years unless a citric acid wash is used approximately every six months.

The discharge from the AOP system will be directed to granular activated carbon units.

J. Granular Activated Carbon (GAC)

Disposable granular activated carbon (GAC) units will be installed in series to polish the waste water prior to discharge to Naylors Run. These units are relatively inexpensive and can also provide effective back-up treatment (redundancy) at low cost, for when there is an upset in the PACT unit or AOP unit.

Each disposable carbon unit contains approximately 1,000 pounds of carbon, and can treat up to 30 gpm. For the anticipated flow of 25 gpm, there will be a minimum of two units installed in series. Periodic samples would be collected from the influent and effluent of the GAC units, to predict breakthrough times and to indicate how often the units would need to be replaced. Samples of the spent carbon would be taken to determine disposal options for the carbon.

The piping for the two units would permit any combination or sequence of flow. Operation of the units will be staggered so that the carbon units would not both reach breakthrough at the same time. Treatability studies will be performed during the remedial design phase of the project to adequately characterize the necessary size and features of the granular activated carbon treatment system.

K. Stream Discharge

The effluent from the treatment plant will be conveyed to Naylors

Run in the vicinity of Eagle Road for discharge. Periodic samples will be collected in accordance with any discharge permit for the facility. Discharge monitoring reports will be submitted per any National Pollutant Discharge Elimination System (NPDES) requirements.

L. Waste Disposal or Discharge to Hazardous Waste Facilities

It is anticipated that the recovered free product from the oil/water separator and free product recovery wells, as well as the solids collected from the chemical precipitation, PACT process, and GAC units may contain hazardous compounds which will require special handling for disposal at an off-site facility. A secure storage area will be provided, located on the NWP site, to store the residuals until they can be removed or treated.

For instance, the residuals may be listed as K001 wastes. There are several off-site facilities which can accept the K001 wastes, subject to analysis and verification of the waste characteristics. K001 wastes are wastes from wood preservation processes as listed in 40 C.F.R. 261.32. A waste disposal firm was contacted to explore actual disposal alternatives. It was determined that K001 wastes could be incinerated at two of its facilities - one in New Jersey (drummed waste), or a facility in Texas (bulk roll-off trailers). On-site incineration of the solids is undesirable given the suburban location.

On-site treatment and destruction of organic residuals could be provided by the wet air oxidation (WAO) system, particularly with respect to residuals produced by the PACT process. Treatability studies would evaluate operational conditions and equipment sizes necessary to oxidize the spent carbon, recovered free product, and other similar materials to the required destruction and removal efficiency.

M. Ground Water Collector Drain

Installation of a collector drain near the existing storm sewer will provide controlled collection of the contaminated shallow ground water. The estimated chemical concentration of shallow ground water collected by the drain is given in Table 17. The drain is shown on Figure 11.

The purpose of a collector drain is to effectively capture the plume of contaminated water in the shallow aquifer at the southern edge of the site. The contaminated water can then be sent to a treatment system for removal of the contaminants. System components are selected to be compatible with any free product which may be collected.

Although not designed to act as an collector drain, the existing 30" storm sewer pipe has intercepted a portion of the flow of

contaminated ground water. The storm sewer pipe is subject to periodic high storm water flows, which significantly restrict the utility of using the storm sewer to collect water for further treatment. Also, the storm sewer does not appear to be effective in capturing the plume along its entire length. This significantly limits the effectiveness of the storm sewer for capturing the plume of contaminants in the shallow ground water.

Installation of the collector drain will significantly improve capture of the plume, in comparison to the performance of the existing storm sewer. The collector trench will be installed to the depth of the fractured bedrock (significantly deeper than the storm sewer), to improve collection throughout the shallow aquifer. Also, the collector pipe will not be subject to periodic flow excursions and flooding during storm events. The periodic high flows into the storm sewer make continuous treatment unrealistic for the storm sewer effluent.

Unless this action is taken, there is a significant concern that the plume of contaminated ground water will migrate beyond the storm sewer, and possibly into seeps in the back yards of residences along Rittenhouse Circle.

A collector drain will be installed, roughly in parallel with the existing storm sewer pipe. Unlike the storm sewer, however, the collector drain will be designed and installed to efficiently intercept the flow of contaminated ground water. The following factors have been identified concerning construction and placement of the drain:

N. Drain Excavation

The drain excavation will be extended to the approximate elevation of the fractured bedrock for maximum effect. This will require excavation to a depth of approximately fifteen to twenty feet. The base of the drain will be a minimum of two feet wide in section. Shoring of the drain trench will be needed during construction to minimize the quantity and cost of disposal of excavation material. Shoring is also necessary to prevent possible cave-ins and personal injury or property damage.

O. Interceptor Pipe

A perforated pipe will be placed at the bottom of the drain, which will serve to convey the ground water to a pumping station. The perforations will be oriented so that they are above the normal depth of water flowing in the pipe to minimize accumulation of debris.

The slope of the interceptor pipe will be designed so that a constantly descending gradient is maintained to the pumping station. Test pits will be excavated along the route of the

interceptor pipe during the Remedial Design and Remedial Action (RD/RA) phase of the project, so that the interceptor pipe design invert elevations can be determined.

Samples will be collected at various depths in the test pits to determine the levels of contaminants and disposal options for the excavated materials. Depending on the contaminant levels, the soils could be used as clean fill, or if contamination is present, could be landfilled, incinerated, or other possible alternatives.

During installation, irregularities in the elevation of the fractured bedrock between test pits may require excavation of fractured bedrock where it extends above the interpolated bedrock elevations.

P. Access Manholes

Manholes will be provided every few hundred feet for access, and at any changes in pipe alignment. The access manholes will be vented to ensure free drainage of the interceptor pipe. The Remedial Design will evaluate the possible provision for retrofitting disposable vapor phase carbon units, if odors become a problem.

Q. Selection of Materials of Construction

In many cases, there will be a choice of different possible materials of construction for a given system component. For instance, the interceptor pipe could be made of PVC or some other appropriate material. Costs have been estimated assuming that the major pieces of equipment will not require significant use of exotic materials of construction.

R. Drain Backfill Material

The drain will be appropriately graded and backfilled with a highly porous select gravel. The gravel will drain freely to the perforated interceptor pipe at the bottom of the drain.

The drain will be lined with a permeable geotextile fabric on the face of the trench which is upgradient to the collector pipe, to permit unimpeded flow while minimizing gradual plugging of the gravel with fine particles (fines).

To minimize entry of surface drainage and run-off into the collector drain, an impermeable membrane liner will be placed above the gravel layer. This membrane liner will be extended along the face of the trench which is downgradient to the collector pipe. Without this feature, where the collector drain crosses any buried utility lines, there would be the undesirable possibility of contaminated ground water flow entering the select

backfill present in other utility trenches.

The impermeable membrane will minimize such flows wherever the collector drain encounters such potential conduits for the ground water to escape the collector trench. This key feature will minimize any communication between the ground water in the collector trench with permeable soil formations which are present.

The seams where two rolls of membrane adjoin will be sealed to be water tight. The liner thickness (and any necessary reinforcing) will be selected to withstand any hydraulic forces acting on the membrane due to the differential head across the membrane.

S. Collector Drain Pumping Station

A pumping station will be provided to convey the collected ground water to a suitable treatment system. Installation of the pumping station will require extending an electrical service to power the pumps, system controls, and any desired alarm systems. Pumping capacity will depend on the actual flow of water in the collector trench, and the instantaneous flow capacity of-the treatment system. Each pump will have a capacity of approximately 25 gpm.

The pump system shall be provided with necessary features for explosion-proof operation. Low shear diaphragm pumps will be provided to minimize emulsification of the oily water.

T. Monitoring Wells

Installation of the interceptor trench could potentially affect the performance of existing monitoring wells which are located in the vicinity of the drain. This will require careful attention to the design and installation of the drain, or possibly installation of new wells outside the drain area, so that representative samples can be collected.

U. Rehabilitation of the Existing 30-inch Storm Sewer

A recent closed circuit television surveillance of the storm sewer pipe indicates the presence of a small pipe discharging into a manhole located on the south side of the Philadelphia Chewing Gum property. This source of inflow is apparently an unpermitted connection to the storm sewer, which unnecessarily increases the dry weather flow of the storm sewer. It is anticipated that this source of inflow will be plugged, after USEPA notifies the affected property owners of the action to be taken.

The last section of storm sewer pipe (extending approximately 200 feet from the manhole south of PCG to the discharge point into Naylors Run) was observed to contribute noticeable infiltration

into the storm sewer pipe during dry weather.

The storm sewer pipe will be lined in-place. The lining will virtually eliminate any infiltration into the storm sewer pipe. The contaminated water which is presently being collected by the storm sewer pipe will instead be collected in the interceptor drain, with the advantage that the flows in the interceptor drain will not be subject to radical increases in flow during storm events.

Summary

This alternative calls for the design and implementation of an interim remedial action to protect human health and the environment. The goals of this remedial action is to remove all free product and contaminated ground water from the shallow ground water aquifer and to collect data on the aquifer and contaminant response to remedial measures. The ultimate goal of remediation will be determined in a final remedial action for this site. This remedial action will be monitored in accordance with the below performance standards to determine the feasibility of achieving this goal with this method and to ensure that hydraulic control of the contaminated plume is maintained. After the period of time necessary, in EPA's judgment, to arrive at a final decision for the site, a final ROD for ground water, which specifies the ultimate goal, remedy, and anticipated timeframe, will be prepared. Upon completion of a final RIFS, this interim remedy may be incorporated into the design of the site remedy specified in the final action ROD.

In order to restore contaminated ground water to beneficial use, and to further reduce human health risk levels in surface waters, the remediation implemented under the selected remedy shall operate until site-specific remediation levels are achieved. Thus, ground water shall be collected and treated up to 30 years or until the levels of the contaminants of concern reach background levels, maximum contaminant levels (MCLs) or maximum contaminant level goals (MCLGs), whichever are lower, or until information from the final operable unit impacts upon these levels. MCLGs are health goals which are set at a level at which no known or anticipated adverse effects of the health of persons occur and which allows an adequate margin of safety. MCLs are levels, set as close to MCLGs as possible, which are considered feasible. The MCLs and MCLGs for organics are set forth respectively in 40 CFR 141.61 (a) and 40 CFR 141.50 and for inorganics in 40 CFR 141.11 (b) and 141.62 (b). MCLs and MCLGs for selected chemicals of concern are listed in Table 23.

Background concentration of the contaminants of concern will be approved by EPA after a determination of compliance with the procedures for ground water monitoring as outlined in 25 PA Code 264.97. In the event that a contaminant is not detected in

Table 23

Havertown PCP Site
Chemical-Specific ARARs
µg/ℓ

Chemicals of Potential Concern	USEPA National Drinking Water Regulations		PA Water Quality Criteria
	Current & Final MCLs[a]	Final MCLGs[a]	Naylors Run Surface Water Discharge
Organics:			
acenaphthene	♦	♦	17[c]
acenaphthylene	♦	♦	0.003[b]
anthracene	♦	♦	0.003[b]
benzene	5	0	1[b]
benzo(a)anthracene	♦	♦	0.003[b]
benzo(a)pyrene	♦	♦	0.003[b]
bis(2-ethylhexyl)phthalate	♦	♦	909[c]
chrysene	♦	♦	0.003[b]
1,2-trichloroethylene	♦	100	♦
ethylbenzene	700	700	580[c]
fluoranthene	♦	♦	40[c]
naphthalene	♦	♦	10[b]
2-methylnaphthalene	♦	♦	♦
pentachlorophenol	1	0	13 @ pH 7.8[c] 3.5 @ pH 6.5[c]
phenanthrene	♦	♦	0.003[b]
pyrene	♦	♦	0.003[b]
2,3,7,8-TCDD (Equivalent)	♦	♦	1×10^{-8}[b]
toluene	1,000	1,000	330[c]
trichloroethylene	5	0	3[b]
vinyl chloride	5	0	0.02[b]
xylene	10,000	10,000	♦

Table 23 (continued)
Havertown PCP Site
Chemical-Specific ARARs
$\mu g/\ell$

Chemicals of Potential Concern	USEPA National Drinking Water Regulations		PA Water Quality Criteria
	Current & Final MCLs[a]	Final MCLGs[a]	Naylors Run Surface Water Discharge
Inorganics:			
aluminum	♦	♦	♦
arsenic	50	♦	50[b]
cobalt	♦	♦	♦
manganese	50	♦	♦

Notes:

[a] Final MCLs and MCLGs become effective July 1992

[b] Human Health Criteria

[c] Chronic Toxicity for the Protection of Fish and Aquatic Life

♦ No USEPA National Drinking Water Regulation or Commonwealth of Pennsylvania ARARs for these chemicals

ORIGINAL

Table 24 METHOD DETECTION LIMIT COMPARISON, VOLATILES

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP CRDL [b,c] ug/Kg	601 ug/L	602 & 603 ug/L	624 ug/L	8010 ug/L	8020 & 8030 ug/L	8240 ug/L	501.3 ug/L	502.1 ug/L	502.2 PID ug/L	502.2 HECD ug/L	503.1 & 504 ug/L	524.1 ug/L	524.2 WIDE ug/L	524.2 NARROW ug/L
Acetone	67-64-1	81552	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Acrolein (Propenal)	107-02-8	34210	-	-	-	0.7(3)	-	-	0.6(3)	-	-	-	-	-	-	-	-	-
Acrylonitrile	107-13-1	34215	-	-	-	0.5(3)	-	-	0.5(3)	-	-	-	-	-	-	-	-	-
Benzene	71-43-2	34030	10	10	-	0.2(2)	4.4	-	0.2(2)	4.4	-	-	.009	-	0.02	0.10	0.04	0.03
Bromobenzene	108-86-1	-	-	-	-	-	-	nd	-	-	-	nd	-	-	0.002	0.12	0.03	0.11
Bromochloromethane	74-97-5	34413	-	-	-	-	-	-	-	-	-	nd	-	0.01	-	nd	0.04	0.09
Bromodichloromethane	75-27-4	32101	10	10	0.10	-	2.2	0.10	-	2.2	0.07	0.002	-	0.02	-	0.28	0.08	0.03
Bromoform	75-25-2	32104	10	10	0.20	-	4.7	0.20	-	4.7	0.04	0.02	-	1.6	-	0.66	0.12	0.20
Bromomethane	74-83-9	34413	10	10	1.18	-	nd	nd	-	nd	-	-	-	1.1	1.1	-	0.11	0.06
2-Butanone (Methyl ethyl ketone)	78-93-3	-	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Butylbenzene	104-51-8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	nd	0.11	0.10
Sec-Butylbenzene	135-98-8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	nd	0.13	0.12
Tert-Butylbenzene	98-06-6	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006	nd	0.14	0.33
Carbon disulfide	75-15-0	-	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon tetrachloride	56-23-5	32102	10	10	0.12	-	2.8	0.12	-	2.8	-	0.003	-	0.01	-	0.28	0.21	0.02
Chlorobenzene	108-90-7	34301	10	10	0.25	0.2(2)	6.0	0.25	0.2(2)	6.0	-	0.001	0.003	0.01	0.004	0.14	0.04	0.03
Chloroethane	75-00-3	34311	10	10	0.52	-	nd	0.52	-	nd	-	0.008	-	0.1	-	-	0.10	0.02
1-Chlorocyclohexene	-	-	-	-	-	-	-	-	-	-	-	nd	-	-	0.008	-	-	-
2-Chloroethyl vinyl ether	100-75-8	34576	-	-	0.13	-	nd	0.13	-	nd	-	0.02	-	-	-	-	-	-
Chloroform	67-66-3	32106	10	10	0.05	-	1.6	0.05	-	1.6	0.06	0.002	-	0.02	-	0.24	0.03	0.04
1-Chlorohexane	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-
Chloromethane	74-87-3	34418	10	10	0.08	-	nd	0.08	-	nd	-	0.01	-	0.03	-	-	0.13	0.05
Chlorotoluene	95-49-8	-	-	-	-	-	-	nd	-	-	-	nd	-	-	0.008	nd	-	-
2-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	0.08
4-Chlorotoluene	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.06	0.06
Dibromochloromethane	124-48-1	34105	10	10	0.09	-	3.1	0.09	-	3.1	0.05	nd	-	0.03	-	0.30	0.05	0.07
1,2-Dibrom-3-chloropropane	-	-	-	-	-	-	-	-	-	-	-	0.03	-	-	0.01(4)	1.8	0.26	0.50
1,2-Dibromoethane	106-93-4	-	-	-	-	-	-	-	-	-	-	0.03	-	0.8	0.01(4)	0.36	0.06	0.10
Dibromomethane	74-95-3	-	-	-	-	-	-	nd	-	-	-	nd	-	2.2	-	0.30	0.24	0.10
1,2-Dichlorobenzene	95-50-1	34536	-	-	0.15	0.4(2)	nd	0.15	0.4(2)	nd	-	nd	-	-	0.02	1.0	0.03	0.05
1,3-Dichlorobenzene	541-73-1	34566	-	-	0.32	0.4(2)	nd	0.32	0.4(2)	nd	-	nd	-	-	0.006	-	0.12	0.09
1,4-Dichlorobenzene	106-46-7	34571	-	-	0.24	0.3(2)	nd	0.24	0.3(2)	nd	-	nd	-	-	0.006	2.0	0.03	0.04
Dichlorodifluoromethane	75-71-8	34668	-	-	1.81	-	-	nd	-	nd	-	nd	-	0.05	-	0.33	0.10	0.11
1,1-Dichloroethane	75-34-3	34496	10	10	0.07	-	4.7	0.07	-	4.7	-	0.002	-	0.07	-	0.17	0.04	0.03
1,2-Dichloroethane	107-06-2	34531	10	10	0.03	-	2.8	0.03	-	2.8	-	0.002	-	0.03	-	0.22	0.06	0.02

Table 24 (CON'T)

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL[b] ug/L	CLP CRDL[a,b,c] ug/Kg	601 ug/L	602 & 603 ug/L	624 ug/L	8010 ug/L	8020 & 8030 ug/L	8240 ug/L	501.3 ug/L	502.1 ug/L	502.2 PID ug/L	502.2 HECD ug/L	503.1 & 504 ug/L	524.1 ug/L	524.2 WIDE ug/L	524.2 NARROW ug/L
1,1-Dichloroethene	75-35-4	34501	10	10	0.13	-	2.8	0.13	-	2.8	-	0.003	nd	0.07	-	0.19	0.12	0.05
Cis-1,2-Dichloroethene	156-59-2	-	10*	10*	-	-	-	-	-	-	-	0.002	0.02	0.01	-	-	0.12	0.06
Trans-1,2-Dichloroethene	156-60-5	34546	10*	10*	0.10	-	1.6	0.10	-	1.6	-	0.002	0.05	0.06	-	0.19	0.06	0.03
1,2-Dichloropropene	78-87-5	34541	10	10	0.04	-	6.0	0.04	-	6.0	-	nd	-	0.006	-	0.17	0.04	0.02
1,3-Dichloropropane	142-28-9	-	-	-	-	-	-	-	-	-	-	nd	-	0.03	-	0.10	0.04	0.08
2,2-Dichloropropane	594-20-7	-	-	-	-	-	-	-	-	-	-	-	-	0.05	-	-	0.35	0.08
1,1-Dichloropropene	563-58-6	-	-	-	-	-	-	-	-	-	-	-	0.02	0.02	-	-	0.10	0.12
Cis-1,3-Dichloropropene	10061-01-5	34704	10	10	0.34	-	5.0	0.34	-	nd	-	-	-	-	-	-	-	-
Trans-1,3-Dichloropropene	10061-02-6	34699	10	10	0.20	-	nd	0.34	-	5.0	-	-	-	-	-	-	-	-
Ethyl benzene	100-41-4	34371	10	10	-	0.2(2)	7.2	-	0.2(2)	7.2	-	-	0.005	-	0.002	-	0.06	0.03
Hexachlorobutadiene	87-68-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.11	0.10
2-Hexanone	591-78-6	-	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Isopropylbenzene	98-82-8	-	-	-	-	-	-	-	-	-	-	-	0.05	-	0.005	nd	0.15	0.10
4-Isopropyltoluene	99-87-6	-	-	-	-	-	-	-	-	-	-	-	-	-	0.009	nd	0.12	0.26
Methylene chloride	75-09-2	34423	10	10	0.25	-	2.8	-	-	2.8	-	nd	-	0.02	-	0.13	0.03	0.09
4-Methyl-2-pentanone	108-10-1	-	10	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	91-20-3	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	nd	0.04	0.10
N-Propylbenzene	103-65-1	-	-	-	-	-	-	-	-	-	-	-	-	-	0.009	nd	0.04	0.10
Styrene	100-42-5	-	10	10	-	-	-	-	-	-	-	-	0.01	-	0.008	0.20	0.04	0.27
1,1,1,2-Tetrachloroethane	630-20-6	-	-	-	-	-	-	-	-	-	-	-	-	0.005	-	-	0.05	0.07
1,1,2,2-Tetrachloroethane	79-34-5	34516	10	10	0.03	-	6.9	0.03	-	6.9	-	0.01	-	0.01	-	0.41	0.04	0.20
Tetrachloroethene	127-18-4	34475	10	10	0.03	-	4.1	0.03	-	4.1	-	0.001	0.05	0.04	0.01	0.29	0.14	0.05
Toluene	108-88-3	34010	10	10	-	0.2(2)	6.0	-	0.2(2)	6.0	-	-	0.01	-	0.02	0.12	0.11	0.08
1,2,3-Trichlorobenzene	87-61-6	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	nd	0.03	0.14
1,2,4-Trichlorobenzene	120-82-1	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03	nd	0.04	0.20
1,1,1-Trichloroethane	71-55-6	34506	10	10	0.03	-	3.8	0.03	-	3.8	-	0.003	-	0.03	-	0.26	0.08	0.04
1,1,2-Trichloroethane	79-00-5	34511	10	10	0.02	-	5.0	0.02	-	5.0	-	0.007	-	nd	-	-	0.10	0.08
Trichloroethene	79-01-6	39180	10	10	0.12	-	1.9	0.12	-	1.9	-	0.001	0.02	0.01	0.01	0.36	0.19	0.02
Trichlorofluoromethane	75-69-4	34488	-	-	nd	-	nd	nd	-	nd	-	nd	-	0.03	-	0.21	0.08	0.07
1,2,3-Trichloropropane	96-18-4	-	-	-	-	-	-	-	-	-	-	-	-	0.4	-	-	0.32	0.09
1,2,4-Trimethylbenzene	95-63-6	-	-	-	-	-	-	-	-	-	-	-	-	-	0.006	nd	0.13	0.09
1,3,5-Trimethylbenzene	108-67-8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.003	nd	0.05	0.06
Vinyl acetate	108-05-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl chloride	75-01-4	39175	10	10	0.18	-	nd	0.18	-	nd	-	0.006	0.02	0.04	-	0.31	0.17	0.04
O-Xylene	95-47-6	-	-	-	-	-	-	-	nd	-	-	-	0.02	-	0.004	0.20	0.11	0.0
M-Xylene	108-38-3	-	-	-	-	-	-	-	nd	-	-	-	0.01	-	0.004	nd	0.05	0.0
P-Xylene	106-42-3	-	-	-	-	-	-	-	nd	-	-	-	0.01	-	0.002	0.13	0.13	0.0
Total Xylenes	1330-20-7	-	10	10	-	-	-	-	nd	-	-	-	-	-	-	-	-	-

* Cis-1,2-Dichloroethene and Trans-1,2-Dichloroethene not separated. Detection limits measured together.

Table 24 METHOD DETECTION LIMIT - PESTICIDE, PCB's and HERBICIDES

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP CRDL [b] ug/Kg	8080 ug/L	8250 ug/L	8140 ug/L	8150 ug/L	608 ug/L	625 ug/L	505 ug/L	507 [a] ug/L	508 [a] & 508A ug/L	515.1 [a] ug/L	525 MAGNETIC ug/L	525 ION ug/L	531.1 [a] ug/L
Acifluorfen	50594-66-6	-	-	-	-	-	-	-	-	-	-	-	-	0.096	-	-	-
Alachlor	15972-60-8	-	-	-	-	-	-	-	-	-	0.225	0.38	-	-	1.0*	-	-
Aldicarb	116-06-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0
Aldicarb sulfone	1646-88-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Aldicarb sulfoxide	1646-87-3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Aldrin	309-00-2	39330	0.05	1.7	0.004	1.9	-	-	0.004	1.9	0.075	-	0.075	-	0.1	0.1	-
Atraton	1610-17-9	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-
Ametryn	834-12-8	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-
Aroclor 1016	12674-11-2	34671	1.0	33	nd	nd	-	-	nd	nd	0.08	-	-	-	-	-	-
Aroclor 1221	11104-28-2	39488	2.0	67	nd	30	-	-	nd	30	15.0	-	0.14(A)	-	-	-	-
Aroclor 1232	11141-16-5	39492	1.0	33	nd	nd	-	-	nd	nd	0.48	-	0.23(A)	-	-	-	-
Aroclor 1242	53469-21-9	39496	1.0	33	0.065	nd	-	-	0.065	nd	0.31	-	0.21(A)	-	-	-	-
Aroclor 1248	12672-29-6	39500	1.0	33	nd	nd	-	-	nd	nd	0.102	-	0.15(A)	-	-	-	-
Aroclor 1254	11097-69-1	39504	1.0	33	nd	36	-	-	nd	36	0.102	-	0.14(A)	-	-	-	-
Aroclor 1260	11096-82-5	39508	1.0	33	nd	nd	-	-	nd	nd	0.189	-	0.14(A)	-	-	-	-
Atrazine	1912-24-9	-	-	-	-	-	-	-	-	-	2.4	0.13	-	-	0.3	0.1	-
Azinphos methyl	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-
Baygon	114-26-1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0
Bentazon	25057-89-0	-	-	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-
Bromacil	314-40-9	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-
Butachlor	23184-66-9	-	-	-	-	-	-	-	-	-	-	0.38	-	-	-	-	-
Butylate	2008-41-5	-	-	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-
Alpha-BHC	319-84-6	39337	0.05	1.7	0.004	nd	-	-	0.003	-	-	-	0.025	-	-	-	-
Beta-BHC	319-85-7	39338	0.05	1.7	0.006	4.2	-	-	0.00	4.2	-	-	0.01	-	-	-	-
Delta-BHC	319-86-8	34259	0.05	1.7	0.009	3.1	-	-	0.009	3.1	-	-	0.01	-	-	-	-
Gamma-BHC (Lindane)	58-89-9	39340	0.05	1.7	0.004	nd	-	-	0.00	-	0.003	-	0.015	-	0.1	0.1	-
Bolstar (Sulprofos)	-	-	-	-	-	-	0.15	-	-	-	-	-	-	-	-	-	-
Carbaryl	63-25-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Carbofuran	1563-66-2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5
Carboxin	5234-68-5	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-
Chloramben	133-90-4	-	-	-	-	-	-	-	-	-	-	-	-	0.093	-	-	-
Alpha-Chlordane	5103-71-9	-	0.05	1.7	-	-	-	-	-	-	0.006	-	0.0015	-	0.1	0.2	-
Gamma-Chlordane	5103-74-2	-	0.05	1.7	-	-	-	-	-	-	0.012	-	0.0015	-	0.3	0.1	-
Chlordane	57-74-9	39350	-	-	0.014	nd	-	-	0.014	nd	0.14	-	-	-	-	-	-
Chlorneb	2675-77-6	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-

* Method 525 using a quadrupole mass spectrometer.

Table 24 (CON'T)

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP CRDL [a,b] ug/Kg	8080 ug/L	8250 ug/L	8140 ug/L	8150 ug/L	608 ug/L	625 ug/L	505 ug/L	507 [a] ug/L	508 [a] & 508A ug/L	515.1 [a] ug/L	525 MAGNETIC ug/L	525 ION ug/L	531.1 [a] ug/L
Chlorobenzilate	501-15-6	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	-
2-Chlorobiphenyl	2051-60-7	-	-	-	-	-	-	-	-	-	-	-	0.08(A)	-	0.1	0.1	-
Chlorpropham	101-21-3	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-
Chlorpyrifos	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-
Chlorothalonil	2921-88-2	-	-	-	-	-	-	-	-	-	-	-	0.025	-	-	-	-
Coumaphos	56-72-4	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-
Cycloate	1134-23-2	-	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	-
DCPA	1897-45-6	-	-	-	-	-	-	-	-	-	-	-	0.025	0.02	-	-	-
2,4-D	94-75-7	-	-	-	-	-	-	1.0	-	-	-	-	-	0.2	-	-	-
2,4-DB	94-82-6	-	-	-	-	-	-	1.0	-	-	-	-	-	0.8	-	-	-
4,4'-DDD	72-54-8	39310	0.10	3.3	0.012	2.8	-	-	0.011	2.8	-	-	0.0025	-	-	-	-
4,4'-DDE	72-55-9	39320	0.10	3.3	0.004	5.6	-	-	0.004	5.6	-	-	0.01	-	-	-	-
4,4'-DDT	50-29-3	39300	0.10	3.3	0.012	4.7	-	-	0.012	4.7	-	-	0.06	-	-	-	-
Dalapon	75-99-0	-	-	-	-	-	-	1.0	-	-	-	-	-	1.3	-	-	-
Demeton	8065-48-3	-	-	-	-	-	0.25	-	-	-	-	-	-	-	-	-	-
Diazinon	333-41-5	-	-	-	-	-	0.6	-	-	-	-	0.25	-	-	-	-	-
Dicamba	1918-00-9	-	-	-	-	-	-	1.0	-	-	-	-	-	0.081	-	-	-
3,5-Dichlorobenzoic Acid	51-36-5	-	-	-	-	-		-	-	-	-	-	-	0.061	-	-	-
2,3-Dichlorobiphenyl	16605-91-7	-	-	-	-	-	-	-	-	-	-	-	-	-	0.2	0.1	-
Dichlorprop	120-36-5	-	-	-	-	-	-	1.0	-	-	-	-	-	0.26	-	-	-
Dichlorvos	62-73-7	-	-	-	-	-	0.1	-	-	-	-	2.5	-	-	-	-	-
Dieldrin	60-57-1	39380	0.10	3.3	0.002	2.5	-	-	0.002	2.5	0.012	-	0.02	-	-	-	-
Dinoseb	88-85-7	-	-	-	-	-	-	0.1	-	-	-	-	-	0.19	-	-	-
Diphenamid	957-51-7	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-
Disulfoton	298-04-4	-	-	-	-	-	0.20	-	-	-	-	0.3	-	-	-	-	-
Disulfoton sulfone	2497-06-5	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	-
Disulfoton sulfoxide	2497-07-6	-	-	-	-	-	-	-	-	-	-	0.38	-	-	-	-	-
Endosulfan I	959-98-8	34361	0.05	1.7	0.014	nd	-	-	0.014	nd	-	-	0.015	-	-	-	-
Endosulfan II	33213-65-9	34356	0.10	3.3	0.004	nd	-	-	0.004	nd	-	-	0.024	-	-	-	-
Endosulfan sulfate	1031-07-8	34351	0.10	3.3	0.066	5.6	-	-	0.066	5.6	-	-	0.015	-	-	-	-
Endrin	72-20-8	39390	0.10	3.3	0.006	nd	-	-	0.006	nd	0.063	-	0.015	-	1.0	0.5	-
Endrin aldehyde	7421-93-4	34366	0.10	3.3	0.023	nd	-	-	0.023	nd	-	-	0.025	-	-	-	-
Endrin ketone	53494-70-5	-	0.10	3.3	-	-	-	-	-	-	-	-	-	-	-	-	-
EPTC	759-94-4	-	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	-

Table 24 (CON'T)

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP CRDL [b] ug/Kg	8080 ug/L	8250 ug/L	8140 ug/L	8150 ug/L	608 ug/L	625 ug/L	505 ug/L	507 [a] ug/L	508 [a] & 508A ug/L	515.1 [a] ug/L	525 MAGNETIC ug/L	525 ION ug/L	531.1 [a] ug/L
thoprop	13194-48-4	-	-	-	-	-	0.25	-	-	-	-	0.19	-	-	-	-	-
tridiazole	2593-15-9	-	-	-	-	-	-	-	-	-	-	-	0.025	-	-	-	-
enamiphos	22224-92-6	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
enarimol	60168-88-9	-	-	-	-	-	-	-	-	-	-	0.38	-	-	-	-	-
ensulfothion	115-90-2	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-
enthion	55-38-9	-	-	-	-	-	0.10	-	-	-	-	-	-	-	-	-	-
luridone	59756-60-4	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	-
Heptachlor	76-44-8	39410	0.05	1.7	0.004	1.9	-	-	0.003	1.9	0.003	-	0.01	-	0.2	0.04	-
Heptachlor epoxide	1024-57-3	39420	0.05	1.7	0.083	2.2	-	-	0.083	2.2	0.004	-	0.015	-	0.3	0.2	-
2,2',3,3',4,4',6-Heptachlorobiphenyl	52663-71-5	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04	0.1	-
Hexachlorobenzene	118-74-1	-	-	-	-	-	-	-	-	-	0.002	-	0.0077	-	0.2	0.1	-
2,2',4,4',5,6'-Hexachlorobiphenyl	60145-22-4	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	-
Hexachlorocyclopentadiene	77-74-4	-	-	-	-	-	-	-	-	-	0.13	-	-	-	0.1	0.03	-
Hexazinone	51235-04-2	-	-	-	-	-	-	-	-	-	-	0.76	-	-	-	-	-
3-Hydroxycarbofuran	16655-82-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
5-Hydroxydicamba	7600-50-2	-	-	-	-	-	-	-	-	-	-	-	-	0.04	-	-	-
MCPA	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-
MCPP	-	-	-	-	-	-	-	200	-	-	-	-	-	-	-	-	-
Merphos	150-50-5	-	-	-	-	-	0.25	-	-	-	-	0.25	-	-	-	-	-
Methiocarb	2032-65-7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0
Methomyl	16752-77-5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.5
Methoxychlor	72-43-5	-	0.5	17.0	0.176	-	-	-	-	-	0.96	-	0.05	-	0.3	0.04	-
Methyl paraoxon	950-35-6	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-
Metolachlor	51218-45-2	-	-	-	-	-	-	-	-	-	-	0.75	-	-	-	-	-
Metribuzin	21087-64-9	-	-	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-
Mevinphos	7786-34-7	-	-	-	-	-	0.3	-	-	-	-	5.0	-	-	-	-	-
MGK 264	113-48-4	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-
Molinate	2212-67-1	-	-	-	-	-	-	-	-	-	-	0.15	-	-	-	-	-
Naled	300-76-5	-	-	-	-	-	0.1	-	-	-	-	-	-	-	-	-	-
Napropamide	15299-99-7	-	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	-
4-Nitrophenol	100-02-7	-	-	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-
Cis-Nonachlor	-	-	-	-	-	-	-	-	-	-	0.027	-	-	-	-	-	-
Trans-Nonachlor	39765-80-5	-	-	-	-	-	-	-	-	-	0.011	-	-	-	0.1	0.3	-

Table 24 (CON'T)

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP CRDL [b] ug/Kg	8080 ug/L	8250 ug/L	8140 ug/L	8150 ug/L	608 ug/L	625 ug/L	505 ug/L	507 [a] ug/L	508 [a] & 508A ug/L	515.1 [a] ug/L	525 MAGNETIC ug/L	525 ION ug/L	531.1 [a] ug/L
Norflurazon	27314-13-2	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	40186-71-8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.2	-
Oxamyl	23135-22-0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0
Parathion methyl	298-00-0	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-
Pebulate	1114-71-2	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-	-	-
2,2',3',4,6-Pentachlorobiphenyl	60233-25-2	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	-
Pentachlorophenol	87-86-5	-	-	-	-	-	-	-	-	-	-	-	-	0.076	3.0	0.3	-
Cis-Permethrin	52645-53-1	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-
Trans-Permethrin	52645-53-1	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-
Phorate	298-02-2	-	-	-	-	-	0.15	-	-	-	-	-	-	-	-	-	-
Picloram	1918-02-1	-	-	-	-	-	-	-	-	-	-	-	-	0.14	-	-	-
Prometon	1610-18-0	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-
Prometryn	7287-19-6	-	-	-	-	-	-	-	-	-	-	0.19	-	-	-	-	-
Pronamide	23950-58-5	-	-	-	-	-	-	-	-	-	-	0.76	-	-	-	-	-
Propachlor	1918-16-7	-	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-
Propazine	139-40-2	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-	-	-
Ronnel	-	-	-	-	-	-	0.3	-	-	-	-	-	-	-	-	-	-
Simazine	122-34-9	-	-	-	-	-	-	-	-	-	6.8	0.075	-	-	0.2	0.2	-
Simetryn	1014-70-6	-	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	-
Stifophos	-	-	-	-	-	-	5.0	-	-	-	-	-	-	-	-	-	-
Stirofos	22248-79-9	-	-	-	-	-	-	-	-	-	-	0.76	-	-	-	-	-
2,4,5-T	93-76-5	-	-	-	-	-	-	0.1	-	-	-	-	-	0.08	-	-	-
2,4,5-TP (Silvex)	93-72-1	-	-	-	-	-	-	0.1	-	-	-	-	-	0.075	-	-	-
Tebuthiuron	34014-18-1	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-
Terbacil	5902-51-2	-	-	-	-	-	-	-	-	-	-	4.5	-	-	-	-	-
Terbufos	13071-79-9	-	-	-	-	-	-	-	-	-	-	0.5	-	-	-	-	-
Terbutryn	886-50-0	-	-	-	-	-	-	-	-	-	-	0.25	-	-	-	-	-
2,2',4,4'-Tetrachlorobiphenyl	2437-79-8	-	-	-	-	-	-	-	-	-	-	-	-	-	0.1	0.1	-
Tokuthion (Prothiofos)	-	-	-	-	-	-	0.50	-	-	-	-	-	-	-	-	-	-
Toxaphene	8001-35-2	39400	5.0	170	nd	nd	-	-	0.24	nd	1.0	-	-	-	nd	nd	-
Triademefon	43121-43-3	-	-	-	-	-	-	-	-	-	-	0.65	-	-	-	-	-
2,4,5-Trichloro-biphenyl	15862-07-4	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	0.06	-
Trichloronate	327-98-0	-	-	-	-	-	0.15	-	-	-	-	-	-	-	-	-	-
Tricyclazole	41814-78-2	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
Trifluralin	1582-09-8	-	-	-	-	-	-	-	-	-	-	-	0.025	-	-	-	-
Vernolate	1929-77-7	-	-	-	-	-	-	-	-	-	-	0.13	-	-	-	-	-

Table 24 METHOD DETECTION LIMIT COMPARISONS, SEMI-VOLATILES

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP [a] CRDL [b,d] ug/Kg	8040 to 8120 FID ug/L	8040 to 8120 ECD ug/L	8250 GC/MS ug/L	8310 HPLC ug/L	604 to 612 ug/L	625 GC/MS ug/L	513 ug/L	525 MAGNETIC ug/L	525 ION ug/L
Acenaphthene	83-32-9	34205	10	330	-	-	1.9	1.8 UV	1.8 (10)	1.9	-	-	-
Acenaphthylene	208-96-8	34200	10	330	-	-	3.5	2.3 UV	2.3 (10)	3.5	-	0.1	0.1
Anthracene	120-12-7	34220	10	330	-	-	1.9	0.66 FL	0.66 (10)	1.9	-	0.1	0.04
Benzo(a)anthracene	56-55-3	34526	10	330	-	-	7.8	0.013 FL	0.013(10)	7.8	-	0.2	0.04
Benzo(b)fluoranthene	205-99-2	34230	10	330	-	-	4.8	0.018 FL	0.018(10)	4.8	-	0.3*	0.2*
Benzo(k)fluoranthene	207-08-9	34242	10	330	-	-	2.5	0.017 FL	0.017(10)	2.5	-	0.3*	0.2*
Benzo(a)pyrene	50-32-8	34247	10	330	-	-	2.5	0.023 FL	0.023(10)	2.5	-	0.1	0.04
Benzo(g,h,i)perylene	191-24-2	34521	10	330	-	-	4.1	0.076 FL	0.076(10)	4.1	-	0.1	0.1
Benzidine	92-87-5	39120	-	-	-	-	44	-	0.08 (5)	44	-	-	-
Bis(2-chloroethyl)ether	111-44-4	34273	10	330	-	-	5.7	-	0.3 (11)	5.7	-	-	-
Bis(2-chloroethoxy)methene	111-91-1	34278	10	330	-	-	5.3	-	0.5 (11)	5.3	-	-	-
Bis(2-chloroisopropyl)ether or 2,2'-oxybis(1-Chloropropene)	108-6-1	34283	10	330	-	-	5.7	-	0.8 (11)	5.7	-	-	-
Bis(2-ethylhexyl)adipate	103-23-1	-			-	-	-	-	-	-	-	0.5	0.6
Bis(2-ethylhexyl)phthalate	117-81-7	39100	10	330	20	2.0 (6)	2.5	-	2.0 (6)	2.5	-	0.8	0.6
4-Bromophenylphenylether	101-55-3	34636	10	330	-	-	1.9	-	2.3 (11)	1.9	-	-	-
Butylbenzylphthalate	85-68-7	34292	10	330	15	0.34 (6)	2.5	-	0.34 (6)	2.5	-	0.5	0.3
Carbazole	86-74-8	-	10	330	-	-	-	-	-	-	-	-	-
4-Chloroaniline	106-47-8	-	10	330	-	-	-	-	-	-	-	-	-
4-Chloro-3-methylphenol	59-50-7	34452	10	330	0.36	1.8 (4)	3.0	-	0.36 (4)	3.0	-	-	-
2-Chloronaphthalene	91-58-7	34581	10	330	-	0.94(12)	1.9	-	0.94 (12)	1.9	-	-	-
2-Chlorophenol	95-57-8	34586	10	330	0.31	0.58 (4)	3.3	-	0.31 (4)	3.3	-	-	-
4-Chlorophenylphenylether	7005-72-3	34641	10	330	-	-	4.2	-	3.9 (11)	4.2	-	-	-
Chrysene	218-01-9	34320	10	330	-	-	2.5	0.15 FL	0.15 (10)	2.5	-	0.3	0.04
Dibenzo(a,h)anthracene	53-70-3	34556	10	330	-	-	2.5	0.030 FL	0.030(10)	2.5	-	0.1	0.1
Dibenzofuran	132-64-9	81302	10	330	-	-	-	-	-	-	-	-	-
Di-n-butylphthalate	84-74-2	39110	10	330	14	0.36 (6)	2.5	-	0.36 (6)	2.5	-	4.0	0.3
1,3-Dichlorobenzene	541-73-1	34566	10	330	-	1.19(12)	1.9	-	1.19 (12)	1.9	-	-	-
1,4-Dichlorobenzene	106-46-7	34571	10	330	-	1.34(12)	4.4	-	1.34 (12)	4.4	-	-	-
1,2-Dichlorobenzene	95-50-1	34536	10	330	-	1.14(12)	1.9	-	1.14 (12)	1.9	-	-	-
3,3'-Dichlorobenzidine	91-94-1	34631	10	330	-	-	16.5	-	0.13 (5)	16.5	-	-	-
2,4-Dichlorophenol	120-83-2	34601	10	330	0.39	0.68 (4)	2.7	-	0.39 (4)	2.7	-	-	-
Diethylphthalate	84-66-2	34336	10	330	31	0.49 (6)	22	-	0.49 (6)	1.9	-	0.6	0.8
2,4-Dimethylphenol	105-67-9	34606	10	330	0.32	0.63 (4)	2.7	-	0.32 (4)	2.7	-	-	-
Dimethylphthalate	131-11-3	34341	10	330	19	0.29 (6)	1.6	-	0.29 (6)	1.6	-	0.3	0.04

* Benzo(b)fluoranthene and benzo(k)fluoranthene not separated. Detection limits measured together.

Table 24 (CON'T)

Revision Date: October 1990

COMPOUND	CAS #	STORET #	CLP CRDL [b] ug/L	CLP CRDL [b,d] ug/Kg	8040 to 8120 FID ug/L	8040 to 8120 ECD ug/L	8250 GC/MS ug/L	8310 HPLC ug/L	604 to 612 ug/L	625 GC/MS ug/L	513 ug/L	525 MAGNETIC ug/L	525 ION ug/L
2,4-Dinitrophenol	51-28-5	34616	50	1700	13	nd (4)	42	-	13 (4)	42	-	-	-
2,4-Dinitrotoluene	121-14-2	34611	10	330	nd	0.06 (9)	5.7	-	0.02 (9)	5.7	-	-	-
2,6-Dinitrotoluene	606-20-2	34626	10	330	nd	0.06 (9)	1.0	-	0.01 (9)	1.9	-	-	-
Di-n-octylphthalate	117-84-0	34596	10	330	31	3.0 (6)	2.5	-	3.0 (6)	2.5	-	-	-
Fluoranthene	206-44-0	34376	10	330	-	-	2.2	0.21 FL	0.21 (10)	2.2	-	-	-
Fluorene	86-73-7	34381	10	330	-	-	1.9	0.21 UV	0.21 (10)	1.9	-	0.1	0.2
Hexachlorobenzene	118-74-1	39700	10	330	-	0.05(12)	1.9	-	0.05 (12)	1.9	-	0.2	0.1
Hexachlorobutadiene	87-68-3	34391	10	330	-	0.34(12)	0.9	-	0.34 (12)	0.9	-	-	-
Hexachloroethane	67-72-1	34396	10	330	-	0.03(12)	1.6	-	0.03 (12)	1.6	-	-	-
Hexachlorocyclopentadiene	77-47-4	34386	10	330	-	nd (12)	nd	-	0.40 (12)	nd	-	0.1	0.03
Indeno(1,2,3-cd)pyrene	193-39-5	34403	10	330	-	-	3.7	0.043 FL	0.043(10)	3.7	-	0.02	0.1
Isophorone	78-59-1	34408	10	330	5	nd (9)	2.2	-	15.7/5.7(9+)	2.2	-	-	-
2-Methyl-4,6-dinitrophenol	534-52-1	34657	50	1700	16	nd (4)	24	-	16.0	24	-	-	-
2-Methylnaphthalene	91-57-6	-	10	330	-	-	-	-	-	-	-	-	-
2-Methylphenol	95-48-7	-	10	330	-	-	-	-	-	-	-	-	-
4-Methylphenol	106-44-5	-	10	330	-	-	-	-	-	-	-	-	-
Naphthalene	91-20-3	34696	10	330	-	-	1.6	1.8 UV	1.8 (10)	1.6	-	-	-
2-Nitroaniline	88-74-7	-	50	1700	-	-	-	-	-	-	-	-	-
3-Nitroaniline	99-09-2	-	50	1700	-	-	-	-	-	-	-	-	-
4-Nitroaniline	100-01-6	-	50	1700	-	-	-	-	-	-	-	-	-
Nitrobenzene	98-95-3	34447	10	330	5.0	nd (9)	1.9	-	3.7/3.6(9+)	1.9	-	-	-
2-Nitrophenol	88-75-5	34591	10	330	0.45	0.77 (4)	3.6	-	0.45 (4)	3.6	-	-	-
4-Nitrophenol	100-02-7	34646	50	1700	2.8	0.70 (4)	2.4	-	2.8 (4)	2.4	-	-	-
N-Nitrosodimethylamine	62-75-9	34438	-	-	-	-	nd	-	0.15 (7)	nd	-	-	-
N-Nitrosodi-n-propylamine	621-64-7	34428	10	330	-	-	nd	-	0.46 (7)	nd	-	-	-
N-Nitrosodiphenylamine	86-30-6	34433	10	330	-	-	1.9	-	0.81 (7)	1.9	-	-	-
Pentachlorophenol	87-86-5	39032	50	1700	7.4	0.59 (4)	3.6	-	7.4 (4)	3.6	-	3.0	0.3
Phenanthrene	85-01-8	34461	10	330	-	-	5.4	0.64 FL	0.64 (10)	5.4	-	0.2	0.01
Phenol	108-95-2	34694	10	330	0.14	2.2 (4)	1.5	-	0.14 (4)	1.5	-	-	-
Pyrene	129-00-0	34469	10	330	-	-	1.9	0.27 FL	0.27 (10)	1.9	-	0.1	0.02
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	34675	-	-	-	-	-	-	0.002(13)	-	0.002	-	-
1,2,4-Trichlorobenzene	120-82-1	34551	10	330	-	0.05(12)	1.9	-	0.05 (12)	1.9	-	-	-
2,4,5-Trichlorophenol	95-95-4	-	50	1700	nd	nd	-	-	-	-	-	-	-
2,4,6-Trichlorophenol	88-06-2	34621	10	330	0.64	0.58 (4)	2.7	-	0.64 (4)	2.7	-	-	-

+ Two different detectors are used, FID and ECD.

FOOTNOTES (CONT.)

600 SERIES: 40 CFR Part 136 Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act. Consists of 2 HPLC methods (605 & 610), 10 GC methods and 3 GC/MS methods (613, 624 & 625).

- 601 Purgeable Halocarbons
- 602 Purgeable Aromatics
- 603 Acrolein & Acrylonitrile
- 604 Phenols
- 605 Benzidines
- 606 Phthalate Esters
- 607 Nitrosamines
- 608 Organochlorine Pesticides & PCBs
- 609 Nitroaromatics and Isophorone
- 610 Polynuclear Aromatic Hydrocarbons
- 611 Haloethers
- 612 Chlorinated Hydrocarbons
- 613 2,3,7,8-Tetrachlorodibenzo-p-dioxin
- 624 Purgeables GC/MS
- 625 Base/Neutrals and Acids GC/MS

8000 SERIES or SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. To determine whether solid waste is Hazardous Wastes as defined by Resource Conservation & Recovery Act (RCRA).

- 8010 Halogenated Volatile Organics
- 8020 Aromatic Volatile Organics
- 8030 Acrolein, Acrylonitrile and Acetonitrile
- 8040 Phenols
- 8060 Phthalate Esters
- 8080 Organochlorine Pesticides & PCBs
- 8090 Nitroaromatics and Isophorone
- 8120 Chlorinated Hydrocarbons
- 8140 Organophosphorus Pesticides
- 8150 Chlorinated Herbicides
- 8240 GC/MS Method for Volatile Organics
- 8250 Base/Neutral extractables by GC/MS
- 8310 Polynuclear Aromatic Hydrocarbons (PAH) by HPLC; (UV = 254 nm, FL = ex:280 nm, em:380 nm)

FOOTNOTES

nd - not determined

(#) - number in parenthesis indicates the method used in the series

CLP/CRDL - Contract Laboratory Program/ Contract Required Detection Limits (SOW 3/90)

a - Detection limits listed for soil/sediment are based on wet weight. The detection limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the contract, will be higher.

b - The values in these tables are quantitation limits, not absolute detection limits. The amount of material necessary to produce a detector response that can be identified and reliably quantified is greater than that needed to simply be detected above the background noise. The quantitation limits in these tables are set at the concentrations in the sample equivalent to the concentration of the lowest calibration standard analyzed for each analyte. Specific detection limits are highly matrix dependent. The detection limits listed herein are provided for guidance and may not always be achievable. There is no differentiation between the preparation of low and medium soil samples in this method for the analysis for Pesticides/Aroclors.

c - Low Detection Limits for Volatile HSL Compounds in soil/sediment. For compounds with a low detection limit of 10 ug/Kg, the medium detection limit is 1200 ug/Kg.

d - Low Detection Limits for Semi-Volatile HSL Compounds in soil/sediment. For compounds with a low detection limit of 330 ug/Kg, the medium detection limit is 10000 ug/Kg. For compounds with a low detection limit of 1700 ug/Kg, the medium detection limit is 50000 ug/Kg.

e - Estimated Detection Limit; defined as either MDL (Appendix B to 40 CFR Part 136 - Definition and Procedure for the Determination of the Method Detection Limit - Revision 1.11) or a level of compound in a sample yielding a peak in the final extract with signal-to-noise ratio of approximately 5, whichever value is higher. The concentration level used in determining the EDL is not the same as the concentration level presented in this table.

500 SERIES: Methods for the determination of Organic Compounds in finished Drinking Water and Raw Source Water

- 501.3 Measurement of Trihalomethanes in Drinking Water with Gas Chromatograph/Mass Spectrometry and Selected Ion Monitoring
- 502.1 Volatile Halogenated Organic Compounds in Water by Purge and Trap Gas Chromatograph, packed column
- 502.2 Volatile Organic Compounds in Water by Purge and Trap Capillary Gas Chromatograph with Photoionization (PID) and Electrolytic Conductivity (HECD) Detectors in Series, capillary column
- 503.1 Volatile Aromatics and Unsaturated Organic Compounds in Water by Purge and Trap Gas Chromatograph
- 504 Measurement of 1,2-Dibromoethane (EDB) and 1,2-Dibromo-3-chloropropane (DBCP) in Drinking Water by Microextraction and GC
- 505 Analysis of Organohalide Pesticides and Commercial Polychlorinated Biphenyl (PCB) Products in Water by Microextraction and Gas Chromatography
- 507 Determination of Nitrogen- and Phosphorus-Containing Pesticides in Water by Gas Chromatography with a Nitrogen-Phosphorus Detector
- 508 Determination of Chlorinated Pesticides in Water by Gas Chromatography with an Electron Capture Detector
- 508A Screening for Polychlorinated Biphenyls by Perchlorination and Gas Chromatography
- 513 2,3,7,8-Tetrachlorodibenzo-p-Dioxin
- 515.1 Determination of Chlorinated Acids in Water by Gas Chromatography with an Electron Capture Detector
- 524.1 Volatile Organic Compounds in Water by Purge and Trap Gas Chromatography/Mass Spectrometry, packed column
- 524.2 Volatile Organic Compounds in Water by Purge and Trap Capillary Column Gas Chromatography/Mass Spectrometry, capillary column - wide bore and narrow bore
- 525 Determination of Organic Compounds in Drinking Water by Liquid-Solid Extraction and Capillary Column Gas Chromatography/Mass Spectrometry - magnetic, ion trap, and quadrupole
- 531.1 Measurement of N-Methylcarbamoyloximes and N-Methylcarbamates in Water by Direct Aqueous Injection HPLC with Post Column Derivatization

samples taken for determination of background concentration, the detection limit for the method of analysis utilized with the respect to that contaminant shall constitute the "background" concentration of the contaminant. The appropriate detection methods for chemicals of concern (as specified in Table 6) would be the 600 Series and the detection limits that should be used are specified in the "Region III, Method Detection Limit Comparison of October 1990" and included as Table 24. Although the operable unit is not necessarily intended to meet background cleanup levels, EPA will seek to comply with these levels to the maximum extent possible to make progress toward the final remedy. If EPA determines that implementation of the selected remedy demonstrates, in corroboration with hydrogeological and chemical evidence, that it will be technically impractical to achieve and maintain the remediation levels throughout the area of attainment, the EPA, in consultation with the PADER, will amend the ROD or issue an Explanation of Significant Differences to inform the public of alternative remediation levels.

The discharge levels for contaminants in the treated ground water effluent will be determined by EPA in consultation with PADER as part of remedial design in accordance with the substantive requirements of Pennsylvania's NPDES program.

10. Statutory Determinations

The Superfund process requires that the alternatives chosen to clean up a hazardous waste site meet several criteria. The alternative must protect human health and the environment, be cost-effective, and meet the requirements of all state and federal laws and regulations. Permanent solutions to contamination problems should be developed, whenever possible. These solutions should reduce the volume, toxicity, or mobility of the contaminants. Emphasis is also placed on treating the wastes at the site, whenever this is possible, and on applying innovative technologies to clean up the contaminants.

Protection of Human Health and the Environment

The selected interim remedy, alternative GW-4, will provide adequate protection of human health and the environment through the collection of contaminated ground water, its treatment and release into the surface waters, and the collection of existing free product through extraction wells. In addition, well monitoring will be continuous to monitor progress. At the present time, with contaminated ground water feeding Naylors Run, an additional cancer risk of 1.0×10^{-4} exists to children playing in Naylors Run, which is marginally unacceptable. It is believed that this action alone will reduce this risk and when combined with future planned remedial actions during operable unit 3, will reduce the risk to a level between 10^{-4} and 10^{-6},

which is in the acceptable range. The Hazard Index for this scenario is already less than one and this action will further reduce this risk. This action alone will also reduce any carcinogenic and non-carcinogenic risks to individuals who are consuming fish caught in Cobbs Creek. It also may remediate the ground water contamination to a point where, in the future, it may be used as a drinking source.

Implementation of the selected remedy will not pose unacceptable short term risks or cross media impacts.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

This ROD and its associated remedial action is considered to be an interim action. This action is not meant to achieve groundwater cleanup ARARs, which will be evaluated in connection with the final remedy for the site. The remedy selected will however, comply with ARARs directly associated with this limited scope action. This interim action is in furtherance of, and not inconsistent with, the planned final remedy which will finally evaluate, among other things, the clean up of ground water. When the final ROD for ground water is issued, ground water ARARs will have to be met or waived. However, this ROD will identify the ARARs, and all remedial actions taken will seek to comply with ARARs to the maximum extent possible or to make progress toward meeting all ARARs so that the final remedy can more easily and fully comply with ARARs.

The known ARARs for chemicals of concern are as follows:

Air Emissions

The National Emissions Standards for Hazardous Air Pollutants set forth in 40 C.F.R. §61.64(b) and promulgated under the Clean Air Act, 42 U.S.C. Section 7401.

PA Air Pollution Control Act and Air Discharge Regulations, 25 PA Code, Sections 123.1, 123.2, and 127.12(a)(5)

Waste Management

Standards Applicable to Generators of Hazardous Waste (40 C.F.R. Part 262)

Standards Applicable to Transporters of Hazardous Waste (49 C.F.R. §171.1-171.16)

Regulations and Standards for owners and operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 C.F.R. Part 264)

Land Disposal Restrictions (LDR) Requirements (40 C.F.R. §268.1-268.50)

Dioxin Containing Waste (50 Fed. Reg. 1978)

PA Hazardous Management Regulations (25 PA Code Subchapter D, Sections 260.2 through 260.22, 261.1 through 261.34, 262.10 through 262.60, and 263.10 through 263.32 relating to the identification and determination of hazardous waste, generator and transporter rules and regulations.

Occupation Safety and Health Act (OSHA)

OSHA, 29 C.F.R. §1910.170

Surface Water

Clean Water Act, NPDES discharge regulations (40 C.F.R. §§122-124)

PA Clean Streams Law (PA Code Title 25, Chapter 5)

PA NPDES Regulations (PA Code Title 25, Chapter 93.1 through 93.9 and 16, 92, 95, and 101)

Ground Water

PA Hazardous Waste Management Regulations (25 PA Code Section 264.90 through 264.100)

The Source Removal, Containment, Collection, Treatment, and Disposal Alternative (GW-4) would provide extensive collection and treatment of ground water through an underground collection drain and through a 3 step treatment process. It is believed that this alternative would be in compliance with the air emission and OSHA ARARs. The air emissions standards would be ARARs for any possible volatilization of contaminants during monitoring or construction or any off-gas venting from the treatment plant. The OSHA standards would be ARARs for work done during construction.

Although the disposal of generated wastes may present problems in meeting waste management ARARs, it is expected that all waste management ARARS can be met for any wastes that were generated by construction of the treatment plant, any soil excavation, or residuals from the treatment process such as oils and carbon. This waste could alter disposal plans, depending on the level of dioxin in the wastes. If there are levels of dioxin less than 1 PPB, then the wastes could be disposed of at a RCRA Subtitle C facility. If the dioxin levels in the soils exceed 1 PPB, then

the wastes would not be considered K001 wastes (wastes from a wood treatment site). As a result, the waste would have to be incinerated off site, if possible, or stored on site until another disposal method was arranged. However, it is anticipated that the proposed treatment plant process (AOP or PACT) will destroy dioxins to below the 1 PPB level. Additionally, if a WAO system is installed as part of the PACT system, on site destruction of organic wastes, including dioxin, could be provided. Installation of the WAO may be necessary in order to meet this ARAR.

While this is an interim ROD for ground water, the air emissions, waste management and OSHA standards are ARARs for this interim action and will be met by this alternative. Surface water standards are ARARs for the treated ground water, discharged into Naylors Run, and such surface water ARARs would be met to the maximum extent possible, as the treatment being utilized is the best available technology. As noted above, ground water cleanup levels are not intended to be finally addressed in this remedial action, and, therefore, ground water cleanup levels are not ARARs for this action. (To the extent that ground water cleanup levels were to apply to this action, which EPA does not believe, such ARARs would be waived on the basis that this interim action is only a part of a total remedial action for the site that will attain such ARARs when completed or such ARARs would be waived under the other waiver criteria, pursuant to CERCLA Section 121 (d)(4)(A).

Cost-Effectiveness

The selected remedy affords overall effectiveness proportionate to its costs. Additionally, there were no other alternatives which provided the same degree of remediation which were more cost effective.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

The selected remedy utilizes permanent solutions to the maximum extent practicable. This interim action is not designed nor expected to be final but the selected remedy represents the best balance of tradeoffs among alternatives with respect to pertinent criteria, given the limited scope of work. EPA expects to use permanent treatment that will provide, when implemented, immediate capture and treatment of the contaminants and will be effective in the both the short and long term. This treatment will reduce toxicity, mobility and volume of the contaminants and is implementable. Although the solution may be temporarily disruptive to the community during construction, it will achieve the permanent capture and treatment of contaminants in the

shallow ground water aquifer, which have been a concern to the community for over 30 years. Both the Commonwealth of Pennsylvania and the Havertown Community at large have been supportive of the selected remedy.

Preference for Treatment as a Principal Element

The principal threat addressed by this ROD is the ground water contamination, which originated at the NWP facility, and has slowly migrated to the southeast in the shallow aquifer and also lays directly under the NWP facility. Very significant concentrations of PCP and other chemicals of concern remain in the ground water. Natural flushing and attenuation of the contamination has been ineffective in removing the contaminants to low residual levels. As such, the installation of a treatment plant with an associated collection drain is the principal element of this remedy needed to remediate the principal threat. Additional discussion of the preference for treatment will be addressed in the final decision document for the site.