Final Decision

RESOURCE CONSERVATION AND RECOVERY ACT
RECORD OF DECISION

FACILITY NAME AND LOCATION

Bristol Landfill

12-31-1991

Rohm and Haas Delaware Valley Inc. Bristol Landfill
Bristol, PA

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected Corrective Measure for the Rohm and Haas Delaware Valley Inc. in Bristol, Pennsylvania Landfill (Landfill). This decision is based on the Administrative Record file for this facility.

DESCRIPTION OF THE CORRECTIVE MEASURE

As a result of a Resource Conservation and Recovery Act (RCRA) 3008(h) Consent Order which EPA entered into with Rohm and Haas Delaware Valley Inc. (Rohm and Haas) in February 1989, EPA has selected corrective measures to be implemented for the Landfill. The Landfill consists of the three Areas A, B, and C. Portions of Area A are located on properties previously sold by Rohm and Haas to Chemical Properties, Inc. and given to the Bristol Township Authority. The main purpose of the remedies is to eliminate the transport of contamination through groundwater from Areas A and B, and to prevent direct contact threats for all three Areas. The remedies which EPA is proposing are described below:

At the Bristol Township Authority portion of Landfill Area A, EPA has selected that the wastes which remain in the subsurface be moved and consolidated into the portion of Area A owned by Rohm and Haas.

For the remaining portion of Landfill Area A including the property owned by Chemical Properties, Inc., EPA has selected installation of a RCRA cap and a cut-off wall. The cut-off wall will be constructed around the entire area and grouted into the bedrock. A trench to divert groundwater around the containment structure and groundwater management to contain waste within the structure are also included in the selected remedy. In addition, EPA has selected that enhanced remediation be performed for the Southeast Area of the encapsulated portion of Area A to reduce the high contamination of groundwater in that location.

EPA has selected that an identical corrective measure be implemented for Area B. The corrective measure for Area B includes a RCRA cap, a cut-off wall and groundwater management. For Area C, where the threat to groundwater is not a concern, EPA has selected to have the area covered with a soil cap to protect trespassers, workers and animals from direct contact with the waste. If Landfill Area C remains below the 100-year flood elevation after placement of the soil cap, a flood wall will also be placed around Area C to protect the cap from adverse impacts due to flooding.

DECLARATION

The selected Corrective Measures are necessary to protect human health or the environment from releases of hazardous waste within the meaning of Section 3008(h) of RCRA, 42 U.S.C. Section 6928 (h), from the Rohm and Haas Delaware Valley Inc. Bristol Landfill to the environment. The selected Corrective Measures will attain soil and groundwater cleanup standards, will reduce or eliminate to the maximum extent possible further releases of hazardous waste, and provide for the proper management of wastes generated during implementation of the Corrective Measures. Furthermore, the selected Corrective Measures will be effective and reliable, both in the long term and the short term; will result in the reduction of toxicity, mobility and volume of hazardous waste; and will be implementable and cost effective in comparison to the other corrective measure alternatives presented in the EPA approved Corrective Measures Study for the Landfill. Finally, the selected Corrective Measures utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

Edwin B. Erickson

EDWIN B. ERICKSON
REGIONAL ADMINISTRATOR
U.S. EPA, REGION III

DEC 31 1991

DATE

Rohm and Haas Landfill
Bristol, Pennsylvania

Purpose of EPA's Record of Decision

In February, 1989 EPA and Rohm and Haas Delaware Valley Inc. (Rohm and Haas) entered into a Consent Order pursuant to Section 3008(h) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §6928(h). Under the terms of this Consent Order, Rohm and Haas was required to complete further investigation of the nature and extent of the release(s) of hazardous wastes from its facility in Bristol, Pennsylvania (Facility) and to conduct a study to evaluate various cleanup alternatives. Rohm and Haas completed these investigations for the Rohm and Haas Delaware Valley Inc. Bristol Landfill (Landfill) located at the Facility and submitted to EPA for approval a Corrective Measures Study (CMS) which evaluates several Corrective Measure Alternatives (CMAs) for remediation of the releases.

This RCRA ROD provides EPA's rationale for the selection of the CMAs as the Corrective Measures to be implemented for the Landfill. The CMAs address onsite and offsite groundwater contamination as well as onsite source control. A more detailed description of EPA's decision process regarding these selections can be found in the attached Statement of Basis. The major components of the CMAs are:

- At the Bristol Township Authority (BTA) portion of Landfill Area A, EPA has selected the corrective measure alternative requirng that the wastes which remain in the subsurface be removed and consolidated into the portion of Landfill Area A owned by the Rohm and Haas Company.

  For the remaining portion of Landfill Area A, including the property owned by Chemical Properties, Inc., EPA has selected the alternative requiring that the area be enclosed with a RCRA cap and a containment structure. The containment structure will be constructed around Landfill Area A not including the BTA portion of Landfill Area A and grouted into the bedrock. A diversion trench to divert groundwater around the containment structure and groundwater management to contain waste within the structure is also included in the selected remedy. In addition, EPA is requiring that enhanced remediation be performed for the Southeast Area of Area A to reduce the high level of groundwater contamination in that location.

  EPA has selected the alternative requiring that an identical corrective measure be implemented for Area B. The corrective measure selected for Area B includes a RCRA cap, a containment structure and groundwater management.

For Area C, where the threat to groundwater is not a concern, EPA has selected the alternative requiring that the area be covered with a soil cap to protect trespassers, workers and animals from direct contact with the waste. If Area C remains below the 100-year flood plain after placement of the soil cap, a flood wall will be placed in Area C to protect the cap from adverse impacts due to flooding.

EPA made a preliminary identification of these four CMAs as the preferred Corrective Measures in the Statement of Basis (SB). A public notice soliciting public comment regarding EPA's preliminary identification of these CMAs was issued August 26, 1991, in which the SB, CMS and other relevant documents were made available for public review. By the close of the 30 day comment period, EPA received numerous public comments. A public meeting was also held on September 19, 1991. A summary of the public comments received by EPA and EPA's responses, including those from the public meeting, can be found in the Response to Comments (RTC) Section of this Document.

The purpose of the public comment period and the public meeting was to provide an opportunity for any interested citizens to submit their questions and/or comments regarding the Corrective Measures Alternatives to EPA.

The Regional Administrator, EPA Region III, has made a final determination selecting the above described Corrective Measures to be implemented for the Rohm and Haas Landfill.

FACILITY BACKGROUND

The Facility is an active manufacturing plant located adjacent to the Delaware River in Bucks County, Pennsylvania. The Facility, which has been in operation since 1917, has produced a variety of compounds including hydrosulfites, plexiglas, acrylate and methacrylate compounds, detergents and additives for hydraulic fluids and various pesticides. Plastics and emulsions are currently manufactured at the Facility. This Record of Decision addresses the Landfill which was used by the Facility from approximately 1952 through 1975. The Landfill, depicted in Figure 1, is comprised of three landfill areas: Landfill Area A, Landfill Area B, and Landfill Area C. Hog Run Creek flows between Landfill Area A and Landfill Areas B and C. Portions of Landfill Area A are located at the Facility and on property currently owned by BTA and Chemical Properties, Inc.

SITE HISTORY

In 1980, groundwater and surface water samples taken in the vicinity of the Landfill indicated the presence of several

Rohm and Haas Bristol Landfill

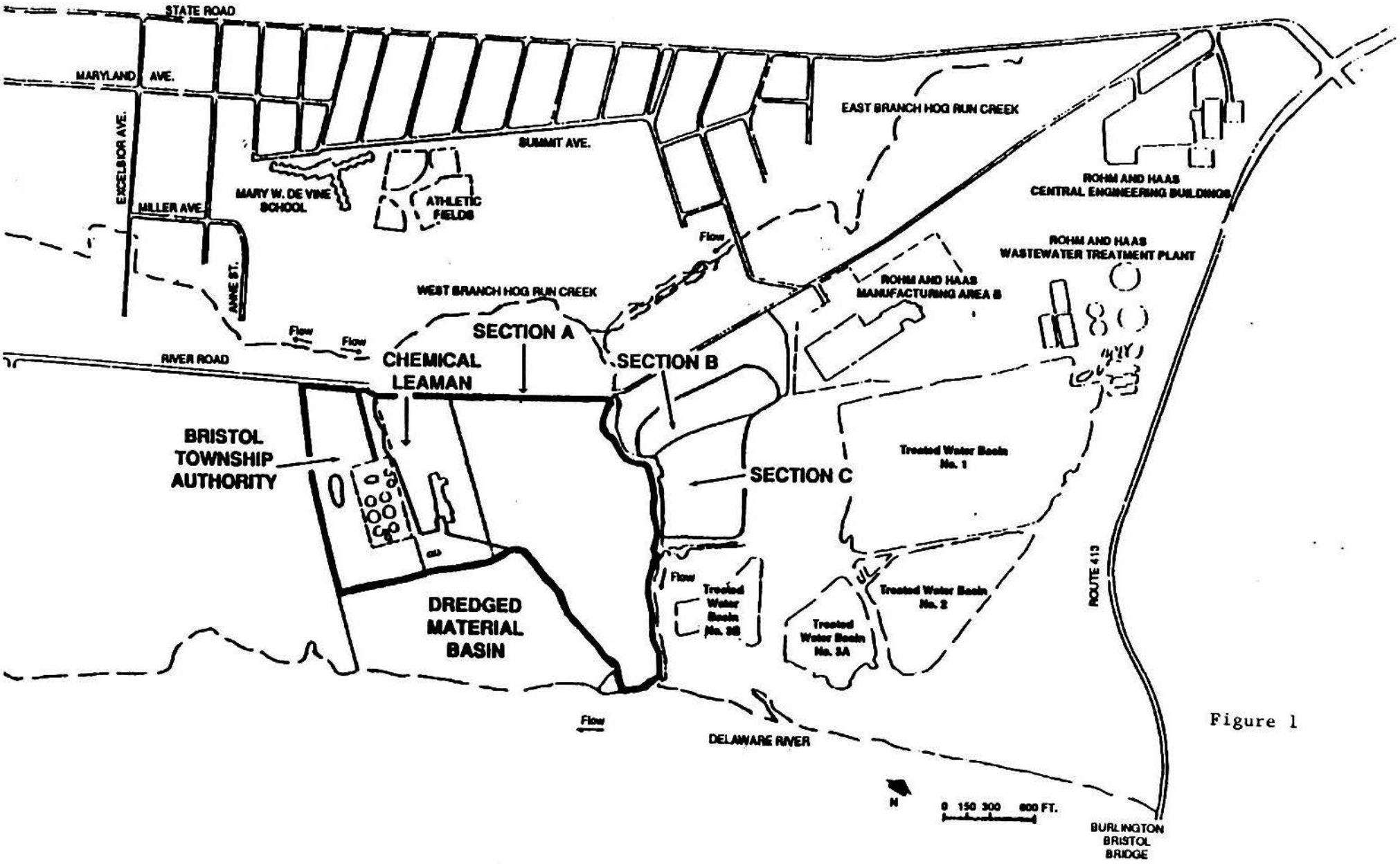

Figure 1

volatile and base neutral organic hazardous wastes and/or hazardous constituents. In April 1984, Rohm and Haas submitted its first report on investigation of the Landfill to EPA. The report revealed contamination of the groundwater, surface water, and soil within the Landfill.

In 1985, EPA proposed the Landfill for inclusion on the Superfund National Priorities List (NPL).

At that time, facilities placed on the NPL were to be addressed pursuant to EPA's authorities under the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended, (CERCLA, otherwise known as Superfund), 42 U.S.C. §§ 9601 et seq. However, in 1984, the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§ 6901 et seq., was amended to allow EPA to address contamination at certain hazardous waste facilities using RCRA authorities. Additionally, on June 24, 1988, EPA finalized the RCRA/NPL Listing Policy, which further defined EPA's ability to address NPL sites under RCRA. Such sites may be addressed under RCRA if the facility where the site is located is subject to Interim Status[1] requirements to operate a hazardous waste facility under RCRA. As a result of these revisions to the RCRA statute and policy, Rohm and Haas requested that the investigation of contamination and study of corrective measure alternatives be addressed using RCRA authorities.

On February 6, 1989, EPA and Rohm and Haas entered into a Consent Order pursuant to Section 3008 (h) of RCRA, 42 U.S.C. § 6928 (h). Under the terms of this Consent Order ("Order"), Rohm and Haas was required to complete an investigation on the nature and extent of contamination and on various cleanup alternatives for the Landfill, as well as for the Facility. As a result of the transfer of the investigation and remediation of the Landfill to the RCRA program, EPA deleted the Landfill from the proposed NPL under the CERCLA program in August, 1989.

For the purposes of facilitating an investigation of the entire Facility under the Order, the 800 acre property has been divided into five study areas identified as the Landfill, the Trailer Staging Area, the Ammonium Sulfate Area, the Manufacturing Area, and the Wastewater Treatment Plant. Rohm and Haas has completed investigations for the Landfill and has submitted to EPA for approval a Corrective Measure Study (CMS) which evaluates Corrective Measure Alternatives (CMAs) for contaminant remediation for the Landfill.

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[1] Facilities which submitted or should have submitted a "Notification of Hazardous Waste Activity" and "Part A" of the application for operating a hazardous waste treatment, storage or disposal facility in 1980 are subject to Interim Status requirements under RCRA.

The Landfill occupies approximately 60 acres. Landfill Area A is approximately 38 acres in size and contains most of the refuse and process wastes generated by the Rohm and Haas Bristol and Croyden chemical manufacturing plants from 1952 to 1975 and some wastes from the Philadelphia chemical manufacturing plant.

Some refuse from the Bristol Township community and sewage from the Levittown Sewage Treatment Plant and the BTA Sewage Treatment Plant is also contained in Landfill Area A. Waste was buried in Landfill Area A in trenches or in layers. Drums and other containers were crushed at the time of disposal. Currently, the BTA and Chemical Properties, Inc. own portions of the land where Landfill Area A is located. Rohm and Haas waste materials were deposited at the current location of the BTA portion of Landfill Area A from approximately 1952 to 1963. The waste materials placed on the BTA portion of Landfill Area A were oil additives filter cake, trickling filter sludge, and enzyme filter cake. In 1986 and 1987, approximately 11,700 cubic yards of waste and soil from the BTA portion of Landfill Area A were moved within Landfill Area A to the Rohm and Haas Company portion of Landfill Area A. The consolidation of waste onto the Rohm and Haas Company property was completed to accommodate a planned expansion of the BTA sewage treatment plant on the BTA property.

Disposal records indicate that waste materials were placed in Landfill Areas B and C from approximately 1965 through 1975. Landfill Area B is approximately 11 acres in size and contains drummed and bulk emulsion wastes and drummed solution polymer wastes and still bottoms. An estimated 20,000 drums containing waste materials were placed uncrushed into Landfill Area B. These wastes were disposed of in trenches in approximately 4.5 acres of Landfill Area B. Landfill Area C is approximately 8 acres in size. Liquid "white water" from the Rohm and Haas wastewater treatment plant was placed in two shallow (1 foot) containment areas for evaporation and settling in Landfill Area C. In addition, coagulated sludge material from the Rohm and Haas wastewater treatment plant sand beds was placed in Landfill Area C along with some miscellaneous manufacturing debris. Waste material is present on the soil surface within Landfill Area C.

The objective of the corrective measures selected is to protect human health and the environment as noted in Section 3008(h) of RCRA. As a result of the conditions at the Landfill and existing exposure pathways, the following requirements were identified to meet the objective of protecting human health and the environment: further release of any hazardous waste and hazardous constituent which exceeds current MCLs will be controlled; harmful impacts on drinking water, the Delaware River, or fish attributable to the Landfill will be eliminated; persons walking on the Landfill perimeter will breathe air meeting the current Philadelphia Department of Public Health, Air Management Service air quality guidelines; direct contact

exposure to wastes in the Landfill will be eliminated; and ammonia levels in Hog Run Creek will be controlled and/or eliminated such that applicable EPA Ambient Water Quality Criteria as developed under the Federal Clean Water Act and listed at 54 FR 19227 and Pennsylvania Department of Environmental Resources criteria developed under the Pennsylvania Clean Streams Law Title 25 Rules and Regulations for ammonia in tidal creeks are achieved.

The following Landfill conditions were identified as requiring response actions to meet the above stated objectives:

1. Discharge of contaminated groundwater as well as seepage to Hog Run Creek and the Delaware River from Landfill Areas A and B;

2. Discharge of contaminated groundwater west of the northwest section of the BTA portion of Landfill Area A;

3. Elevated groundwater contamination in the southeast area of Landfill Area A;

4. Infiltrating precipitation through the unsaturated fill/soil at Landfill Areas A and B and its resulting contribution to leachate generation;

5. Potential release of drummed waste materials from Landfill Area B into soil and groundwater; and

6. Surface soil contamination in Landfill Area C and subsurface soil contamination at the BTA property.

RISK ASSESSMENT OF INVESTIGATED AREAS

In Volume III of the "Bristol Landfill Remedial Investigation Addendum, March, 1988", analyses are presented to estimate the health and/or environmental problems which could result if the contamination at and resulting from the Landfill is not cleaned up. For fresh water aquatic life in the Delaware River, an environmental risk assessment indicated that at depth of six (6) feet in the River, calculated concentrations exceeded the acceptable concentration for five chemicals: bis(2-ethylhexyl)phthalate, manganese and compounds, inorganic mercury, cyclohexadiene, and tetraethyl diphosphoric acid. The calculated concentrations are based on maximum concentrations found in the groundwater entering the River during a period of low flow. The acceptable concentrations are based on the application of

uncertainty factors[2] to the lowest concentration found in literature searches to cause an adverse effect to freshwater aquatic life. The methodology which was used is based on the procedure developed by EPA's Office of Toxic Substances (OTS), Environmental Effects Branch, for estimating levels of concern for chemicals in the aquatic environment (USEPA 1984). Based on an evaluation of the available toxicity data for the five chemicals listed above, the calculated concentrations pose a potential chronic health effect[3] to aquatic life. Acute health effects (such as death of aquatic life) are not expected as a result of releases from the Landfill.

In conducting the public health risk assessment, the focus was on the health effects which could result from exposure through direct contact and ingestion of water from Hog Run Creek; direct contact, ingestion and inhalation of water from the Delaware River; and direct contact with surface soil. Separate calculations were made for those substances which can cause cancer and for those which can cause other health effects. Potential human receptors which were modeled in the assessment were dirt bike riders, outside contractors at the BTA portion of Landfill Area A, local residents who use the Delaware River as their domestic water supply, local fishermen who fish in the Delaware River and their families, and recreational swimmers who use the Delaware River. Other potential human receptors were not modeled in the assessment because their risks were judged to be less than or equal to risks calculated for the receptors listed above.

A worst-case analysis was determined to be an individual who spends 70 years of his/her life in the Bristol-Croyden area engaging in <u>all</u> of the assessed activities (i.e., dirt biking on the Bristol Landfill as a teenager and using the Delaware River as a source of fish, domestic water and recreation) and is exposed to contaminants believed to have been disposed of at the Landfill which could impact Hog Run Creek and the Delaware River.

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[2] A number (equal or greater than one) used to divide the values of the "no observable adverse effect level" (LOAEL) derived from measurements in animals or small groups of humans, in order to estimate a NOAEL value for the whole population. Uncertainty factors account for such considerations as variations in sensitivity within a species, the uncertainty in extrapolating data to other species, the uncertainty in extrapolating from data obtained in a study which is of less-than-lifetime exposure, and the uncertainty in using data where a NOAEL was not identified.

[3] Chronic health effects are adverse effects on a human or animal body with symptoms which develop slowly over a long period of time or which recur frequently. Chronic health effects do not include cancer, birth defects or death from toxicity.

Contaminants believed to have been disposed of at the Landfill were identified through analysis of contaminants in the groundwater at the Landfill, through records of what was disposed in the Landfill and through interviews of persons knowledgable about the material disposed in the Landfill. The probability for an individual to develop cancer from engaging in all of the above activities for a life span of 70 years was calculated to be three cases of cancer per one million people (a risk of 3×10^{-6} or 0.000003). EPA generally considers risks in the range of 1×10^{-4} to 1×10^{-6} (1 in 10,000 to 1 in 1,000,000 chance of cancer) acceptable and may choose not to require remediation for those media in which the concentration of chemicals and exposure represents a risk less than 1×10^{-4} (1 in 10,000 chance of cancer). The calculated risks were based on the concentration of Landfill constituents observed in the groundwater through five years of groundwater monitoring. If the concentrations in the groundwater increase, the risk will be recalculated.

With the exception of outside contractors at the BTA property (BTA contractors), no chronic or acute health effects (non-cancer health effects) would be expected for on-site dirt bikers or local residents who use the Delaware River as their domestic water source, or for fishing or swimming. However, potential exposure of unprotected BTA contractors to non-carcinogenic contaminants during manual excavation around tanks and pipes at the BTA property was estimated to be above safe levels. The estimated dose which would result from potential inhalation and dermal absorption of 2,4-dimethylphenol during such work was significantly greater than the acceptable daily intake level for 2,4 -dimethylphenol.

In an additional investigation for Landfill Area B, the risk was calculated for the hypothetical release at one time of contents of all remaining drums in the Area. This investigation was conducted to determine if additional releases from the remaining intact drums could create an unacceptable risk. The results of this investigation are based on the Drummed Waste Investigation Results for Landfill Section B and are contained in the Assessment of Off-Site Public Health Risks Posed by as Hypothetical Catastrophic Release from Drummed Materials in Section B of Rohm and Haas DVI Bristol Landfill. The results of this investigation showed that if such an event occurred, the risk of contracting cancer would be less than one person in a million (1×10^{-6}) through the pathways described above for the public health risk assessment. In addition, the investigation showed that there would be no chronic or acute health effects (non-cancer health effects) associated with such a release through the pathways described above.

EPA's SELECTED CORRECTIVE MEASURES

Rohm and Haas has recommended corrective measure alternatives (CMAs) BTA3, A12, B4, and C2 as the remedies to be implemented for Landfill Areas A, B and C, respectively. Implementation of these alternatives will meet the above stated objective of protecting human health and the environment as noted in Section 3008(h) of the RCRA. To accomplish this objective the following requirements were identified: further release of any hazardous waste and hazardous constituent which exceeds current MCLs will be controlled; harmful impacts on drinking water, the Delaware River, or fish attributable to the Landfill will be eliminated; persons walking on the Landfill perimeter will breathe air meeting the current Philadelphia Department of Public Health, Air Management Service air quality guidelines; direct contact exposure to wastes in the Landfill will be eliminated; and ammonia levels in Hog Run Creek will be controlled and/or eliminated such that applicable EPA Ambient Water Quality Criteria as developed under the Federal Clean Water Act and listed at 54 FR 19227 and Pennsylvania Department of Environmental Resources criteria developed under the Pennsylvania Clean Streams Law Title 25 Rules and Regulations for ammonia in tidal creeks are achieved.

These alternatives (BTA3, A12, B4, and C2) are acceptable to EPA because they utilize proven technologies and are protective of human health and the environment. EPA is confident that these corrective measures can be effectively employed to eliminate migration of contaminants from the Landfill and isolate the waste from human and environmental exposure. Implementation of these alternatives will attain the Media Protection Standards described below and will comply with applicable standards for management of wastes. Based on the decision criteria which are identified above, EPA has determined that these remedies are protective of human health and the environment.

EPA notes that implementation of these technologies requires perpetual maintenance. Rohm and Haas has indicated commitment to perform the required perpetual maintenance if the property is ever sold. With this understanding, EPA is confident that the selected alternatives will achieve long-term performance so the community and environment are not subject to unacceptable risk.

The paragraphs below further describe EPA's rationale for selection of these Corrective Measures:

BTA Portion of Landfill area A Corrective Measure Alternative BTA3: Consolidate most wastes into the Rohm and Haas Company's portion of Landfill Area A.

Contaminated soil located below structures and around pipes on the BTA property will not be excavated. The selection of this alternative will eliminate most subsurface soil contamination at the BTA Portion of Landfill Area A. The selection of this alternative will additionally prevent precipitation from contributing to leachate generation and subsequent contaminated groundwater and surface water. Evaluation of this alternative against the other alternatives, the corrective measure objectives and the criteria of performance, reliability, implementability, safety, overall protection of human health and the environment, ability to obtain institutional requirements and cost demonstrates that this is the preferred alternative. If followup sampling of groundwater indicates releases from the inaccessible portions of the BTA portion of Landfill Area A contributing to the exceedence of the Media Protection Standards, potential additional remedies will be evaluated for the BTA portion of Area A.

Remaining Portion of Landfill Area A (including Chemical Properties, Inc. property) Corrective Measure Alternative A12: Impermeable Cap, Complete Cutoff Wall with Diversion Trench and Groundwater Management and Enhanced Remediation of the Southeast Area (see Figure 2).

The selection of this alternative will prevent the release of contaminated groundwater and seepage from Landfill Area A to Hog Run Creek and the Delaware River. The selection of this alternative will help to eliminate the discharge of contaminated groundwater to the west of the northwest section of the BTA Portion of Landfill Area A . The selection of this alternative will additionally prevent precipitation from contributing to leachate generation. Enhanced remediation of the southeast area will further prevent the potential for elevated concentrations of contaminants in the southeast area to impact the Delaware River. Evaluation of this alternative against the other alternatives, the corrective measure objectives and the criteria of performance, reliability, implementability, safety, overall protection of human health and the environment, ability to obtain institutional requirements and cost demonstrates that this is the preferred alternative.

Landfill Area B Corrective Measure Alternative B4: Impermeable Cap and Complete Cutoff Wall with Groundwater Management (see Figure 3).

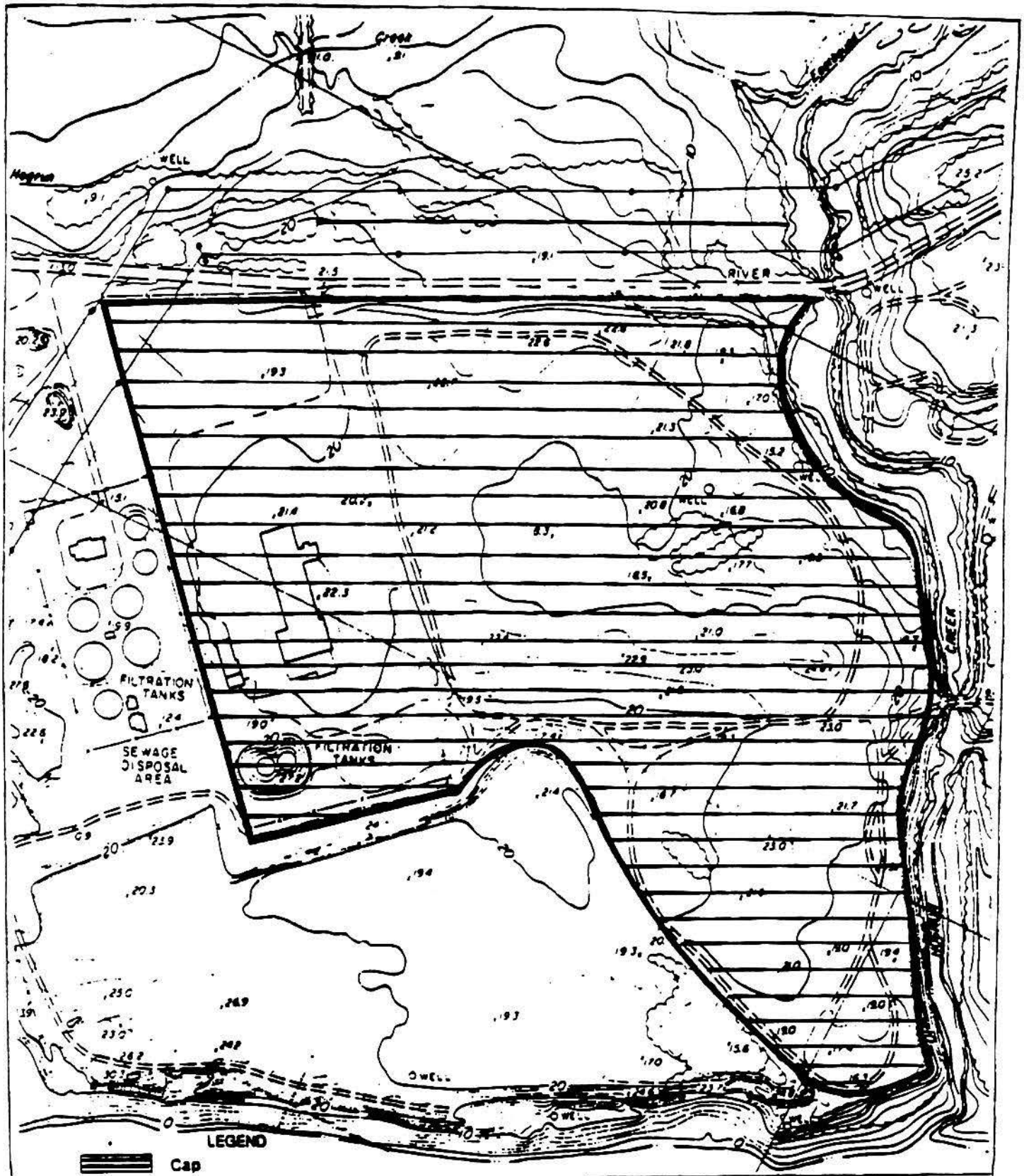

Figure 2

ROHM AND HAAS DELAWARE VALLEY INC.

Landfill Corrective Measures Study

LANDFILL SECTION A
REMEDIAL ALTERNATIVE A 12
CAP, COMPLETE CUTOFF WALL WITH DIVERSION TRENCH. GROUNDWATER MGMT

BCM Project No. 00-4061-14

BCM

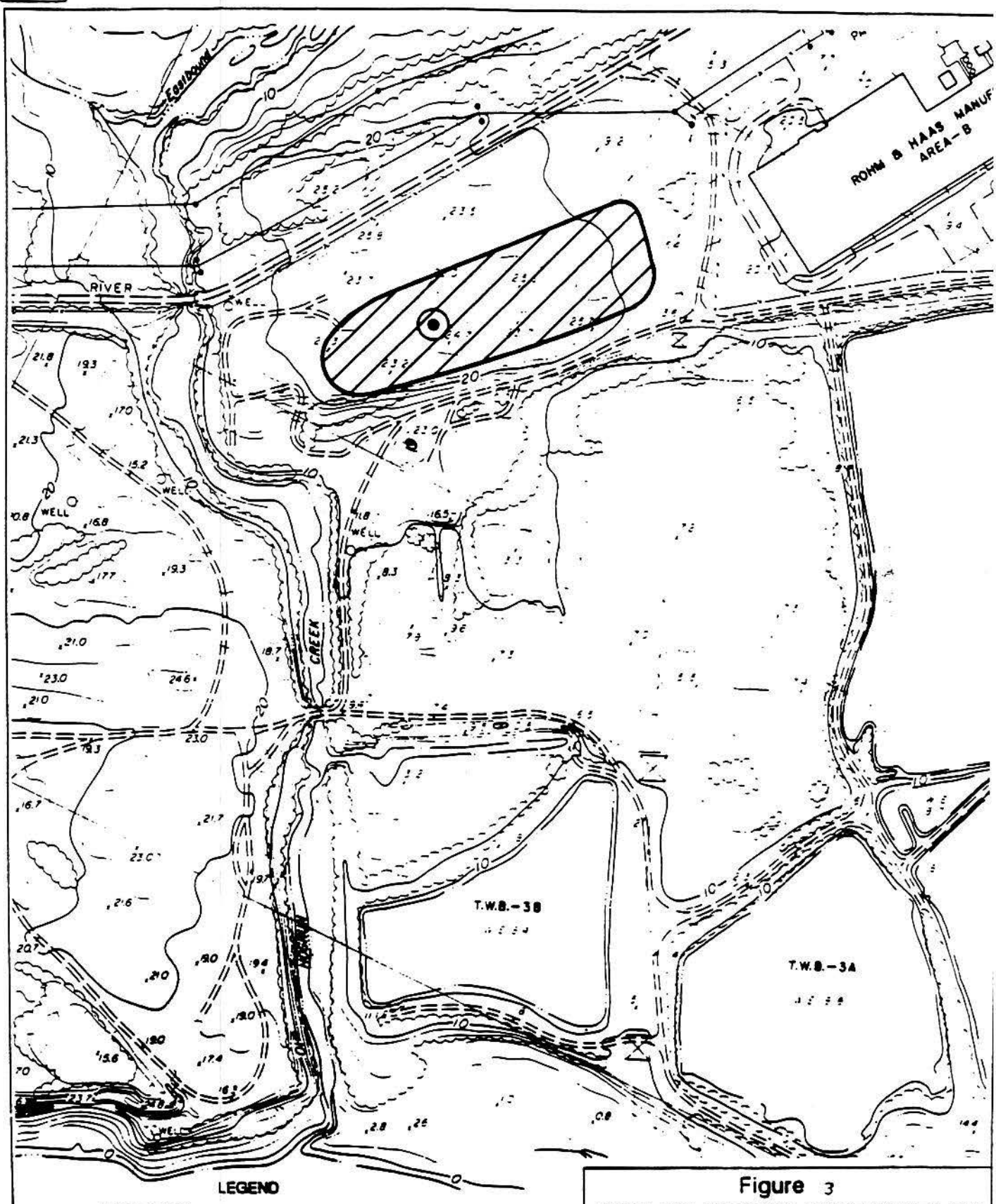

Figure 3

ROHM AND HAAS DELAWARE VALLEY INC.

Landfill Corrective Measures Study

LANDFILL SECTION B
REMEDIAL ALTERNATIVE B4
CAP & CUTOFF WALL
GROUNDWATER MANAGEMENT

BCM Project No. 00-4061-14

The selection of this alternative will prevent releases from the drummed waste materials in Landfill Area B from migrating into the soil and groundwater. The selection of this alternative will prevent the release of contaminated groundwater and seepage from Landfill Area B to Hog Run Creek and the Delaware River. The selection of this alternative will additionally prevent precipitation from contributing to leachate generation. Evaluation of this alternative against the other alternatives, the corrective measure objectives and the criteria of performance, reliablity, implementability, safety, overall protection of human health and the environment, ability to obtain institutional requirements and cost demonstrates that this is the preferred alternative.

Landfill Area C Corrective Measure Alternative C2: Soil Cap and Levee (see Figure 4).

The selection of this alternative will prevent contact will surface soil contamination in Landfill Area C. If through followup sampling of groundwater, it is found that releases from Landfill Area C are contributing to exceedences of the Media Protection Standards, potential additional remedies will be evaluated for the Landfill Area C. Alternative C2 provides protection as great in the short- and long-term as any of the other alternatives. Evaluation of this alternative against the other alternatives, the corrective measure objectives and the criteria of performance, reliability, implementability, safety, overall protection of human health requirements and cost demonstrates that this is the preferred alternative.

COMPLIANCE MONITORING

A. Chemical Specific Media Protection Standards

Chemical specific media protection standards (CSMPS) which must be achieved by the preferred CMAs are listed in Table 1. In cases where the analytical detection limit is greater than the calculated CSMPS, the analytical detection limit will be used as the CSMPS. The CSMPS were developed based on existing MCLs, current toxicological data and Ambient Water Quality Criteria for chronic health effects to fresh water fish. The CSMPS will ensure that releases from the Landfill which may be discharged into soil, groundwater, sediments, Hog Run Creek and the Delaware River will not adversely impact human health or the environment at any time in the future. Rohm and Haas will apply modeling techniques to create standards at the perimeter of the Landfill necessary to achieve the CSMPS. Modeling shall require periodic confirmation sampling of the locations noted in Table 1 where the criteria shall be met.

BCM

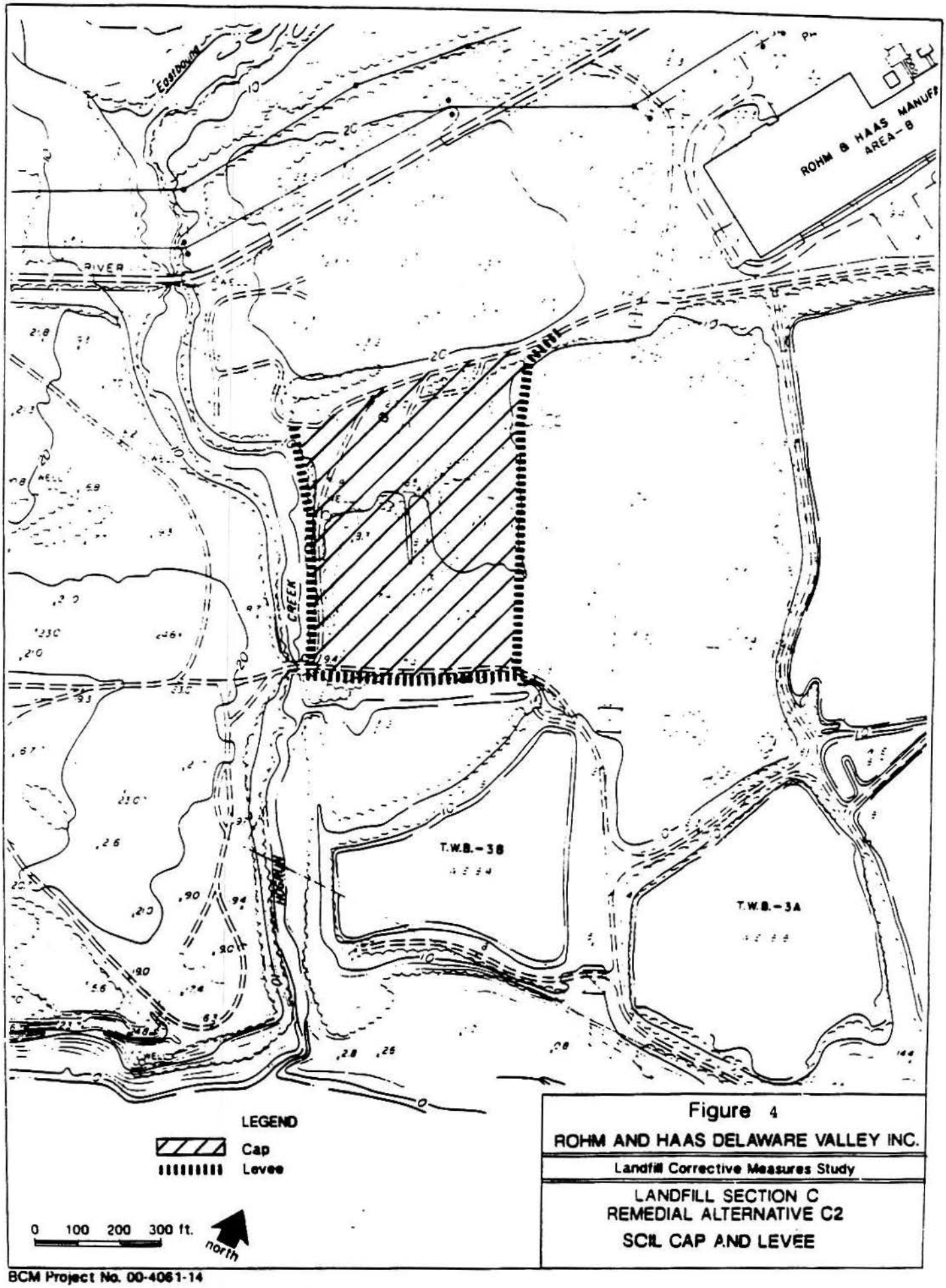

Figure 4

ROHM AND HAAS DELAWARE VALLEY INC.

Landfill Corrective Measures Study

LANDFILL SECTION C
REMEDIAL ALTERNATIVE C2
SOIL CAP AND LEVEE

BCM Project No. 00-4061-14

Table 1

Media Protection Standards
Rohm and Haas Delaware Valley Inc. Bristol Landfill

Chemical	Criteria (micrograms/liter) AWQC[1] * (chronic fresh water)	Human Health **
1,2-Dichloroethane	20,000	0.20
1,1-Dichloroethane	-	0.20
Benzene	-	0.62
Vinyl Chloride	-	0.014
1,4-Dichloroethane	763	0.75
2,4,6-Trichlorophenol	970	3.18
bis(2-Chloroethyl)ether	-	0.03
bis(2-Ethylhexyl)phthalate	3.0	2.50
Dibenz(a,h)anthracene	-	0.010
Lindane	0.08	0.03
Isophorone	-	8.54
1,1-Dichloroethane	-	0.02
Chloroform	1,240	0.42
Methylene Chloride	-	3.86
Tetrachloroethene	840	0.65
Trichlorothene	21,900	1.29
2,4-Dichlorophenol	365	105
2-Chlorophenol	2000	175
Boron	-	3,150
Chlorobenzene	-	146
Ethylbenzene	-	1,795
Manganese	-	3,500
Naphthalene	620	140
Antimony	1,600	14
Cadmium	1.1	5
Cyanide	5.2	200
Lead	3.2	5
Mercury	0.012	2
Nickel	160	100
Pentachlorophenol	13	0.71
Zinc	110	7,000

* AWQC (Ambient Water Quality Criteria) are to be met in surface water along the edge of Hog Run Creek and the Delaware River nearest to the Landfill.

** Human Health Criteria are to be met in groundwater immediately outside of the perimeter of the northwest edge of the Landfill and in Delaware River water six feet from the edge of the River nearest to the Landfill.

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[1] Ambient Water Quality Criteria

With respect to the goals for enhanced remediation of the southeast area of Landfill Area A, the levels of contaminants in the groundwater which shall be strived for in groundwater wells LH-4-21 and LF-102-15 are listed in Table 2. These specified groundwater wells are located as indicated in Figure 5. EPA acknowledges that due to the high concentrations of organics in the southeast area of Landfill Area A and the hydrogeology of the area, it may be technically impossible to attain the clean-up goals. To account for this possibility, EPA provides Rohm and Haas with the opportunity to petition EPA to modify the clean-up goals if after application of enhanced remediation, an asymptotic concentration of the specified and total organics is reached for two years. A public comment period will be provided if modification of the clean-up goals is necessary.

B. Additional Requirement

Additional studies shall be completed to identify the need for biological media protection standards (BMPS) to mitigate any existing impact of releases from the Landfill. Rohm and Haas shall complete an initial benchmark biological, chemical and physical characterization of any existing impact. A large portion of the information required for the benchmark characterization was previously developed by Rohm and Haas. The benchmark characterization shall be completed at impacted areas and at locations upstream and downstream of the impacted areas in the Delaware River, Hog Run Creek and any soil around the southeast area where the cap is eliminated for enhanced remediation.

The chemicals which shall be characterized shall be those listed in the CSMPS. In addition, the chemical and physical parameters listed in Attachment 1 "Surface Water and Sediment Investigation: Chemical Physical/Parameters" shall be characterized. The biological characterization shall include a chronic bioassay and tissue analysis of vulnerable benthic organisms for both water and sediment samples at all sampling points where possible. Chronic bioassays shall be carried out with on-site and off-site soils in the vicinity of areas where a cap is not placed and the soil contamination levels are elevated above background levels.

During construction of the selected remedies, the river and creek shall be monitored to identify any additional degradation caused by construction activity. A contingency plan shall be developed to mitigate any damage caused by construction. After construction, any impacted areas shall be resurveyed and the results shall be reviewed to determine whether the impact has been mitigated. If no improvement is shown, a decision on additional remediation shall be made at that time.

C. Operations and Maintenance

The caps, slurry cutoff walls, diversion trenches and levees, as well as the groundwater monitoring and extraction system and potential on-site treatment system will be regularly inspected, maintained and repaired. An "Operations and Maintenance Plan" will be developed during the design phase to assure the integrity of the structures. The Plan will include a schedule for monitoring the MPS in groundwater immediately outside of the individual landfill areas.

Deed restrictions shall include provisions: (a) prohibiting actions which would compromise the effectiveness of any corrective measures being constructed under this decision; (b) prohibiting any use of groundwater at the Landfill or the Dredged Material Basin without the approval of EPA; (c) requiring disclosure of the environmental conditions at the Landfill and Dredged Material Basin to every prospective successor in interest prior to settlement; (d) permitting EPA, Rohm and Haas DVI, BTA, Chemical Properties, Inc. and their respective contractors and representatives to enter upon the Landfill and the Dredged Material Basin for purposes of effectuating all terms of the decision; (e) containing an agreement that successor(s) in interest shall not interfere with or disturb the work to conduct the corrective measures and any future remedial activities (including operation and maintenance) which may be performed; and (f) containing an agreement to inform any person or entity that subsequently acquires any title, easement, or other interest in the Landfill or the Dredged Material Basin, or any portion thereof, of the requirements, conditions, and operative effect of these requirements. The restrictions and obligations described above shall run with the land and shall be binding upon any and all persons or entities that acquire any title, easement, or any portion thereof. Accordingly, any changes at or construction on the Landfill or the Dredged Material Basin shall require prior approval from EPA.

IMPLEMENTATION OF CORRECTIVE MEASURE

Rohm and Haas will begin the implementation of the selected corrective measures when EPA signs the Record of Decision Document and the Consent Order.

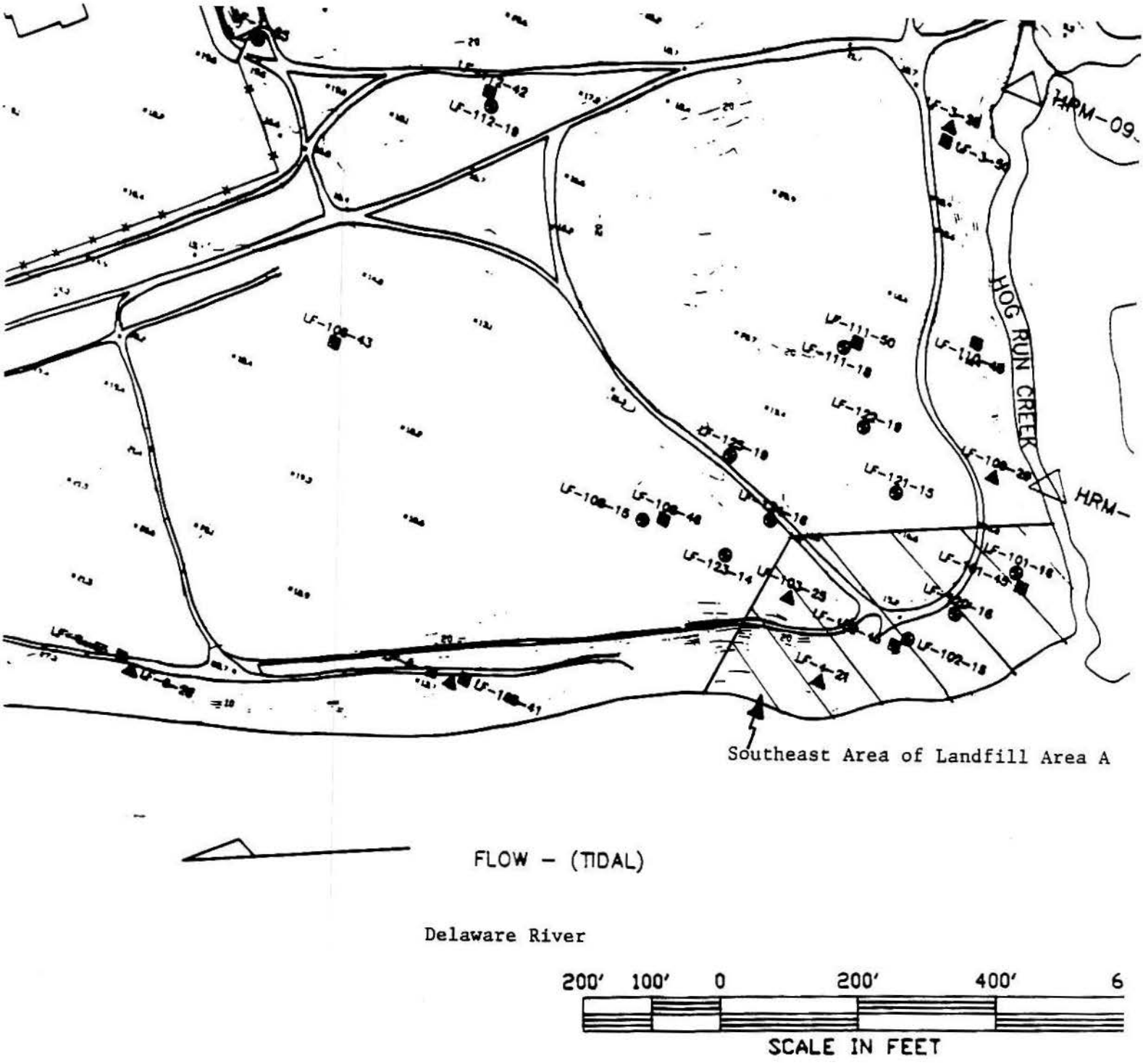

Figure 5: Southeast Area of Landfill Area A

Table 2

Contaminant Concentration Goals for Groundwater in Southeast Area of Landfill Area A

Contaminant	Concentration Highs[1] (ug/l)	Concentration Goals[2] (ug/l)
bis(2-chloroethylether)	890	150
bis(2-ethylhexyl)phthalate	1980	50
chlorobenzene	170	15
1,2 dichlorobenzene	28	20
1,4 dichlorobenzene	61	20
2,4-dimethylphenol	182	35
ethylbenzene	453	200
toluene	940	600
total xylenes	3000	1200
total organics	11194	3500[3]

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[1] "Concentration Highs" were identified based on review of all groundwater data collected from wells LF-4-21 and LF-102-15.

[2] "Concentration Goals" were identified based on review of all groundwater data collected from wells LF-116-13, LF-2-12, LF-119-28, and most CR wells including CR-9-25 and CR-107-25.

[3] "Total organics" for concentration goals includes all organics and is not limited only to those listed above.

Attachment 1

Surface Water and Sediment Investigation: Chemical/Physical Parameters

Recommended or Required by the Bioassessment Work Group

Note: These are the minimum required parameters for surface water and sediment investigations and probably will not full characterize the site. Additional site-specific parameters and the rationale in choosing these parameters should be described in the work plan.

A. Surface Water
   1. Field parameters
      a. temperature
      b. dissolved oxygen (DO)*
      c. Eh
      d. pH*
      e. specific conductance
      f. salinity (in esturarine and marine systems)*

* Can be measured in the lab, but preferable to use field instrumentation.

   2. Laboratory parameters
      a. Total Suspended Solids (TSS)
      b. Alkalinity
      c. Hardness
      d. optional
         1) BOC
         2) COD
         3) Total Dissolved Solids (TDS)
         4) Total Organic Carbon (TOC)

B. Sediment
   1. Field parameters
      a. temperature
      b. Eh (all EPA 9045)
      c. pH
      d. specific conductance (EPA 120.1)
      e. color

   2. Laboratory parameters
      a. Total Organic Carbon (EPA 415.13, combustion methodology; TOC = % Organic Carbon)
      b. grain size analysis (ASTM Method with hydrometer analysis)
      c. % moisture (RAS)
      d. % solids (RAS)

FINAL DECISION AND RESPONSE TO COMMENTS
ROHM AND HAAS BRISTOL LANDFILL

I INTRODUCTION

This document will provide a response to all significant comments received by the U.S. Environmental Protection Agency (EPA) regarding the proposed corrective measures for the Rohm and Haas Delaware Valley Inc. Bristol Landfill (Landfill) located in Bristol, Pennsylvania.

The comments addressed by EPA in this document were raised during the public comment period held for the Landfill. The public was encouraged to review and comment on all remedial alternatives considered for the Landfill because EPA can modify the proposed remedy or select another remedy based on new information or public comments.

All comments expressed to and/or received by EPA during the public comment period, including comments received at the September 19, 1991 public meeting, have been reviewed and considered by EPA prior to the issuance of the Record of Decision for the Landfill. These comments and questions, as well as EPA's responses are recorded in the following sections.

II THE SELECTED REMEDY

The areas at the Landfill identified for remediation include the Bristol Township Authority (BTA) portion of Landfill Area A, the remaining portion of Landfill Area A, Landfill Area B and Landfill Area C.

At the Bristol Township Authority portion of Landfill Area A, EPA has determined that the wastes which remain in the subsurface shall be moved and consolidated into the portion of Landfill Area A owned by Rohm and Haas Company.

For the remaining portion of Landfill Area A, including the property owned by Chemical Properties, Inc., EPA has determined that the area shall be enclosed with a RCRA cap and a containment structure which is constructed around the entire area and grouted into the bedrock. A diversion trench to divert groundwater around the containment structure and groundwater management to contain waste within the structure is also included in the proposal. In addition, EPA has determined that enhanced remediation shall be performed for the Southeast Area of the encapsulated portion of Landfill Area A to reduce the elevated contamination of groundwater in that location.

EPA has determined that an identical corrective measure be implemented for Landfill Area B. The corrective measure which shall be implemented for Landfill Area B includes a RCRA cap, a containment structure and groundwater management. For Landfill

Area C, where the threat to groundwater is not a concern, EPA has determined that the area shall be covered with a soil cap to protect trespassers, workers and animals from direct contact with the waste. If Landfill Area C remains below the 100-year flood elevation after placement of the soil cap, a flood wall will be placed around Landfill Area C to protect the cap from adverse impacts due to flooding.

Implementation of these remedies includes perpetual monitoring and maintenance of the remedies. Future uses of the Landfill property will be limited through a deed restriction and EPA review to assure that the integrity of the remedy is not impacted.

These selected corrective measures, as well as all of the proposed remedies, were evaluated by EPA against EPA criteria for performance, reliability, implementability, safety, overall protection of human health and the environment, cost and the ability to obtain institutional requirements such as permits.

After evaluating all of the proposed remedies against the criteria listed above, EPA believes that the selected remedies will attain soil and groundwater cleanup standards, will reduce or eliminate to the maximum extent possible further releases of hazardous waste, and will provide for proper management of wastes generated during implementation of the Corrective Measure. Furthermore, the selected Corrective Measure will be effective and reliable, in both the long term and short term; will result in the reduction of further toxicity of material outside of the containment area, reduction of mobility of the contents of the Landfill, and reduction of the volume of infiltrating precipitation and groundwater which will contact the hazardous material and become contaminated; and will be implementable and cost effective in comparison to the other corrective measure alternatives presented in the EPA approved Corrective Measures Study for the Landfill.

III PUBLIC PARTICIPATION

EPA held a public comment period for the corrective measures proposed for the Landfill from August 25, 1991 through September 24, 1991. EPA conducted several interviews with interested residents and business owners in the community, as well as with local officials. A public meeting was held on the proposed corrective measures on September 19, 1991 at the FDR Secondary School, 1001 Rodgers Road, Route 413, Bristol, PA. Both the public comment period and the public meeting were advertised in The Bucks County Courier Times on August 25, 1991.

IV PUBLIC COMMENTS AND EPA'S RESPONSE

A. Comments/Questions on the Facility and Site Investigations:

1. A resident questioned why the Facility is not identified as a Superfund Site. The resident is concerned that the regulations of the RCRA program are not as stringent as the Superfund program.

EPA Response: In 1985, EPA proposed the Landfill for inclusion on the Superfund National Priorities List (NPL), 40 C.F.R. Part 300. At that time, facilities placed on the NPL were to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended, 42 U.S.C. §§ 9601 et. seq. (CERCLA), otherwise known as Superfund. In 1984, the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901 et seq., (RCRA), was amended to allow EPA to address contamination at certain hazardous waste facilities using RCRA authorities. In June, 1988, EPA finalized its RCRA/NPL Listing Policy, which further defined EPA's ability to address NPL sites under RCRA. As a result, contamination at the Landfill was deferred from being addressed under CERCLA authorities to RCRA authorities.

In February, 1989 EPA and Rohm and Haas entered into a Consent Order pursuant to Section 3008(h) of RCRA. As a result of the RCRA/NPL listing policy, EPA deleted the Landfill from the proposed NPL under Superfund in August, 1989.

The goals to prevent risk to human health and the environment are identical in both the RCRA Corrective Action Program and the CERCLA Remedial Action Program.

2. A resident asked if EPA could create a Citizen Advisory Committee for oversight of the remediation and to help disseminate information to the community.

EPA Response: EPA notes that resources available to EPA to implement such a request are limited. EPA is, therefore, considering requiring Rohm and Haas Delaware Valley, Inc. (Rohm and Haas) to implement a program for community oversight of the project and dissemination of information under the terms of a future order to implement the Landfill remedy.

3. A resident asked, of the 20,000 drums indicated to be in the Landfill, how many were actually tested?

EPA Response: More than 20,000 drums were placed in the Landfill, which includes Landfill areas A, B, and C. 20,000 drums were estimated to be disposed of in Landfill Area B. Of the estimated 20,000 drums disposed in Landfill Area B, 40 were sampled pursuant to the corrective measures study.

Information on the type and quantity of waste placed in the Landfill was submitted by Rohm and Haas in a report to EPA contained in Appendix I to the March 1980 Remedial Investigation Addendum contained in the Administrative Record. A summary of information on drummed wastes in the Landfill was submitted to EPA by BCM Engineers on behalf of Rohm and Haas on August 22, 1991. These documents are attached to this Response to Comments. (See Attachment 1 Drummed Waste in the Rohm and Haas Bristol Landfill and Attachment 2, Summary of Waste Materials in the Landfill.)

4. A resident asked "Why were only 40 drums tested out of 20,000?"

EPA Response: EPA determined that 40 drums should be sampled based on a statistical analysis conducted as part of the corrective measures study to determine if additional risks in the future need to be prevented as a result of further release of the contents of the drums. The statistical analysis took into consideration the following information:

a. 20,000 drums were placed in Landfill Area B;

b. The drums contained quantities of chemicals in proportion to what was known to have been placed in the drums prior to disposal in Landfill Area B;

c. A calculation of risk assuming all of the drums broke on the same day and the material seeped into the groundwater, into Hog Run Creek and into the Delaware River; and

d. The number of drums which actually needed to be sampled to make sure that what is really in the drums is not worse than what was assumed.

The statistical analysis was completed by Rohm and Haas and was reviewed and approved by an EPA toxicologist/statistician. A detailed description of the statistical analysis is contained in the Technical Memorandum, Assessment of Public Health Risks Posed by a Hypothetical Catastrophic Release from Drummed Materials in Section B of the Rohm and Haas Bristol Landfill prepared by ENVIRON Corporation on behalf of Rohm and Haas in February 1991. This report is contained in the Administrative Record.

Based upon the number of drums sampled and review of documents and other information on the materials disposed in the Landfill, EPA believes it has adequately characterized the wastes in the drums.

5. A resident asked if Rohm and Haas had supplied EPA with all of the records documenting what is buried in the Landfill.

EPA Response: Information on types and quantities of waste placed in the Landfill was submitted by Rohm and Haas in a report to EPA contained in Appendix I to the March 1980 Remedial Investigation Addendum contained in the Administrative Record. A summary of information on drummed wastes in the Landfill was submitted to EPA by BCM Engineers on behalf of Rohm and Haas on August 22, 1991. These documents are attached to this Response to Comments. (See Attachment 1, Drummed Waste in the Rohm and Haas Bristol Landfill and Attachment 2, Summary of Waste Materials in the Landfill.)

6. A resident asked "How long has this stuff been in there?"

EPA Response: Rohm and Haas began construction of the Landfill around 1952. The company used the Landfill until 1975. Material has been in the Landfill for approximately 39 years.

7. A Burlington County, NJ official asked if a geophysical survey was done to determine if a trough exists in the Landfill area, and also, if a survey was not done, how does EPA know the depths of the sediments where the slurry wall will be placed?

EPA Response: Yes, geophysical surveys were completed to determine if a trough exists in the Landfill. A trough, which is a long but shallow depression in the bedrock, is located below the Landfill in a northeast to southwest orientation. The depths of the sediments on the bedrock in the trough have been defined through borings completed for well placement in the trough. This information is necessary to determine the depth where the slurry wall will be placed when it crosses the trough.

8. A resident commented that Rohm and Haas, as the chemical company that made the chemicals now in the Landfill, should have known the chemicals were hazardous, whether or not there were government regulations in place at the time.

EPA Response: The purpose of the public comment period is to address comments relating to EPA's preferred corrective action, the RCRA Facility Investigation Addendum or the Corrective Measure Study. This comment, however, is outside of the scope of that purpose.

9. A question was asked regarding the possibility that Rohm and Haas manufactured nerve gas at the Facility. If Rohm and Haas did manufacture nerve gas, was any of that material buried in the Landfill?

EPA Response: EPA has received information submitted by Rohm and Haas and has determined that there is no evidence or information that Rohm and Haas has ever manufactured nerve gas at the Facility. Rohm and Haas further indicated that no nerve gas was ever manufactured by the company or used in any company process.

10. A resident asked, "Has Rohm and Haas ever indicated that any of these materials in the Landfill were from the Bridesburg Plant in Philadelphia?"

EPA Response: Yes, Rohm and Haas has indicated that some of the waste was from Bridesburg. Of the approximately 315,000 tons of waste reported to have been placed in the Landfill, 500 tons of process waste and 200 tons of laboratory waste were reported to have come from the Bridesburg plant. Thus, approximately 0.15% of the waste in the Landfill is process waste from the Bridesburg plant and approximately 0.06% of the waste is laboratory waste from the Bridesburg plant. None of the 500 tons of process waste is considered a hazardous waste pursuant to RCRA. (See Attachment 2, Summary of Waste Materials in the Landfill.)

11. A local official from Bristol Township stated that "I am concerned about the actual quantity of chemicals that we are dealing with." This resident cited reports and newspaper articles from 1983 and 1984 quoting Rohm and Haas officials stating that 350,000 tons of chemicals were dumped at the Landfill. He asked, "What have you determined to be the quantity of drums of chemicals that have been dumped?"

EPA Response: The reports and newspaper articles cited by the Bristol Township official have not been submitted to EPA. Records submitted by Rohm and Haas to EPA indicate that approximately 315,000 tons of chemicals were disposed in the Landfill. Based on information submitted by Rohm and Haas in Attachment 2, Summary of Waste Materials in the Landfill, EPA estimated that 10% of the total waste disposed in the Landfill was disposed in drums. EPA calculated that approximately 134,000 drums were placed in the Landfill based on the assumption that the density of the contents of

the drums was that of water (8.35 lbs per gallon). EPA notes that most of the chemicals disposed in the Landfill were not disposed in containers. This information is supported by the results of three geophysical surveys which were conducted at the Landfill (consisting of a magnetic survey, a terrain conductivity survey and a radar survey) and the excavation of 37 test pits to confirm the findings of the surveys. EPA has based the selection of the remedy on over five years of analyses of groundwater samples collected throughout the Landfill area. Based on the data which has been collected, EPA is confident that the selected remedy will effectively minimize releases from the Landfill.

12. A resident said that he had seen slides of the polymers and monomers that were dug up from the landfill. He stated that "I guess we're thinking in terms of plastic. It looked pretty gooey."

EPA Response: Polymers and monomers are present in the Landfill and appear "gooey".

13. A resident asked, "If these polymers help to keep it (chemicals) out of the water, what's going to happen when they eventually break up?"

EPA Response: If the chemicals break up, they will be contained in the encapsulation unit through the groundwater pumping mechanism.

14. A resident stated: "after eight years of groundwater sampling by Rohm and Haas, I would like to know":

a. What parameters was the groundwater tested for?

EPA Response: Groundwater sampling which has occurred through the last eight years has included analyses for all of the chemicals on EPA's priority list, target compound list and target analyte list. These lists are those used regularly in EPA's Superfund program to identify contaminants in landfills. The analyte lists which are regularly scanned for in each well are based on chemicals identified in each well during the periodic full scans for EPA's entire list of regularly scanned chemicals. The results of these analyses are contained in reports in the Landfill Investigation Addendum Report and the Corrective Measures Study Report located in the Administrative Record.

b. Who determined what test parameters were to be run for the groundwater?

EPA Response: Rohm and Haas began analyzing the groundwater in 1983 prior to being subject to the 1989 Consent Order. At that time, Rohm and Haas determined what parameters to analyze based on EPA policy. EPA has reviewed the list of test parameters and has determined that the list is consistent with EPA policy. Parameters which will be analyzed in the groundwater as a result of the selected remedy will be determined by EPA.

c. Was TCLP/EPTOX method used on the groundwater?

EPA Response: No. The toxicity characteristic leaching procedure/extraction procedure toxicity (TCLP/EPTOX) method is a filtrate method to determine if a solid waste can leach hazardous concentrations of chemicals. This method is not applicable to materials already in a liquid state. A comparison can be made of the concentrations of chemicals in the groundwater with the concentrations which would render a leachate under the TCLP/EPTOX method as a hazardous waste pursuant to 40 C.F.R. Part 261. While all of the chemicals on the TCLP/EPTOX list are not contained in the lists of chemicals which were analyzed for, a preliminary comparison of those which were analyzed indicates that the concentration of the chemicals in the groundwater are not hazardous wastes pursuant to 40 C.F.R. Part 261.

d. What EPA Hazardous Waste Classification has been assigned to the water/leachate? If none has been determined, how can this plan be considered the best available technology for remediating the waste material?

EPA Response: No EPA hazardous waste classification has been assigned to the leachate. However EPA has investigated whether the selected groundwater maintenance/containment remedy will be effective for the types of wastes which have been identified in the leachate. EPA determined that the remedy can be effectively designed to contain the leachate.

15. A resident asked, "If the material is considered hazardous waste, why was the comment made that the water would probably be treated at the Rohm and Haas Company Water Treatment Plant, which at this time is not permitted to treat hazardous waste?"

EPA Response: Rohm and Haas has no plans to treat hazardous waste at the waste water treatment plant which is under construction. The extracted groundwater from the containment/pumping remedy will only be able to be treated in that Facility waste water treatment plant, if 1) the waste stream is not a "hazardous waste" stream; and 2) the contaminants in the extracted groundwater can be successfully treated by the plant.

16. A resident asked if Hog Run Creek has been affected by the contamination in the Landfill, what is the current risk assessment of the Creek in regard to human health and the environment and, are the fish in the Creek safe to eat?

EPA Response: Contamination from the Landfill does enter into Hog Run Creek. However, there has been no documented adverse affect on marine or human health as a result of releases from the Landfill. It has been determined that the Creek is safe for children to wash their hands in. The fish in the Creek are safe to eat. This information can be found in the reports entitled Aquatic Baseline Survey of Hog Run Creek, May 1986 and The Bristol Landfill Remedial Investigation Addendum, March 1988.

17. Local officials questioned whether the Bristol Borough water intake and the Philadelphia water intakes have been affected by releases from the Landfill?

EPA Response: It has been determined through sampling and analysis of water taken from the Delaware River at strategic positions that neither the Bristol Borough or Philadelphia water intakes have been adversely affected by releases from the Landfill.

18. A resident asked if "these landfills were legal when they were being used. Did they meet all of the requirements they were supposed to?"

EPA Response: The legal status of the Landfill does not affect EPA's final decision to implement the selected remedy at the Landfill. However, no Federal laws or regulations were imposed on landfills during the time of operation of the Rohm and Haas Bristol Landfill (1952-1975).

19. A resident questioned if Rohm and Haas still uses these types of chemicals that are in the Landfill and if so, where are they disposed now. Also, why can't the chemicals in the Landfill be similarly disposed?

EPA Response: Rohm and Haas still manufactures chemicals which produce some of the types of chemicals in the Landfill. Hazardous chemicals are now sent to a commercial treatment facility (Rollins) in Bridgeport, New Jersey. Although disposal of the Landfill waste at a commercial treatment facility was an alternative considered during the corrective measure study, EPA did not select that remedy because excavation of the chemicals would release chemicals to the air which would create a greater health risk to the community. EPA has determined that human health and the environment are adequately protected by leaving the chemicals in place and implementing the corrective measures selected.

20. A resident expressed a concern that the groundwater from Hog Run Creek is flowing toward his house.

EPA Response: Groundwater from Hog Run Creek does not flow towards the resident's home. In the vicinity of the resident's house, groundwater flows from west/southwest to north/northeast. The direction of flow of groundwater is determined by pressure whereas the direction of flow of surface water on land is controlled by gravity. Therefore, the direction in which rain water would flow from the resident's house could be quite different from the direction in which groundwater is flowing beneath the house. The depth to groundwater in the vicinity of the resident's house is approximately 9', while the depth to groundwater in the nearby West Branch of Hog Run Creek is approximately 8.5'. What this means is that groundwater is under a greater pressure in the vicinity of the resident's house relative to the groundwater pressure in the vicinity of the West Branch of Hog Run Creek, and that the groundwater flow beneath the residents house is towards Hog Run Creek. (See Attachment 3, Groundwater Topography.)

21. One resident commented that he is aware of a place in Croyden near his home where tanks are buried. Another resident stated that there are allegations that there is material buried under a portion of the Mary Divine Elementary School playground. This property was donated to the school by Rohm and Haas.

EPA Response: This decision addresses the Landfill only. However, EPA is gathering information through studies underway at other portions of the Rohm and Haas Company property in Bristol focused on additional areas to investigate where waste may have been disposed at the Facility.

22. A resident asked if the water at the Mary Divine Elementary School is monitored by EPA on any regular basis.

EPA Response: The water supplied to the Mary Divine Elementary School is supplied through the public water system. The EPA does not monitor the Mary Divine Elementary School Water.

23. Several residents requested that a health study be conducted in the area. One resident questioned how a remedy could be proposed for the Facility if a health study had not been conducted since a health study would identify the impact this Landfill had on the community's health.

EPA Response: EPA will contact a representative of the Agency for Toxic Substances and Disease Registry (ATSDR) to arrange a community meeting to discuss how to proceed with a health study. EPA has completed a risk assessment which focused on specific chemicals, the concentrations of those chemicals, how the chemicals are moving through the environment, what the points might be where the chemicals could contact humans and the environment and the potential effects. Through a risk assessment, EPA can determine the risks posed by a specific site. A health study would not necessarily identify the source of a health abnormality in the area and a risk assessment could only give a generalized prediction.

24. A resident asked, "If the worst is over, can't we look at the health records of the area compared to a controlled area and find out if there's actually been any problem from this?"

EPA Response: EPA's goal in conducting the Corrective Measures Study and implementing the corrective action is to prevent future impacts from occurring. Based on what is being released from the Landfill, EPA has no reason to predict that there would be any detectable health impacts from the Landfill. (EPA is implementing these remedies to alleviate a potential chronic risk to aquatic life in the Delaware River as well as to prevent humans from directly contacting the waste in the Landfill). A health study may not be able to distinguish the adverse health effects caused by the Landfill as opposed to the adverse effects caused by other sources/factors in the community. It would be very difficult to distinguish what the cause of any health impacts are specifically accountable to.

25. A resident expressed a request for Rohm and Haas to make reparations to the public for any past damage they may have caused.

EPA Response: The EPA's goals for this decision are to prevent future harm. EPA has no authority to require Rohm and Haas to make reparation to the public for any past harm.

26. A resident asked how the cleanup could be affected if Rohm and Haas moved from the property or went bankrupt.

EPA Response: A provision will be written into the deed for the property so that, in the case that Rohm and Haas sells the property, the new owner will be required to accept responsibility for implementing the corrective measures selected including future monitoring and maintenance. In addition, if Rohm and Haas should ever declare bankruptcy, this Facility can be handled under EPA's Superfund program which provides money to address abandoned or uncontrolled hazardous waste sites.

27. A resident questioned how many deep wells have been installed to unweathered bedrock.

EPA Response: The following five bedrock wells exist in Landfill Area B: LF106 and LF10; CR-110 on the western side of Landfill Area C and two new bedrock wells in Landfill Area A were installed fairly recently.

28. A resident asked, "How many bedrock wells were used to determine if there is communication between the production well on Burlington Island and bedrock at the Landfill?"

EPA Response: Three on-site bedrock wells.

29. A Burlington County official commented in reference to the construction of a slurry wall that "We haven't defined bedrock to the point where we absolutely know where it is going to be."

EPA Response: Bedrock will be further defined in the design stage for the corrective measures. Attachment 4 is a top of bedrock contour map which depicts the Landfill as well as nearby areas. This map was submitted to EPA by Rohm and Haas on Friday, September 27, 1991 to respond to this comment. In addition, per information received from Rohm and Haas after the public meeting, commencing on September 30, 1991, BCM Engineers, Inc., on behalf of Rohm and Haas will implement a soil boring program in Landfill Areas B and C. The objectives of the boring program are to obtain data on the depth of the bedrock along the course of the proposed slurry wall in Landfill Area B, and to delineate the area of waste occurrence in Landfill Areas B and C. This information will be used in the preparation of the design documents. (See Attachment 4 Depth of Bedrock.)

30. A resident asked, what are the number of data points for the trough?

EPA Response: There are five data points for the bedrock trough.

31. A resident asked, what is the direction of the trough?

EPA Response: The orientation of the trough, as well as other bedrock fractures is northeast/southeast. This is shown in Figure 5-2 of the Trailer Staging Area Report, Vol.1, Task 1 available in the Administrative Record.

32. A resident asked, "Can restriction be made on other activities that Rohm and Haas may take on in the future which may further degrade the environment, i.e., no incineration of research waste, no burning of any kind? And, if Rohm and Haas continues to burn waste, can the Landfill be removed?"

EPA Response: Restrictions on other pollution emitting activities are made under the regulations which apply to each specific activity. EPA has no authority to require removal of the Landfill based on other activities at the Facility. Furthermore, EPA evaluated, during the corrective measures study, the alternative of removing the waste from the Landfill. EPA determined that removal of the waste material would create a greater community risk than the corrective measures selected.

33. A Burlington County official commented that he thinks a Feasibility Study should be done to ensure that EPA has the capability of reaching the bedrock for the slurry wall.

EPA Response: As noted in a document prepared by the U.S. EPA entitled Slurry Trench Construction for Pollution Migration Control (EPA-540/2-84-001), trench excavation can be accomplished with appropriately sized backhoes from 70 to 90 feet deep. The depth of bedrock at the Landfill is estimated to be no greater than 40 feet. Additional borings are planned to confirm the depth to bedrock. (See Response 29A.)

34. In a letter, a resident commented, "The wastes at the Site contain potential dense non-aqueous phase liquids (DNAPLs). DNAPLs are heavy liquids which are not soluble in water. These liquids, if they exist, exist as another layer of liquid below or at the bottom of the water table. If these are to be contained within the proposed slurry wall, the integrity of the underlying geologic materials must be assured. Therefore, I am concerned that the Wissahickon Schist bedrock underlying the site has not been adequately investigated for fracturing. According to Tom Buntin, EPA geologist for the site, the investigation for fractured bedrock has centered around a bedrock trough at the site, which, it is thought, exists in this location due to preferential weathering of bedrock along fractures by the river over time. I would suggest that this process could operate along fractures oriented roughly parallel to the direction of flow of the river, but that fractures oriented roughly perpendicular to the flow direction of the river would be comparatively unaffected by this weathering mechanism. To investigate the locations of fractures perpendicular to the river in other locations than the bedrock trough, I suggest an inspection of aerial photographs for fracture trace, supplemented by a VLF geophysical survey over the areas where wastes are to remain. Deep bedrock wells, with open holes in unweathered schist bedrock, should be installed in all fracture trace intersections and single fracture traces detected by these investigations. These wells should be sampled for parameters characteristic of wastes disposed at the site.

Aquifer tests should be performed on these wells to determine whether they are located on fracture traces. The proximity of the River should be taken into account in the interpretation of the aquifer tests. Downhole geophysical logging would also be helpful in determining the extent of fracturing encountered in the wells, as would oriented cores."

EPA Response: The containment pumping system will ensure that any contaminated water within the Landfill will migrate to the pumping systems. This will move contaminated wastes laterally away from the slurry walls and vertically upward from the bedrock. Investigations indicate that no DNAPL currently exist in the Landfill. (See Attachment 5, Evidence that a Dense Nonaqueous Phase Liquids Does Not Exist at the Landfill.)

If a DNAPL forms within the Landfill after the slurry wall has been completed, groundwater recovery wells will intercept and extract the DNAPL. The selected Corrective Measure includes groundwater recovery wells which will be installed within the slurry wall and screened at the holocene/alluvium interface which will intercept the slurry wall and extract DNAPL at that interface. If a DNAPL "breaks through" the holocene sediment horizon, there will also be recovery wells screened in the Trenton gravel which will intercept and extract DNAPL in the Trenton gravel.

35. A resident comments in a letter to EPA, "The bedrock contour map of the site (Figure 2-6, BCM, April 1984) seems to show a slight bedrock trough located to the west of the location of most of the wastes in Area A, B and C. To the east of the bedrock high area shown on this map, where most of the wastes are said to be located, the bedrock surface slopes toward the river. Therefore, most DNAPL, would flow on top of the bedrock surface and flow into the River."

EPA Response: EPA agrees that if DNAPLs existed at the Landfill, they would flow on top of the bedrock into the River. However, investigations indicate that no DNAPLs currently exist in the Landfill. Also see above Response to Comment 34.

36. A resident comments in a letter to EPA, "In the public meeting, it was said that compatibility testing is presently being conducted between the on-site wastes and the proposed slurry wall material. I would like to know what waste types were chosen for this testing. I would also like to know how the waste types were chosen, and why EPA thinks testing will be adequate, when "no one knows" all the waste types that are in the Landfill. I direct EPA to the July 1990 issue of Ground Water, p. 524-533. This paper, by Abdul, Gibson and

Rai describes experiments which show a tendency of clays to aggregate or crack in the presence of solvents such as benzene and trichloroethylene, which are contained in the wastes at the Rohm and Haas Bristol site. If these solvents are not included in the compatibility testing, EPA should show why the testing is not deficient as a consequence of such an omission."

EPA Response: The use of a slurry mixture for the cut-off wall in this encapsulation/pumping remedy has been determined by EPA to be feasible for this Landfill. Compatibility testing will be conducted for the design phase to identify the best slurry mixture to use in the construction of the slurry walls. The waste types which will be selected for testing will also be determined in the design phase. EPA will consider concerns raised regarding compatibility of the wall with the waste and the groundwater at the time of design.

37. A resident comments in a letter to EPA, "If "no one knows" what is in the Landfill, someone should, at least have a good idea. EPA should require Rohm and Haas to put together thorough records, photographic evidence, interviews of past and present employees and local residents, a history of landfilling activity related to their Bristol plant. What was landfilled, where and when. Sufficient soil borings of the fill should be taken, with samples field screened and analyzed in a reputable laboratory to characterize the fill. This is just part of a complete site investigation and should be done to support the choice of remedial alternatives, monitoring location, parameters, inspections, etc."

EPA Response: EPA believes many years of groundwater analysis and other information have adequately characterized the waste. Through records and interviews of past and present employees, Rohm and Haas developed the information included in Attachment 2 on the quantities and types of wastes estimated to have been placed into the Landfill. Waste in drums in Landfill Area B was analyzed by EPA and Rohm and Haas in 1991. The results are contained in the Drummed Waste Investigation Results for the Landfill Section B. These results were submitted to EPA on July 3, 1991 and are contained in the Administrative Record. Soil borings and test pits have been completed throughout the Landfill Areas. The results of each are presented in the Administrative Record. (See Attachment 1, Drummed Waste in the Rohm and Haas Bristol Landfill and Attachment 2, Summary of Waste Materials in the Landfill.)

38. A resident states in a letter, "I would like to say that the permanence of the chosen "final" remediation is problematic as is the adequacy of the site investigation upon which it is based."

EPA Response: EPA has determined that implementation of the selected encapsulation/pumping remedy with perpetual maintenance and monitoring is feasible as a permanent remedy and that the investigation on which the remedy is based is adequate. EPA notes, however, that all remedies are re-evaluated every five years. Every five years EPA will look at the remedy to determine if the remedy is still being effective and if a better remedy can be or needs to be implemented at the Landfill.

39. A resident states, "Removal of the wastes would be most protective of human health and the environment in the long run."

EPA Response: EPA has determined that removal of the wastes would pose a health risk to the community through release of chemicals in the Landfill to the air. Leaving the wastes in place with the encapsulation/pumping remedy will not pose a risk to the community. EPA has therefore determined that removal of the wastes would <u>not</u> be the most protective of human health and the environment in the long run.

40. A resident asked, "Where can more information on the proposed corrective measures be found?"

EPA Response: In the Administrative Record for the Facility.

B. <u>Questions/Comments on Selection of the Remedy:</u>

1. A resident asked if EPA has a fallback position if this remedy does not work.

EPA Response: EPA has determined that the encapsulation/pumping remedy can effectively be implemented at the Landfill. It is not anticipated that additional investigations for design of the remedy will reveal that the design cannot be effectively implemented. However, if it is learned during the design phase that the remedy cannot be implemented successfully, EPA will re-evaluate its selection. EPA will regularly monitor the implemented remedy to assure that it is effective. If during this monitoring or during an evaluation of the success of the remedy, which will occur approximately every five years, EPA determines that the remedy is not working, EPA will re-evaluate its decision.

2. A resident asked if this decision was affected by a Rohm and Haas employee who is currently working with President Bush.

EPA Response: This decision was not affected by a Rohm and Haas employee who is currently working with President Bush. This decision was reviewed and proposed by EPA's peer group within EPA Region III. EPA's decision is based solely on technology and EPA regulations and policy. At no time were members of EPA requested to change their decision in response to political pressure.

3. A local official asked if all of the drums in the Landfill were taken into consideration when the remedy was proposed?

EPA Response: Yes, EPA took into consideration all of the drums estimated to be placed in the Landfill when proposing the encapsulation/pumping remedy. Since most of the drums placed into Landfill Area A were crushed at the time of disposal and no drums were placed into Landfill Area C, as supported by information obtained through test pit excavations, EPA's main concern was for the future rupture of the estimated 20,000 drums placed into Landfill Area B. Rohm and Haas addressed this concern in the February 1991 and subsequent reports on the Assessment of Public Health Risks Posed by a Hypothetical Catastrophic Release from Drummed Materials in Section B of the Rohm and Haas Bristol Landfill contained in the Administrative Record which EPA reviewed and accepted.

4. A resident asked why anything was being done to the Landfill if, as EPA stated, the worst leaching has already occurred.

EPA Response: EPA is proposing this remedy to stop any releases from the Landfill to the air, surface water and groundwater which are currently occurring. EPA regulations provide for protection of human health and of the whole environment. There is presently a potential for chronic adverse health effects to fish in the River as a result of releases from the Landfill, and adverse effects to trespassers, workers and animals from direct contact with wastes at the Landfill.

5. A resident stated that "there doesn't seem that there has been a thorough study as to all the contaminants that could potentially be there (in the Landfill). I am proposing that instead of calling this a final remedy, that EPA consider this as an interim status (remedy) and come back and do some further investigation."

EPA Response: EPA believes that the selected remedy will be a permanent final remedy for the Landfill.

6. A resident requested that EPA give the public the opportunity to comment on the remedy design at a public meeting to be held when the design stage is completed.

EPA Response: EPA will provide the opportunity for the public to comment on the remedy design when the design is completed. The public comment period will include a public meeting as requested.

C. **Questions/Comments on What the Remedy Will Include:**

1. A resident asked how deep will the slurry wall be?

EPA Response: 55 to 60 feet.

2. A resident asked, what does bedrock mean?

EPA Response: "Bedrock" is a general term for the consolidated (solid) rock that underlies solid or other unconsolidated surficial material (Reference: Basic Ground-Water Hydrology, United States Geological Survey Water-Supply Paper 2220, 1984). The bedrock beneath the Landfill consists of the Precambrian age Wissahickon Schist. The top of the bedrock, the weathered bedrock, consists of saprolite, a soft, mica-and-clay-rich, thoroughly decomposed rock formed by natural weathering of the bedrock in place. The bedrock where the slurry wall is proposed to be grouted into at the Landfill is the bedrock below the weathered bedrock.

3. A resident asked, how deep were the borings/wells made?

EPA Response: 60 to 80 feet.

4. A resident questioned, will the clay wall be effective?

EPA Response: The slurry wall or clay wall in conjunction with the other components of the selected corrective measures will be effective in preventing releases from the Landfill. A critical component of the remedy is the groundwater maintenance system to keep the contaminated groundwater in the containment area. The groundwater maintenance system will maintain the contaminated groundwater within the unit at a lower pressure than groundwater outside of the unit. Groundwater will then be pumped up from the unit creating an inward and upward gradient. This inward and upward gradient will prevent wastes from migrating through the slurry wall or down through the bedrock.

5. A resident asked if the contaminated groundwater can be released through the wall or through bedrock?

EPA Response: See above Response to Comment 4.

6. A resident asked whether there will be monitoring outside of the containment structure and how many monitoring wells will be placed around the structure?

EPA Response: Yes, there will be monitoring outside of the containment structure to determine if releases have occurred and to monitor pressure of groundwater outside of the wall. Monitoring will also be required in Hog Run Creek and the Delaware River. The number of monitoring wells will be determined during the design stage.

7. A resident questioned how surface water runoff has happened in the past, and how it will be addressed during construction, and in the future.

EPA Response: Surface water and groundwater drainage flows to Hog Run Creek and the Delaware River. Surface water runoff during construction will be addressed in the design stage. The goal of the design will be to divert surface water off and away from the Landfill area. Plans are being made, however, for rainwater runoff from the Landfill to potentially flow from the impermeable cap to a retention basin, a lake, to be constructed on the dredge material property. The dredge material property, which is located adjacent to the Landfill, is not part of the Landfill.

8. A resident asked, if, as stated by EPA, the Landfill poses no threat to the air space surrounding it, why are the remedial contractors going to use level B protection as opposed to C or D?

EPA Response: In an investigation of air releases from the Landfill, organics were found in the air above the surface of the Landfill but none were detected at the perimeter. (See report in the Administrative Record on Landfill Air Monitoring Program dated February, 1985.) The organic waste materials in the Landfill are currently covered with fill material which prevents large concentrations of organics from being emitted to the air. Excavation of the waste materials will require that the organic materials be directly exposed to air. Some of the organic materials in the Landfill can volatilize very quickly and in large concentrations when exposed to air. Persons working at the site during excavation will be directly exposed to the organics emitted unless Level B protection is required. Persons outside of the worksite area will be protected through discontinuation of excavation and covering of the

Site if monitoring at the perimeter of the worksite identifies a risk to persons outside of the worksite area.

9. A resident asked, how can this unit remain in the flood zone, would placement of a dike eliminate a flood zone and what would be the effect of a flood to the containment structure?

EPA Response: Only Area C is in the flood zone. Although placement of a dike can eliminate the flood zone, only through application to the Federal Emergency Management Administration (FEMA) can flood lines be changed. A flood may kill the vegetation which will be planted on the cap to prevent erosion. Any death to vegetation will require immediate maintenance to prevent erosion. Maintenance requirements are included in the remedy.

10. What type of security will be required for the structure?

EPA Response: During construction of the remedy, a fence will be located around the Landfill and 24 hour security will be provided specifically for the Landfill. After construction, a fence will be located around the Landfill and the 24 hour security which is responsible for the entire Rohm and Haas Facility will also be responsible for the Landfill.

11. Several residents have stated that the community does not want the water that will be pumped from the Landfill treated on-site. They want the water removed and treated off-site.

EPA Response: EPA is considering the community's request for no new treatment facilities to be built on the Rohm and Haas Company property to treat the extracted groundwater and for storing the extracted groundwater in a tank for less than 90 days.

12. A resident questioned "What type of equipment is going to be utilized to dig a trench approximately 60 feet deep to the bedrock in order to allow securing of a slurry wall." Another resident asked what the size limit is on backhoes that have been used to dig slurry walls.

EPA Response: Trench excavation is usually accomplished with appropriately sized backhoes with adequate boom length and bucket capacity. Frequently, boom lengths are extended by construction contractors to meet the needs of the trench installation. Counterweights are often required to offset the movement created by the long boom lifting a full bucket from the trench. The backhoe is the favored means of excavating a slurry trench because it is much faster than other equipment, such as a crane and clamshell. However, backhoe boom lengths are currently limited to 70 to 90 feet.

For greater depths, the crane and clamshell are normally used. Drag lines have been used in the past, but have been used rarely for recent installations (D'Appolonia 1982). Also see Response to Comment 33 in Section A.

13. A resident asked questions regarding the Dredge Material Disposal Area which is part of the Rohm and Haas Facility. He stated that "I would like to know how large that basin is going to be and how deep?"

EPA Response: The dredge material disposal area already exists on the Facility property. While Rohm and Haas has verbally indicated that this area may be used to collect rainwater runoff from the Landfill, no design plans including this area have been submitted to EPA. Collection of rainwater runoff from the Landfill will be addressed in the design stage for this remedy.

14. A resident asked if the water to be placed in a lake on the dredge material disposal area will be contaminated and if there is any contamination present in the dredge material basin now.

EPA Response: The water which may be collected onto the dredge material disposal area will not be contaminated. The water will be surface water which will result from precipitation. The surface water will not contact the waste because an impermeable cap will be on top of the waste.

The dredge material soil was sampled to use as back fill during the excavation of the Bristol Township property in 1986/87. Details are provided in Appendix I of the Waste Removal Project at the Bristol Township Sewage Treatment Plant Report prepared by BCM on behalf of Rohm and Haas in July, 1987. (See Administrative Record). Volatile and semi-volatile organics, pesticides and metals were found in the soil.

Based on the results of analyses of groundwater located below the dredge material disposal area, EPA has determined that the dredge material does not pose a risk to human health and the environment through the leaching of contaminants into the groundwater.

15. A resident asked "What is the expected cost of the cleanup and who is paying?" Also, a resident asked if the estimated cost has monitoring costs built into it.

EPA Response: The expected cost of the cleanup will range from $15 to $35 million. The estimated cost includes some monitoring. The full requirements for monitoring will be determined during the design of the remedy. Rohm and Haas will pay for all of the cleanup.

16. A resident commented that, "There is a couple of major flaws in your design. How are you going to determine, if you put wells on the outside of a slurry wall, what's going on the inside of the wall?"

EPA Response: What is going on inside the wall will be determined in several ways. Although the design has not been completed, pairs of piezometers are planned to be placed around the perimeter. The piezometer pairs will consist of one piezometer inside the wall and one piezometer outside of the wall. The piezometer pairs will be used to insure that the water level and groundwater pressure is less inside the encapsulation unit than outside. In addition, water which will be pumped out to maintain the lower groundwater pressure in the unit will be monitored to determine how much is being pumped and how the extracted groundwater should be treated. Further, aquifer testing will be completed to confirm that no downward migration occurs into the bedrock as the result of the encapsulation or outside sources.

17. A resident commented that if the saltwater from the Delaware comes up over time, the encapsulation units could be exposed to brackish water that could affect the slurry wall permeability.

EPA Response: Brackish or high chloride conditions as a result of salt water intrusion are not allowed in that part of the Delaware River due to an agreement between New York, New Jersey, Pennsylvania and Delaware. Saltwater intrusion is not allowed this far up on the Delaware River because it would affect the drinking water intakes for the City of Philadelphia.

18. A resident questioned the structural construction of a slurry wall. The resident worked on several landfills and stated "I don't think we're there yet in terms of technology."

EPA Response: Studies indicate that a slurry wall can be effectively designed and implemented for this encapsulation/pumping remedy. This decision was arrived at through technical reviews by EPA technical experts and EPA's Office of Research and Development. In addition, this remedy has successfully been implemented at the Kane and Lombard Site in Maryland.

D. Questions/Comments on Remedy Implementation:

1. A concern was raised over the contractor (BCM Engineers) that Rohm and Haas will employ to implement the remedy.

EPA Response: EPA has little jurisdiction over a Facility's selection of a contractor to design or implement a selected remedy. EPA's primary role is to assure that facilities properly design and implement selected remedies. Thus, it is the facilities who are ultimately responsible and liable for what their contractors complete. In recent orders issued by EPA however, EPA has sought the right to disapprove of a contractor selected by a facility. EPA will seek to include this provision in an order with Rohm and Haas to implement the selected remedy.

2. A resident asked if digging (excavation) will continue until all of the waste which has seeped out has been removed?

EPA Response: Excavation will continue at the Bristol Township Waste Water Treatment Plant, the PECO right of way, and the locations of the slurry walls for Landfill Areas A and B, until all waste which can be removed is removed. Excavation is not planned for locations which will undermine structures or within 25 feet of the PECO tower.

3. A resident asked if protective suits will be required for persons involved in excavation?

EPA Response: Level B protection will be needed for persons completing the excavation. Level B requires white plastic suits with an air supply. Refer also to Response to Comment #8 in Section C.

4. A resident asked, "Who will be paying for the excavation?"

EPA Response: Rohm and Haas will pay for the entire design and implementation of the remedy, which includes the excavation.

5. A resident asked if there are emergency provisions in place in case something happens during the excavation?

EPA Response: The Health and Safety Plan proposed for this excavation is being reviewed by EPA and all local governments in the area. The emergency response community was alerted and notified as to what could happen in case of an emergency and an immediate response action plan will be implemented if an emergency occurs. No emergencies caused

by an air release of organics are anticipated since limitations will be placed on the release of organics to the air during construction. The area of excavation which will be exposed to the air will be limited to prevent an unhealthy quantity of releases to the air.

6. Several residents asked about where the excavated material will be placed and wondered why it was not being moved off-site.

EPA Response: Excavated material will be placed into the area planned for encapsulation for two reasons: 1) It is less contaminated than the material already in the area to be encapsulated and 2) Placement in the Landfill will not increase risk of release from the Landfill.

7. Many residents asked why River Road may be potentially closed during the excavation. If it does close, how will the road be blocked off? These residents question why River Road can be closed for the excavation when State Road could not be closed for a Memorial Day Parade. The community does not want any additional traffic on State Road or other side roads as a result of the potential River Road closing. They stated there is already too much traffic on these other roads.

EPA Response: River Road could potentially be closed during the excavation for safety reasons such as to protect passing vehicles from releases, to better manage monitoring for releases and to prevent anyone from falling or driving into excavation holes at night. EPA has not received or approved any plans for the excavation which include the road closing. If the road is blocked, it may potentially involve the area of River Road immediately near the Landfill. EPA will work with the community to address concerns regarding the road closing.

In response to the parade statement, the Township has advised EPA that River Road is owned by the Township. State Road is a state owned road. The Township did petition and obtain permission for State Road to be closed for the parade, but did not permit three state owned roads to be closed for the parade as had originally been requested by the community.

8. A resident asked about access for safety vehicles in the event that River Road is closed.

EPA Response: Safety vehicles will have emergency access.

9. A resident requested that tarps be placed over the excavation holes at night and on weekends to prevent accidents.

EPA Response: In addition to placing a fence around the areas to be excavated and providing 24 hour security, Rohm and Haas has indicated that they do not plan to have any open holes at night. Rohm and Haas has agreed that if a hole is left open, a tarp will be placed over the hole.

10. A letter submitted by a resident had several comments/questions regarding the proposed slurry wall. The letter reads, "During the public meeting, the EPA indicated that the slurry walls would be tied into the underlying bedrock. Information contained in BCM's reports indicates that the depth of bedrock at the site varies from 15 to 55 feet (or 13 to 75 feet).

Saprolite, or weathered schist, overlies the unweathered Wissahickon schist bedrock and varies between 2 and 20 feet thick. Typically, installation of slurry walls is accomplished by excavation of a trench with a backhoe and backfilling the trench with impermeable materials such as bentonite/soil or bentonite/cement slurries. The maximum depth of such activities is typically on the order of 35 feet. Deeper installation requires the use of more sophisticated equipment (e.g. clam shell excavators). Since the depth to the competent bedrock may be as deep as 55 feet, or deeper depending on the thickness of the saprolite specialized equipment must be employed.

During the public meeting, the EPA geologist indicated that the slurry walls would be securely tied into unweathered bedrock, possibly by blasting the bedrock with explosives. Besides obvious health and safety concerns, such an activity would result in fracturing the bedrock. This could result in seepage of contaminated groundwater beneath the slurry wall through the fractures in the bedrock. In addition, there is no way to verify if the slurry walls are indeed tied into the bedrock as proposed. Monitoring of the wells probably will not provide conclusive evidence of this because of the extent of groundwater contamination at the site. For these reasons, the geologist's claim is questionable."

EPA Response: The unweathered schist can be prepared to key the slurry trench into the bedrock by ripping and/or drilling. If blasting is necessary to prepare the bedrock, controlled charges placed to account for the jointing of the bedrock can be used. The grouting, used to key the slurry wall into the bedrock, will also penetrate any joints or fractures in the bedrock.

A pump test can determine if the slurry walls are tied into the bedrock through observing the effect of pumping groundwater from wells inside of the encapsulated units on groundwater heights in wells outside of the encapsulated units.

Also, the main purpose of the slurry wall pumping system is to maintain a differential, negative, hydraulic gradient between the Landfill and the area outside the slurry wall and the Landfill. Therefore, with this negative hydraulic gradient, the water within the Landfill will migrate toward the pumps, away from the slurry walls and upward from the bedrock. This will ensure that any contaminants in the Landfill will not migrate toward the slurry wall and the bedrock.

11. A resident comments in a letter to EPA, "In the 9/19/91 public meeting in Bristol on this site, Tom Buntin stated that the slurry wall would be seated into the top of competent bedrock. From this, I gather that the saprolite on top of bedrock is not impermeable enough or consistent enough in occurrence to the slurry wall. I have the following concerns about tying the slurry wall into bedrock:

a) The publication, Engineering Characteristics of the Rocks of Pennsylvania (PA Bureau of Topo. and Geo. Survey, 1972) states that the "unweathered rock will require blasting." Blasting the bedrock to form a trench for the slurry wall will cause a higher porosity in the schist bedrock surrounding the trench (and perhaps at some distance away). This will lessen the effectiveness of the slurry wall in containing the waste.

b) Any of the usual techniques to excavate competent bedrock, e.g., blasting, jackhammering, would most likely disrupt the mudcake that would be used to keep the trench open and dry through the unconsolidated sediments for construction of the slurry wall."

EPA Response: Information provided in the following publications indicates that the slurry wall can be tied into bedrock without decreasing the effectiveness of the encapsulation pumping remedy:

1. Slurry Trench Construction for Pollution (EPA publication: EPA-540/2-84-001);
2. Investigation of Slurry Cutoff Wall Design and Construction Methods for Containing Hazardous Wastes (EPA publication: NTIS PB87-229688);
3. Engineering Characteristics of the Rocks of Pennsylvania (PA Bureau of Topographic and Geologic Survey, 1972); and
4. Designing with Geosynthetics 2nd Edition by Robert Koerner (Prentice Hall, NJ 1990)

The specific method to tie the slurry wall into the bedrock will be addressed in the design stage.

12. In a letter to EPA a resident states, "Information provided at the public meeting did not clearly indicate if the slurry walls would extend above the water table. It was indicated that the depth to water ranges from 1 to 11 feet below grade. Any portions of a bentonite slurry installed above the water table will dehydrate. Likewise, groundwater recovery from inside the sealed caps or groundwater diversion using the trench would lower the water table and allow for portions of the slurry wall to dehydrate. Therefore, the slurry material must consist of a proper mixture of bentonite and cement."

EPA Response: Information provided in the following EPA publications indicates that an effective mixture for the slurry wall can be developed for implementation of the encapsulation, pumping remedy at the Landfill:

1. Slurry Trench Construction for Pollution (EPA publication: EPA-540/2-84001);
2. Investigation of Slurry Cutoff Wall Design and Construction Methods for Containing Hazardous Wastes (EPA publication: NTIS PB87-229688);

EPA will address this issue in the design stage.

13. In a letter to EPA a resident states, "Certain water quality conditions inhibit the swelling of bentonite. For example, bentonite mixed with water that has either a total dissolved solids content greater than 500 parts per million (ppm) or a high chloride content may not swell properly. This is a concern since the Delaware River is tidally influenced in the Bristol area."

EPA Response: See EPA Response to Comment 17 in Section C.

14. In a letter to EPA a resident states, "During the public meeting, EPA admitted that the type and quantity of the materials deposited in the Landfills are not completely known. EPA's geologist stated that most of the materials are insoluble polymers and monomers. Groundwater sampling indicates significant concentrations of volatile organic compounds (VOCs) present in the groundwater at the site. It is not known if VOCs or other organic contaminants are present as free product at the site. If free product is present in the Landfills, bentonite slurry walls can desiccate and dehydrate which will increase their permeability. Again, the design of the slurry wall materials must take this into consideration."

EPA Response: EPA will address this issue in the design stage.

15. In a letter to EPA a resident states, "No mention was made of the methods used to repair the slurry walls if groundwater monitoring indicates degradation of the walls. Likewise, how would the slurry walls be repaired if it is determined that they were not properly tied into the bedrock during their installation? The feasibility of repairing the slurry walls must be investigated."

EPA Response: Slurry walls can be repaired by the same method that the walls are constructed. That is, excavation of the hypothetically damaged wall and regrouting and construction of a new slurry wall.

16. The resident further states, "Although the selected CMAs should reduce the amount of contaminants reaching the groundwater and surface water, I feel these items must be adequately addressed prior to final approval of the CMAs by the EPA."

EPA Response: EPA is only approving conceptual design. If, in taking conceptual design to final design stage, the remedy is determined not to be feasible, EPA will re-evaluate the remedy selection to identify and pursue a different conceptual design and/or corrective measure.

E. <u>Comments/Questions on the Effect of the Remedy:</u>

1. A resident asked if this remedy will really stop leakage from the Landfill and can the damage that has been done be cleaned up.

EPA Response: The <u>Corrective Measures Study</u> indicates that this remedy will stop leakage. Areas outside of the containment area which have been affected by releases from the Landfill will be remediated.

2. Several residents were concerned about safety of residents and workers in the area while excavation is taking place. Specific mention was made of the workers at the Bristol Township Waste Water Treatment Plant and Highway Department which are located next to the Landfill.

EPA Response: The conditions at the worksite will be monitored and controlled to provide for the safety of residents who live in the area and workers who work at businesses in the area. Areas of exposed waste will be limited to restrict the potential for air contamination. Work will be stopped and excavations will be covered if the wind direction is towards the community or businesses.

Perimeter locations will be monitored to determine if air releases have reached that distance. During the 1986/87 excavation, no chemicals were found in the air at the perimeter locations.

Employees of the Bristol Township Waste Water Treatment Plant and Highway Department will wear the same type of buttons used by the employees of the Bristol Township Waste Water Treatment Plant during the excavation of the Bristol Township Authority property in 1986/87. The monitors were organic vapor monitors containing charcoal impregnated onto a membrane. The monitors were passive in that they did not utilize an active pump. Analysis of the monitors provided information on the average concentration of organic chemicals in the air which the workers were exposed to during the excavation. No organics were found on the buttons worn by the Bristol Township employees during the 1986/87 excavation.

3. A resident asked if pets who roam onto the Landfill are at risk from the contamination.

EPA Response: Pets will not be affected by the waste in the Landfill after it is capped. Exposure to the contaminated material will be prevented by a cap which is three feet in depth and contains and impermeable liner.

4. A resident asked, how will 122,000 gallons of water per day into the Hog Run Creek from the Croyden groundwater TCE cleanup affect the remedy selected for the Landfill?

EPA Response: The remedy for the Landfill will be designed to not be affected by the increased flow of water in Hog Run Creek resulting from the Croyden TCE cleanup.

5. Several residents questioned where this remedy has been used in the past? How far was it located from a residential neighborhood? Were there any problems with monitoring afterwards? If so, what was done in response?

EPA Response: This remedy was also used at the Kane and Lombard Site in Maryland. The site is a mixed waste dumping ground located within a mile of a residential neighborhood and located adjacent to a high school and sports fields. This remedy, which has been in effect since August 1990, has effectively contained waste within the unit. There have been no problems with monitoring the remedy at the Kane and Lombard Site.

6. Several residents were concerned over the implementation of this remedy affecting the value of their homes. A few residents asked if Rohm and Haas would purchase their homes.

EPA Response: The remedy will reduce risks from the Landfill. If the value of homes is affected in any way, the value should increase as a result of improvements to the Landfill. The purchase of houses by Rohm and Haas is between the individuals and Rohm and Haas. No risks to homeowners as a result of releases from the Landfill have been identified at this time.

7. A resident asked if the containment structure will reduce air contamination releases? Will there be a need for gas vents on the landfill because of gas buildup/releases? Are there any permanent air monitoring stations at the Facility and are any planned for the containment structure?

EPA Response: It is not known if the overall amount of air contamination releases from the Landfill will be reduced through the containment/pumping remedy. Results from a 1985 study of air releases from the Landfill showed that while releases of contaminants to the air are detectable at the surface of the Landfill, no releases to the air are detectable at the perimeter of the Landfill. It is therefore unlikely that there will be risks posed by releases of contaminants to the air from the Landfill after the containments/pumping remedy is implemented. However, gas vents will need to be placed throughout the Landfill as a result of the remedy. The gas vents may provide a pathway through which contaminants released to the air from the Landfill will be concentrated. Monitoring will be performed and reviewed to determine if any risk is being caused as a result of releases from the vents. No adverse health effects will be allowed as a result of any air contamination releases from the gas vents. Thus, if necessary, treatment may be required for releases from the gas vents. There are no permanent air monitoring stations at the Facility and none are planned for the Facility or the containment structure.

F. <u>Questions/Concerns About Remedy Maintenance:</u>

1. A resident asked about who will be conducting the monitoring after the Landfill is capped, and will it be monitored constantly,?

EPA Response: Rohm and Haas will conduct periodic monitoring. EPA will maintain oversight over the monitoring including split samples and analysis.

2. A comment by a resident expressed doubt over the credibility of Rohm and Haas, particularly related to monitoring at the Landfill. How will the community know that Rohm and Haas is being responsible in maintaining the structure? Also, "Is there some way we can get community

funds or is there some way we can get community involvement monitoring the Rohm and Haas monitoring, is that a possibility?"

EPA Response: EPA will provide oversight of the design, implementation and operation and maintenance of the remedy. EPA will also be analyzing split samples. All oversight records will be submitted to the repository for the Facility located at the Grundy Library and will be available for public review.

In addition, with regards to Rohm and Haas credibility concerning maintenance of the structure, Rohm and Haas will have a financial incentive to maintain the cap and slurry wall to limit the quantity of water which will need to be pumped out of the encapsulation units (and subsequently treated) to maintain the inward hydraulic gradient.

EPA notes that there are no mechanisms known to be available for the community to obtain funds for oversight under the RCRA program. EPA agrees to further investigate and inform the community of whether the Bristol community can obtain funding to oversee the implementation of the remedy.

3. Several residents questioned what type of funding will be provided to ensure that the Landfill would be monitored and overseen in perpetuity. One resident commented that Rohm and Haas should be paying EPA salaries for the EPA staff that will oversee the monitoring, not the taxpayers.

EPA Response: EPA will maintain perpetual oversight over the monitoring of this remedy. EPA is pursuing reimbursement of oversight costs from Rohm and Haas.

4. A local official asked, "How long is this (remedy) good for?"

EPA Response: The life expectancy of the Landfill cap is 250+ years with maintenance, and may be virtually indefinite provided the vegetative soil layer and topsoil are maintained. The life expectancy of the slurry wall/pumping system is indefinite provided that an erosion, dehydration cover is maintained over the slurry wall and a negative hydraulic gradient is maintained by pumping to keep the contaminants migrating away from the slurry wall.

5. A resident asked "After the completion of this cap that is being proposed, when will you (EPA) start monitoring and how often?"

EPA Response: EPA will start monitoring the implementation of the remedy immediately after construction. EPA cannot predict how frequently it will be overseeing the monitoring which will be implemented for the remedy. Although monitoring of the remedy will initially be a high priority for EPA, the frequency of monitoring will depend throughout the years on resources, commitments and priority relative to other EPA needs.

6. A resident requests the opportunity to comment on EPA's monitoring frequency.

EPA Response: EPA's oversight of the monitoring is subject to internal management decisions and will be made available to the public. EPA acknowledges the community's concern that frequent oversight monitoring remain a priority for overall oversight of this remedy. This information will be used by EPA when decisions are made on the frequency to monitor this remedy.

7. During Diane Schott's presentation at the public meeting she mentioned that the Bristol Township Authority has indicated that it will check to confirm that EPA has maintained oversight of the design, implementation and maintenance of the remedy. A resident questioned why the Bristol Township Authority will be doing that type of work.

EPA Response: Bristol Township Authority has requested that they be allowed to call EPA to keep track of the oversight as a matter of concern for their community.

8. Questions were asked about EPA's ability to be aware if breaks occur in the slurry wall.

EPA Response: Through the groundwater maintenance program, the groundwater will be pumped to maintain an inward flow into the encapsulated unit. EPA will be able to tell if a break has occurred if significant changes occur in the amount of pumping which is required to maintain the inward flow. Due to the groundwater maintenance system, no waste should be released from the encapsulated unit if a break in the wall occurs.

In addition, EPA will monitor water pressure inside and outside of the containment area. If a break occurred in the wall, it would be evident because the pressure inside of the wall would be the same as outside of the wall at the location of the break.

9. A Burlington County official commented that, based on the information he had heard during the meeting, he believes there is a potential for movement of contaminants from the Landfill across the River to New Jersey.

EPA Response: As a result if the impervious nature of the bedrock and the lack of alluvial material in sections of the Delaware River adjacent to and downriver from the Landfill, it is unlikely that contaminants from the Landfill have migrated beneath the River to New Jersey. No unacceptable human health risks were found in a risk assessment on the affect of releases from the Landfill on the nearest public water supply intake on the Delaware River (Bristol Borough water intake). Therefore, it is unlikely that any unacceptable human health risks are posed to any New Jersey public water supplies from releases from the Landfill to the Delaware River. (See March, 1988 Landfill Remedial Investigation Addendum Report contained in the Administrative Record.) Through the groundwater maintenance system, required in the remedy, groundwater will be pumped to maintain an inward flow into the encapsulation unit. Aquifer tests will be completed to assure that no downward components of the groundwater from the encapsulated unit exist into the bedrock. The groundwater maintenance system will prevent the release of waste from the unit across the Delaware River into New Jersey.

10. A Burlington County official asked "Is there a head difference?"

EPA Response: Yes, there is a head difference. "Head difference" in this instance is referring to the differences in elevations in shallow wells versus deep wells. Since the pressure deep within the aquifer below the Landfill is greater than the pressure higher in the aquifer, water levels in the deep wells are higher than in the shallow wells. As a result, groundwater deep beneath the Landfill is not continuing to migrate more deeply into the aquifer; rather, the Landfill area is a major zone in which groundwater from far away is discharging in an upward flow.

11. The Burlington County official asked, "Is the deep groundwater under artisan conditions?"

EPA Response: No. However, molecules of water deep in the aquifer beneath the Landfill tend to migrate upward, not downward.

12. The Burlington County official expressed a concern over forcing contamination deeper.

EPA Response: The groundwater maintenance system will be designed to prevent downward migration.

13. A resident asked how many years will the original structures last before they have to be touched up?

EPA Response: The life expectancy of the Landfill cap is 250+ years with maintenance, and may be virtually indefinite provided the vegetative soil layer and topsoil are maintained. The life expectancy of the slurry wall/pumping system is indefinite provided that an erosion, dehydration cover is maintained over the slurry wall and a negative hydraulic gradient is maintained by pumping to minimize contact of contaminants with the slurry wall. If anything breaks, it will be repaired or replace as needed.

14. A resident stated that "If we're so sure that this slurry wall is going to last for a couple hundred years, why do we need to monitor it?"

EPA Response: The slurry wall will only last for a long time if it is maintained. This is not a maintenance-free remedy. This remedy will be evaluated every five years to determine if a better remedy exists or needs to be implemented.

G. <u>Comments/Questions Regarding Other Corrective Measures</u>

1. A resident asked if complete excavation and removal was considered for the Site. Several residents commented that they would prefer that the Landfill be excavated, not encapsulated.

EPA Response: EPA evaluated excavation very seriously. Volatilization of organics into the air through excavation poses a much greater health risk to the community than leaving the wastes in the Landfill.

2. A comment was made regarding the cost of capping the Landfill compared to the cost of excavating the Landfill. The resident stated, "Is one billion dollars to dig it up a cost you are weighing against safety?"

EPA Response: EPA has not selected this remedy solely on the basis of cost although cost was a factor considered as is described below. EPA selected this remedy based on effectiveness, safety, protection of human health and the environment, and long-term and short-term health effects. EPA only looked at cost to distinguish between choosing between more than one remedy, when more than one remedy met EPA's criteria.

3. Several residents made reference during the public meeting to Rohm and Haas' request to continue incineration of waste fuels in their industrial boilers. These residents requested that a public meeting be held to address this issue.

EPA Response: EPA has referred this request to the RCRA Programs Branch of EPA Region III.

H. Comments Received on Background Information (Statement of Basis)

1. Rohm and Haas refers to page 5, paragraph 3 of the Statement of Basis (SB) and states that "The 1983-84 investigation of the Bristol Landfill and adjacent Rohm and Haas owned or previously owned properties consisted of a study area encompassing more than 350 acres, of which approximately 60 acres plus the Bristol Township Authority property were used for waste disposal."

EPA Response: EPA acknowledges receipt of this comment.

2. In the same paragraph, Rohm and Haas comments that "the waste materials placed beneath the Bristol Township Authority property were oil additive filter cake, trickling filter sludge, and enzyme filter cake."

EPA Response: EPA acknowledges receipt of this comment. A typographical error regarding this information occurred in the Statement of Basis.

3. On Page 5, paragraph 4, Rohm & Haas comments that "the normal method of handling drummed wastes was to randomly dump the drums into the Landfill and then crush them with a piece of heavy equipment."

EPA Response: EPA acknowledges receipt of this comment.

4. Rohm and Haas refers to Page 7, No. 5, of the SB and states that "During the 1984 test pit investigation, two test pits were conducted in the zones identified as highly magnetic. A review of the logs and photographs for test pits nos. TP-1 and TP-2 does not support EPA's statement that 23 of the approximately 24 drums found were intact. In fact no statement regarding the number found versus number intact were found in the February 1985 report which summarized the test pit findings."

EPA Response: The information that 23 of the approximately 24 drums found in Landfill Area B were found intact was determined by EPA by reviewing the logs which were developed during the test pit investigation. These logs were not submitted by Rohm and Haas in the February 1985 Test Pits Report. EPA subsequently verbally requested submission of the logs and a summary of information provided in the logs was prepared by EPA. This summary is included in the Administrative Record with the February 1985 Test Pits Report.

5. Referring to Page 8, No. 13, Rohm and Haas comments that "Bis (2-chloroethyl) either (BCEE) was detected in a surface water sample collected from station HRM-210 in November 1983. The level detected was 21 parts per billion (ppb). Subsequent sampling of the same location in May 1984 resulted in a non-detect level for BCEE. Di-n-butyl phthalate was also detected at the same location in November 1983 at a level of 11 ppb or 1 ppb above the detection limit. Subsequent sampling in May 1984 again resulted in a non-detect level. As outlined in the April 1984 Report on Landfill Investigation, positive results were recorded for formaldehyde. However, the analysis for formaldehyde can yield a positive result when either formaldehyde is present or when a variety of natural organic substances yield formaldehyde under the conditions of the analysis. Thus, it was not conclusive that formaldehyde was present in the Hog Run Creek samples.

It is suggested that EPA in the Record of Decision prepare more clarification regarding the frequency of and levels detected for BCEE and di-n-butyl phthalate, as their detection occurred at a significantly lesser frequency than ammonia, sulfate, surfactants, and oil and grease. We also suggest that the above explanation for formaldehyde be provided."

EPA Response: EPA acknowledges receipt of this comment. Since this information does not affect EPA's final decision, it is not necessary for EPA to determine the full accuracy of this comment or to further address this comment in the Record of Decision.

6. Rohm and Haas refers to Page 9, entitled "Risk Assessment" and comments that "The five compounds for which the environmental risk assessment concluded that at a depth of six feet in the River, calculated maximum concentration/acceptable concentration ratios exceeded a one to one ratio were: bis(2-ethylhexyl) phthalate, inorganic mercury, manganese and two tentatively identified compounds, 2,5,-cyclohexadiene-1,4-dione and tetracthyldiphosphoric acid."

EPA Response: EPA acknowledges receipt of this comment. This information is consistent with information submitted to EPA by Rohm and Haas in the Bristol Landfill Remedial Investigation Addendum contained in the Administrative Record.

7. Rohm and Haas refers to Page 12, No. 2 and comments that "A review of the groundwater level data for those wells located in the northwest portion of the BTA property shows that an elevated groundwater table or groundwater high exists in this area. The eastern edge of this groundwater high is in the area of monitoring wells LF-19-18, LF-17-18,

LF-18-15 and piezometer P-3-18. The western edge cannot be defined by the current groundwater monitoring network, but is beyond the BTA site. Based on the available data groundwater in this area is discharged radially, that is towards the north of Hog Run Creek, to the east towards Chemical Properties, Inc., and Landfill Section A and to the south towards the Delaware River."

EPA Response: EPA acknowledges receipt of this comment. Since this information does not affect EPA's final decision, it is not necessary for EPA to determine the full accuracy of this comment or to address this comment in the Record of Decision.

8. Rohm and Haas refers to Page 16, No.3 and comments that "More recent computer modeling conducted by BCM Engineers of the recommended corrective measures for Landfill Section A does not support the need for a groundwater diversion trench. Results from the modelling and BCM's conclusions will be submitted to EPA as part of the Corrective Measures Implementation design documentation."

EPA Response: EPA acknowledges receipt of this comment. EPA will further address the necessity of a diversion trench during the design stage.

9. Referring to Pages 19-21, entitled Media Protection Standards, Rohm and Haas comments, "With respect to chemical specific Media Protection Standards, Rohm and Haas has completed the studies of groundwater dilution factors for both the northwest and southeast corners of the landfill. The results will be transmitted to EPA upon completion of the written report."

EPA Response: EPA acknowledges receipt of this comment. EPA will address this comment in the design stage.

10. Referring to Pages 19-21, entitled Media Protection Standards, Rohm and Haas comments, "The Statement of Basis refers to Biological Media Protection Standards to be applied to any existing impacted areas (page 20). Because these standards have not been given to Rohm and Haas, their appropriateness in assessing the environmental concerns in Hog Run Creek cannot be determined. Furthermore, it is unclear as to which areas have been impacted by the landfill and are to be assessed. In the Statement of Basis, benchmark characterization is discussed as forming the basis for the assessment of these impacted areas. However, we are aware of only a single study of the aquatic community of Hog Run Creek and this study concluded that there was no acute impact to the biological community (Aquatic Baseline Survey of Hog Run Creek, A Tributary to the Delaware River, 1986). Consequently, the impacted areas to which the Statement of Basis refers have not been reported in any findings known to Rohm and Haas."

EPA Response: EPA will require Rohm and Haas to complete the Benchmark Characterization prior to initiating construction activities. The purpose of the Benchmark Characterization is to identify any areas of the surface water and biological community affected by releases from the Landfill. While EPA acknowledges that the study which was completed did not identify any impacted areas, EPA will require additional diverse studies for Hog Run Creek for the purpose of identifying any impact from releases from the Landfill on a broader range of the biological community in Hog Run Creek. The Benchmark Characterization must include the following:

a. Prior to initiation of construction, the Delaware River and Hog Run Creek should be characterized biologically, chemically, and physically. The characterization shall be for water, sediments, and, as noted below, for soils. The chemical characterization shall be for the constituents of concern which are in the Landfill and the parameters on the attached sheet titled Surface Water and Sediment Investigation; Chemical Physical Parameters (This document is included as an attachment to the Statement of Basis.) The biological characterization shall include a chronic bioassay for both water and sediment for samples at all sampling points. Chronic bioassays shall be carried out for onsite and off-site soils in the vicinity of areas where a cap is not placed and the soil contamination levels are sufficiently high.

b. During construction, the River and Creek shall be monitored to identify any additional degradation caused by construction activities. A contingency plan shall be developed to mitigate any damage caused by construction.

c. After construction, the impacted area shall be resurveyed. A biologist should review the results to determine whether the previously existing impact has been mitigated. If no improvement is shown, a decision on additional remediation shall be made at that time.

This information was provided to Rohm and Haas during a meeting between EPA and Rohm and Haas representatives on June 27, 1991 and is included in the Administrative Record along with notes from that meeting.

11. Referring to Pages 19-21, entitled Media Protection Standards, Rohm and Haas states, "EPA has also requested that chronic bioassays be carried out for onsite and off-site soils in the vicinity of areas where a cap is not placed and the soil contamination levels are elevated." This appears to be unnecessary because after the remediation no soils "where contamination levels are sufficiently high" or soil which has been in immediate contact with the

landfilled wastes will be located outside the capped areas. All site soils within Landfill Section A found to be of high concentrations as defined by soil borings will be contained within the slurry wall and covered by an impermeable cap system. Additionally, during construction of the slurry wall, all waste and overlying soil bordering Hog Run Creek and the Delaware River will be excavated and contained within the Landfill. New side slopes will be constructed from soil gathered from the on-site dredge material basin or from another source. Similarly, in Landfill Section C, all waste along Hog Run Creek as determined by soil borings will be excavated to be incorporated in the capped Landfill. The sideslopes of Hog Run Creek will be re-established with dredged material or soil. There is no waste bordering the creek along Landfill Section B. Consequently, no soils "where contamination levels are sufficiently high" or soil which has been in immediate contact with the landfilled wastes will be located outside the capped areas. Therefore, it will not be necessary to conduct chronic bioassays on any on-site or soils.

EPA Response: EPA recognizes that a cap is proposed to be placed over the entire Landfill area. EPA included the request for bioassays of the soils in the event that a cap is excluded from any portion of the Landfill in the final remedy design. EPA is particularly concerned about the Southeast Area of Landfill Area A where Enhanced Remediation is proposed. Some of the methods for Enhanced Remediation which are being investigated for the area, i.e. flushing, do not include placement of a cap over that area.

12. Rohm and Haas again comments on Pages 19-21, entitled Media Protection Standards: "EPA further requests that the Hog Run Creek be monitored to "identify any additional degradation caused by construction activity." However, assessing the impact of construction alone is not feasible because three other changes, which could also affect the biological community, will occur during the same time as construction. First, physical changes to the streambank will occur with the removal of deep-rooted vegetation which may degrade the slurry wall and/or cap. Shallow rooting plants will be re-established on the sideslopes but the change in shading is likely to influence the character of the biological community. Second, as a result of a change in Rohm and Haas National Pollutant Discharge Elimination System (NPDES) permit the discharge from its wastewater treatment plant will be moved from a point south of Landfill Section C to a point just south of Landfill Section B. This change will result in an increased volume flow of the creek and a possible change to the biological community in the main branch of Hog Run Creek. This discharge location change will occur by the end of 1991 as required by the NPDES permit conditions for effluent quality. Thirdly, EPA has indicated that they will be discharging effluent wastewater from the Croydon TCE Superfund Site into the east

branch of Hog Run Creek, upstream of the Landfill. This new wastestream, estimated to be 120 gallons per minute, is also likely to affect changes in the biological community of Hog Run Creek."

EPA Response: EPA acknowledges receipt of this comment. However, EPA is retaining the requirement that Hog Run Creek be monitored to identify any additional degradation caused by construction activity in the final decision for the following reasons.:

a. The statement that physical changes to the stream bank are not likely to influence character of the biological community is inconclusive; EPA needs documented proof that no degradation will occur as a result of construction of the remedy; the only document of proof which EPA will accept is actual analytical results.

b. The change in location of the discharge of the wastewater treatment plant to Hog Run Creek is planned to be implemented prior to the initiation of construction activities for the remedy; if the change of the discharge location does take place during construction activities, EPA is requiring documented proof that any degradation of the biological community in Hog Run Creek is not due to activities related to construction of the remedy to the Landfill; and

c. It is not known when implementation of the discharge of effluent wastewater from the Croydon TCE Superfund Site will occur; if in fact the discharge is implemented during construction activities, EPA is requiring documented proof from Rohm and Haas that any degradation of the biological community in Hog Run Creek is not due to activities related to construction of the remedy at the Landfill.

13. Rohm and Haas refers to Pages 19-21, entitled Media Protection Standards, and states that "Rohm and Haas would like to suggest that BCM and EPA meet and discuss the issues raised by these comments. The following topics of discussion would be particularly useful to complete this phase: sampling methods, timing of the assessment, sampling locations, contingency plan, and alterations to Hog Run Creek.

EPA Response: EPA acknowledges receipt of this comment and will address it in the design stage.

V Future Actions

This decision only applies to the Landfill. Any future corrective measures at the Facility will be addressed through separate Corrective Measures Studies and public participation will be encouraged at the appropriate time.

VI Declaration

The selected Corrective Measures are necessary to protect human health or the environment from releases of hazardous waste within the meaning of Section 3008(h) of RCRA, 42 U.S.C. Section 6928(h), from the Landfill to the environment. The selected Corrective Measures will attain soil and groundwater cleanup standards, will reduce or eliminate to the maximum extent possible further releases of hazardous waste, and provide for the proper management of wastes generated during implementation of the Corrective Measures. Furthermore, the selected Corrective Measures will be effective and reliable, both in the long term and the short term; will result in the reduction of toxicity, mobility and volume of hazardous waste; and will be implementable and cost effective in comparison to the other corrective measure alternatives presented in the EPA approved Corrective Measures Study for the Landfill. Finally, the selected Corrective Measures utilize permanent solutions and alternative treatment technologies to the maximum extent practicable.

ATTACHMENT 1

Drummed Waste
in the
Rohm and Haas Bristol Landfill

To be Added to the Administrative Record

BCM Engineers
Engineers, Planners, Scientists and Laboratory Services
One Plymouth Meeting • Plymouth Meeting, PA 19462 • (215) 825-3800

August 22, 1991

Ms. Diane B. Schott
Project Coordinator (3HW61)
U.S. EPA Region III
841 Chestnut Building
Philadelphia, PA 19107

Subject: Drummed Wastes in the Rohm and Haas
Bristol Landfill
BCM Project No. 00-6201-0101

Dear Diane:

In a number of recent conversations with EPA, questions have been raised concerning the placement of drummed waste in Section A of the Rohm and Haas Bristol landfill. EPA has requested information on the number of drums which may have been deposited, their contents and their method of handling or placement. On behalf of Rohm and Haas Delaware Valley Inc. (Rohm and Haas), BCM Engineers Inc. (BCM) has reviewed a number of documents which pertain to operations of the landfill facility as well as the findings from two test pit investigations conducted in 1984 and 1985 which were previously submitted to EPA. The documents which were reviewed are:

1. "Notification of Hazardous Waste Site", (Rohm and Haas Delaware Valley Inc.), dated June 4, 1981.
2. Landfill Investigation, Vol. III, Magnetic Survey Report (BCM), dated February 1985
3. Landfill Investigation, Vol. V, Part 2, Confirmation Test Pits Report (BCM), dated February 1985
4. Letter from BCM Eastern Inc. to EPA - Region III, Subject - Rohm and Haas Bristol Landfill Waste Characterization Information, dated September 4, 1986
5. Chemical Leaman Investigations and River Road Test Pits (BCM), dated April 1986
6. Bristol Landfill Remedial Investigation Addendum (BCM), dated March 1988
7. Letter from BCM Engineers to EPA-Region III, Subject - EPA RFI comment letter of 11/12/89, dated March 6, 1990

8. Bristol Landfill RCRA Corrective Measures Study (BCM), dated May 1990

In 1984, 42 discrete strongly magnetic anamolies were identified at landfill Section A and the adjacent Chemical Leaman property. These anamolies were identified as the result of a magnetic survey conducted over the landfill surface. Areas of chaotic stratification which could indicate waste filling were also identified in a 1984 ground penetrating radar survey. Following the identification of these areas, fourteen test pits were constructed in 1984 in areas identified as strongly magnetic. In 1985, 12 additional test pits were constructed along the landfill/River Road perimeter, an area which was identified as a single continuous strongly magnetic zone. A total of 15 test pits were constructed along the landfill/River Road boundary. The remaining 11 magnetic anamoly test pits were constructed in a somewhat random approach along the landfill perimeter and at locations in the center of Section A. Metal or fiber drums were found in 20 of the 26 magnetic zone test pits. Table 1 is a summary of the test pit findings. A review of the actual field logs and photographs taken during the two test pit investigations indicates that in the majority of cases, the metal drums were crushed and are not intact. Many of the fiber drums uncovered were also in very poor condition. This finding agrees with statements by Rohm and Haas that at the time of placement, drums in the landfill were crushed or broken open.

As no records were maintained by Rohm and Haas which would outline the exact number of drums which might have been deposited in the landfill, one must rely on the evidence or records which do exist. Approximately 20,000 drums are believed by Rohm and Haas to have been deposited in landfill Section B. Based on the visual evidence obtained during test pits conducted in 1984 and 1991 in Section B, this number is reasonably accurate. In each test pit which was constructed within the four identified magnetic anomalies in Section B, remains of fiber drums and metal drums were found. Due to the poor condition of many of the drums, the exact number of drums found in each pit could not be determined, however, from the photographs it is reasonable to assume that at least 15 to 20 drums were identified within each test pit.

BCM has determined that the magnetic anomalies in Section B cover approximately 85,600 square feet (sq. ft.) or about 2 acres. In Area A, including the Chemical Leaman property, the strongly magnetic zones cover approximately 443,300 sq. ft. or about 10.2 acres. Thus, if we assumed a worst-case situation, that is, drums within Section A were placed in the same density as in Section B then there should be approximately 100,000 drums in the magnetic zones identified in Section A. This number would agree with EPA's extrapolation from data approximated by Rohm and Haas in their 1981 "Notification of Hazardous Waste Site". However, data from

the 26 test pits constructed in Section A does not support this worst case hypothesis or EPA's extrapolation. That is, the density of drums found in the Section A test pits in no way approached the density recorded for Section B. In fact, from Table 1, the density is more on the order of 4 to 6 drums per pit constructed in the Section A magnetic zones. Based on the visual evidence, one could reasonably extrapolate the number of drums from the average area covered by a test pit (i.e., 10 feet by 12 feet), the visual drum density, and the area identified as magnetic. For Section B, the number of drums was calculated to be about 14,200 drums. For Section A, the calculation yielded approximately 22,200 drums.

Regarding the drum contents, the black solid or semi-solid materials noted in a number of the drums are most likely 1,2-dichloroethane (EDC) distillation residue from acryloid coating kettle cleaning, t-BAEMA and DMAEMA still bottoms or trichloroethylene still residues are solid and consist of entrapped solvents in polymers. The white solid material is off-grade emulsion. Any of the viscous liquids are most likely off-grade Acryloid coatings. The spongy or gummy solids are waste pesticide compounds or B-Process tars. Fiber drums containing small jars or bags of materials are lab packs from Rohm and Haas research facilities. It should be noted that a review of the photos taken during the 1984 investigation and previously submitted to EPA, shows that a number of the drums excavated in Section A were crushed and empty.

In summary, the exact number of drums deposited in Section A cannot be accurately determined. However, based on the visual evidence the number is probably on the same order as that deposited in Section B. Both fiber and metal drums were placed in Section A. The majority of drums excavated during the 1984 and 1985 test pit excavations were crushed or were in very poor condition. The visual evidence supports claims by Rohm and Haas that the common landfill practice was to crush all drums that went into the landfill. Based on the test pits few intact drums are present within Section A, which is consistent with the findings from the Section B 1991 test pits. Data from groundwater samples collected within and around Section A, since routine monitoring commenced in 1983, has been very consistent in terms of compounds and levels detected. This fact further supports both the visual evidence and Rohm and Haas records that drummed wastes were routinely crushed when placed in the landfill. The claim by Rohm and Haas that approximately 20,000 drums were deposited within Section B is reasonable based on the 1984 and 1991 test pit investigations. No drums or drum remains were found in any of the 1984 test pits constructed in landfill Section C.

BCM

Should you require any additional information, please do not hesitate to contact me.

Very truly yours,

Mary M. Mang

Mary M. Mang
Assistant Vice President

/emm 0316J
cc: B. McPeak, Rohm and Haas
R.J. Leonard, Rohm and Haas
G.A. Schnabel, Rohm and Haas
W.H. Fleming, BCM
F.M. Poli, BCM

BCM

TABLE 1
1984/1985 TEST PIT RESULTS
LANDFILL SECTION A
ROHM AND HAAS DELAWARE VALLEY

Test Pit Identification	Drums Found, Condition and Contents
TP-18	7, crushed; one rusted at 9-10' depth
TP-19	8, crushed
TP-20	4, crushed, 3 drums contained black solid material, 1 contained black semi-solid/liquid.
TP-21	1, crushed
TP-22	1, condition not indicated
TP-25A	Number not identified, fiber drums containing small intact jars (lab packs)
TP-25B	2, condition not indicated
TP-26	4, crushed, contained black gummy material, 3 fiber lab packs
TP-31	3, crushed
TP-32	8, crushed, contained hard white material; remains of fiber drums
TP-33	3, crushed, one contained solid material, several fiber drums
TP-34	Number not identified, crushed, solidified white and black materials
TP-35	1, broken, black viscous material
TP-36	None
TP-101	None

BCM

Table (Continued)

TP-102	2, condition not indicated, white to black gummy material
TP-103	Number not identified, crushed, several fiber lab packs
TP-104	None
TP-105	1, condition not indicated, tan viscous liquid, several fiber drums containing bagged material
TP-106	Number not identified, metal and fiber, gray viscous liquid in one metal drum
TP-107	None
TP-108	1, crushed, gray-white spongy material, remains of several fiber drums
TP-109	Number not identified, semi-crushed
TP-110	None
TP-111	None
TP-112	Number not identified, crushed, solid material

ATTACHMENT 2

Summary of
Waste Material in the Landfill

Report Submitted by BCM Engineers on Behalf of Rohm and Haas
Attached to Remedial Investigation Addendum 3/15/80
Located in the Administrative Record

THE BRISTOL LANDFILL

I. Introduction

This report describes what is known about the nature and amounts of chemical waste disposed of at the River Road Bristol landfill.

There are some indications that the Bristol landfill at River Road began operation in about 1952. Others indicate the landfill was opened and began operation in 1955, and continued in use until 1975. As expected, records of the early landfill years are very sparse. Even for the later years (1967-1975), complete data are not available for amounts and for type of waste disposed of at the landfill. However, a picture can be reconstructed on the amounts and types of waste contained in the Bristol landfill.

II. Material Discarded To Landfill

Table I lists various materials sent to the River Road landfill. Types of waste generated at the Bristol Plant, but which were not disposed at the landfill were: radioactive, highly corrosive, pathological, highly flammable liquids or solids, and material which had low taste or odor thresholds.

The operation of the River Road landfill can be divided into three periods. In the early years, 1953 to about 1960, trash (paper, cardboard, wood, etc.), trickle filter sludge, enzyme waste, B-Process and ammonium sulfate mother liquor, and Petroleum Acryloid polymer and monomer filter cakes were the major wastes deposited. Although no specific records are available, it is conjectured that Bristol laboratory waste and small amounts of other process waste were also sent. Burial is believed to have been methodical with definite areas for the various types of waste.

During the middle period, about 1960 to 1968, there was a significant increase in types and amount of landfill process wastes. Ammonium sulfate mother liquor, fly ash (stored for later sale), white water, plastics and "off-grade materials" were then added to the original types of landfilled waste. Process wastes, excluding ammonium sulfate mother liquor, increased from an annual average of about 7,100 tons (1953-1960) to about 13,100 tons. Ammonium sulfate mother liquor averaged about 3,600 tons per year.

II. Material Discarded To Landfill (cont'd)

In the final period of the landfill, from about 1969 to 1975, average yearly chemical waste increased slightly to about 13,900 tons per year, even though two major wastes, B-Process tar and ammonium sulfate mother liquor were eliminated. The trickle filter sludge volume was also greatly reduced. Elimination of the former was due to the shutdown of the B-Process (1970) which also terminated the by-product, ammonium sulfate mother liquor waste. However, it was during this period that wastes considered hazardous under current regulations were sent to the Bristol landfill. Examples of these wastes are lead dross, ethylene dichloride and trichloroethylene residues, Kydex hopper drainings, and wastes from the Petroleum Acryloid and Acryloid Coatings production areas. Very large amounts of emulsion waste (non-hazardous) also went to the landfill during this period and about fifty percent of the drummed waste was from the emulsion areas. Drum waste sent to the landfill peaked in about 1970-1973 at about 20,000-25,000 drums per year. It is believed there was considerable mixing of wastes in this period.

Table II shows waste materials "probably" sent to the landfill based on knowledge of the product mix. Although insecticides, pesticides and herbicides were to be excluded from the landfill, it is believed that some laboratory samples of Lethane, Karathane, DNCP, Kelthane, Perthane, and Dithane were probably sent to the landfill. There is a possible presence of quantities of the herbicide 2,4-D at two locations in the landfill. Also, the presence of DDT-DDD and "pesticides of the chlorinated type" in occasional loads of waste sludge to the landfill from the Philadelphia Plant is suspected.

Finally, sludges from the Levittown sewerage treatment plant and the Bristol Township sewerage plant are believed to have also been dumped in the River Road landfill. Trash from two Bristol Township clean-up days also went to the landfill.

No radioactive material or dioxin (2,3,7,8-TCDD) was sent to the landfill. Radioactive waste (Research) was carefully collected, documented and disposed of using outside contractors. Oral reports of dioxin being disposed probably relate to a bacteriacide with the tradename "Dioxin" that is not chemically related to 2,3,7,8-TCDD. A final point, there is no evidence to show any Rohm and Haas chemical waste dumping north of River Road either in the Mary Devine School area or elsewhere on that side of River Road.

III. The Eckhardt Report

In 1979, Rohm and Haas and fifty-two other chemical companies submitted data to the Congressional Subcommittee on Oversight and Investigations (Robert Eckhardt, Chairman) on the disposal of chemical waste from 1950 to 1979. This waste disposal site survey is commonly called the "Eckhardt Report". It was voluntary and requested the waste disposal sites used for the disposal of process wastes generated by each company. The total amount of process waste disposed of at each site and its waste components or characteristics was also requested. As instructed, trash and laboratory or research waste was not included in the survey. The Bristol Plant portion of this survey included the then inactive Bristol Plant landfill at River Road.

The Eckhardt Report for the Bristol Plant (APPENDIX) was compiled from scraps and fragments of relevant information from various Bristol sources. Similar reports prepared by Spring House Research and the Croydon and Philadelphia Plants also indicate that they sent some wastes to the Bristol Plant landfill. The total amount of Bristol process waste (chemical waste and ammonium sulfate mother liquor) disposed at the Bristol "Plant Landfill" was reported as 309,000 tons; wastes from other sources raised the total to about 315,000 tons (Table III). The "Plant Landfill" includes the landfill at River Road and the plant dump in the Bristol Plant. All wastes from other locations went to the River Road site. The total did not include trash or laboratory waste and covered the period 1950-1975. The yearly Eckhardt totals are given in Table IV. Approximately 99% of the total chemical wastes shown (1953-1975 period) were disposed at the landfill at River Road.

It is necessary to emphasize that the Eckhardt quantities are estimates, and as such they have a range of possible error associated with them. The quantity reported for Bristol probably has an error of plus or minus ten percent.

IV. Estimated Waste To Landfill

As discussed in Section III and shown in Table III, the total process waste interred is estimated at 315,000 tons. Trash quantities are not given, but are simply listed as "present" (sent to landfill) or "zero". Trash quantities cannot be estimated. Quantities of office trash and waste wood were burned at the landfill. This practice continued at the landfill until at least 1969. The estimated total laboratory waste is based on Eckhardt numbers from the Philadelphia Plant and estimated drum totals for Spring House and Bristol.

V. Estimated Hazardous Waste To Landfill

Based on an examination of Tables I and II, and general knowledge of the production departments, processes and practices of the Bristol Plant, a list of RCRA wastes possibly disposed at the landfill has been compiled (Table V). The difficulty in estimating total quantity of hazardous waste is the lack of discard lists and the uncertainty of classification (hazardous or non-hazardous) due to insufficient waste composition data. If one defines hazardous waste as either RCRA Hazardous (Table VI), or the material or its components are listed, then an estimated 16%* of the total Bristol chemical wastes (NOT including ammonium sulfate mother liquor) may be hazardous. Total estimated "hazardous" waste is given in Table VII and assumes that none of the Croydon or Philadelphia Plant production waste was hazardous. All of the laboratory waste is assumed to be hazardous (about 5,400 drums). (Laboratory drums were normally emptied and the cans and bottles were crushed.)

* Range .9-27%

MATERIAL BELIEVED TO BE SENT TO LANDFILL

1. Trash
2. Enzyme Filter Cake, spent mash and mold-contaminated batches
3. Petroleum Acryloid and Monomer Filter Cake
4. B-Process and Ammonium Sulfate Tars
5. Trickle Filter Sludge
6. Ammonium Sulfate Mother Liquor
7. Off-Grade Emulsions and Acrysol (Gels and filter cakes)
8. Fly Ash (cinders)
9. Latex wash (White Water) and flushes
10. Kydex sheet, edge trim and hopper drainings
11. Spray Dried Powder
12. Molding Powder (Implex and Plexiglas)
13. Korad Film (Tuffak)
14. Various plastic discards (Plexiglas, Plex 55, Vinyl Spacers, PVA film, router chips, fines and slabs)
15. Lykopon Press Cake
16. Off-Grade Acryloid Coatings (batches and line drainings)
17. Acryloid Modifiers (K and KM series)
18. EDC Distillation Residue
19. t-BAEMA/DMAEMA press cake and residue
20. Off-Grade Petroleum Acryloid and line drainings
21. Laboratory Waste Drums (Bristol, Philadelphia Plant, Spring House and local schools)
22. Trichloroethylene Residue
23. Lead Dross
24. Kettle cleaning residues (Petroleum Acryloid production)
25. Trash from Bristol (town) clean-up
26. Miscellaneous raw materials (i.e. mercaptans, paraformaldehyde, phosphoric acid, monomers, N-vinyl pyrrolidone, carbon black, ATF raw materials, BCC distillation residue, methyl salicylate, and ion exchange beads.

TABLE II

MATERIAL "PROBABLY" SENT TO LANDFILL

1. "Pesticides of the chlorinated hydrocarbon type".
2. DDT-DDD
3. 2,4-D
4. Lethane (some Chlorex contamination), Karathane and DNCP
5. Bristol Township digestion sludges
6. Levittown Treatment Plant sludges
7. Kelthane, Perthane and Dithane (lab samples)

TABLE III

ESTIMATED TOTAL WASTE TO LANDFILL
(M Tons)

	Process*	Laboratory	Trash
Bristol	309.0	0.3	Present
Philadelphia	0.5	0.2	Present
Spring House	---	0.3	-0-
Area B	5.0	---	
Total	314.5	0.8	---

*Eckhardt Report

TABLE IV

ESTIMATED BRISTOL PROCESS WASTE TO LANDFILL (TONS/YEAR)(1)

Year	Chemical Waste	Ammonium Sulfate Mother Liquor
1950	600	-0-
1951	900	-0-
1952	1,000	-0-
1953	1,100	-0-
1954	1,800	-0-
1955	2,900	-0-
1956	12,400	-0-
1957	9,800	-0-
1958	9,300	-0-
1959	10,800	-0-
1960	8,900	7,700
1961	10,100	7,500
1962	12,200	7,200
1963	13,300	7,300
1964	13,400	7,000
1965	15,000	9,000
1966	15,300	10,600
1967	15,000	7,600
1968	10,500	9,500
1969	15,400	14,300
1970	17,000	14,900
1971	12,900	16,100
1972	14,700	-0-
1973	14,000	-0-
1974	13,100	-0-
1975	10,200	-0-
Sub-Totals	262,000 Tons	119,000 at 40% Solids = 47,000 Tons

Total = 262,000 + 47,000 = 309,000 Tons

(1) These estimates probably have an error of plus or minus 10%

TABLE V

RCRA HAZARDOUS MATERIALS POSSIBLY DISPOSED AT LANDFILL

Salts and/or Metals	Organic
Lead (metal	Ethylene Dichloride (EDC)
Cadmium	Trichloroethylene (TCE)
Zinc	Toluene
Barium	Xylene
Mercury	Benzene
Chromium	Acrylonitrile
Copper	DDT-DDD
Manganese	Chlorex (2,2-dichloroethylether)
Cyanide	2,4-D
	Monomers (MMA)
	Phenols

TABLE VI

DEFINITION OF RCRA HAZARDOUS WASTE

1. Characteristic:

   Ignitability
   Corrosivity
   Reactivity
   E. P. Toxicity

2. Listed:

TABLE VII

ESTIMATED TOTAL HAZARDOUS WASTE TO LANDFILL
(M Tons)

	Process	Laboratory	
Bristol	42	0.3	
Philadelphia	Nil	0.2	
Spring House	---	0.3	
Area B (Croydon)	Nil	---	
Total	42	0.8 (5,400 drums) (810 tons)	42.8

ATTACHMENT 3

Groundwater Topography

Submitted by BCM Engineers on Behalf of Rohm and Haas During Public Comment Period for Response to Comments

BCM Engineers Inc.
Engineers, Planners, Scientists and Laboratory Services
One Plymouth Meeting • Plymouth Meeting, PA 19462 • (215) 825-3800 • FAX (215) 834-8238

September 16, 1991

Ms. Diane Schott
Project Coordinator
U.S. EPA - Region III (3HW11)
841 Chestnut Building
Philadelphia, PA 19107

Subject: Rohm and Haas Delaware Valley Inc.
Administrative Order on Consent
Docket No. RCRA III-013-CA
BCM Project No. 00-6201-0101

Dear Diane:

Enclosed for your review are several potentiometric surface contour maps and a table containing groundwater elevation data for the wells located on or near the Bristol Township Authority (BTA) property. A review of the maps and data shows that groundwater flows radially away from a potentiometric high near the northwest corner of the BTA property. Groundwater flow is to the north toward Hog Run Creek, and to the east and southeast toward the landfill.

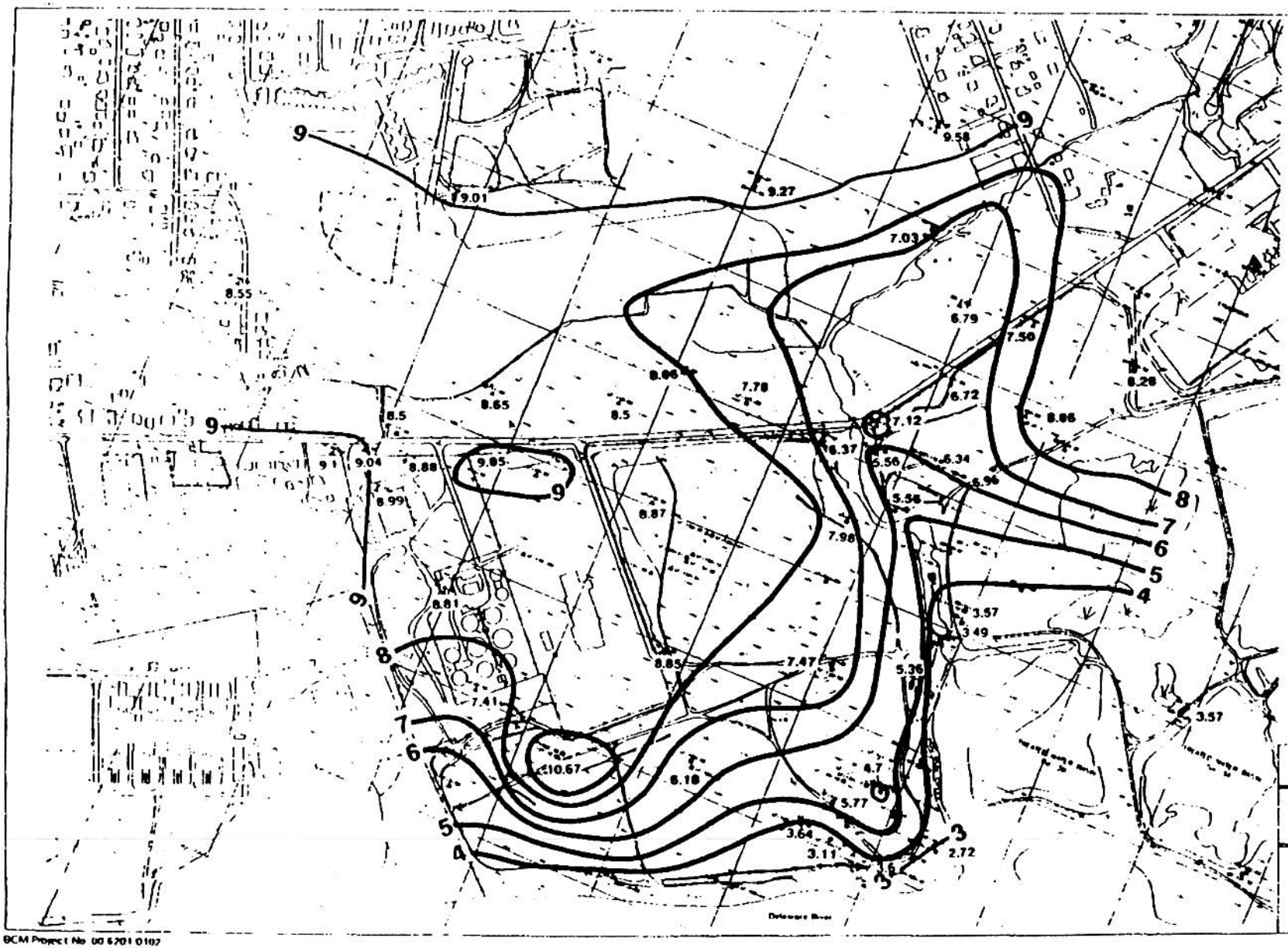
Should you have any questions regarding this matter, please feel free to call me or Brian McPeak.

Very truly yours,

Richard K. Sacks for

Mary M. Mang
Assistant Vice President

/res
Enclosures
cc: Brian McPeak, Rohm and Haas
George Schnabel, Rohm and Haas
William Fleming, BCM
Richard Sacks, BCM



Figure

ROHM AND HAAS
DELAWARE VALLEY INC

Potentiometric Surface Contour Map Shallow Groundwater
October 1988

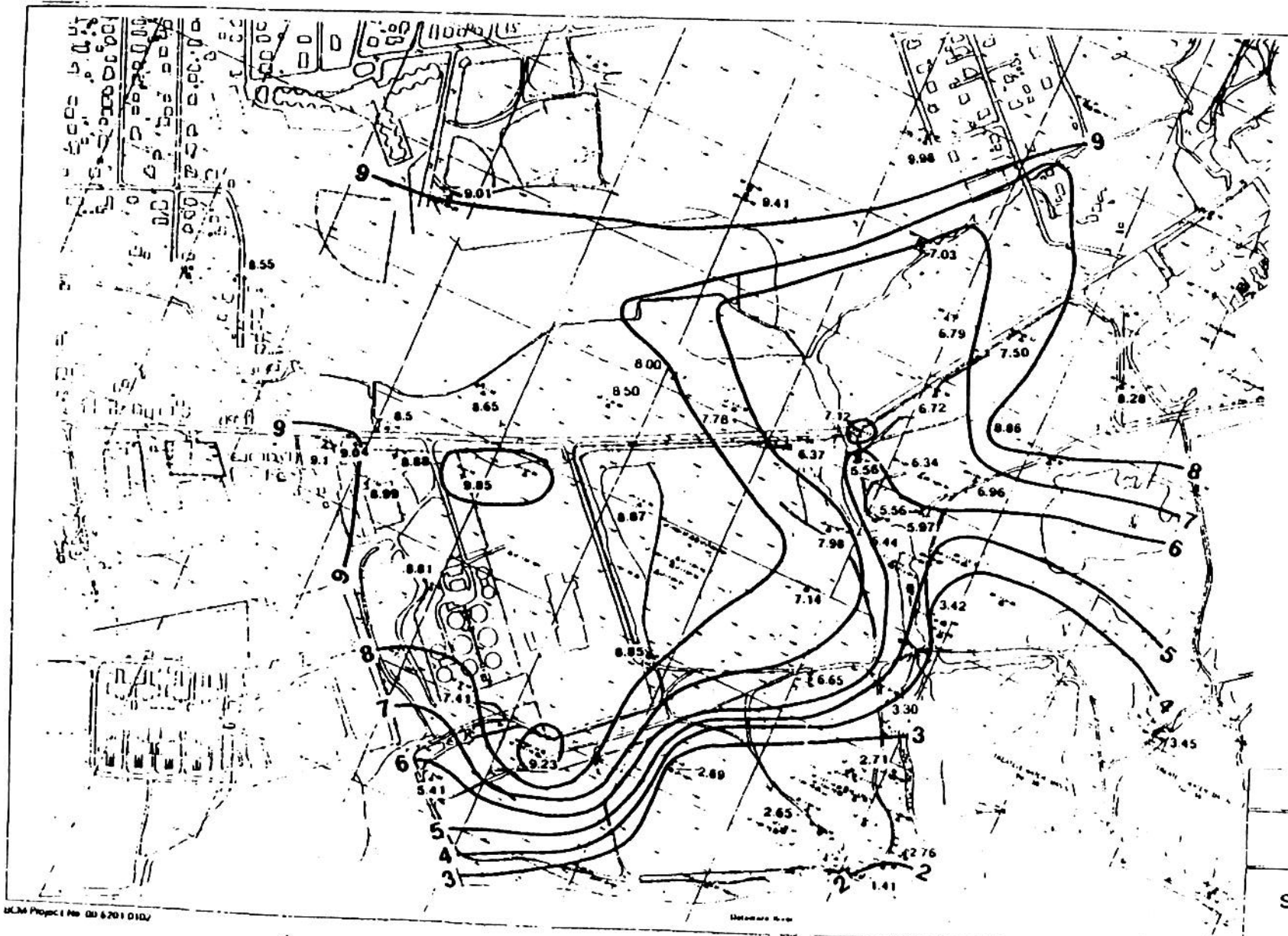
BCM Project No 00 6201 0102

0 400 ft

NORTH

6 — Potentiometric Contour in Feet

BCM



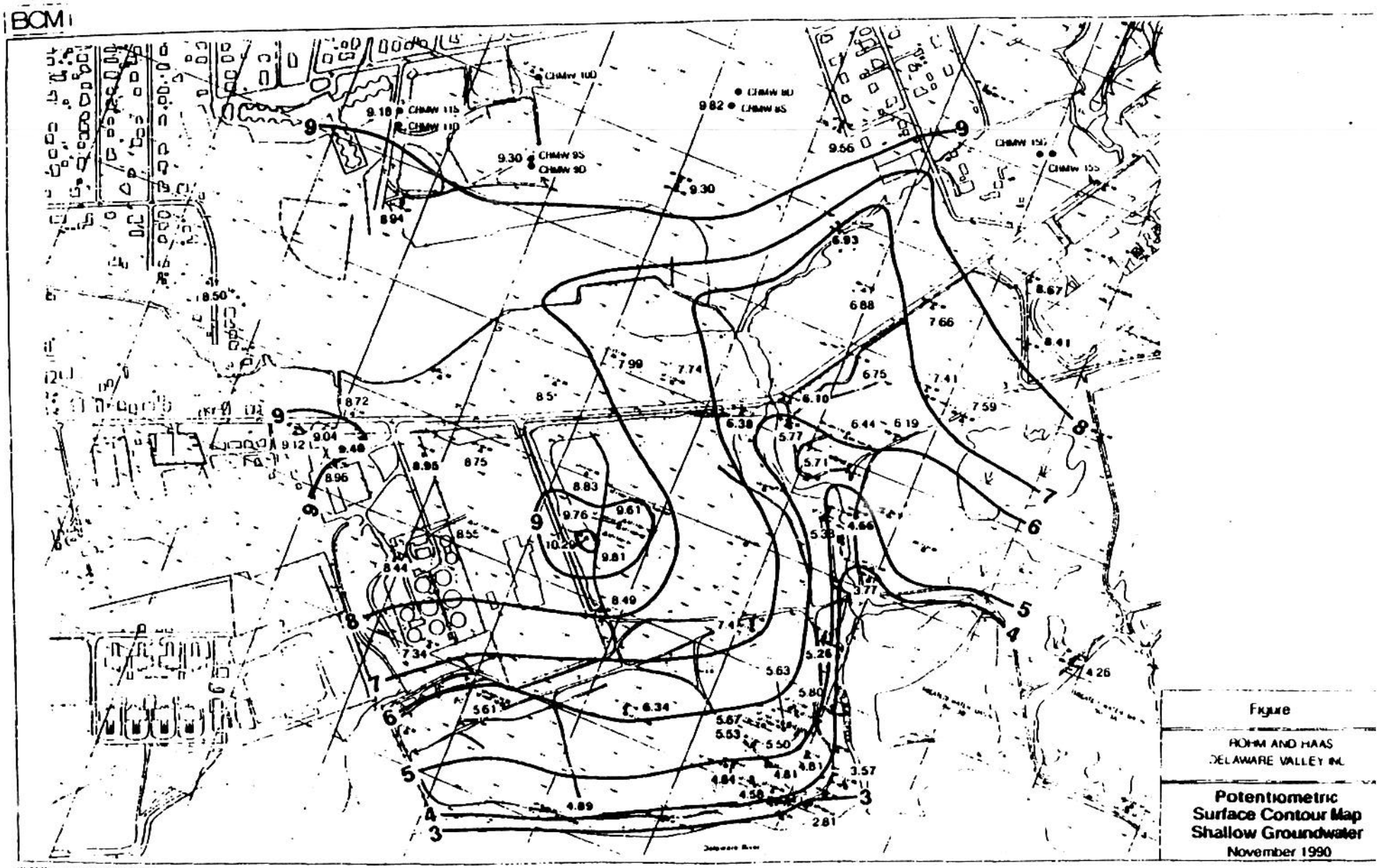
Figure

ROHM AND HAAS
DELAWARE VALLEY PA

Potentiometric Surface Contour Map Deep Groundwater

October 1988

BCM Project No 00 6201 010J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CHMW 11S
CHMW 11D
CHMW 9S
CHMW 9D
CHMW 8D
CHMW 8S
CHMW 15S
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9.30
9.82
9.56
8.94
8.50
6.93
8.67
6.88
7.66
8.41
7.99
7.74
6.75
7.41
8.72
8.5
6.10
6.38
5.77
6.44
6.19
7.59
9.04
9.12
9.48
8.96
8.95
8.75
5.71
8.83
9.76
9.61
10.29
9.81
4.66
5.38
8.55
8.44
3.77
8.49
7.45
7.34
5.26
5.63
4.26
5.80
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5.61
5.67
5.53
5.50
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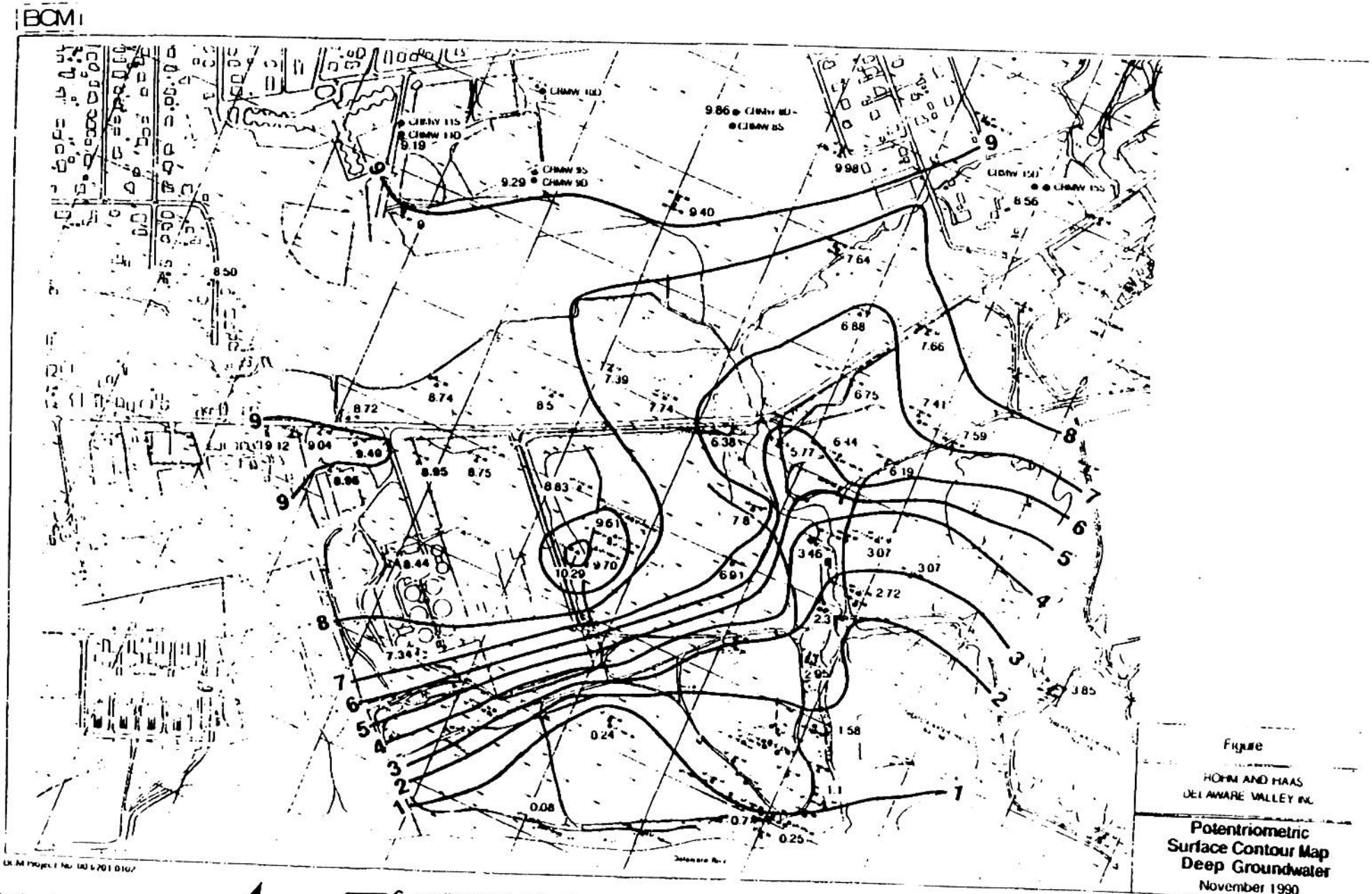
4.84
4.81
3.57
4.58
4.89
2.81
Figure
ROHM AND HAAS
DELAWARE VALLEY INC.
Potentiometric
Surface Contour Map
Shallow Groundwater
November 1990
6 Potentiometric Contour in Feet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9.29
9.86
9.98
9.40
8.56
8.50
7.64
6.88
7.66
7.39
8.74
8.72
8.5
7.74
6.75
7.41
6.38
5.77
6.44
7.59
6.19
9.04
9.49
8.96
8.95
8.75
8.83
7.8
9.61
10.29
9.70
8.44
6.91
3.46
3.07
3.07
2.72
2.3
7.34
2.95
3.85
1.58
0.24
1.1
0.08
0.7
0.25
Figure
HOHM AND HAAS
DELAWARE VALLEY INC.
Potentriometric
Surface Contour Map
Deep Groundwater
November 1990
6
Potentiometric Contour in Feet

BCM Engineers
Water Level Report
ALL DATA JAN. 1983 TO CURRENT

Location	Date	Casing	Reference Elevation	Measurement	Water Elevation
LF-11-20					
	02/17/84	Outer	14.26	3.94	10.32
	05/03/84	Outer	14.26	4.15	10.11
	11/08/84	Outer	14.26	5.27	8.99
	12/11/84	Outer	14.26	5.04	9.22
	01/10/85	Outer	14.26	5.26	9.00
	02/04/85	Outer	14.26	5.21	9.05
	03/04/85	Outer	14.26	4.88	9.38
	04/04/85	Outer	14.26	5.09	9.17
	05/09/85	Outer	14.26	5.35	8.91
	06/06/85	Outer	14.26	5.61	8.65
	07/09/85	Outer	14.26	6.40	7.86
	10/21/85	Outer	14.26	5.72	8.54
	01/15/86	Outer	14.26	5.13	9.13
	04/16/86	Outer	14.26	3.72	10.54
	10/14/86	Outer	14.26	6.23	8.03
	12/31/86	Outer	14.26	3.72	10.54
	03/25/87	Inner	13.92	4.02	9.90
	06/25/87	Inner	13.92	4.87	9.05
	10/13/87	Inner	13.92	5.15	8.77
	12/17/87	Inner	13.92	4.68	9.24
	03/30/88	Inner	13.92	6.96	6.96
	06/24/88	Inner	13.92	5.29	8.63
	10/04/88	Inner	13.92	5.27	8.65
	12/28/88	Inner	13.92	4.47	9.45
	02/24/89	Inner	13.92	2.62	11.30
	06/16/89	Inner	13.92	3.58	10.34
	09/27/89	Inner	13.92	3.99	9.93
	12/21/89	Inner	13.92	4.58	9.34
	03/29/90	Inner	13.92	3.91	10.01
	06/12/90	Inner	13.92	4.28	9.64
	11/16/90	Inner	13.92	5.18	8.74
	03/25/91	Inner	13.92	3.82	10.10
LF-15-26					
	02/17/84	Outer	18.46	7.27	11.19
	05/03/84	Outer	18.46	7.42	11.04
	11/08/84	Outer	18.46	9.30	9.16
	12/11/84	Outer	18.46	9.17	9.29
	01/10/85	Outer	18.46	9.34	9.12
	02/04/85	Outer	18.46	9.28	9.18
	03/04/85	Outer	18.46	9.18	9.28
	04/04/85	Outer	18.46	9.17	9.29
	05/09/85	Outer	18.46	9.30	9.16
	06/06/85	Outer	18.46	9.60	8.86
	07/09/85	Outer	18.46	10.10	8.36
	10/21/85	Outer	18.46	9.26	9.20
	01/15/86	Outer	18.46	11.01	7.45
	04/16/86	Outer	18.46	6.88	11.58
	10/14/86	Outer	18.46	10.28	8.18
	12/31/86	Outer	18.46	6.86	11.60
	03/25/87	Inner	18.06	7.56	10.50
	06/25/87	Inner	18.06	8.32	9.74
	10/13/87	Inner	18.06	8.68	9.38
	12/17/87	Inner	18.06	8.16	9.90

BCM Engineers
Water Level Report
ALL DATA JAN. 1983 TO CURRENT

Location	Date	Casing	Reference Elevation	Measurement	Water Elevation
	03/30/88	Inner	18.06	6.86	11.20
	06/24/88	Inner	18.06	8.79	9.27
	10/04/88	Inner	18.06	9.05	9.01
	12/28/88	Inner	18.06	8.56	9.50
	02/24/89	Inner	18.06	6.44	11.62
	06/16/89	Inner	18.06	6.71	11.35
	09/27/89	Inner	18.06	7.41	10.65
	12/21/89	Inner	18.06	8.32	9.74
	03/29/90	Inner	18.06	7.65	10.41
	06/12/90	Inner	18.06	7.89	10.17
	11/16/90	Inner	18.06	9.12	8.94
	03/25/91	Inner	18.06	7.57	10.49
LF-15-37					
	02/17/84	Outer	18.79	7.50	11.29
	05/03/84	Outer	18.79	7.69	11.10
	11/08/84	Outer	18.79	9.57	9.22
	12/11/84	Outer	18.79	9.48	9.31
	01/10/85	Outer	18.79	9.64	9.15
	02/04/85	Outer	18.79	9.60	9.19
	03/04/85	Outer	18.79	9.40	9.39
	04/04/85	Outer	18.79	9.48	9.31
	05/09/85	Outer	18.79	9.57	9.22
	06/06/85	Outer	18.79	9.90	8.89
	07/09/85	Outer	18.79	10.34	8.45
	10/21/85	Outer	18.79	9.54	9.25
	01/15/86	Outer	18.79	9.23	9.56
	04/16/86	Outer	18.79	7.14	11.65
	10/14/86	Outer	18.79	10.19	8.60
	12/31/86	Outer	18.79	7.18	11.61
	03/25/87	Inner	17.36	6.86	10.50
	06/25/87	Inner	17.36	7.67	9.69
	10/13/87	Inner	17.36	7.99	9.37
	12/17/87	Inner	17.36	7.45	9.91
	03/30/88	Inner	17.36	7.56	9.80
	06/24/88	Inner	17.36	7.97	9.39
	10/04/88	Inner	17.36	8.28	9.08
	12/28/88	Inner	17.36	7.78	9.58
	02/24/89	Inner	17.36	5.75	11.61
	06/16/89	Inner	17.36	6.00	11.36
	09/27/89	Inner	17.36	6.73	10.63
	12/21/89	Inner	17.36	7.59	9.77
	03/29/90	Inner	17.36	7.10	10.26
	06/12/90	Inner	17.36	7.09	10.27
	11/16/90	Inner	17.36	8.36	9.00
	03/25/91	Inner	17.36	6.85	10.51
LF-16-37					
	02/17/84	Outer	14.38	4.25	10.13
	05/03/84	Outer	14.38	4.33	10.05
	11/08/84	Outer	14.38	5.71	8.67
	12/11/84	Outer	14.38	5.61	8.77
	01/10/85	Outer	14.38	5.78	8.60
	02/04/85	Outer	14.38	5.82	8.56
	03/04/85	Outer	14.38	5.58	8.80
	04/04/85	Outer	14.38	5.62	8.76

BCM Engineers
Water Level Report
ALL DATA JAN. 1983 TO CURRENT

Location	Date	Casing	Reference Elevation	Measurement	Water Elevation
	05/09/85	Outer	14.38	5.75	8.63
	06/06/85	Outer	14.38	6.03	8.35
	07/09/85	Outer	14.38	6.31	8.07
	10/21/85	Outer	14.38	5.53	8.85
	01/15/86	Outer	14.38	5.50	8.88
	04/16/86	Outer	14.38	3.70	10.68
	10/14/86	Outer	14.38	6.23	8.15
	12/31/86	Outer	14.38	4.08	10.30
	03/25/87	Inner	14.10	4.75	9.35
	06/25/87	Inner	14.10	5.02	9.08
	10/13/87	Inner	14.10	5.35	8.75
	12/17/87	Inner	14.10	4.72	9.38
	03/30/88	Inner	14.10	4.53	9.57
	06/24/88	Inner	14.10	5.12	8.98
	10/04/88	Inner	14.10	5.55	8.55
	12/28/88	Inner	14.10	7.57	6.53
	02/24/89	Inner	14.10	3.45	10.65
	06/16/89	Inner	14.10	6.02	8.08
	09/27/89	Inner	14.10	4.63	9.47
	12/21/89	Inner	14.10	5.41	8.69
	03/29/90	Inner	14.10	4.54	9.56
	06/12/90	Inner	14.10	4.56	9.54
	11/16/90	Inner	14.10	5.60	8.50
	03/25/91	Inner	14.10	4.54	9.56
LF-17-18					
	02/17/84	Outer	18.48	7.48	11.00
	05/03/84	Outer	18.48	7.49	10.99
	11/08/84	Outer	18.48	9.38	9.10
	12/11/84	Outer	18.48	9.10	9.38
	01/10/85	Outer	18.48	9.22	9.26
	02/04/85	Outer	18.48	9.19	9.29
	03/04/85	Outer	18.48	8.91	9.57
	04/04/85	Outer	18.48	9.02	9.46
	05/09/85	Outer	18.48	9.37	9.11
	06/06/85	Outer	18.48	9.53	8.95
	07/09/85	Outer	18.48	10.47	8.01
	10/21/85	Outer	18.48	9.40	9.08
	01/15/86	Outer	18.48	8.05	10.43
	04/16/86	Outer	18.48	6.98	11.50
	10/14/86	Outer	18.48	10.66	7.82
	12/31/86	Outer	18.48	7.29	11.19
	03/25/87	Inner	18.13	8.02	10.11
	06/25/87	Inner	18.13	8.99	9.14
	10/13/87	Inner	18.13	8.54	9.59
	12/17/87	Inner	18.13	8.40	9.73
	03/30/88	Inner	18.13	7.83	10.30
	06/24/88	Inner	18.13	9.37	8.76
	10/04/88	Inner	18.13	9.63	8.50
	12/28/88	Inner	18.13	8.64	9.49
	02/24/89	Inner	18.13	6.24	11.89
	06/16/89	Inner	18.13	7.33	10.80
	09/27/89	Inner	18.13	7.97	10.16
	12/21/89	Inner	18.13	8.76	9.37
	03/29/90	Inner	18.13	7.80	10.33

BCM Engineers
Water Level Report
ALL DATA JAN. 1983 TO CURRENT

Location	Date	Casing	Reference Elevation	Measurement	Water Elevation
LF-18-15	06/12/90	Inner	18.13	8.16	9.97
	11/16/90	Inner	18.13	9.41	8.72
	03/25/91	Inner	18.13	7.78	10.35
	02/17/84	Outer	16.14	4.50	11.64
	05/03/84	Outer	16.14	4.51	11.63
	11/08/84	Outer	16.14	6.75	9.39
	12/11/84	Outer	16.14	6.54	9.60
	01/10/85	Outer	16.14	6.57	9.57
	02/04/85	Outer	16.14	6.75	9.39
	03/04/85	Outer	16.14	6.19	9.95
	04/04/85	Outer	16.14	6.30	9.84
	05/09/85	Outer	16.14	6.54	9.60
	06/06/85	Outer	16.14	6.57	9.57
	07/09/85	Outer	16.14	7.18	8.96
	10/21/85	Outer	16.14	6.58	9.56
	01/15/86	Outer	16.14	6.32	9.82
	04/16/86	Outer	16.14	4.27	11.87
	10/14/86	Outer	16.14	7.63	8.51
	12/31/86	Outer	16.14	3.81	12.33
	03/25/87	Inner	15.53	4.71	10.82
	06/25/87	Inner	15.53	5.56	9.97
	10/13/87	Inner	15.53	6.17	9.36
	12/17/87	Inner	15.53	5.75	9.78
	03/30/88	Inner	15.53	12.69	2.84
	06/24/88	Inner	15.53	5.87	9.66
	10/04/88	Inner	15.53	6.54	8.99
	12/28/88	Inner	15.53	5.80	9.73
	02/24/89	Inner	15.53	3.82	11.71
	06/16/89	Inner	15.53	3.59	11.94
	09/27/89	Inner	15.61	4.62	10.99
	12/21/89	Inner	15.61	5.83	9.78
	03/29/90	Inner	15.61	4.59	11.02
	06/12/90	Inner	15.61	4.76	10.85
	11/16/90	Inner	15.61	6.65	8.96
	03/25/91	Inner	15.61	4.56	11.05
LF-19-18	02/17/84	Outer	19.75	8.10	11.65
	05/03/84	Outer	19.75	8.13	11.62
	11/08/84	Outer	19.75	10.38	9.37
	12/11/84	Outer	19.75	10.15	9.60
	01/10/85	Outer	19.75	10.15	9.60
	02/04/85	Outer	19.75	10.38	9.37
	03/04/85	Outer	19.75	9.84	9.91
	04/04/85	Outer	19.75	9.96	9.79
	05/09/85	Outer	19.75	10.08	9.67
	06/06/85	Outer	19.75	10.19	9.56
	07/09/85	Outer	19.75	10.82	8.93
	10/21/85	Outer	19.75	10.11	9.64
	01/15/86	Outer	19.75	9.90	9.85
	04/16/86	Outer	19.75	7.82	11.93
	10/14/86	Outer	19.75	11.20	8.55
	12/31/86	Outer	19.75	7.24	12.51
	03/25/87	Inner	18.90	8.03	10.87

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Location	Date	Casing	Reference Elevation	Measurement	Water Elevation
	06/25/87	Inner	18.90	8.88	10.02
	10/13/87	Inner	18.90	9.55	9.35
	12/17/87	Inner	18.90	9.02	9.88
	03/30/88	Inner	18.90	9.98	8.92
	06/24/88	Inner	18.90	9.00	9.90
	10/04/88	Inner	18.90	9.86	9.04
	12/28/88	Inner	18.90	9.12	9.78
	02/24/89	Inner	18.90	7.30	11.60
	06/16/89	Inner	18.90	6.88	12.02
	09/27/89	Inner	18.90	7.71	11.19
	12/21/89	Inner	18.90	9.07	9.83
	03/29/90	Inner	18.90	7.99	10.91
	06/12/90	Inner	18.90	7.95	10.95
	11/16/90	Inner	18.90	9.86	9.04
	03/25/91	Inner	18.90	7.76	11.14
LF-20-23					
	02/17/84	Outer	24.16	12.35	11.81
	05/03/84	Outer	24.16	12.34	11.82
	11/08/84	Outer	24.16	14.69	9.47
	12/11/84	Outer	24.16	14.48	9.68
	01/10/85	Outer	24.16	14.45	9.71
	02/04/85	Outer	24.16	14.66	9.50
	03/04/85	Outer	24.16	14.08	10.08
	04/04/85	Outer	24.16	14.25	9.91
	05/09/85	Outer	24.16	14.37	9.79
	06/06/85	Outer	24.16	14.33	9.83
	07/09/85	Outer	24.16	15.12	9.04
	10/21/85	Outer	24.16	14.40	9.76
	01/15/86	Outer	24.16	14.14	10.02
	04/16/86	Outer	24.16	11.88	12.28
	10/14/86	Outer	24.16	15.48	8.68
	12/31/86	Outer	24.16	11.37	12.79
	03/25/87	Inner	23.55	12.47	11.08
	06/25/87	Inner	23.55	11.37	12.18
	10/13/87	Inner	23.55	13.98	9.57
	12/17/87	Inner	23.55	13.57	9.98
	03/30/88	Inner	23.55	14.48	9.07
	06/24/88	Inner	23.55	13.67	9.88
	10/04/88	Inner	23.55	14.45	9.10
	12/28/88	Inner	23.55	13.54	10.01
	02/24/89	Inner	23.55	11.65	11.90
	06/16/89	Inner	23.55	11.31	12.24
	09/27/89	Inner	23.53	12.49	11.04
	12/21/89	Inner	23.53	13.57	9.96
	03/29/90	Inner	23.53	12.43	11.10
	06/12/90	Inner	23.53	12.42	11.11
	11/16/90	Inner	23.53	14.41	9.12
	03/25/91	Inner	23.53	12.29	11.24
LF-9-20					
	02/17/84	Outer	17.31	7.10	10.21
	05/03/84	Outer	17.31	9.06	8.25
	11/08/84	Outer	17.31	8.28	9.03
	12/11/84	Outer	17.31	8.25	9.06
	01/10/85	Outer	17.31	8.42	8.89

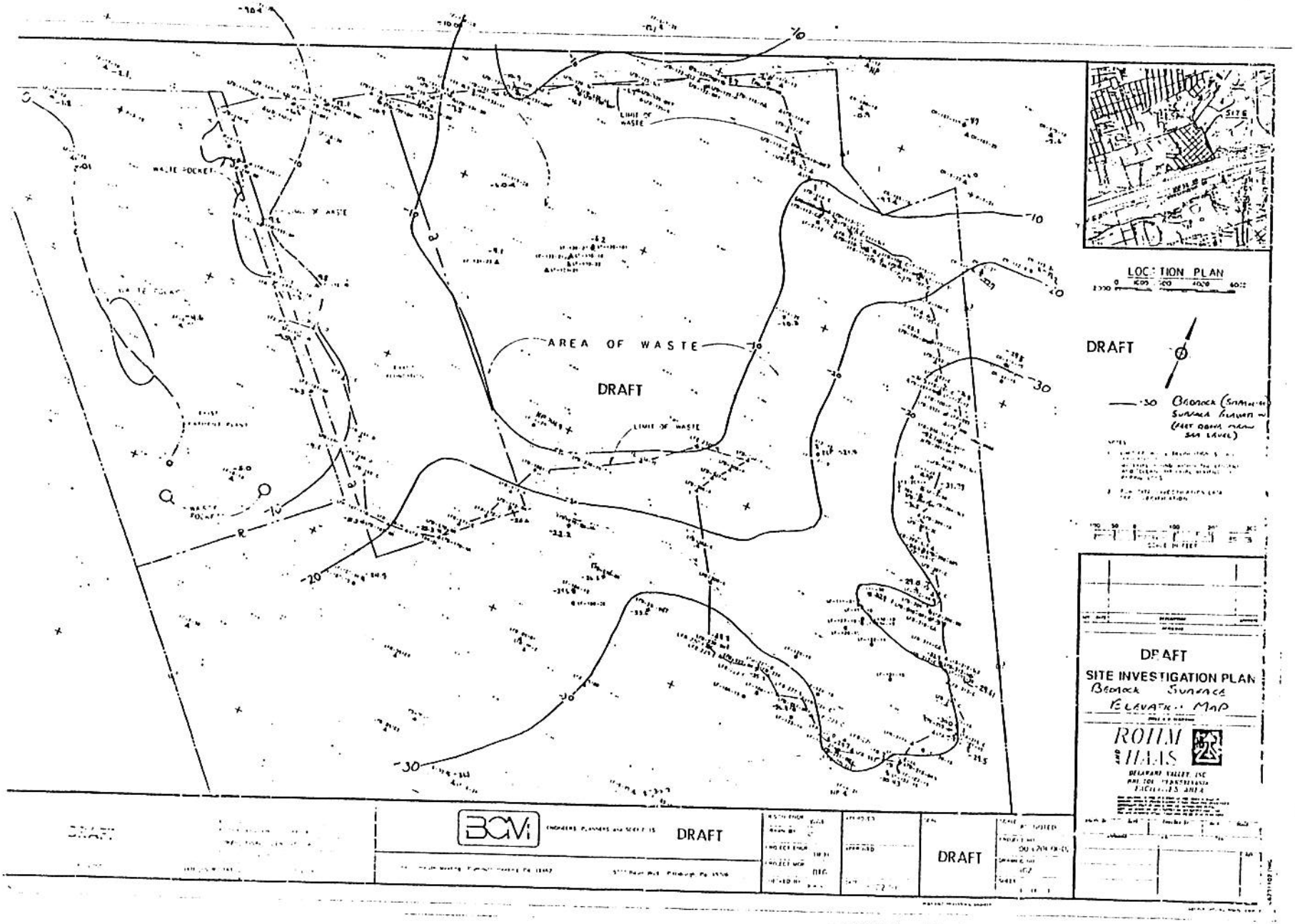
BCM Engineers
Water Level Report
ALL DATA JAN. 1983 TO CURRENT

Location	Date	Casing	Reference Elevation	Measurement	Water Elevation
	02/04/85	Outer	17.31	8.70	8.61
	03/04/85	Outer	17.31	8.27	9.04
	04/04/85	Outer	17.31	8.32	8.99
	05/09/85	Outer	17.31	9.35	7.96
	06/06/85	Outer	17.31	8.23	9.08
	07/09/85	Outer	17.31	8.79	8.52
	10/21/85	Outer	17.31	8.23	9.08
	01/15/86	Outer	17.31	8.45	8.86
	04/16/86	Outer	17.31	6.68	10.63
	10/14/86	Outer	17.31	9.16	8.15
	12/31/86	Outer	17.31	7.02	10.29
	03/25/87	Inner	17.03	6.89	10.14
	06/25/87	Inner	17.03	7.71	9.32
	10/13/87	Inner	17.03	7.65	9.38
	12/17/87	Inner	17.03	7.56	9.47
	03/30/88	Inner	17.03	6.96	10.07
	06/24/88	Inner	17.03	7.84	9.19
	10/04/88	Inner	17.03	8.22	8.81
	12/28/88	Inner	17.03	7.75	9.28
	02/24/89	Inner	17.03	5.95	11.08
	06/16/89	Inner	17.03	6.14	10.89
	09/27/89	Inner	17.03	6.72	10.31
	12/21/89	Inner	17.03	8.02	9.01
	03/29/90	Inner	17.03	7.00	10.03
	06/12/90	Inner	17.03	6.93	10.10
	11/16/90	Inner	17.03	8.59	8.44
	03/25/91	Inner	17.03	9.77	7.26

ATTACHMENT 4

Map Depicting Depth to Bedrock

Submitted by BCM Engineers on Behalf of Rohm and Haas on 9/27/91 for Response to Comments


AREA OF WASTE
DRAFT
LIMIT OF WASTE
WASTE POCKET
LOCATION PLAN
DRAFT
-30 BEDROCK (SHOWING SURFACE ELEVATION (FEET ABOVE MEAN SEA LEVEL)
DRAFT
SITE INVESTIGATION PLAN
BEDROCK SURFACE
ELEVATION MAP
ROHM AND HAAS
DELAWARE VALLEY, INC.
AND THE PENNSYLVANIA FACILITIES AREA
BCM
DRAFT
DRAFT

ATTACHMENT 5

Evidence That
A Dense Nonaqueous Phase Liquid
Does Not Exist
In The Landfill

Geologic testing and analysis indicated that a DNAPL does not exist at the Landfill.

A) Through historical analyses of manufacturing activities, as well as waste disposal practices, EPA is confident that the waste constituents deposited in the Landfill (both liquids and drums) are fairly well identified.

B) During a recent sampling event, 40 drums from Landfill Section B were analyzed and split samples were taken by EPA. Both Diane Schott, EPA's Project Manager for this site and Tom Buntin, EPA's hydrologist for this site, were present on separate days during these sampling events. Based on EPA's observation, the vast majority of drums are not intact, and therefore, if a DNAPL were going to form, it would already exist, in which case it would have been identified during the RCRA Facilities Investigation.

C) The liquid and drummed waste in the Landfill consists of hydrophobic monomers and polymers of plastics. A rigerous review of the specific gravity of the chemical components or constituents of these monomers and polymers clearly shows that, essentially all of the compounds have a specific gravity of less than 1 gram per cubic centimeter. That is, essentially all the compounds are "floaters" not "sinkers".

One particular compound, which constitutes a significant weight percent of these monomers and polymers, termed bis-2 chloroethyl ether (BCEE), has a specific gravity significantly greater than 1 gram per cubic centimeter. Therefore, BCEE sinks. Nevertheless, EPA has determined, based on the following information, that a DNAPL consisting of BCEE does not exist in the Landfill.

1. Extensive soil borings of the Landfill were conducted in 1988 and reported in the RI Addendum. Cross-sections provided in the RI Addendum show that the halocene silt and clay, which tie beneath the alluvium are thick and continuous throughout the entire Landfill; i.e., due to the high density of soil borings, the cross-section shows that the halocene sediment is continuous beneath the Landfill and no "windows" or "pinching-out" of the halocene sediments has occurred. The cross-sections also show that the Trenton gravel facies exist below the halocene sediments.

   Well pairs, which are exclusively screened in either the halocene sediment or Trenton gravel support the following findings:

BCEE is only found alone and in the upper and mid-levels of the halocene sediments. No BCEE has been found in the Trenton gravel. These groundwater data are also provided in the RI Addendum of 1988 available in the Administrative Record. Therefore, even if a DNAPL existed, consisting of BCEE, even though one is not evidenced, the DNAPL would have flowed along the alluvium/halocene sediment interface and would have discharged to the Delaware and/or Hog Run Creek. In terms of today, the concentration of BCEE in the upper halocene sediments are well below the solubility of BCEE, which strongly argues against the existence of a DNAPL migrating through the halocene sediment.

2) EPA recently required the determination of the specific gravity of water obtained from the most contaminated monitoring well in the Landfill. This well is termed LF-102, is screened at the alluvium/halocene sediment interface. The specific gravity was 1.0017 grams per cubic centimeters. Therefore, this data not only supports the nonexistence of a DNAPL, but also suggests the nonexistence of even a dense plume.