

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

UNITED STATES OF AMERICA and
STATE OF DELAWARE,

Plaintiffs,

v.

GENERAL MOTORS CORPORATION,

Defendant.

Civil Action No.

87-464

AR000109

CONSENT DECREE

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LIST OF EXHIBITS

- Exhibit 1.....Map of Harvey & Knotts Site
- Exhibit 2.....Record of Decision
- Exhibit 3.....Remedial Action Plan
- Exhibit 4.....Preauthorization Decision Document
- Exhibit 5.....Project Schedule

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PRIVILEGED & CONFIDENTIAL
FOR SETTLEMENT PURPOSES ONLY

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

UNITED STATES OF AMERICA and	)	
STATE OF DELAWARE,	)	
Plaintiffs,	)	
	)	
v.	)	Civil Action No.
	)	
GENERAL MOTORS CORPORATION,	)	87-464
	)	
	)	
Defendant.	)	

CONSENT DECREE

This Consent Decree is made and entered into by and between the United States of America ("United States") on behalf of the United States Environmental Protection Agency ("EPA"); the State of Delaware ("State"); and General Motors Corporation (hereinafter "Settling Party"), including their respective divisions, officials, officers, directors, principals, agents, servants, employees, successors and assigns.

WHEREAS, the United States on behalf of the Administrator of EPA filed a complaint ("Complaint") for response,

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1 removal and remedial activities pursuant to Sections 104, 106 and 107 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. §§ 9604, 9606 and 9607, as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L. No. 99-499, 100 Stat. 1613 (1986) ("CERCLA") including, inter alia, "the reimbursement of all funds expended by the United States not inconsistent with the National Contingency Plan and/or any other authority for investigations, clean-up activities, and other response activities, and for injunctive relief in connection with a site located on County Road 395 in New Castle County, Delaware ("Harvey & Knotts Site" or "Site"), a map of which is attached hereto as Exhibit 1;

WHEREAS, the State also filed a Complaint for response, removal and remedial activities not inconsistent with Section 107 of CERCLA, 42 U.S.C. § 9607, 7 Del. Code Chapter 60, 7 Del. Code Chapter 63, and applicable state common law, including, inter alia, the reimbursement of all funds expended by the State for investigations, clean-up activities, and other response activities and for injunctive relief in connection with the Harvey & Knotts Site;

WHEREAS, the United States and the State allege, inter alia, that hazardous substances, as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14), and other pollutants

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or contaminants as defined by Section 101(33) of CERCLA, 42 U.S.C. § 9601(33), (hereinafter collectively "hazardous substances"), which were shipped to, stored, treated, and/or disposed of at the Harvey & Knotts Site have been released and threaten to be released from the Harvey & Knotts Site into the environment;

WHEREAS, on October 16, 1985 the United States issued a Record of Decision ("ROD"), which selected a remedial alternative for the Harvey & Knotts Site, which is attached hereto as Exhibit 2;

WHEREAS, the United States and the State allege that the Settling Party is among responsible parties pursuant to Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), and is thereby jointly and severally liable for the release or threats of release of hazardous substances at the Harvey & Knotts Site;

WHEREAS, the Settling Party denies responsibility for the disposal of hazardous substances at the Harvey & Knotts Site and denies any legal or equitable liability under any statute, regulation, ordinance or common law for any response costs or damages caused by storage, treatment, handling or disposal activities or actual or threatened release of hazardous substances at the Harvey & Knotts Site or by hazardous substances, if any, disposed of by the

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Settling Party to, through or at the direction of Harvey & Knotts, Inc.;

WHEREAS, the Settling Party, nevertheless, desires to settle the claims made against it by the Plaintiffs;

WHEREAS, Settling Party agrees to conduct the cleanup of the Harvey & Knotts Site pursuant to the Remedial Action Plan ("Plan"), which is attached hereto as Exhibit 3;

WHEREAS, the United States and the State reserve the right to file a separate cost-recovery action against any other responsible party for Total Costs (as hereinafter defined), incurred at the Harvey & Knotts Site;

WHEREAS, the parties, acting in good faith to resolve the problems arising out of the Harvey & Knotts Site, recognize and intend hereby to further the public interest in avoiding prolonged and complicated litigation between the parties and in expediting the correction and abatement of the releases or threats of releases of hazardous substances and/or the damage which is alleged to be presented at the Harvey & Knotts Site; and

WHEREAS, in consideration of, and in exchange for the promises and the mutual undertaking and covenants herein, and intending to be bound legally hereby, the Settling Party, the United States and the State by their authorized representatives have agreed to the entry of this Consent Decree.

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THEREFORE, before the taking of any testimony, without adjudication of any issue of law or fact, except as provided in Paragraph XIII(A) and upon the consent of the parties hereto, it is hereby

ORDERED, ADJUDGED AND DECREED, as follows:

I. JURISDICTION

The Court has jurisdiction over the subject matter herein and the parties to this action.

II. PARTIES BOUND

This Consent Decree shall apply to and be binding upon the United States, the State, the Settling Party and their respective divisions, officials, officers, directors, principals, agents, servants, employees, successors and assigns, and upon all persons, contractors and consultants acting under or for either the United States, the State or the Settling Party. The undersigned representative of each party to this Consent Decree certifies that he or she is fully authorized by the party or parties whom he or she represents to enter into the terms and conditions of the Consent Decree and to execute and to legally bind that party to it. The Settling Party shall provide a copy of this Consent Decree to each contractor, subcontractor, laboratory and consultant retained to perform the Work (as hereinafter

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defined), required by this Consent Decree. Settling Party shall require all contractors, subcontractors, laboratories and consultants retained to perform the Work required by this Consent Decree to comply with the terms of this Consent Decree, and instruct the contractor to provide a copy thereof to any subcontractor retained to perform the Work required by this Consent Decree.

III. DEFINITIONS

For the purposes of this Consent Decree, the following terms shall have the meanings set forth below:

A. "Contractor" means the company or companies retained by the Settling Party to undertake and complete the Work (as hereinafter defined). Each Contractor and subcontractor, (subject to EPA's right of disapproval as set forth in paragraph V(C)), shall be qualified to do those portions of the Work for which it is retained. The Contractor and any subcontractors retained by the Contractor shall be deemed to be related by contract to the Settling Party within the meaning of Section 107(b)(3) of CERCLA, 42 U.S.C.

§ 9607(b)(3). Thus, as to Contractors or any subcontractors retained by Contractors, Settling Party shall not assert a defense based on Section 107(b)(3), 42 U.S.C.

§ 9607(b)(3).

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B. "Contractor claim" means a written demand or written assertion by a contractor seeking as a matter of right, the payment of money, adjustment or interpretation of contract terms, or other relief, arising under or related to a contract, except that a voucher, invoice, change order proposal or routine request for payment that is not in dispute when submitted is not a contractor claim. Contractor claims may include, but are not limited to, claims for project acceleration, constructive changes, extended overhead costs, interest expenses, damages for delay and disruption, impact costs not included in change orders, and inefficiencies and disruptions associated with cumulative changes in the contract. Vouchers, invoices, change order proposals or routine requests for payment may be converted to a claim if they are disputed as to liability or amount or are not acted upon.

C. "Discrete tasks" shall be the fourteen (14) tasks described in the Plan (as defined herein), which is attached hereto as Exhibit 3.

D. "Future Response Costs" means all administrative, enforcement; investigative, remedial and removal costs (except the costs of enforcement against parties other than the Settling Party) incurred pursuant to Sections 104 and 107 of CERCLA, 42 U.S.C. §§ 9604, and 9607 subsequent to September 30, 1986. Future Response Costs shall include, but not be limited to, the cost of oversight and monitoring

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of the Work (as hereinafter defined) after such date.

E. "Operation and Maintenance" shall be the actions that are described in Task Fourteen (14) of the Plan (as defined herein) which is attached hereto as Exhibit 3:

F. "Past Response Costs" means all administrative, enforcement, investigative, remedial and removal costs incurred pursuant to Sections 104 and 107 of CERCLA, 42 U.S.C. §§ 9604, and 9607 prior to and including September 30, 1986.

G. "Plan" means the Remedial Action Plan for implementation of remedial work set forth in Exhibit 3 and made a part hereof.

H. "Total Costs" means (a) the costs of implementing the Plan, (b) Past Response Costs, and (c) Future Response Costs.

I. "Work" means the implementation, in accordance with Section V hereof, of the Plan as it may be modified pursuant to the provisions of this Consent Decree, and any schedule or plans required to be submitted pursuant thereto.

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IV. PAYMENT OF GOVERNMENT
RESPONSE COSTS

A. Within thirty (30) days after the entry of this Consent Decree, the Settling Party shall pay the United States Environmental Protection Agency the sum of \$979,688.08 in settlement of the United States' claim for Past Response Costs. The payment to EPA shall be by certified check payable to "EPA-Hazardous Substance Superfund" and shall be sent by certified mail return receipt requested, to U.S. EPA, Superfund, P. O. Box 371003M, Pittsburgh, Pennsylvania 15251. A copy of the cover letter and the check shall be sent to Regional Hearing Clerk, United States Environmental Protection Agency, Region III, 841 Chestnut Building, Philadelphia, Pennsylvania 19107.

B. Within thirty (30) days after the entry of this decree, the State shall provide the Settling Party with . documentation in support of its claim of Past Response Costs, in an amount not to exceed \$65,000.00. Within thirty (30) days of receipt of this documentation, Settling Party will pay 66 2/3% of that documented amount. The payment shall be by certified check payable to "State of Delaware," and shall be sent by certified mail return receipt requested to Director of Air

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and Waste Management, Department of Natural Resources and Environmental Control, 89 Kings Highway, Dover, Delaware 19901.

C. Annually, beginning January 1988, EPA shall submit to the Settling Party an itemized statement of the Future Response Costs at the Harvey & Knotts Site which were paid during the immediately preceding fiscal year. Within thirty (30) days of receipt of that statement, the Settling Party shall remit payment for two-thirds of such Future Response Costs in the manner set out in Paragraph IV(A).

D. Annually, beginning January 1988, the State shall submit to the Settling Party an itemized statement of its reasonable Response Costs for oversight at the Harvey & Knotts site during the preceeding 12 months. Within thirty (30) days of receipt of that statement, the Settling Party shall remit payment for two-thirds of such Response Costs in the manner set out in Paragraph IV(B).

V. PERFORMANCE OF THE WORK

A. Attached to this Consent Decree and made a part hereof as Exhibit 3 is the Plan for the Harvey & Knotts Site. The Plan describes in detail how the Settling Party will implement the Work and provides a phased schedule of completion of the Work. It is understood and

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agreed that the attachment of the Plan to this Consent Decree, and the Plaintiffs' agreement to the Plan, shall not constitute a warranty or representation of any kind by Plaintiffs and shall not foreclose Plaintiffs from seeking performance of all terms and conditions of this Consent Decree, including the performance schedules, specifications and standards set forth herein and in Exhibit 3.

B. Within thirty (30) days of the entry date of this Consent Decree, the Work shall be commenced by the Settling Party. The Work shall be completed in accordance with the standards, specifications, and the schedule of completion set forth in the Plan.

C. All Work performed pursuant to this Consent Decree shall be under the direction and supervision of a qualified professional engineer and shall be in conformance with the requirements of Exhibit 4. At the time of entry of this Consent Decree and subject to EPA's right of disapproval, the Settling Party shall notify EPA in writing regarding the name, title, and qualifications of such engineer. At the conclusion of any bidding process necessary to procure contractors to Work at the Site, the Settling Party shall notify EPA in writing regarding the name, title and qualifications of any contractors and/or subcontractors to be used in carrying out the terms of this Consent Decree. In the event of a disapproval of the engineer or any contractor or subcontractor, Settling Party shall notify EPA within

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twenty (20) days of the name, title, and the qualifications of the engineer, contractors or subcontractors that will replace the one(s) that was disapproved. Settling Party shall, within ten (10) days of the entry of this Consent Decree, and subject to EPA's right of disapproval, enter into an agreement with the engineer to perform the Work. Settling Party may replace the engineer or any contractor upon notice to and approval by EPA of any substitute engineer or contractor.

D. All activities undertaken by the Settling Party pursuant to this Consent Decree shall be undertaken in accordance with the requirements of all applicable or relevant and appropriate state and federal laws and regulations, including land disposal restrictions imposed under RCRA, as defined in CERCLA and the National Contingency Plan, 40 C.F.R. § 300. Alternate Concentration Limits ("ACLs") may be used only insofar as their use is permitted in Section 121 of CERCLA. The parties agree and the Court finds that the proposed use of ACLs as set out in the Plan (pages 5-50 through 5-51) complies with CERCLA.

E. Reimbursement under Section VII, shall be subject to the conditions set forth in Exhibit 4. Pursuant to Section 300.68(a)(3) of the National Contingency Plan, 40 C.F.R. § 300.68(a)(3)), federal, state and local permits are not

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required for the Work. However, the off-site storage, treatment, or disposal of hazardous substances, barrels, rubbish, soil and any other hazardous materials and any other waste material generated by the Work shall comply with Section 121(d)(3) of CERCLA, 42 U.S.C. § 9621(d)(3) and with EPA's off-site policy as described in the May 6, 1985 memorandum entitled "Procedures for Planning and Implementing Off-Site Response Actions". In the event of the temporary unavailability of such a facility operating under appropriate federal or state permits or other legal requirements, within 1500 miles of the Site, the Settling Party shall not be subject to stipulated penalties for delay in completing Tasks 4 or 5 of the Plan and may store materials at the site for up to 90 days.

F. Information or data gathered during the course of the Work may indicate that modifications are necessary to accomplish the objectives of the Plan, which is Exhibit 3 hereto. Any Party may recommend in writing modifications to the Work or the schedule for its performance. Such modifications shall not be made prior to approval by the United States. If the United States denies a modification requested by the Settling Party or directs a modification with which the

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Settling Party does not agree, the Settling Party may request resolution of the dispute pursuant to Section XII. Any modifications made shall be reduced to writing. Until the entry of this Consent Decree, no modifications shall be made pursuant to this Section except by mutual agreement of the Signatories.

G. The Settling Party shall require that every contractor working at the Site, except any Architect/Engineering ("A/E") firm, shall purchase, and maintain in force, insurance policies to protect the United States and the public against all liability arising out of the acts and omissions of the contractors in amounts not less than those specified below:

(1) Workmen's Compensation and Employer's Liability Insurance in accordance with the laws of the State;

(2) Comprehensive General Liability Insurance,
Including Contractual Liability -

Bodily Injury Liability	\$1,000,000 each person \$1,000,000 each accident
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Property Damage Liability	\$1,000,000 each accident \$1,000,000 aggregate:
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(3) Automobile Liability Insurance -

Bodily Injury Liability	\$ 500,000 each person \$1,000,000 each accident
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Property Damage Liability	\$ 500,000 each accident and
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(4) Umbrella policy in the amount of \$15,000,000.00, which shall provide coverage in excess of

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the underlying coverage described in subparagraphs
(G)(1)-(3) above.

H. The Settling Party shall require that every A/E firm working at the Site shall purchase, and maintain in force, insurance policies to protect the United States and the public against all liability arising out of the acts and omissions of the A/E firm in amounts not less than those specified below:

(1) Workmen's Compensation and Employer's Liability Insurance in accordance with the laws of the State:

(2) Comprehensive General Liability Insurance,
Including Contractual Liability -

Bodily Injury Liability	\$1,000,000 each person. \$1,000,000 each accident
-------------------------	---

Property Damage Liability	\$1,000,000 each accident \$1,000,000 aggregate:
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(3) Automobile Liability Insurance -

Bodily Injury Liability	\$ 500,000 each person \$1,000,000 each accident
-------------------------	---

Property Damage Liability	\$ 500,000 each accident and
---------------------------	---------------------------------

(4) Umbrella policy in the amount of
\$2,000,000.00, which shall provide coverage in excess of the
underlying coverage described in subparagraphs H(1)-(3)
above.

Settling Party shall provide the United States and
the State with a copy of the insurance agreements.

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I. Settling Party shall by telephone notify the United States, and the State within seventy-two (72) hours of the completion of all elements of the Work. Written notice of completion, in the form of a petition to terminate this Consent Decree as required by Section XVIII, shall be provided within fifteen (15) days of completion. The United States shall review the Work and indicate its agreement or disagreement as to its completion within sixty (60) days of (1) receipt of the notification or (2) receipt of all sampling results, whichever is later. The Work shall be deemed to have been completed when all of the elements set forth in Exhibit 3 hereto have been determined by the United States in writing, and in accordance with Section 122 (f)(3) of CERCLA, 42 U.S.C. § 9622(f)(3), to have been completed satisfactorily. If the United States does not respond within the applicable time period set forth above, the Settling Party may request of the Court a hearing in which the United States must demonstrate why it should not be compelled to make such a determination. In the event the Settling Party disagrees with the United States regarding the completion of the Work, the Settling Party can resort to the Dispute Resolution procedures set forth in Section XII.

J. If the United States believes that the Work has not been completed in accordance with the standards and specifications set forth in Exhibit 3 hereto, it shall notify Settling Party in writing of any deficiencies and what

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measures must be taken to complete the Work, referencing the specific portions(s) of Exhibit 3 and proposing a schedule for completion. Any dispute under this paragraph shall be subject to the Dispute Resolution provisions of Section XII.

K. Nothing in this Consent Decree shall release Settling Party from liability arising out of or relating to the negligent acts or omissions or the negligent performance of the Work by the Contractor or other agents of the Settling Party.

L. After completion of the Work (to the exclusion of Operation and Maintenance), and during the period of Operation and Maintenance, the Settling Party will submit to the State an annual statement of Operation and Maintenance costs at the Site. The State shall pay to the Settling Party 33 1/3 % of the annual costs of Operation and Maintenance (pursuant to Fiscal 1986 Bond and Capital Improvement Act of the State of Delaware (Senate Bill 311)), as set out in Settling Party's annual statement of Operation and Maintenance costs for the Site.

M. This Consent Decree shall not be construed to obligate the Settling Party to pay for any costs incurred for restoration to natural resources as defined in Section 101(16) of CERCLA, 42 U.S.C. § 9601(16), that are not in accordance with Exhibit 4.

VI. DELAY IN PERFORMANCE: STIPULATED PENALTIES

A. The Settling Party shall be liable to the United States and the State for stipulated penalties for each day, after entry of this Consent Decree, during which it fails to comply

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with the time requirements of this Consent Decree set forth in Exhibit 5, as follows:

Delay	Amount
1-7 days	\$ 750
8-14 days	\$ 1000
15-30 days	\$ 1500
31-60 days	\$ 3000
61 days or more	\$ 6000

The Project Schedule (Exhibit 5) sets forth successive completion dates for the fourteen Tasks to be undertaken at the Site.

B. The United States shall notify the Settling Party that stipulated penalties are due and payable within ten (10) days of receipt of notice. In the event the United States and the State demand stipulated penalties for delay and the Settling Party does not agree to make such payments, resolution of the issue shall be pursuant to the dispute resolution provisions of Section XII. The Settling Party shall have the burden of establishing that the delay was caused by circumstances beyond its control which could not have been overcome by due diligence. If the Court resolves the dispute in favor of the United States, the stipulated penalties shall be found to have continued to run in the interim period between invocation of dispute resolution and final decision, unless the Task to which the penalties related was completed in the interim, in which case, penalties, if any,

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shall continue only until such time as the Task was completed.

C. Stipulated penalties under this Section shall be paid by two certified checks of equal amounts with one-half of the amount payable and mailed to the

U.S. EPA-Hazardous Substance Superfund
P. O. Box 37100-3M
Pittsburgh, PA 15251

and the other one-half payable and mailed to the

Department of Natural Resources and
Environmental Control
Attention: Legal Office
P. O. Box 1401
89 King's Highway
Dover, Delaware 19903

D. The stipulated penalties set forth above shall be in addition to any other remedies or sanctions which may be available to United States or the State by reason of the Settling Party's failure to comply with the requirements of this Consent Decree.

VII. CLAIMS AGAINST THE FUND

A. In accordance with the preauthorization decision document (Exhibit 4 to the Consent Decree), the Settling Party may submit a claim for reimbursement to the Hazardous Substance Superfund (the "Superfund") for up to thirty-three and one-third percent (33 1/3%) of

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the costs incurred in completing the remedial action. In no event shall the claims against the Fund exceed the sum of \$3,086,300.00, unless the amount preauthorized is modified pursuant to Paragraph B. The claims against the Fund shall cover only the Settling Party's costs of the remedial action. The claims shall not include any of the United States' oversight costs, or investigatory costs or past Response Costs that were incurred prior to the lodging of this Decree, which costs the Settling Party is to pay to the Fund a portion thereof, pursuant to Paragraph IV. Reimbursement from the Fund of the amount claimed by the Settling Party shall be subject to the applicable claims and audit procedures specified in Exhibit 4, and shall be made in accordance with the procedures outlined in Exhibit 4. The Settling Party may not submit Contractor Claims for reimbursement from the Fund. Any claim which has been presented to any known responsible party and which has not been satisfied within sixty days, may be presented against the Fund. If the Agency denies a claim in whole or in part, it shall notify the claimant of the reason for such denial. If the claimant is dissatisfied with EPA's decision, or if EPA fails to act on a claim within 90 days of its submission, the claimant may demand an administrative hearing before an administrative law judge as provided in Section 121(b) of CERCLA, 42 U.S.C. § 9621(b).

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B. If it is subsequently determined that it is necessary to modify the actions that EPA preauthorized, or if it becomes apparent that the project's costs will exceed the approved costs as set out in Exhibit 4, the Settling Party may submit to EPA a revised application for preauthorization. Further, the Settling Party may submit a revised application for preauthorization upon EPA's determination of the requirements for final closure of the Site. EPA will consider requests for preauthorization from the Settling Party in a timely manner and will revise the preauthorization to cover 33 and 1/3 percent (33 1/3%) of reasonable and necessary costs to implement the approved remedy.

VIII. REPORTING AND RECORD KEEPING:
RETENTION AND AVAILABILITY OF
INFORMATION

A. Settling Party shall maintain documentation, pursuant to Section 300.69 of the NCP, 40 C.F.R. § 300.69, to support all actions taken and to provide the basis for cost recovery. Settling Party shall provide written progress reports to EPA and the State, as required by this Paragraph or the Plan, containing the information therein required. At a minimum, these reports shall include:

1. Monthly Progress Reports during system construction and for five years thereafter. These shall be submitted on the tenth day of

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each month setting forth a summary of activities, including

- (a) any changes or modifications in the System or Work schedule; and
 - (b) a schedule of the activities planned for the following month.
2. Major Milestone Reports during system construction and, thereafter, for the first five years. These shall be submitted within thirty (30) days of the completion of any major milestone shown in Exhibit 5 shall include a summary of activities undertaken toward, and problems encountered, if any, in the attainment of the Major Milestones, and shall describe any System modifications that were necessary for attainment.
3. Emergency/Major Modification Reports. In the event of any emergency event or planned major modification to the System, not previously the subject of notice to EPA, the Settling Party shall promptly notify the EPA Remedial Project Manager and the State Site Coordinator by telephone, or in the event of their unavailability, the Director of Waste Management Division of EPA, and shall within thirty (30) days supply a written report setting forth the major modification planned, and/or the emergency events that occurred and the measures taken and to be taken in response. If appropriate, these reports may be used also to satisfy the reporting requirement established by Paragraph XI hereof.
4. Emergency/Major Modification Conclusion Reports. Within thirty (30) days of the conclusion of any emergency event or major modification, the Settling Party shall submit a report setting forth the actions taken to effect the major modification and/or to respond to the emergency events.
5. Periodic Monitoring Reports that shall on a prompt basis provide the raw monitoring data gathered as part of the Work, whether or not such data are required to be gathered by this Consent Decree or the Plan.

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6. Annual Monitoring Reports that shall provide annual summaries of the monitoring data gathered as part of the Work, whether or not such data are required to be gathered by this Consent Decree or the Plan, including daily pumping rates and water level readings, along with a description of any operational steps taken or planned on the basis of those data.
7. Periodic monitoring reports to be submitted within fourteen (14) days of the completion of the inspection, sampling and analytical efforts to be conducted during the Operation and Maintenance period.

B. EPA and the State shall review the preliminary and final reports and within 60 days of receipt, EPA and the State shall notify the Settling Party in writing of EPA's and/or the State's approval or disapproval of these reports or any part thereof. In the event of any disapproval EPA and/or the State shall specify in writing both the deficiencies and the reasons for such disapproval.

C. Documents, including reports, approvals, disapprovals, and other correspondence, to be submitted pursuant to this Consent Decree, shall be sent by first class mail to the following addresses or to such other addresses as the Settling Party, EPA or the State hereafter may designate in writing: -

- (1) Documents to be submitted to the United States should be sent to:

EPA Region III
DELMARVA, D.C. WV CERCLA
Remedial Enforcement Section
Attn: Harvey & Knotts Site
841 Chestnut Street
Philadelphia, Pennsylvania 19107

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With a copy to:

EPA Region III
Office of Regional Counsel
Attn: Harvey & Knotts Site
841 Chestnut Street
Philadelphia, PA 19107

- (2) Documents to be submitted to the Settling Party should be sent to:

Leonard F. Charla
Senior Counsel
Energy and Environmental Legal Staff
General Motors Corporation
General Motors Building
3044 West Grand Boulevard
Detroit, Michigan 48202

With copies to:

Aloysius A. Aguwa
Environmental Activities Staff
General Motors Corporation
30400 Mound Road
Warren, Michigan 48090-9015

and

Edmund Frost, Esq.
John Whatley, Esq.
Kirkland & Ellis
655 Fifteenth Street, N.W.
Washington, D.C. 20005

- (3) Documents to be submitted to the State should be sent to:

Joseph J. Hardman, Manager
CERCLA Management Branch
89 King's Highway
P.O. Box 1401
Dover, Delaware 19903

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E. Upon completion of the Work and termination of this Consent Decree, the Settling Party shall notify EPA and allow EPA an opportunity to take possession of all records, documents and information of whatever kind, nature or description relating to the performance of Work at the Harvey & Knotts site.

F. All data, factual information, and documents submitted by the Settling Party to EPA and the State pursuant to this Consent Decree shall be subject to public inspection unless identified as confidential by the Settling Party in conformance with 40 C.F.R. Part 2 or applicable State law. The data, factual information and documents so identified as confidential will be disclosed only in accordance with EPA regulations or applicable State law. The Settling Party shall not assert confidentiality regarding any hydrogeological or chemical data, data submitted in support of remedial proposal, or any other scientific or engineering tests or data. This provision does not apply to documents exchanged by the parties relating to issues of liability or the determination of what additional remedies if any, other than those specifically required by the terms of this Decree, may be necessary to remedy conditions at the Site.

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IX. ACCESS

To the extent access to or easements over property other than the Harvey & Knotts Site is required for the proper and complete performance of this Consent Decree, the Settling Party shall use its best efforts to gain access to or easements over such property and, if necessary, Plaintiffs agree to use their best efforts, consistent with their legal authority, to assist the Settling Party in obtaining such access. In the event the United States and/or the State exercise any legal authority they may have to assist the Settling Party in obtaining any such access, the Settling Party shall reimburse the United States and the State for sixty-six and two-thirds percent (66 2/3%) of any amount of costs awarded or incurred in the exercise of such authority. The United States and the State shall exercise their legal authority to assist the Settling Party in obtaining any such access only to the extent necessary for the implementation of the Work, except as otherwise required by law.

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X. REMEDIAL PROJECT MANAGER

The United States shall designate a Remedial Project Manager ("RPM") and may designate an On-Scene Coordinator ("OSC") and the State shall designate a Site Coordinator ("SC") for the Harvey & Knotts Site, and may designate other representatives, including EPA and State employees, and federal and State contractors and consultants, to observe and monitor the progress of any activity undertaken pursuant to this Consent Decree. The RPM and any OSC so designated shall have the authority lawfully vested in him/her by Section 300 of the National Contingency Plan, 40 C.F.R. § 300. The absence of the RPM or the SC from the Site shall not be cause for stoppage of the Work.

XI. FORCE MAJEURE

A. "Force Majeure" for purposes of this Consent Decree is defined as any event arising from causes beyond the control of the Settling Party which delays or prevents the performance of any obligation under this Consent Decree. "Force Majeure" shall not include increased costs or expenses, non-attainment

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of the goals and standards set forth in the Remedial Action Plan (except as specifically provided therein), failure to apply for any required permits or approvals or failure to provide all information necessary for such permits or approvals thereafter in a timely manner. Circumstances beyond the Settling Party's control may include but not be limited to adverse weather conditions, delay in obtaining access to property upon which the Work is to be done, and delay in obtaining permits or approvals required for the Work; provided that such delay could not have been overcome by Settling Party's due diligence. Increased costs or expenses in connection with the performance of the Work shall not constitute a circumstance beyond the Settling Party's control.

B. When circumstances are occurring or have occurred which may delay the completion of any phase of the Work or delay access to the Site or to any property on which any part of the Work is to be performed, whether or not due to a "force majeure" event, the Settling Party shall promptly notify the RPM and SC by telephone and by telegram within 24 hours, or in the event of their unavailability, the Director of the Waste Management Division of EPA, and shall within thirty (30) days supply to the Plaintiffs in writing the reason therefor; the anticipated duration of such delay; the measures taken and to be taken by the Settling Party's to prevent or minimize the delay; and the timetable for implementation of such measures. Failure to so notify the RPM

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and SC shall constitute a waiver of any claim of force majeure.

C. If the Plaintiffs agree that a delay is or was attributable to a "force majeure" event, the Parties shall modify the Remedial Action Plan to provide such additional time as may be necessary to allow the completion of the specific phase of the Work and/or any succeeding phase of the Work affected by such delay, not to exceed the actual duration of the delay.

D. If the Plaintiffs and the Settling Party cannot agree whether the reason for the delay was a "force majeure" event, or whether the duration of the delay is or was warranted under the circumstances, the Dispute Resolution provisions of Section XII shall apply. If the Settling Party provides the notification described in Paragraph B of this section, any failure to complete properly the Work caused by circumstances beyond the control of the Settling Party which could not have been overcome by due diligence shall not be deemed to be a violation of their obligations, shall not make the Settling Party liable for stipulated penalties, and the time for performance hereunder shall be extended upon agreement of the Parties for a period equal to the duration of the delay. In any event, the burden of proving the existence of a force majeure event is with the Settling Party.

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XII. DISPUTE RESOLUTION

A. Any dispute which arises with respect to the meaning or application of this Consent Decree or the Exhibits hereto (excluding Exhibit 4 which shall be governed by 40 C.F.R. Part 305) shall in the first instance be the subject of informal negotiations between and among Plaintiffs and the Settling Party. If either the Plaintiffs or the Settling Party believes it has a dispute with the other Party it shall notify the other Party in writing within ten days of the time the dispute arises. If the Plaintiffs and the Settling Party cannot resolve the dispute within twenty (20) days from notification, then either Plaintiffs, or the Settling Party may file a petition with this Court setting forth the matter in dispute and the relief requested. In an emergency, any Party may file a petition prior to the expiration of the twenty (20) day period. The period for negotiations may be extended by mutual agreement between the Plaintiffs and the Settling Party. In no circumstances shall the invocation of this paragraph delay the Work or any part thereof.

B. In the event of a dispute between the Plaintiffs and the Settling Party, the Settling Party shall bear

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the burden of proof and the standard for the judicial review of any actions taken by the United States shall be arbitrary and capricious.

XIII. EFFECT OF SETTLEMENT

A. This Consent Decree was negotiated in good faith by the Plaintiffs and the Settling Party, and the Settling Party's performance of the Work as described in Section V and payments pursuant to Paragraph IV represent a fair and equitable apportionment of the total settlement costs.

B. With regard to claims for contribution against the Settling Party, the Parties hereto agree and this Court hereby finds and concludes that the principles of Section 113(f)(2) of CERCLA, 42 U.S.C. § 9613(f)(2) shall govern. If the Settling Party fails to make any payment required by this Consent Decree in a timely fashion it shall lose the benefit of this paragraph. Further, the parties agree that, as to any claims governed by State statutory or common law, the State of Delaware's claims regarding the Harvey & Knotts Site against any party not subject to this Consent Decree shall be reduced pursuant to 10 Delaware Code 6301, to the extent of the pro rata share of the Settling Party.

C. The Settling Party agrees that with respect to any suit or claim for contribution brought against it for

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matters covered by this Consent Decree, it will timely notify the Plaintiffs of the institution of such suit or claim. It is also agreed that the United States shall be under no obligation to assist the Settling Party in any way in defending against such suits for contribution.

XIV. COVENANT NOT TO SUE

A. Except as specifically provided hereafter in Paragraph XIV(B) and (C), upon compliance by the Settling Parties with Paragraph IV(C) and V(C) hereof, Plaintiffs and the Settling Party hereby covenant not to sue each other as to all matters alleged or all matters which could have been alleged in the Complaint with regard to the Site, except claims against the EPA-Hazardous Substance Superfund as provided herein in Section VII. With respect to future liability, this covenant shall take effect upon certification by the United States that the remedial action (the Work), has been successfully completed. This Paragraph shall not be construed as a covenant not to sue the Settling Party if it does not make all payments required by this Consent Decree or any

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other person or entity not a party to this Consent Decree. This covenant not to sue applies only to the Settling Party, including its respective divisions, officials, officers, directors, principals, agents, servants, employees, successors, and assigns, and not to any parent corporation, subsidiaries and affiliates of the Settling Party.

B. This Covenant Not to Sue shall not apply to the following:

1. criminal liability;
2. failure to perform the Work in accordance with law or failure to meet the requirements of this Consent Decree or the Plan; or
3. liability arising from the transportation of Hazardous Substances recovered from the Site and redisposal thereof of Waste Materials taken from the Harvey & Knotts Site; or
4. any costs incurred by the United States as a result of a response action undertaken under Section 104 of CERCLA, 42 U.S.C. § 9604, or any costs incurred by the State as a result of the exercise of its response authority under 7 Del. Code §6308, due to a release or threat of a release at or from the Harvey & Knotts Site as a result of the failure of the Settling Party to perform the Work or meet the requirements of Section VIII or the Plan, whenever the Settling Party has failed to so respond after reasonable

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notice. In the event the Settling Party fails to implement the provisions of Section V in a timely manner, either Plaintiff may perform such portions of the Work as may be necessary, at the cost of the Settling Party, subject to Section X hereof;

5. any costs incurred by either Plaintiff as a result of any release or threat of release of hazardous substances at or from the Harvey & Knotts Site which results from failure(s) of the Settling Party to perform the Work or meet the requirements of this Consent Decree or the Plan; or

6. liability for damage to natural resources, as defined in Section 101(16) of CERCLA, 42 U.S.C. § 9601(16).

C. Notwithstanding any other provisions of this Consent Decree, the United States reserves the right to institute proceedings in this action or in a new action seeking to compel the Settling Party to perform additional response work at the Harvey & Knotts Site or to reimburse the United States for Response Costs, other than Response Costs incurred prior to the effective date of this Consent Decree, if:

1. For proceedings prior to certification of completion of the remedial action (the Work) by the United States,

- (a) conditions at the Harvey & Knotts Site previously unknown to or undetected by the United States are discovered after the lodging of this Consent Decree and these

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conditions indicate that a hazardous substance has been, or is being, released or that there is a substantial threat of such a release into the environment; or
(b) the United States determines, based on information received, in whole or in part, after the lodging of this Consent Decree, that the remedial action (the Work) taken at the Harvey & Knotts Site, is not protective of human health and the environment.

2. For proceedings subsequent to certification of completion of the remedial action (the Work), by the United States,

(a) conditions at the Harvey & Knotts Site previously unknown to or undetected by the United States are discovered after the certification of completion and these conditions indicate that a hazardous substance has been, or is being, released or that there is a substantial threat of such a release into the environment; or
(b) the United States determines, based on information received, in whole or in part, after the certification of completion, that the remedial action (the Work) taken at the Harvey & Knotts Site, is not protective of human health and the environment.

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D. Notwithstanding any other provision in this Consent Decree, the covenant not to sue in Paragraph XIV(A) shall be subject to the satisfactory performance by the Settling Party of its obligations under this Consent Decree and the covenant not to sue shall not relieve the Settling Party of its obligation to meet and maintain compliance with the requirements set forth in this Consent Decree.

E. Settling Party's claim against any other party in this or any other proceeding for contribution or indemnification of all or a portion of the cost of its settlement herein, shall be secondary to the United States' claim against such other party for the response actions or other costs incurred by the Plaintiffs for actions taken at the Site.

XV. CONSISTENCY WITH
NATIONAL CONTINGENCY PLAN

The United States and the State agree that the Work, if properly performed as set forth in Section V hereof, is consistent with the provisions of the National Contingency Plan, 40 C.F.R. §300, pursuant to 42 U.S.C. § 9605, and, subject to Section XIV, all actions taken or omitted pursuant to the Plan are afforded all protection contained in 42 U.S.C. § 9607(d).

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XVI. RESPONSE AUTHORITY

A. Nothing in this Consent Decree shall be deemed to limit the response authority of the United States under Section 104 of CERCLA, 42 U.S.C. § 9604, or to alter the applicable legal principles governing judicial review of any action taken by EPA pursuant to that authority.

B. Nothing in this Consent Decree shall be deemed to limit the State's authority under 7 Del. Code § 6308 or to alter the applicable legal principles governing judicial review of any action taken by the State pursuant to that authority.

XVII. MODIFICATION, COUNTERPARTS,
PARAGRAPH HEADINGS

A. Except as provided for herein, there shall be no modification of this Consent Decree without written approval of all Parties to this Consent Decree.

B. This Consent Decree may be executed in any number of counterparts, each of which shall be deemed an original but all of which taken together shall constitute one and the same instrument.

C. All paragraph headings herein are for convenience only and are in no way to be construed as part of this Consent Decree or as a limitation on the scope of the provisions to which they may refer.

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XVIII. EFFECTIVE AND TERMINATION DATES

A. This Consent Decree shall be effective upon the date of its entry by the Court.

B. When the Settling Party believes that the Work contemplated by the Plan has been completed and all payments have been made pursuant to Section IV it shall petition the United States and the State for agreement to terminate this Consent Decree. If the United States and the State accept the petition, the United States and the State and the Settling Party shall jointly petition the Court for termination of the Consent Decree. If the United States and/or the State rejects the petition, it/they shall explain its/their reasons in writing, and the dispute resolution procedures of Section XII shall apply. Termination shall not affect the provisions of Section XIII.

XIX. USE OF DECREE

This Consent Decree was negotiated and executed by Plaintiffs and the Settling Party in good faith to avoid further expensive and protracted litigation. The execution of this Consent Decree is not an admission of liability on

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any issue dealt with in this Consent Decree. Accordingly, it is the intention of the Plaintiffs and the Settling Party that, with the exception of this proceeding and any other proceeding contemplated by this Consent Decree, this Consent Decree shall not be admissible in any judicial or administrative proceeding (except that it may be admissible in a judicial or administrative proceeding between the Settling Party and its insurance company concerning the obligation of the insurance company).

XX. RETENTION OF JURISDICTION

A. This Court shall retain jurisdiction of this Consent Decree for purposes of insuring compliance with its terms and conditions.

B. Plaintiffs and the Settling Party each retain the right to enforce the terms of this Consent Decree and take any action authorized by Federal or State law not inconsistent with the terms of this Consent Decree to achieve or maintain compliance with the terms and conditions of this Consent Decree or otherwise.

C. EPA reserves the right to enforce all federal environmental laws.

D. The State reserves the right to enforce all State environmental laws.

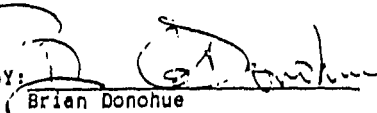
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BY THEIR COUNSEL, THE PARTIES ENTER INTO THIS CONSENT
DECREE AND SUBMIT IT TO THE COURT, THAT IT MAY BE APPROVED
AND ENTERED.

FOR THE UNITED STATES

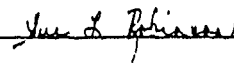
BY: 

Roger J. Marzulla
Acting Assistant Attorney General
Land and Natural Resources Division
U.S. Department of Justice
10th & Pennsylvania Ave., N.W.
Washington, D.C. 20530

BY: 

Brian Donohue
Attorney, Environmental Enforcement
Section
Land and Natural Resources Division
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WILLIAM C. CARPENTER, JR.
United States Attorney
District of Delaware

BY: 

Sue L. Robinson
Assistant United States Attorney
District of Delaware

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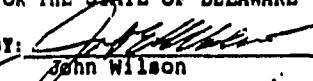
BY: 

Bruce M. Diamond
Regional Counsel
U.S. Environmental Protection
Agency, Region III
841 Chestnut Building
Philadelphia, PA. 19107

BY: 

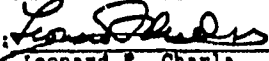
Thomas L. Adams, Jr.
Assistant Administrator
Office of Enforcement and
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Agency
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Washington, D.C. 20460

FOR THE STATE OF DELAWARE

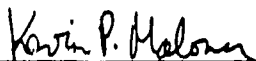
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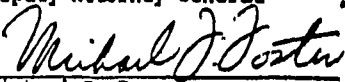
John Wilson
Secretary
Delaware Department of Natural
Resources and Environmental Control
P.O. Box 1401
89 King's Highway
Dover, Delaware 19903

FOR GENERAL MOTORS CORPORATION

BY: 

Leonard F. Charla
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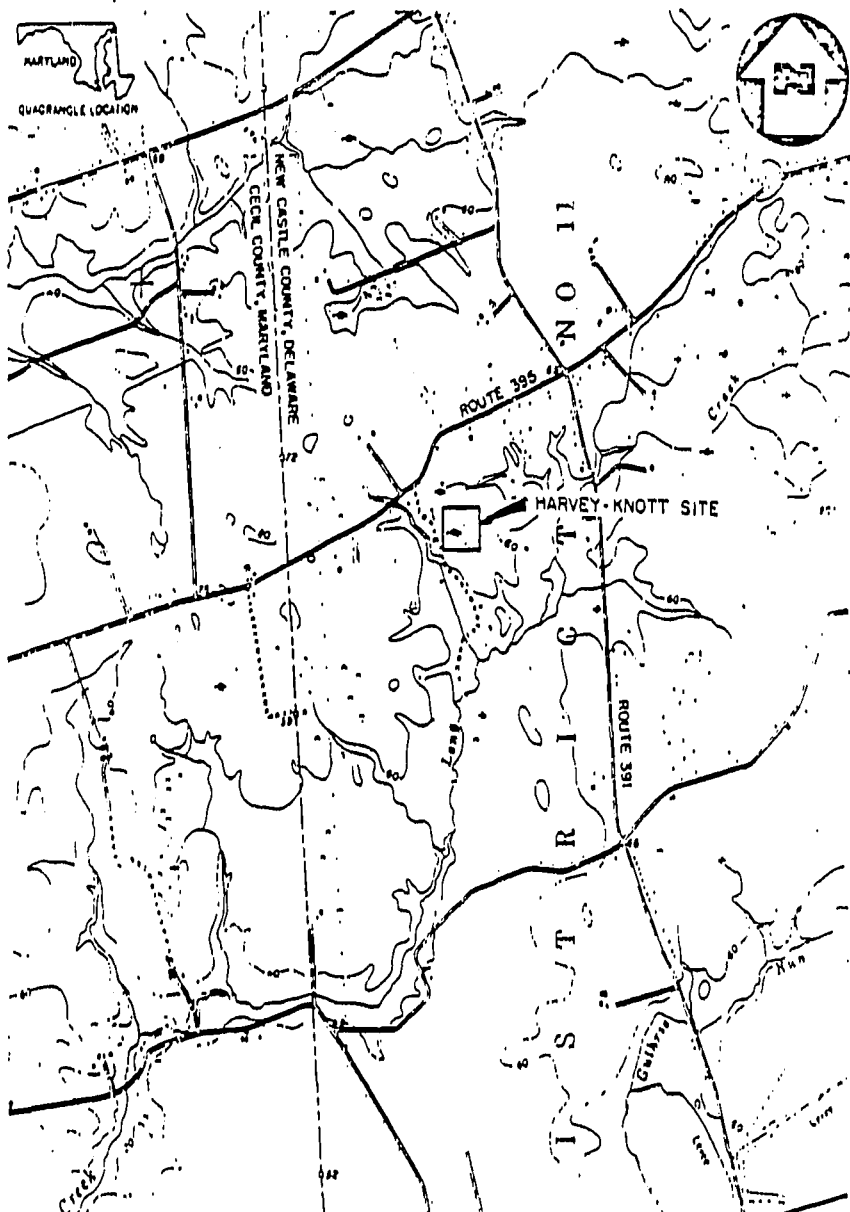

Kevin P. Maloney
Deputy Attorney General


Michael P. Foster
State Solicitor
Department of Justice
State Office Building
820 N. French St.
Wilmington, DE 19801

APPROVED and so ORDERED this 19th day of October, 1987


United States District Judge

AR000152



BASE MAP IS A PORTION OF THE U.S.G.S. ELKTON, MD-DEL QUADRANGLE (7.5 MINUTE SERIES, 1953, PHOTO-REVISED '92')
CONTOUR INTERVAL, 20'

EXHIBIT 1

LOCATION MAP

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

SCALE: 1"=2000'

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EXHIBIT 2
RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: Harvey and Knott Drum Site
New Castle County, Delaware

Data Reviewed:

The underlying technical information, unless otherwise specified, used for analysis of cost-effectiveness and feasibility of remedial alternatives is included in the following documents and project correspondence. I have been briefed by my staff of their contents, and they form the principal basis for my decision of the appropriate extent of remedial action.

- Remedial Investigation/Feasibility Study Report (Draft), Harvey and Knott Drum Site, New Castle County, Delaware, Volumes I, II, III and IV, (NUS Corp., August 1985)
- Work Plan, Initial Remedial Measure/Remedial Investigation/Feasibility Study of Alternatives, Harvey and Knott Drum Site, New Castle County, Delaware (NUS Corp., August 1983).
- Remedial Action Master Plan, Harvey Knott Site, Kirkwood, Delaware (Roy F. Weston, Inc., February 1, 1983)
- Summary of Remedial Alternative Selection
- Recommendations by the Delaware Department of Natural Resources and Environmental Control.
- Staff summaries and recommendations.

Description of the Selected Remedy

Specifically, this alternative includes the following elements:

- * Cleaning the onsite drainage pond by collecting and treating surface water (est. 200,000 gallons). After the pond is dewatered, removal and disposal of contaminated sediments, sludges, and bulk wastes to a qualifying facility permitted under the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. Part 264, Subpart N.
- * Removal and disposal of all crushed or intact surface drums, debris, wastepiles, and sludges to a qualifying RCRA facility.
- * Installation of ground water extraction and treatment facilities to collect and remove contaminants in the shallow ground water. Treated ground water will then be applied to flush contaminants from onsite surface and subsurface soils. It is estimated that this extraction/treatment/flushing program will operate for five years to restore the aquifer to drinking water quality or final EPA approved alternate concentration limits.

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SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

HARVEY AND KNOTT DRUM SITE NEW CASTLE COUNTY, DELAWARE

Site Location and Description

The Harvey and Knott Drum Site is located in New Castle County, Delaware, approximately one-half mile east of the Maryland-Delaware border (figure 1). The community of Kirkwood is located approximately 5 miles southeast of the site and the community of Glasgow lies approximately 3 miles northeast. The site is in a remote, rural area, previously used for farming. Light residential development to the north of the site consists of approximately 100 residences. The closest habitations are several rural and trailer homes along Old County Road (Route 395) and the Shelly Farms development (figure 2).

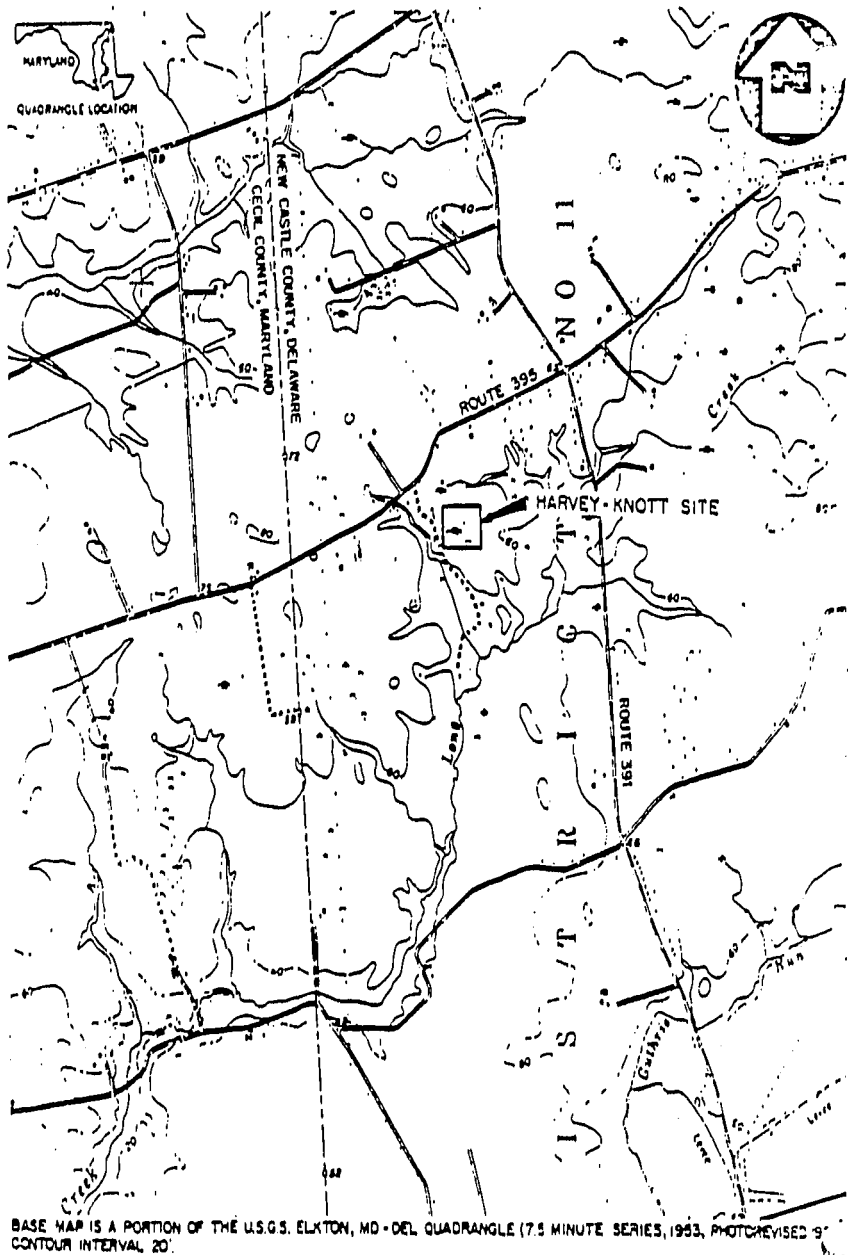
The Harvey and Knoct's Trucking, Inc., operated an open dump and burning ground between 1963 and 1969 at the site. The facility accepted sanitary, municipal, and industrial wastes believed to be sludges, paint pigments, and solvents. Wastes were emptied onto the ground surface, into excavated trenches, or left in drums (some of which were buried). Some of the wastes were then either burned as a means of reducing waste volume or allowed to seep into the soil. A security fence installed as part of an EPA emergency action presently surrounds the areas (2.2 acres) of greatest visible surface contamination.

There are two major water supplying aquifers in the area of the site above bedrock (which is about 350 feet below the ground surface). The shallow ground water occurs under water-table conditions and is referred to as the Upper Hydrologic Zone (UHZ). It is flowing to the southwest, south, and southeast of the site, toward surface waters and wetland areas. Most of the domestic drinking water wells in the area are installed in the UHZ. Wells used for agriculture such as dairy farming or crop irrigation also use the UHZ.

The second major source of ground water in the site area is the Lower Hydrologic Zone (LHZ) which is under confined conditions. The UHZ and the LHZ are separated by an aquitard referred to as the Potomac clay. The LHZ is the major public and industrial water supply in New Castle County (figure 3). Both the UHZ and LHZ are Class II aquifers as classified under the Ground Water Protection Strategy.

Soils in the area consist of predominantly sandy materials underlain by silts, clays, sands, and some gravels. They are well drained with moderate to rapid permeabilities. The soils form a relatively flat land surface that slopes toward the south which is also the general direction of the shallow ground water. Ground water is generally encountered at about five to ten feet below the ground surface.

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BASE MAP IS A PORTION OF THE U.S.G.S. ELKTON, MD-DEL. QUADRANGLE (7.5 MINUTE SERIES, 1953, PHOTO-REVISED 9" CONTOUR INTERVAL, 20'.

FIGURE 1

LOCATION MAP

HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

SCALE: 1" = 2000'

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- * Preparation of the site surface for installing the flushing pipe network will entail (a) grading the entire application area, (b) covering with a 24 inch layer of clean soil, and (c) establishing permanent vegetation as a precaution against direct contact.

Declarations

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), and the National Contingency Plan (40 C.F.R. Part 300), I have determined that the remedial action described above together with proper operation and maintenance constitute remedies which mitigate and minimize threats to and adequately protect public health, welfare and the environment. The remedial action provides for the removal and offsite disposal of surface wastes as a source control remedy and the installation of ground water extraction/treatment/reapplication facilities as management of migration controls. Selection of target and final endpoint levels of residual ground water and soil contaminants will be established in such a way so as to minimize the extent of the shallow aquifer requiring long-term institutional controls while at the same time, providing a technically feasible and cost-effective remedy. The levels will take into account the site specific and regional characteristics and will be protective of the public health, welfare and the environment.

I have deferred a decision on final site closure requirements until the post ground water extraction/treatment/reapplication soil grid sampling program is evaluated.

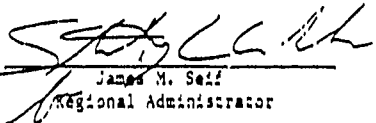
I am also deferring selection of remedial response measures, if any, for the adjacent wetlands and surface waters. Further assessment of the impact of the site on these sensitive areas and evaluation of alternatives to provide adequate protection will be performed.

The selected remedy includes the operation and maintenance of the ground water extraction/treatment/reapplication facilities to reduce or eliminate the potential exposure to ground water contamination. These activities will be considered part of the approved action and eligible for Trust Fund monies until such time that I make the decision regarding the endpoint level of treatment for soils and ground water. At the time when the levels are achieved I will also decide on the future status and funding of O&M.

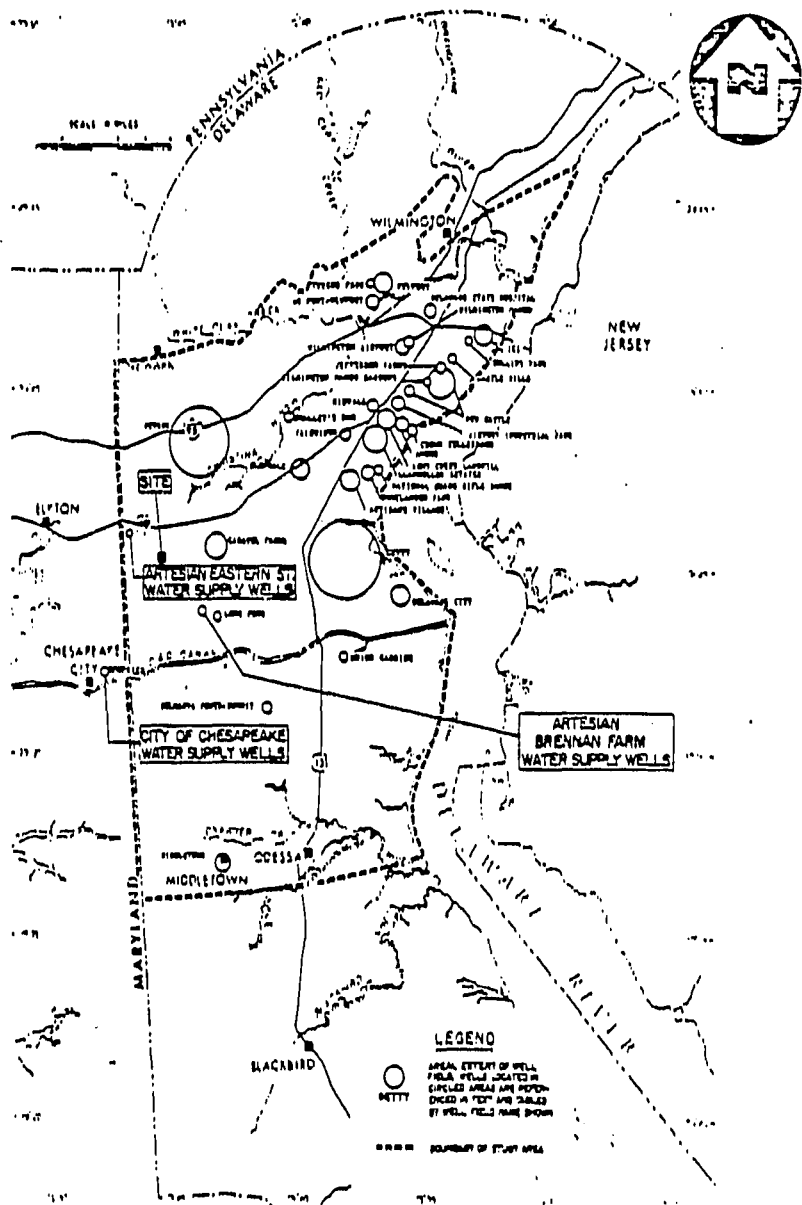
I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the offsite transport and disposal of contaminated material from the site is more cost-effective than other remedial actions and is necessary to protect public health, welfare, or the environment.

Date

9/30/85


James M. Seiff
Regional Administrator

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BASE MAP FROM DENVER AND MARTIN, U.S.G.S. OPEN FILE REPORT 81-916.

FIGURE 3
LOCATION OF POTOMAC FORMATION WELLS
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

AR000159

The site area is drained by two unnamed tributaries which border the site on the east and west and flow south into Long Creek. Extensive wetland areas surround the southwest, south, and southeast sides of the site which have probably resulted from beavers building dams within the last fifteen year along the tributaries and Long Creek.

Site History

The site was discovered by the State of Maryland Waste Management Administration during an aerial overflight on January 14, 1981. Subsequent to the overflight, the State of Maryland conducted a ground search and determined that the site actually was located within the State of Delaware and notified the Delaware Department of Natural Resources and Environmental Control (DNREC). This onsite investigation by the State of Maryland had identified numerous drums and wastes which had been disposed in an uncontrolled manner at the site.

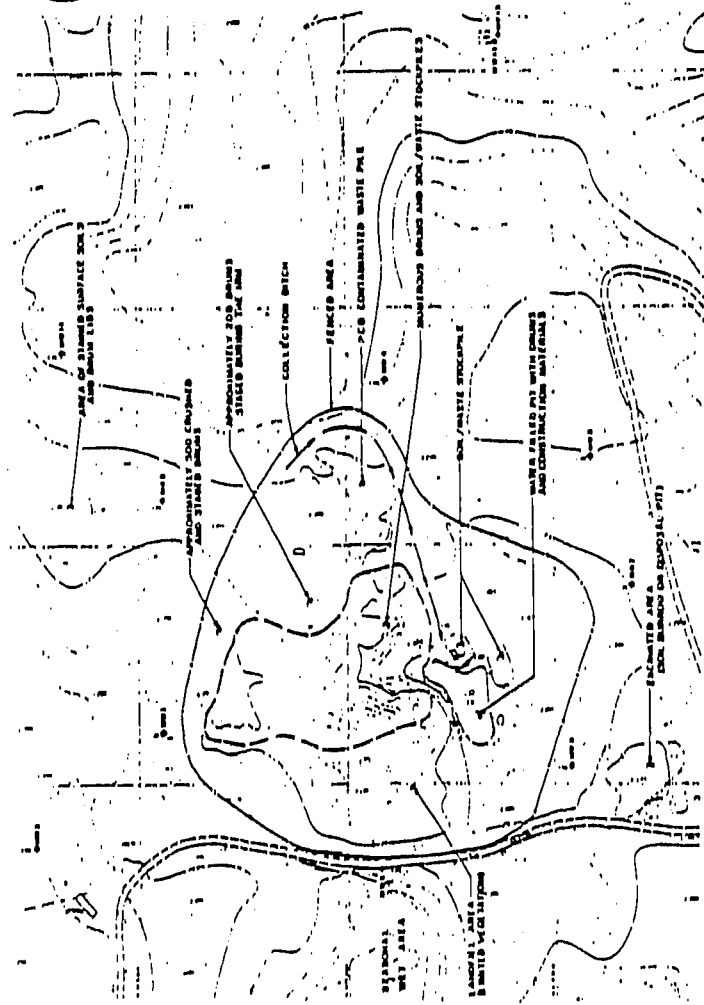
DNREC requested EPA assistance and both agencies conducted a preliminary assessment in December 1981 to determine the immediate effect of the site conditions on the public health and environment. Test results indicated contamination in the soils and ground water by heavy metals and organic chemicals including PCBs. To prevent direct contact with exposed hazardous wastes at the site and to minimize the spread of contamination via surface water runoff and ground water transport offsite, EPA instituted Immediate Removal measures during June through August of 1982. These emergency measures included the installation of a security fence around the areas of greatest visible surface contamination, overpacking and staging 43 leaking drums and performing an extent of contamination survey. In addition, seventeen monitoring wells were installed by the DNREC and EPA to identify the nature and extent of contaminated shallow ground water.

Based on the analytical results received from the preliminary assessment/site investigation, the Hazard Ranking System score at this site was 30.77. The site was then proposed for placement on the National Priorities List, and authorization to proceed with a Remedial Investigation/Feasibility Study was approved in April 1983.

Site conditions (Figure 4) as encountered prior to the Remedial Investigation can be characterized as follows:

- An area of approximately 2.5 acres had been fenced to prevent access to drums and an open pond.
- Stockpiles of empty to full drums in various states of deterioration, were located within the fenced area.

AR000160



CITIZENSHIP - 100

200 0 100
SCALE IN FEET

FIGURE 4
EXISTING CONDITIONS
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

AR000161

- Stockpiles of landfill-type wastes (lumber, steel, garbage, and unknown waste) were generally located in the center of the fenced area.
- A small waste pile had been developed in the eastern side within the fenced area.
- A pond within the fenced limit contained various types of landfill waste in addition to drums.
- An area north to northeast of the fenced area showed evidence of localized stressed vegetation and land surface disposal of liquids and/or sludges.
- An area west of the fenced area, which receives surface runoff from the fenced area, showed evidence of stressed vegetation. However, this area is also poorly drained, a factor which could cause this condition.
- An area south-southwest of the fenced area had been excavated for soil borrow or for use as a supplementary disposal area.
- The natural topography of the land on and offsite indicates that drainage of surface runoff is poor and results in ponded water and swamps, both seasonal and perennial. Furthermore, beavers have created additional ponded water areas west and south of the site increasing wetlands conditions.

Contamination of soil, surface water, and ground water had occurred as a result of disposal of industrial wastes. The exposure to dermal contact had been temporarily mitigated by the installation of a fence. Since there were a number of residents using the shallow ground water upgradient of the site, the potential for contamination existed if the ground water flow was modified by increased pumping of upgradient wells. The wetland environmental habitat downgradient of the site also could be affected by (a) migration and discharge of shallow contaminated ground water and (b) surface runoff from the site.

In an effort to minimize immediate and obvious hazards to the public and the environment, an Initial Remedial Measure (IRM) was conducted by EPA within the fenced area during March through June of 1984. The IRM work plan consisted of characterizing the wastes within the fenced limits, consolidating wastes where appropriate, and transporting the wastes to an EPA-approved disposal facility. During the execution of the work it became obvious that the number of drums, waste stockpiles, and quantity of industrial type wastes (paint pigments, sludges, and solvents) was greater than anticipated. As a result, the amount of materials to be removed had to be reevaluated. The increased quantity affected the characterization of all onsite wastes and the scope of work had to be revised to remove only the most hazardous materials.

AR000162

Based on analytical results (a composite sample of the overpacked drums showed 1.3 percent Aroclor 1254), the existing 43 overpacked drums were repackaged, removed, and disposed of at the CECOS International, Inc., facility in Ohio. Testing also indicated one waste stockpile in the eastern area of the fenceline contained at least 750 ppm of Aroclor 1254. A soil berm and surface drainage ditch were constructed around this PCB-contaminated wastepile to: (1) collect and direct surface runoff from the PCB-laden stockpile into the pond within the fenced limits, and (2) to prevent further runoff to the north and east areas outside the fence.

Approximately 500 drums that were identified as being empty were characterized, crushed, and staged within the fenced area. Another 200 drums that were partially to entirely full are staged in another area within the fenced area. The central zone of the fenced area still has numerous drums that have not been staged and characterized to determine whether they contain any hazardous wastes.

Current Site Status

Results of geophysical surveys did not identify the presence of buried ferromagnetic materials outside of the fenced area. Interpretations of the electromagnetic survey (plume identification or presence of clay) were used to locate monitoring wells and understand the subsurface conditions. A buried gravel deposit was identified outside of the southeast side of the fenced area.

Due to the presence of extensive amounts of surface metal within the fenceline, the use of geophysical techniques was precluded in this area. In an effort to determine the presence of buried drums and the extent of contamination within and immediately outside of the fenced area, test pit excavation programs were performed. Crushed and intact drums were found in the west-central part of the fenced area at depths of four to seven feet.

Surface and subsurface soil sampling locations are shown on figure 5. A number of Hazardous Substances List (HSL) organic compounds and inorganic elements were detected. Organic compounds include: volatile organics (halogenated aliphatics, monocyclic aromatics, and ketones); semi-volatile organics (phthalate esters, phenols, and amines); pesticides; and PCBs. Trace elements include all those on the HSL.

As indicated on Table 1, volatile contamination (numbers 1 through 5) was prevalent in high concentrations particularly in subsurface samples. The most highly contaminated soils were found in test pits 12 (at a depth of 7 ft.), TP-17 (8 ft.) and TP-18 (4 ft.) on the southern periphery of the fenced area and also TP 20 (3 and 6 ft.) just outside the western fence limit. Surface soils generally exhibited 100 to 1,000 times less than the volatile contamination found in subsurface soils. This could be attributed to

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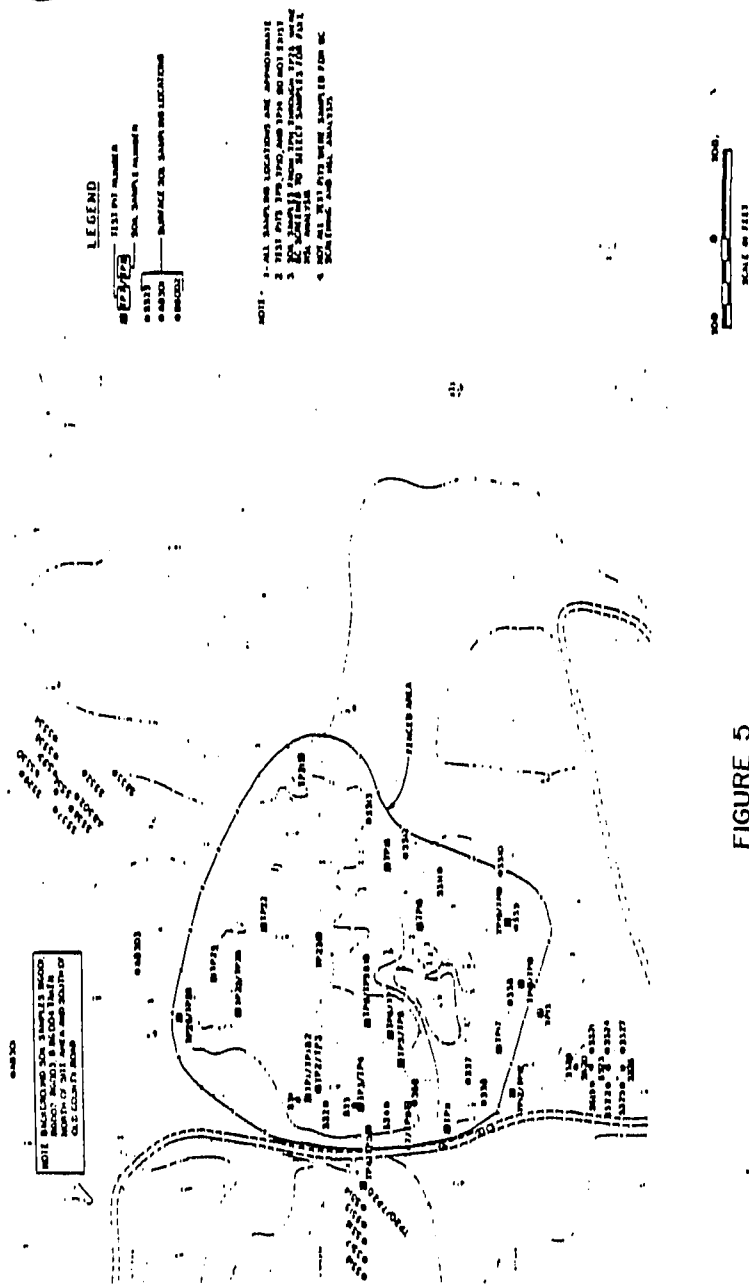


FIGURE 5
SOIL SAMPLING LOCATIONS
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

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CONTAMINANTS OF CONCERN
HAIWEY AND KNOTT DRUM SITE

TABLE 1

Contaminant	Media	No. of Observations/ Total No. of Samples	Concentration Range	Pertinent Inclusion Rationale
1 Benzene CAS No. 74-43-2	Surface Soils Groundwater	1/40 9/72	6 ug/kg 5 - 1,130 ug/l	Proven carcinogen, high groundwater concentration
2 Ethylbenzene CAS No. 100-41-4	Subsurface Soils Groundwater Sediment	6/23 15/72 4/7	10 - 1,200,000 ug/kg 5 - 8,530 ug/l 8 - 900 ug/kg	Prevalent in media, high concentration in groundwater
3 Methylene Chloride CAS No. 75-09-2	Surface Soils Subsurface Soils Groundwater Surface Water Sediment	4/40 14/23 24/72 5/7 7/7	36 - 134 ug/kg 13 - 5,200,000 ug/kg 4 - 81,300 ug/l 5 - 398 ug/l 0 - 47,000 ug/kg	Prevalent throughout media in high concentra. areas, highly mobile.
4 Toluene CAS No. 108-08-3	Surface Soils Subsurface Soils Groundwater Sediment	10/40 8/23 16/72 3/7	1 - 727 ug/kg 6 - 2,400,000 ug/kg 8 - 211,746 ug/l 6 - 830 ug/kg	Prevalent in media, high concentration in groundwater, chronic toxicity
5 Xylenes (Total) CAS No. 1330-20-7	Surface Soils Subsurface Soils Groundwater Sediment	3/40 8/23 20/72 4/7	26 - 180 ug/kg 27 - 1,600,000 ug/kg 7 - 36,593 ug/l 29 - 1,530 ug/kg	Prevalent in media, high concentration in groundwater
6 Bis(2-ethylhexoxy)phthalate CAS No. 117-01-7	Subsurface Soils Groundwater	5/23 8/72	396 - 7,300 ug/kg 18 - 206 ug/l	Carcinogenic potential, present in groundwater
7 PCB-1260 CAS No. 110916-02-5	Surface Soils Subsurface Soils Sediment	3/40 6/23 2/9	93 - 237 ug/kg 49 - 330 ug/kg 1,600 - 41,000 ug/kg	Carcinogenic potential, bioaccumulation potential

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TABLE 1
CONTAMINANTS OF CONCERN
HARVEY AND KNOTT DRUM SITE
PAGE TWO

Contaminant	Media	No of Observations/ Total No. of Samples	Concentration Range	Pertinent Inclusion Rationale
8 Cadmium* CAS No. 7440-43-9	Surface Soils	34/40	0.08 - 291 mg/kg	Prevalent throughout media present in residential wells
	Subsurface Soils	20/23	0.03 - 25 mg/kg	
	Groundwater	5/56	1 - 6 ug/l	
	Residential Wells	3/6	1 - 3 ug/l	
	Surface Water	1/9	4 ug/l	
9 Chromium* CAS No. 7440-47-3	Sediment	8/9	0.22 - 3 mg/kg	Found in groundwater in excess of primary drinking water standards, prevalent throughout media
	Surface Soils	40/40	3 - 181 mg/kg	
	Subsurface Soils	10/23	9 - 66 mg/kg	
	Groundwater	4/56	10 - 420 ug/l	
	Surface Water	2/9	10 ug/l	
10 Lead* CAS No. 7439-92-1	Sediment	8/9	3 - 29 mg/kg	Found in groundwater in excess of primary drinking water standards
	Surface Soils	40/40	3 - 20,200 mg/kg	
	Subsurface Soils	23/23	3 - 6,000 mg/kg	
	Groundwater	8/56	5 - 111 ug/l	
	Residential Wells	3/6	5 - 7 ug/l	
	Surface Water	4/9	6 - 162 ug/l	
	Sediment	8/9	10 - 128 mg/kg	

* Concentrations reported for Groundwater are from post-1983 sampling only

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(a) the volatilization of surface (0-2 1/2 inches) contamination, (b) downward migration from infiltration of precipitation since volatiles are relatively water soluble, and (c) decomposition by biological activity.

Semi-volatile organics detected in subsurface soils reflect the contamination exhibited by volatiles. Samples obtained from test pits 12, 17, and 20 contained high concentrations (10-100 ppm) of base/neutral extractables. Although these compounds are not as mobile in the environment as the volatiles their appearance at high concentrations in subsurface soils may be attributable to increased solubility caused by volatile contamination or to direct deposition.

PCBs identified in surface and subsurface soil samples include the following:

Concentration Range (ppb)

<u>Chemical</u>	<u>Surface Soil</u>	<u>Subsurface Soil</u>
PCB 1254	ND - 3169	ND - 540
PCB 1260	ND - 237	ND - 330

ND - Not detected

Areas contaminated with PCBs are:

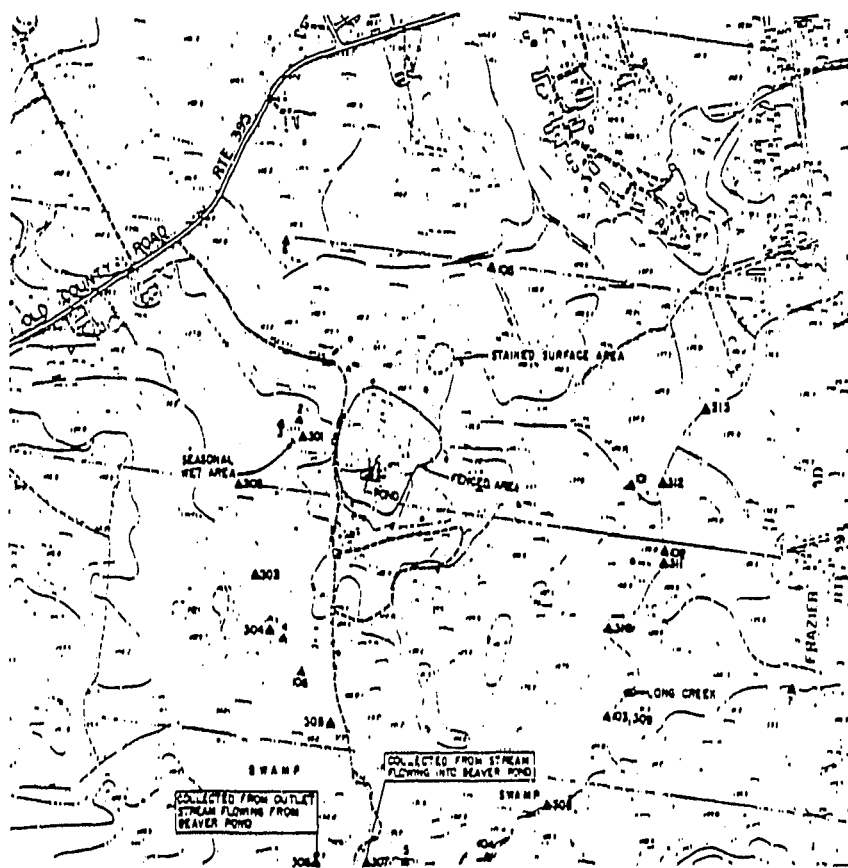
- Surface soil to the northeast of the fenced area.
- Subsurface soil in the central portion of the fenced area.
- Surface soil directly west of the fenced area.
- Surface soil in the lowlying area directly south of the site.

PCBs are relatively immobile in the environment because of their limited water solubility and their tendency to adsorb to at sample locations soils. Thus, it is likely that these contaminants were deposited where they were detected, except in the area to the west of the fenced area. PCBs were probably adsorbed to soil particles and transported by surface water runoff from other areas of the site. The ability of PCBs to adsorb to soil particles makes them susceptible to transport because of erosion or airborne migration. The area to the west of the site is a drainage area that collected surface water runoff from the fenced area during site operation. It appears that the presence of PCBs in this location resulted from erosion of contaminated soils.

Most areas of the site contain trace elements above literature background levels. While trace element contamination is apparently scattered about the site, the concentrations encountered in some areas are very high. These areas include:

- Surface soil to the northeast of the site
- Subsurface soil in TP-1 through TP-8
- Surface soil near TP-7
- Subsurface soil in TP-25

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LEGEND

A SURFACE WATER / SEDIMENT SAMPLING LOCATION

FIGURE 6

SURFACE WATER AND SEDIMENT SAMPLING LOCATIONS
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

0 550 1100



SCALE IN FEET

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The most contaminated area is the vicinity of test pits 1 through 3. Contaminants in this area probably resulted from the deposition of wastes containing trace elements. The presence of trace elements in the northeastern and southern areas is also indicative of concentrated disposal. The presence of trace elements outside of the fence area on the west side is probably due to erosion and surface runoff of contaminated soils, similar to the transport of PCBs in this area.

Chromatographic screening results identified HSL organic and inorganic substances in both surface water and sediment samples obtained from locations (figure 6) within site boundaries and in surface water bodies near the site. Sediment samples contained all of the volatile compounds frequently identified at high concentrations in other site media (see Table 1) which indicates that chemical contaminants are migrating from the site. It is believed that occurrence of volatile compounds in the sediment samples (101 through 106) could be attributed to the discharge of shallow contaminated ground water to the surface water bodies. Transport of eroded contaminated site soils is unlikely due to the distance from the site to the sample locations. Also, overland contaminated surface runoff is a possibility, but due to the volatilization process enroute to the surface water bodies, it is unlikely that this was the major mode of transport.

Surface water contamination from volatile compounds was minimal (only detected at location 101 and 102 at less than 0.4 ppm). Evaporation of volatiles from surface waters is expected to occur quite rapidly.

Semi-volatile contamination was detected in sediment samples 1, 2, 3, 4, 106, and 5. The presence of these compounds in sediment samples is probably attributable to (a) erosion of contaminated site soil since the travel distances are not great (with the exception of location 5) and (b) contaminated ground water discharge through sediments to surface water bodies.

The absence of semi-volatile compounds in surface water samples obtained at the same locations is indicative of the partitioning of the chemicals between the water and sediment compartments and is reflective of their generally low water solubility and high soil adsorption potential.

PCBs were detected in sediment samples at location #2 (41ppm), location #3 (1.6 ppm), and location #5 (0.08 ppm). It should be noted that a duplicate sample at location #5 did not detect PCBs. The presence of PCBs at locations 2 and 3 is probably due to erosion of contaminated soil from the site. There were no detectable PCBs in surface water samples.

Trace elements, which were detected in surface waters, are of concern because of their known toxic effects upon aquatic organisms. Lead (162 ppb) was the only element to significantly surpass the Proposed Water Quality Criteria level 2/7/84 (acute toxicity - 40 ppb based on calculated water hardness). This sample was taken from the pond within the fence line. It should be noted that an upstream sample taken from Long Creek during preliminary investigations contained 130 ppb of lead. The onsite pond also contained the highest sediment sample concentrations for lead (98 ppm), cadmium (3.2 ppm), arsenic (9.5 ppm), and chromium (29 ppm).

AR000169

Geologic and Hydrogeologic Summaries

The purpose of the subsurface investigation/well installation program was to determine the nature and extent of contamination that had migrated through ground water movement. Previous investigations of the site hydrogeology (Shaly 1982) concluded that the shallow ground water under the site is flowing away from the residential area of Shelly Farms which is located northeast and north of the site. The shallow ground water flow is to the southwest, south, and southeast of the site, toward surface waters and wetland areas. Previous investigations also determined that the shallow ground water in the vicinity of the site is contaminated by organic compounds.

The location of site monitoring wells is shown on figure 7 while the A-A' geologic cross section is diagramed on Figure 8.

The uppermost formation occurring at the site is the Columbia Formation consisting of very dense, fine to coarse, grained sands, fine to coarse grained gravels, silty sand and gravels, and occasional cobbles. Deposits that occur at the site range in thickness from 19 to 46 feet. Ground water seepage velocities range from 550 feet/year southwest of the site to 2,300 feet/year southeast of the site.

Beneath the Columbia Formation lies the Upper Potomac Formation. These deposits are very dense, fine to coarse grained sands, uniform medium sands, silty sands, and very stiff, variegated sandy clays, and silty clays. Thickness of the Upper Potomac Formation increases to about 60 feet south of the site from almost non-existent north of the site. The ground water seepage velocity in the Upper Potomac deposits is estimated at 240 feet/year.

Based on the correlation of subsurface geology and hydraulic connection of the Columbia and Upper Potomac Formations, these deposits are considered to be one hydrologic zone (the Upper Hydrologic Zone). The UHZ is under water table conditions over most of the site area. Discharge from the UHZ supports base flow to the unnamed tributaries east and west of the site and Long Creek.

Precipitation is the source of recharge to the UHZ and affects its capacity to support base flow to streams in the study area. The average annual precipitation of over 44 inches is more than adequate to replenish the UHZ which requires about 14 inches per year for recharge.

Beneath the UHZ lies the Potomac clay and Lower Hydrologic Zone. The Potomac clay is a major confining layer (aquicard) between the UHZ and LHZ. It is comprised of very stiff, variegated, silty clay or clay with discontinuous lenses of very fine to medium sand, silty sand and sandy clay. The average thickness of the Potomac clay is approximately 150 feet. Ground water flowing through the Potomac clay has a downward vertical gradient. The average vertical velocity is only 1.3×10^{-2} ft/year.

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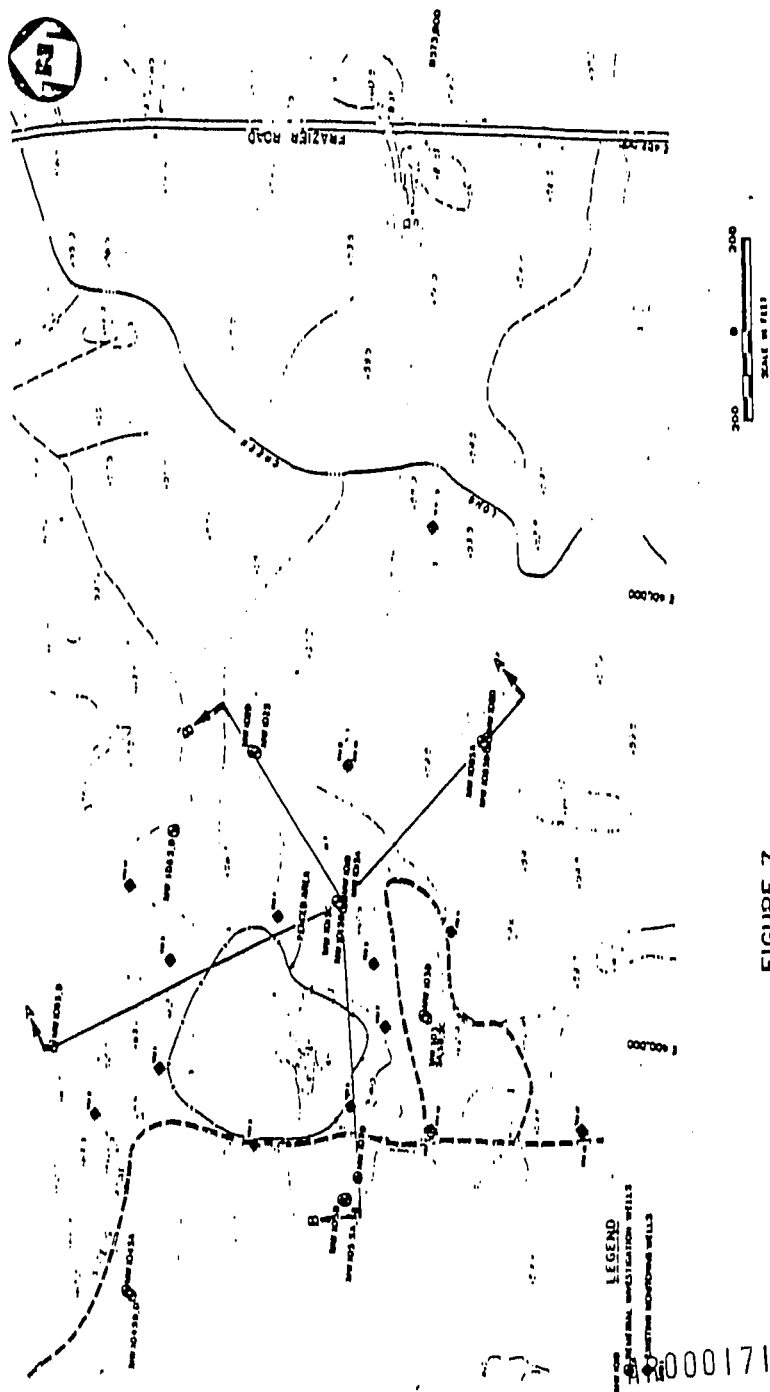


FIGURE 7
MONITORING WELL LOCATIONS
HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE



AR000172

The Lower Potomac deposits and the weathered bedrock comprise the LHZ. Deposits in the LHZ consists of interbedded fine to medium sands, lignitic silty sand, and stiff silty clay. The lower deposits average about 70 feet in thickness. A velocity of 130 feet/year was calculated for the LHZ. Based on geologic data in the LHZ, the direction of ground water flow in the LHZ was expected to be toward the southeast in the downdip direction of the Potomac Formation. Monitoring well readings indicate that the LHZ is actually flowing in a northeast direction. This suggests that the LHZ is under some influence, perhaps from public water supply production wells in the vicinity of the site.

At this time there are three known well fields in the LHZ in the area of the site. As indicated on figure 3, these fields and their distances from the site are: Artesian Eastern State - 1.5 miles; Artesian Brennan Farm Wells - 2 miles; and City of Chesapeake Municipal Wells - 4 miles. The Eastern State well field (500 gpm) probably has more influence than the Chesapeake wells (118 gpm) due to distance from site and higher pumping rates. The Brennan Farm wells are not in production at this time due to the presence of excess iron in the ground water.

Ground Water Contamination

The majority of the monitoring wells installed at the site are screened in the UHZ. The available data indicates that contamination of ground water in the UHZ has occurred and the available data indicates that the LHZ may also be threatened. Monitoring well 101D is screened in a sand lens in the Potomac clay between the UHZ and LHZ (figure 8). Monocyclic aromatic contamination was present in this well during the August 1984 sampling round but not during the August 1985 sampling round. Geologic Investigations reveal that the Potomac clay layer below the site is not continuous and that there is a potential for contaminant migration to the LHZ. This potential is considered to be low based on (a) none of the three deep wells (107D, 108D, and 109D) in the LHZ were contaminated, and (b) the slow ground water velocity (1.3×10^{-2} ft/yr) and thickness of the confining layer (150 ft). It should be noted that there is no existing downgradient well in the LHZ since the general flow direction was found to be toward the northeast. Each Remedial Alternative will include installation and monitoring of the downgradient flow to evaluate whether contaminated ground water has traveled through the Potomac clay. If contamination is detected remedial actions will be investigated and implemented for deep aquifer contamination.

Chemical contaminants identified in shallow ground water correlate with contamination observed in surface and subsurface soils. Toluene, ethylbenzene, total xylenes, and methylene chloride were detected in shallow ground water samples at high concentrations. Coupled with chemical results from test pit samples, contaminants identified in UHZ monitoring wells indicate the existence of at least one major contaminant plume (figure 9). This plume has migrated from the site in the southerly direction of the shallow ground water flow.

AR000173

Figure 10 indicates that contamination has also migrated in an east/southeasterly direction toward the gravel channel and higher relative ground water seepage velocity of 2300 ft/year.

Contrary to expectations, methylene chloride was found in monitoring wells 104SA, 8, 1, and 5 which are north and west of the fenced area. Due to the flatness of the topography surface runoff and shallow ground water may be initially migrating in a radial pattern particularly after periods of heavy precipitation. It should be noted that monitoring wells 3 and 5 were found to be clean during the August 1985 sampling round.

Semi-volatiles followed the trend set by the volatiles in ground water, that is, they reflect the existence of a southerly contaminated ground water plume. The highest concentration of semi-volatiles were present in samples obtained from monitoring wells 6 and 9.

PCBs were not identified in ground water at the site. This is best explained by the low water solubility and high soil adsorption potential of these compounds.

The occurrence of pesticides found in monitoring wells 1 and 101SC is not considered to be site related for two reasons: these compounds were not identified in other media at the site, and these compounds are generally very insoluble in water unless they have been formulated for agricultural application. The adjacent areas around the site have been or are currently being used for agricultural purposes.

Inorganic contamination in ground water was not demonstrated to be widespread with the exception of chromium in monitoring well 11 (420 ppb) and lead in monitoring well 101D (111 ppb). The substantial amounts of inorganics in site soils constitute a source for trace metal contamination in the shallow ground water. Ground water contamination with lead and chromium is indicative of leaching of inorganics from the soil compartment since these locations are near the fenced area.

Available results from the LHZ reveal no inorganic contamination in this aquifer.

None of the organic HSL compounds identified at the site were detected in upgradient residential wells. Lead and cadmium were identified in one well during a 1983 sampling episode at concentrations of 7.1 ppb and 3.3 ppb respectively. These are below the National Interim Primary Drinking Water Standard (NIPDWS) limits of 50-ppb lead and 10-ppb cadmium. A subsequent resampling of this well in 1984 did not identify these contaminants above the detection levels.

Endangerment Assessment

Preliminary and Remedial Investigations at the site have revealed extensive contamination resulting from past waste disposal practices. Surface and subsurface soils and sediments are contaminated with organic compounds, PCBs, and inorganic trace elements. Shallow ground water and surface waters are contaminated with organic and inorganics substances.

AR000175

Routes of contaminant transport paths for potential exposure of human and environmental receptors in the vicinity of the site are:

- Transport via the movement of shallow contaminated ground water under the site. Contaminants may move with shallow ground water and discharge to the nearby surface water and to the wetland areas located in the vicinity of the site.
- Contaminated sediment transport due to erosion and surface water runoff of contaminated surface soils.
- Evaporation of volatile organics to ambient air, if favorable meteorological conditions and soil disturbances (during remedial action) enhance emissions to a significant degree.
- Physical transport of site contaminants by surface water during high flow conditions.

Potential human and environmental receptors at this site include:

- Users of ground water as a potable water supply. Potential receptors in the Upper Hydrologic Zone surround the site at varying distances from it. For receptors presently located upgradient of the site, there is a potential for exposure to site contaminants only if ground water movement is altered (i.e., by pumping). For those receptors in the UHZ located downgradient from the site, the wells are separated from the contaminated plume by the many wetland areas to the southwest, south, and southeast of the site. The effectiveness of the wetland areas in attenuating contaminants is not known; in addition, the percentage of the shallow ground water passing beneath the wetlands is also unknown.

If the Lower Hydrologic Zone (lower Potomac Aquifer), which is classified as a production zone, were to become contaminated, the potential number of receptors would increase dramatically. At this time, there is no actual exposure to receptors via ingestion of contaminated ground water.

- Persons using Long Creek, the beaver pond, and all other surrounding wetland areas for recreational purposes, i.e., swimming (dermal exposure) and fishing (dermal exposure and ingestion of contaminated fish).
- Environmental receptors, including aquatic biota in affected surface waters, onsite terrestrial fauna using aquatic animals as food sources, and terrestrial vegetation.
- Property owners, third party intruders, and remediation personnel who traverse the site and come in direct contact with contaminated wastes, surface soils, or surface waters.

AR000177

It should be noted that the available data do not indicate any documented past or present human exposure. The following health and environmental risks associated with this site are based on comparisons with relevant environmental exposure criteria, and the conclusions are derived from the contaminant patterns, opportunities for exposure, and the toxicity of the contaminants.

- The majority of the potential receptors using ground water for drinking purposes in the locally contaminated Upper Hydrologic Zone (UHZ) are upgradient of the site. Therefore they are not considered to be exposed to the site contaminants unless the ground water gradient changes dramatically. The UHZ water users to the southwest, south, and southeast are hydraulically downgradient from the contaminated ground water plume in the vicinity of the site. The potential for future contamination of these residential wells is related to the degree of contaminant migration beyond the site wetland areas. The downgradient ground water discharge rates have not been quantified because of site data base limitations. Monitoring wells have not been placed beyond and downgradient of the wetlands. Contaminant migration is potentially moving beyond the wetlands toward downgradient receptors.
- The many production wells located in the Lower Hydrologic Zone have not been affected by the contaminated ground water in the UHZ, however, the potential for downward migration between the UHZ and LHZ exists. The contamination detected in the sand lens in the clay-silt matrix separating the UHZ and LHZ (MW-101D) is an indication that the plume is migrating vertically through this aquitard.
- Much of the shallow ground water discharges to the numerous surface water bodies and wetlands to the southeast, south, and southwest of the site. Therefore, the potential for toxic effects to aquatic organisms is expected.
- Inhalation of volatilized contaminants and of contaminated inhalable particulates from the site is not considered to pose a potential health hazard at this time. However, should a major soil disturbance and/or contaminant migration occur, the potential for this exposure will increase.
- Dermal exposure to site contaminants is a concern. Even though the areas of highest surface soil contamination are contained within a fence, contamination to the northeast and west of the fenced area and in the surrounding wetland areas is easily accessible.
- The potential for toxic effects to terrestrial organisms (vegetation, soil/organisms, mammals, etc.) is expected to be high onsite due to levels of contamination found in the soils.
- There exists a potential risk of contaminant migration toward the wetland areas which would result in possible degradation of these environmentally sensitive areas.

AR000178

Alternatives Evaluation

The major objectives for remedial action to be taken at the Harvey and Knott Drum site are to mitigate or eliminate environmental contamination and migration at the source area. This would involve preventing and/or reducing: (a) direct contact with contaminated surface soil, water, sediments and bulk waste products (b) further migration of existing contaminated shallow ground water, (c) existing concentrations of contaminants in the UHZ, (d) future contamination of the UHZ, and (e) existing contamination and further degradation of surface waters. The requirements of CERCLA Section 104, EPA's mandate to protect the public health and welfare and the environment, determine the goals and level of response for the site.

In an effort to determine remedial alternatives for the subject site, feasible technologies were identified for consideration in general response actions. Available technologies were then screened to eliminate all but the most definitive and implementable alternatives. This screening included: technical (site conditions or waste characteristics), environmental and public health, institutional, performance and cost criteria.

Certain response actions and technologies were not associated with any specific remedial objective or feasible technology for the site. These technologies and response actions and the rationale for not including them are listed on Table 2. Further detail of this initial screening is included in Section 9 of the Feasibility Study.

Those technologies that have passed the technology screening process were used to form remedial alternatives. These components were then combined to form various remedial alternatives (Table 3). These alternative are listed in the Alternatives Matrix with associated costs. Remedial alternatives were developed using best engineering judgement to select a technology or group of technologies that best addresses the problems existing at the site to protect public health, welfare and the environment. In an effort to provide a degree of flexibility in the final selection of a remedial action, alternatives covering a range of remedial action categories have been developed. These categories are described below:

A. No action: No-action alternatives could include monitoring activities.

B. Alternatives that meet the CERCLA goals of preventing or minimizing present or future migration of hazardous substances and protecting human health and the environment, but which do not attain all of the applicable or relevant standards. (This category may include an alternative that closely approaches but does not meet, the level of protection provided by the applicable or relevant standards.)

AR000179

TABLE 2

ELIMINATED GENERAL RESPONSE ACTIONS AND
ASSOCIATED REMEDIAL TECHNOLOGIES
HAILEY AND KNOTT DRUM SITE

<u>General Response Action</u>	<u>Eliminated Remedial Technologies</u>	<u>Comments</u>
Containment	Groundwater containment barrier walls and well point systems	Site characteristics do not support this technology (lack of a continuous impermeable formation). Installation and operation costs of this technology do not provide sufficient technical benefit.
Diversion	Gas barriers Terraces and benches Chutes and downpipes Levees	Data does not support the need for this technology Surface water runoff not affecting site significantly Surface water runoff can be controlled by other means. Flood plains not applicable to site
Complete Removal	Sediment basins	Site characteristics do not support this technology
Onsite Treatment	Sewers and water pipes Solidification	Not applicable to this site. Random co-disposal of various industrial waste mixtures cannot be treated with any effectiveness by this technology
In-Situ Treatment	Incineration Permeable treatment beds Fluoroclamation Neutralization Landfarming	Waste characteristics do not support this technology. Random co-disposal of various industrial waste mixtures cannot be treated with any effectiveness by these technologies. Site characteristics, i.e. shallow groundwater table, also preclude the use of these technologies

AR000180

INITIAL ACTION ALTERNATIVES DAILY AND KNIFE DRAIN SITE

Component Technologies	Developed Remedial Action Alternatives									
	1	2A	2B	2C	3A	3B	3C	4	5	
No Action with Monitoring	X	-	-	-	-	-	-	-	-	
Post Closure Monitoring	-	X	X	X	X	X	X	X	X	
Soil Sampling Grid	-	X	X	X	X	X	X	X	X	
Soil Cap	-	X	-	-	-	X	-	-	-	
Surface Preparation	-	-	-	-	X	X	X	X	X	
Magnetometer Survey	-	X	X	X	X	X	X	X	X	
Multimedia Cap	-	-	X	-	-	-	X	-	-	
Surface Water Drainage/Sedimentation	-	X	X	X	X	X	X	X	-	
Groundwater Pumping/Treatment (Includes Pond Water)	-	-	-	-	X	X	X	X	X	
Pond Water Pumping	-	X	X	X	X	X	X	X	X	
Pond Water Treatment	-	X	X	X	-	-	-	-	-	
Soil Leaching/Effluent Discharge	-	-	-	-	X	X	X	X	X	
Pond/Surface Cleanup and Drum Removal	-	X	X	X	X	X	X	X	X	
Partial Removal/Backfill	-	X	X	-	-	X	X	-	-	
Complete Removal/Backfill	-	-	-	X	-	-	-	X	X	
On-site Landfill	-	-	-	-	-	-	-	-	X	
Off-site Landfill (Container/Refuse)	-	X	X	X	X	X	X	X	X	
Off-site Landfill (Complete Removal)	-	-	-	X	-	-	-	X	-	
Grading/Revegetation	-	X	X	X	X	X	X	X	X	

X Technology included in alternative
- Technology not included in alternative

Note: The Soil Sampling Grid will be performed twice for Alternatives 2A, 3B, 5C, 4 and 5

AR000181

REMEDIAL ACTION ALTERNATIVES EVALUATION SUMMARY

Remedial Action Alternative	Costs (\$1,000s)		Public Health Considerations	Environmental Considerations	Technical Considerations	Other
	Capital	Present Worth				
1. No Action with Monitoring	53	729	Potential for chronic and/or carcinogenic health effects if shallow GW in site area were to be ingested at present levels. Does not address surface contamination outside of fenced area (direct contact).	Potential bio-accumulation of contaminants from surface soils (Pb, Cd, VCMs) impacts to wetlands needs further investigation and assessment.	Installation of new WMs. Monitoring of both new and existing WMs will provide historic data on the status of the GW plume.	This alternative does not comply with RCRA GW corrective action requirements. Monitoring program will be implemented for all alternatives.
2A. Onsite Pond Cleanup, Offsite Drum/Debris Wastepile Disposal, Contaminated Soil Excavation and Onsite Soil Cap or media Cap	1,738	2,482	Consolidation of soil contamination and residual capping reduces onsite surface exposure. Does not address existing and future contamination of the shallow aquifer.	Does not address existing contamination in saturated soil and shallow aquifer. Eventual discharge to wetland areas and potential impacts to downgradient wells.	Remaining contaminants in saturated soil will not be removed/treated or contained. GW diversion barrier not technically feasible.	SAME AS 1
2B. Onsite Pond Cleanup, Offsite Drum/Debris Wastepile Disposal, Complete Removal and Onsite Landfilling	19,004	19,721	Removal of unsaturated contaminated soil will eliminate direct contact exposure and future contamination from this source.	SAME AS 2A, 2B	Estimated excavated soil volume is 48,200 cu. yds. Source removal is effective and reliable.	SAME AS 1

AR 000182

C. Alternatives that meet CERCLA goals and attain all applicable or relevant Federal public health and environmental standards, guidance, and advisories.

D. Alternatives that exceed all applicable or relevant Federal public health and environmental standards, guidance, and advisories.

E. Alternatives specifying offsite storage, destruction, treatment, or secure disposal of hazardous substances at a facility approved under the Resource Conservation and Recovery Act (RCRA). Such a facility must also be in compliance with all other applicable Environmental Protection Agency (EPA) standards.

The evaluation criteria selected were: technical feasibility, public health, environmental, institutional evaluation, and cost effectiveness. Particular emphasis was placed on:

- Technical Feasibility
 - Performance
 - Implementability
 - Reliability
- Public Health Evaluation
 - Reduction of Health Impacts
- Environmental Evaluation
 - Reduction of environmental impacts
 - Protection of Natural Resources
- Institutional Evaluation
 - Legal requirements, institutional requirements
 - Community Impacts
- Cost Effectiveness
 - Capital Costs
 - Operation and Maintenance Costs
 - Present Worth Values
 - Sensitivity Analyses

AR000183

Remedial Action Alternative	Costs (\$1,000s)		Public Health Considerations	Environmental Considerations	Technical Considerations	Other
	Capital	Present Worth				
3A. Onsite Pond Cleanup, Offsite Drum/Debris Wastepile Disposal Contaminated Groundwater Extraction, Treatment and Reapplication and	3,572	6,825	Will prevent direct contact with highly contaminated materials. CW extraction should reduce extent of shallow aquifer plume removing pathway of potential ingestion of contaminated CW.	Should address all identified remedial objectives.	Close observation of rate of extraction and reapplication of treated CW is paramount to prevent dewatering of wetland areas.	The RA shall make a decision whether to cap residual soil contamination based on the results of a second soil grid sampling program. (3A ONLY)
3B Soil Cap or	4,363	7,486				
3C Multilevel Cap or	5,020	7,680				
4 Offsite Disposal or	21,635	17,042				
5 Onsite Landfill	6,328	8,468				

NOTE: All alternatives with the exception of No. 1 include a contingency to excavate, transport and dispose in an offsite HMF of an additional 500 drums. This estimate is for buried drums within the fenced area.

PR000184

Description of Remedial Alternatives

A. No Action Alternatives

Alternative No. 1 - No Action with Monitoring

This remediation activity will not improve site conditions, nor will it reduce the migration of site contaminants. Contaminants were identified in the shallow ground water (most notably toluene, xylene, and ethyl benzene). It is expected that ground water discharge to surrounding wetland areas could introduce contaminants into these locations. Regulatory control of the use of ground water in the vicinity of the site is recommended.

Soils in the vicinity of the site are highly contaminated. Soils inside the fenced area are not readily available for direct human contact; however, wildlife species are not currently prohibited from contact with this area. Extensive soil contamination has been detected outside the fenced area as well. These areas are available to human and wildlife receptors because the location of the site is close to a residential area and there is no additional fence to prohibit property access on foot.

Alternative 1 includes a long-term monitoring program to provide information on the extent of contaminant migration as a function of time. The results of the monitoring program could confirm (1) decreases in the extent or concentration of contaminants as a result of natural processes; (2) increases in the extent of concentrations of contaminants, in which case other remedial alternatives could be reconsidered; or (3) no change in the extent of concentration of contaminants, indicating that conditions have stabilized at the site.

The long-term monitoring program will consist of the following activities:

- . installing nine new monitoring wells (one in the LHZ, and eight in the UHZ)
- . sampling nine new and ten existing monitoring wells (see FS report p 10-8)
- . sampling nine surface water locations (see FS report p 10-8).

- COMMON TO ALL ALTERNATIVES -

The remedial components for onsite pond cleanup, surface cleanup and offsite drum disposal, and post closure monitoring are essential site cleanup activities and have been included in all of the alternatives except for the No Action with monitoring.

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Site action will be initiated with onsite pond cleanup. The ponded water (estimated at 200,000 gallons) will be drained and treated to a level acceptable for discharge to a Publicly Owned Treatment Works (POTW). After dewatering, drums, sludges, automobile scraps, and bulk wastes from the pond bottom (approximately 5 tons) will be removed. These wastes will be disposed offsite in a RCRA Hazardous Wastes Management Facility (HWMF).

The second remedial component common to all alternatives is a surface cleanup of all crushed and intact drums, debris, metal, waste piles and sludges. It is estimated that approximately 117 cubic yards of waste material require removal. This material will be removed from the site and disposed offsite in a RCRA HWMF.

Once the site is cleared of all surface debris and metal, a magnetometer study will be performed to determine whether additional drums are buried onsite. This study may indicate that additional excavation and drum removal is required. The cost of removing and disposing these drums is not included within the scope of the cost estimate for each of the alternatives.

The third common remedial component is that upon construction of the recommended remedial alternative, ground water and surface water post-closure monitoring program will be implemented. The scope of this program has been described previously in the No Action with Monitoring alternative.

B. Alternatives that meet the objectives of CERCLA
2A, 2B, 2C

Remedial Action Alternatives 2A, 2B, and 2C were developed to meet the CERCLA objective of protecting public health, welfare, and the environment by reducing present or future threats from hazardous substances. The intent of these alternatives is to reduce the migration of contaminants by providing surface cleanup actions consisting of onsite pond cleanup, pond water treatment, drum and bulk waste removal followed by offsite disposal, and contaminated soil excavation. Excavated materials will either be disposed onsite and capped or hauled offsite to a permitted Hazardous Waste Management Facility.

These remedial action alternatives are a combination of several remedial components and have common elements except for (a) the volume of excavated material and (b) its final disposal. Alternatives 2A and 2B include partial removal and onsite capping actions, whereas Alternative 2C is a complete removal/offsite disposal response.

Based upon results of previous site investigations, the areas of greatest surface and subsurface soil contamination are delineated on figure 11. Alternatives 2A and 2B include excavating soils in areas Nos. 1, 2, and 4, placing these soils into area Nos. 3, and capping onsite. Alternative 2C proposes to excavate areas 1, 2, 3, and 4 and dispose offsite in a RCRA Hazardous Wastes Management Facility.

AR000186

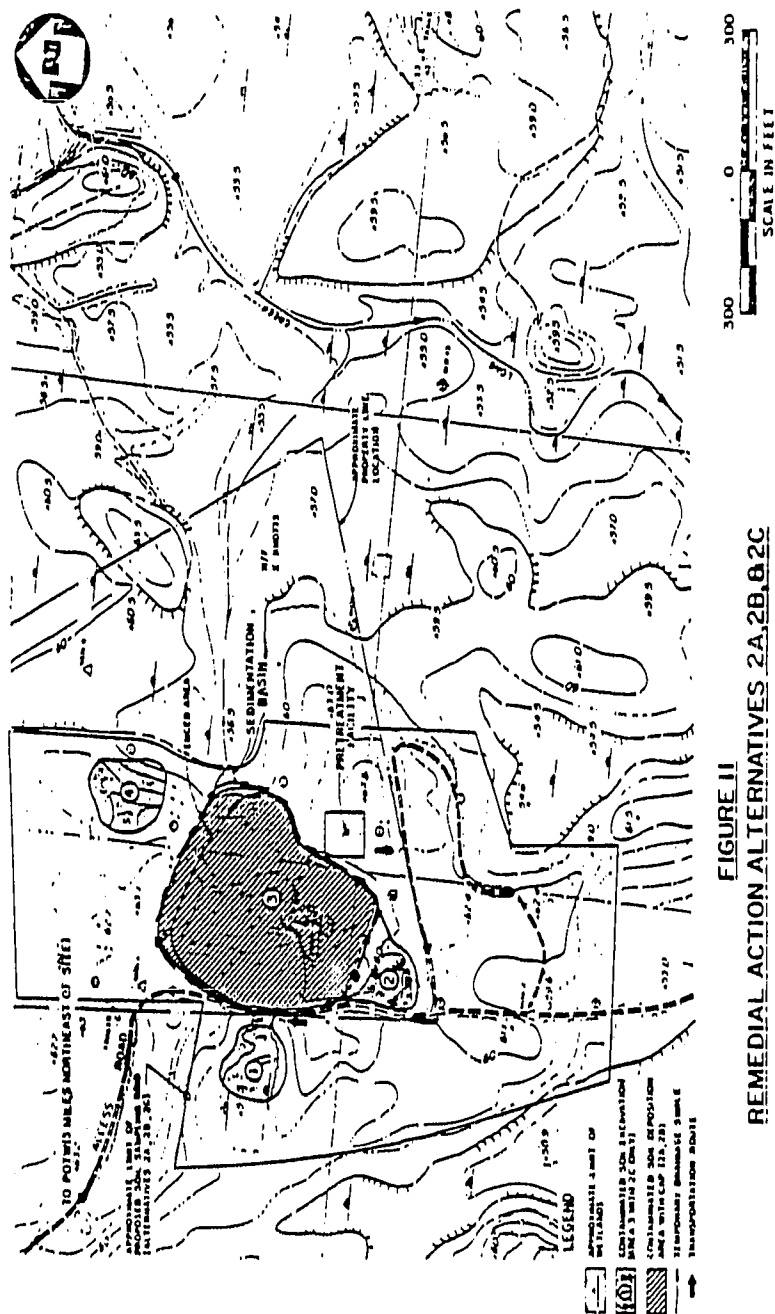


FIGURE II
 REMEDIAL ACTION ALTERNATIVES 2A, 2B, & 2C
 HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

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The depth of excavation will be limited to the elevation of the water table which is approximately five feet from the surface. A supplemental soil grid sampling program is proposed to be conducted during design. This program will determine the lateral extent of soil contamination and representative background soil characteristics. For alternatives 2A and 2B the grid sampling will determine the selected excavation volume and limits of the cap. For alternative 2C, it will determine the volume of excavation for complete removal (areas 1 through 4) and offsite disposal in an HWSF.

The only difference between alternative 2A and 2B is the inclusion of a 30 mil synthetic membrane and geotextile filter below the proposed 2A compacted soil cap. This would classify 2B as a multimedia cap.

After excavation and capping (2A, 2B) or offsite disposal (2C) is accomplished, excavated areas will be backfilled and graded to the approximate original contour. These disturbed areas will then be covered with topsoil and revegetated.

Upon completion of construction of one of these alternatives, the post-closure ground water and surface water monitoring program described under the No-action with monitoring alternative will be implemented.

C. (D) Alternatives that attain (Exceed) All Applicable Standards
3A, 3B, (3C)

Remedial Action Alternatives 3A, 3B, and 3C (figure 12) were developed to address the onsite bulk wastes, contaminated surface water, and contaminated soils (as described with alts. 2A, 2B, and 2C) as well as extraction/treatment/and reapplication of shallow contaminated ground water. Alternatives 3A and 3B are considered to attain all applicable standards while 3C is intended to exceed applicable standards.

The ground water extraction/treatment/reapplication systems are the same for Alternatives 3A to 3C. The alternatives differ with respect to remediation of residual contaminated soils. Final site closure for each alternative is contingent on the effectiveness of the reapplication (flushing) of treated ground water in reducing ground water and soil contaminants below respective target contamination levels.

Target soil and Alternate Concentration Levels (ACLs) for ground water contamination will be established during the design phase. Final levels will be determined as additional information is gained through operation of the systems.

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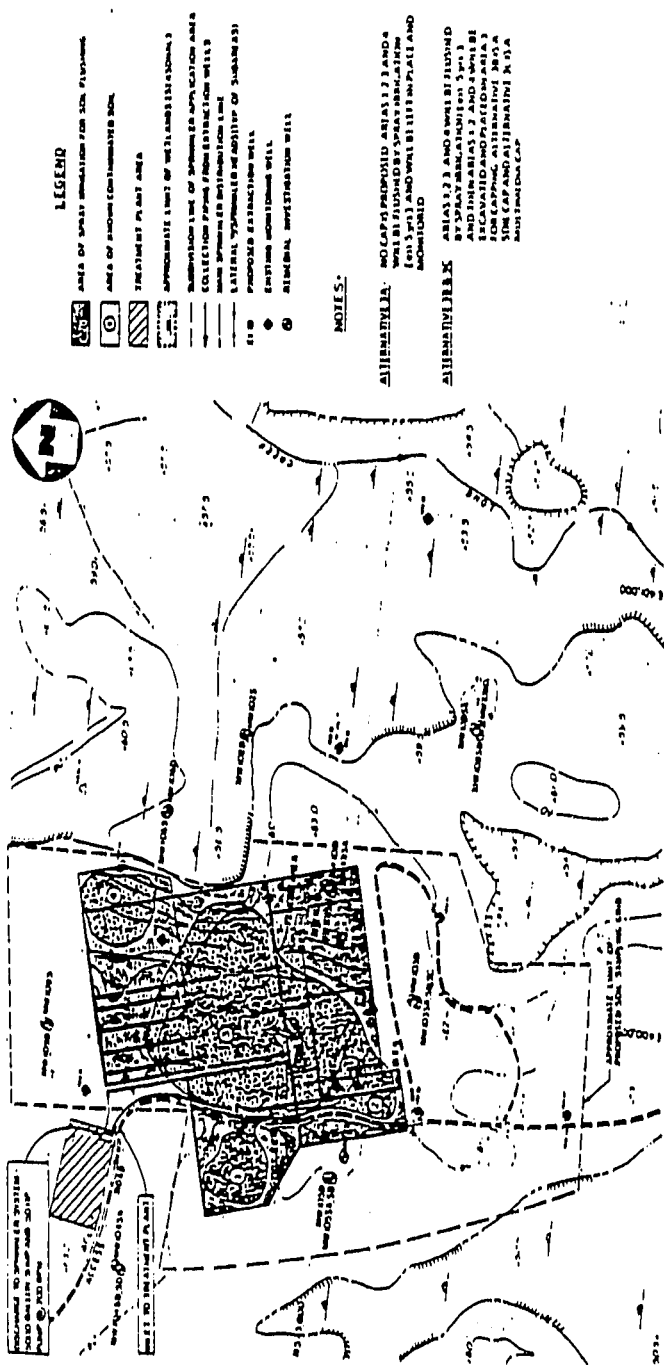


FIGURE 12
 REMEDIAL ACTION ALTERNATIVES 3A, 3B, & 3C
 HARVEY AND KNOTT DRUM SITE, KIRKWOOD, DE

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The contaminant removal efficiency of the water flushing operation is expected to reduce the levels of existing contaminants in surface and subsurface soils thereby lowering the residual risk of contaminants leaching into the shallow ground water. It is estimated that the contaminated ground water extraction/treatment/reapplication systems will operate for at least five years. Once these systems are no longer in operation, Alternative 3A requires no further action (except for post-closure monitoring). Alternative 3B would install a compacted soil cap at the end of the extraction/treatment/reapplication operation due to possible residual soil contaminant levels above levels. Alternative 3C differs from 3B only by the design of the cap - 3C involves the installation of a multimedia cap and is intended to exceed RCRA requirements.

Prior to the installation of the extraction/treatment/reapplication systems the soil grid sampling program, similar to which is described in Category B, will be conducted to determine the actual limits of the reapplication (flushing) areas.

After the soil flushing has been completed, a second soil sampling program will be performed to assess residual contaminant levels in the soil. As stated previously, alternative 3A does not anticipate any further remedial action. Alternatives 3B and 3C propose to install a cap due to their expectation of higher than final levels of contamination remaining in the soil.

Upon completion of construction of the selected cap for alternatives 3B and 3C, the post-closure monitoring program initiated at the outset of these alternatives will continue as part of the operation and maintenance program. The caps will be effective as long as they are not disturbed. Post-closure inspection and maintenance will be required to ensure the integrity of the selected final cover.

Another alternative that meets all applicable standards is alternative 5. This alternative is similar to alternatives 3B and 3C with the difference being the method of remediating remaining soil contamination after the flushing program has been completed. Both 3B and 3C proposed to cap residual contaminated soil areas. Alternative 5 proposes to excavate remaining contaminated soil areas (based on the second soil grid sampling program) and place these in an onsite hazardous waste landfill designed in accordance with RCRA standards. The total estimated volume to be placed in the onsite landfill is 48,200 cubic yards.

Upon completion of construction of the onsite landfill the full post-closure monitoring program will be continued until final ground water levels have been attained, whereby only post closure monitoring for the landfill will be required.

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E. Alternatives that Specify Offsite Disposal

Alternative 4 is also similar to 3B, 3C, and 5 with the difference in final remediation of the remaining post soil flushing contaminated areas being excavated and disposed in an offsite RCRA HWMF. This alternative would also be classified under Category C.

Upon completion of the excavation and offsite disposal of contaminated soil areas, the post-closure, monitoring program will continue until final contaminated ground water levels are attained.

Recommended Alternative

Section 300.68(j) of the National Contingency Plan (NCP) [47 FR 31180; July 16, 1983] states that the appropriate extent of remedy shall be determined by the lead agency's selection of a remedial alternative which the agency determines is cost-effective (i.e., the lowest cost alternative that is technically feasible and reliable) and which effectively mitigates and minimizes damage to and provides adequate protection of public health, welfare, and the environment. In selecting a remedial alternative, EPA considers all environmental laws that are applicable and relevant. Based on the evaluation of the cost-effectiveness of each of the proposed alternatives, the comments received from the public and information from the Delaware Department of Natural Resources and Environmental Control (DNREC), we recommend Alternative No. 3A be implemented at the Harvey and Knott Superfund Site. This selected alternative will address all onsite surface and subsurface contamination problems identified in the Remedial Investigation. Decisions on the extent of aquifer restoration, cleanup actions in offsite streams and wetlands, and final site closure will be deferred pending (a) additional soil investigation during design (b) analyses on the effectiveness of the chosen alternative and (c) the impacts of the site on the wetlands adjacent to the site.

The removal and offsite disposal to a RCRA HWMF of all crushed and intact surface drums, debris, contaminated sediments, and sludges, and the cleanup of the onsite drainage pond will:

- 1) eliminate and prevent further migration from these sources of contamination;
- 2) allow additional investigation for the presence of buried drums; these sources of contamination will also be eliminated if encountered.
- 3) prepare the site for the installation of the contaminated ground water extraction/treatment/reapplication facilities.

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The extraction/treatment/reapplication facilities will serve a dual purpose. They will reduce the contaminated plume found in the UH2 and at the same time flush contaminants from the surface and subsurface soil compartments. These soils do not have the capacity to adsorb and significantly attenuate site contaminants as evidenced by the concentrations found in the shallow ground water. Flushing contaminated soil areas with treated water should expedite the release of contaminants from the soils.

As a precaution to direct contact with contaminated surface soils, alternative 1A proposes to grade the entire reapplication area, backfill and cover with a 24 inch layer of clean soil, and establish permanent vegetation. At the time the extraction/treatment/reapplication facilities are terminated, soils at the site will be sampled to determine whether an impermeable cap will be required. It is intended that soil flushing will reduce soil contaminants until residual levels pose no further threats to the shallow ground water which would and alleviate the necessity to cap the site.

Results from both the ground water monitoring and soil grid sampling programs will then be evaluated to determine the level of residual contaminants and assess whether further remedial action is required. This could entail further operation of the extraction/treatment/reapplication systems and/or the installation of a more impermeable cap to attain a final site closure.

Operation and Maintenance

Periodic inspection and maintenance will be required during operation of the extraction/treatment/reapplication program to assure that it is properly functioning. Operation of the individual equipment units is expected to be relatively simple, however, the operator should have experience with a municipal well field or contaminated ground water pumping system or have demonstrated experience in a ground water related field. This is necessary to ensure that the adjacent wetlands are not dewatered by excessive pumping and insufficient reapplication rates. It is recommended that piezometers be placed at the nearest wetland boundaries to monitor the impact of the selected remedial actions on the wetlands and adjust pumping rates for seasonal fluctuations.

Maintenance of the soil cover will be required to ensure that an adequate vegetative cover is maintained to prevent erosion. The soil cover will be an effective direct contact barrier as long as it is not disturbed.

The ground water and surface water monitoring programs will commence after installation of the extraction/treatment/reapplication systems. Periodic analyses will evaluate the remedy's effectiveness in reducing the extent of contaminated ground water. Once target (ACL) cleanup levels are attained or after the ground water extraction/treatment/reapplication systems are terminated a second soil grid sampling program will be performed.

All operation and maintenance requirements will be the responsibility of the State of Delaware after completion of the extraction/treatment/reapplication program which is estimated to operate for five years.

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Consistency With Other Environmental Laws

EPA is currently proposing regulation requiring the agency to select a remedial Superfund remedy which "..... attains or exceeds applicable or relevant Federal public health or environmental standards." See proposed 40 C.F.R. §300.68(f).

Environmental laws which may be applicable or relevant to remedial activity are:

- National Environmental Policy Act (NEPA)
- Clean Air Act (CAA)
- Clean Water Act (CWA)
- Safe Drinking Water Act (SDWA)
- Resource Conservation and Recovery Act (RCRA)
- Toxic Substances Control Act (TSCA)
- Delaware Hazardous Waste Regulations and Water Quality Standards

Compliance with all applicable substantive requirements of the CWA and CAA as well as Delaware Hazardous Waste Regulations and Water Quality Standards will be incorporated into the design of the recommended remedial alternative. Any potential emission of volatile gasses into the atmosphere which may occur during the construction of the remedial action or operation of the treatment systems is expected to pose a very low hazard to site personnel and a lower hazard to receptors in the vicinity of the site. All State permits for the extraction and discharge of treated ground and surface waters will be complied with as necessary.

This alternative meets the NEPA functional equivalency exception because the necessary and appropriate investigation and analysis of environmental factors as they specifically relate to the Harvey and Knott Drum site and the recommended alternative were considered and evaluated in the Remedial Investigation and Feasibility Study. A meaningful opportunity for public comment on environmental issues was provided before the final selection of the remedial alternative was made.

A Wetlands Functional Assessment was conducted by the U.S. Army Corps of Engineers and supports the implementation of the recommended alternative. Specifically, site area No. 1 as depicted on Figure 12, was designated as a wetland which had been impacted by the site. The cleanup of soil and ground water contamination with successful restoration of native vegetation in this area precludes the need for additional wetlands compensation. On a broader evaluation, the wetlands surrounding the site proper are much more extensive than site area No. 1. It was therefore recommended that measures be taken to ensure that it is not degraded. The recommended alternative will prevent the further migration of contamination from the site. A subsequent environmental assessment of the extensive wetlands and surface waters adjacent to the site will be performed to determine the impact the site has already had on these areas. Remediation decisions for the wetlands will be addressed as separate operable unit.

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There is not at this time, any indication of the consumption of contaminated ground water which exceeds the National Interim Primary Drinking Water Standards (NIPDWS) in the site vicinity. All Maximum Contaminant Levels (MCLs) and Health-based exposure levels (10^{-6} cancer risk) will be used when establishing initial target levels for ground water remediation.

Decisions regarding RCRA final closure of the site and the level of ground water quality to be achieved are deferred. In order to be consistent with 40 C.F.R. 264 Subpart F of the regulations, ground water corrective action is required until the concentration of hazardous constituents at the point of compliance for a site achieves one of the following:

- MCLs for particular substances,
- an ACL which would provide adequate protection of public health and the environment,
- background levels

EPA is not prepared at this time to determine the appropriate level of ground water corrective action at this site. Operation of the extraction/treatment/reapplication facilities will operate for an estimated five years and should substantially reduce the amount of contaminants in the ground water in the vicinity of the fenced area and reduce the plume which has migrated in the southerly direction. Using 1) existing site characteristic data, 2) monitoring well analyses, 3) further wetland assessment and 4) additional information collected during the operation of the extraction/treatment/reapplication program, EPA will make a determination as to the final level of contaminants which would adequately protect human health and the environment. Under CERCLA, the ground water correction systems would continue to operate until the final established level is achieved unless that level proved technically infeasible or would not be cost-effective.

Where RCRA final closure regulations are applicable, they would require that all hazardous wastes at a site be removed, treated onsite, or capped in such a way as to minimize the migration of contaminants from the site. It is the intent of the recommended alternative to flush contaminants from the soil compartment. While these reapplication areas would not be capped immediately in accordance with RCRA, the backfill, clean soil, and revegetation should adequately address direct human exposure during the flushing program.

In conjunction with the establishment of a ground water treatment level, EPA would evaluate the level of contaminants which could be left in the soil without the necessity of a cap at the site.

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Evaluation of Alternatives Not Selected

The No-Action with Monitoring alternative was not selected since it would not control the sources and migration of contamination at the site. Contaminated surface water, soils, and sediments will continue to pose a direct contact threat to human health and the environment. Contaminated peripheral monitoring wells south of the fenced area have documented the migratory behavior of contaminants found within the fenced area. Further leaching of contaminants from these sources as well as contaminated subsurface soils will continue to expand the existing contaminated plume in the shallow ground water. If the direction of the shallow ground water changes or if contamination of the lower Hydrologic Zone occurs, ingestion of contaminated ground water could occur.

Alternatives 2A and 2B involve consolidating contaminated soils and covering with compacted soil and multimedia caps respectively. Both of these alternatives reduce direct contact exposure in the vicinity of the site and decrease the amount of precipitation which would percolate through contaminated soils. Due to the high water table and geologic constraints of installing upgradient ground water barriers, leaching of contamination from saturated soils will continue to affect the shallow aquifer. The contamination persisting in the unsaturated soils will remain vulnerable to interaction with the changing water table. Thus, these two alternatives would not address the existing contamination in the shallow aquifer. The potential risk for ingestion of contaminated ground water would still remain for receptors in the site area. The discharge of contaminants to the wetlands would also cause degradation to these sensitive areas.

Alternative 2C would be more effective than 2A and 2B in reducing further leaching of contaminants in the soil by removing a greater quantity of the source (excavating 5 to 6 feet of unsaturated soils) and disposing in an offsite HWMF. However, all three of these alternatives do not address the residual contamination in saturated soils (below the water table level) and the contamination which has already migrated in the shallow aquifer. This contamination will continue to migrate with the natural ground water flow and could eventually discharge to wetlands and streams in the vicinity of the site or to other areas in the UHZ and potentially, the LHZ.

Alternatives 3B, 3C, 4 and 5 were developed to address the situation of residual soil contamination after the operation of the ground water extraction/treatment/reapplication program is terminated. For the purposes of selecting a cost-effective alternative, these alternatives were more expensive to construct and implement while achieving the same or greater level of protection of human health and the environment when compared to alternative 3A. Unless the post ground water flushing soil grid sampling program demonstrates levels of soil contamination above final accepted limits, these alternatives are considered to be less cost effective based on the expectation of the extraction/treatment/reapplication facilities cleaning the soils below final accepted limits.

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HARVEY AND KNOTT

Responsiveness Summary

A public meeting was held on September 12, 1985 to discuss the Remedial Investigation and Feasibility Study for the Harvey and Knott Drum Site. The meeting was attended by 10 local residents. The EPA and Delaware preferred alternative was outlined in a one page fact sheet and the audience was invited to comment on it. A summary of the public's comments is attached. Two written statements were received. One letter written by an individual expressed concern over her health and the quality of her water source. The second letter requests EPA to pursue legal actions against the owner and operator of the site.

A fact sheet covering all the alternatives under consideration was mailed to all 120 nearby residents prior to the meeting.

There has been low community interest in the RI/FS study of the site. The first RI meeting drew 10-15 local residents.

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A SUMMARY OF
CITIZEN AND INTERESTED-PARTY COMMENTS AND CONCERNS
AND OF U.S. ENVIRONMENTAL PROTECTION AGENCY RESPONSES

HARVEY AND KNOTT DRUM SITE
KIRKACOD, NEW CASTLE COUNTY, DELAWARE
SEPTEMBER 1985

Monitoring and Artesian Wells

Issue: Are there monitoring wells on the site?

Response: Yes, both deep and shallow monitoring wells are located in clusters around the site. There are at least 17 monitoring wells on site. (A slide was presented to show monitoring well locations.)

Issue: Wells in the Shelly Farms area and in the area north and northwest of the site on State Route 40 have been going dry. Could the artesian wells be responsible?

Response: Because of the existence of the Potomac clay, it is unlikely that the deep wells are affecting the shallow wells. There is a great deal of water in the shallow aquifer, and the annual precipitation in the area is sufficient to replenish the supply. Shallow wells at the site are not going dry. However, the wells that are going dry are located in an area that is not involved in our study. It would be a good idea to find out more about conditions in that area from the appropriate local authorities.

A Delaware Department of Natural Resources and Environmental Control (DNREC) spokesman stated that this has been a dry year and that wells across the entire state have been going dry.

Issue: How deep are the artesian wells?

Response: They are about 230 feet deep.

Soil Contamination

Issue: Is the soil contaminated?

Response: There are volatile contaminants in the surface and subsurface soils now. The recommended remedial action alternative will flush these contaminants from the soil.

Issue: Will you be removing the contaminants or just dispersing them?

Response: Water treatment will probably consist of an initial air stripping facility to remove volatile organics from the water, and there will most likely be a carbon adsorption unit for polishing.

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Issue: How long will it take to flush the contaminants from the soil?

Response: That will depend on how many aquifer volumes can be flushed through the system. Water flows very quickly in this area. We will keep water flushing through the system toward extraction wells, and we will treat the water and monitor water quality. After a point, the percentage of volatiles in the water will cease to reduce significantly, and at that time, we will have to decide if it is worthwhile to continue flushing water through the system.

Procedural Issues

Issue: Is there any chance the State government will reject the EPA's remedial recommendations?

Response: The EPA has put a lot of time into deciding on the remedial action alternative that is being recommended for this site and the State has already written a memo approving the EPA recommendations. No problems are anticipated.

Issue: Will the EPA take action against Harvey and Knott Trucking, Inc.?

Response: Part of the Superfund law requires that the Federal Government attempt to identify all potentially responsible parties (PRPs) and then find some kind of remedy with the help of the PRPs. PRPs include site owners, waste transporters, chemical manufacturers, and disposers--everyone identified with a site. From that standpoint, since they were owners and were operating as transporters, they would be identified as responsible parties. Enforcement efforts, however, are the responsibility of the attorneys.

Water Quality

Issue: Four years ago, the State sampled residential water supplies. What was found?

Response: The State did not find the water to be contaminated. The latest residential water samples indicate no organics above detection limits and no inorganic contamination exceeding the primary drinking water standards. As the earlier slide presentation illustrated, the groundwater contamination seems to be heading in a southerly or southeasterly direction.

Comments by the Potentially Responsible Parties (PRPs)

PRPs submitted written comments on three separate occasions:

1. June 19, 1985 - General Motors had retained Fred C. Hart Associates, Inc. to review remedial investigation data. Hart prepared a "Preliminary Endangerment Assessment and Remedial Alternatives" document. GM requested that the final draft RI/FS report take into account Hart's suggestions regarding (a) the endangerment assessment to the extent possible and (b) the remedial action alternatives developed by Hart.

EPA and its contractors, NUS Corporation, reviewed the Hart document, which was timely and pertinent, and to the extent possible incorporated the endangerment assessment into the Public Health and Environmental Concerns section of the RI/FS. Hart's alternatives were also similar to the remedial response alternatives developed by NUS with the exception of upgradient ground water diversion. Due to the lack of a continuous impermeable formation and constructability difficulties (high water table levels and depth to the Potomac clay - 75 feet) this response action was eliminated during the initial screening of alternatives.

2. September 4, 1985 - General Motors submitted comments and observations based on the draft, August 1985 Remedial Investigation and Feasibility Study Report (NUS Corporation).

Comment #1 The report is generally adequate and comprehensive, however, the report (section 8.2) also identifies additional investigations that should be conducted prior to, or concurrent with, the selected remedial action alternative.

Answer: With the exception of the Environmental Assessment of adjacent wetlands and surface waters and Lower Hydrologic Zone investigation, EPA considers the remaining investigative work (p 8-12 of RI/FS) to be preliminary design or performance determination activities related to the recommended alternative. The Environmental Assessment of the wetlands/surface waters has been separated as an operable unit while the LHZ investigation is necessary to further evaluate the impacts the site may have had on this confined aquifer. Thus, EPA believed it has taken GM's comment into account.

Comment #2 The report e.g., page 8-11) appears to recommend the application of drinking water quality criteria as the criteria for ground water remedial action. Since the remedial action design is not a design for the construction of a drinking water supply plant, it would be more appropriate to apply a criterion based on the level of contamination abatement necessary to meet the remedial action objectives and criteria.

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Answer: Target and alternate concentration levels will be established for soil and ground water respectively to reduce or eliminate potential exposures to contamination. These levels will be investigated as a preliminary design task. GM's input will be taken into account during the development of these levels.

Comment #3 The background data for elements and compounds of concern were obtained in the Remedial Investigation. Therefore, the report should include comparisons and discussions of data representing background with those representing contaminated soils and ground water.

Answer: None of the organic Hazardous Substances List compounds identified in shallow ground water wells at the site were detected in upgradient residential wells. Also, the last sampling (1984) for inorganics did not identify these contaminants above detection levels in residential wells.

The surface soil sampling performed during the RI/FS identified areas of contamination and provided estimates for the purpose of developing and evaluating remedial response alternatives. An initial soil grid sampling program will better define the horizontal extent of soil contamination and background soil characteristics. This will be performed as a preliminary design task.

Comment #4 The general conclusions derived from the Remedial Investigation in pages ES-3 and 4, as well as page 6-63, of the report are supported by the data in the report. Relative to ground water, the most crucial migration pathway of concern, it is important to highlight the conclusions that "transport of dissolved organic and inorganic site contaminants to residential wells screened in the UHZ (upper hydrologic zone) is not considered likely at present" and "The absence of chemicals in samples obtained from wells 107D, 108D, and 109D indicates that the LHZ (lower hydrologic zone) is uncontaminated." Further, as stated in the conclusion to Chapter 6, the LHZ "does not appear to be threatened by site contamination."

Answer: Although there does not exist any present documented evidence of consumption of contaminated ground water, EPA must minimize and mitigate the threat of ingestion of contaminated ground water. This has been addressed in the endgame and assessment of the Summary of Remedial Alternative Selection.

Comment #5 We have evaluated the remedial action alternatives in the report. Based on the information in the report, we recommend EPA to select a modified alternative 3B consisting of an Operable Unit (see the February 12, 1985, EPA proposed 40 CFR 300.68(d)) and certain applicable investigation and monitoring. Implementation of the Operable Unit will be consistent with the final remedy if additional action such as Ground Water Extraction, Treatment, and Land Application via Spray Irrigation are determined to be necessary for broadening the Operable Unit into the final remedial measure.

Answer: EPA feels that this phased approach is consistent with the recommended alternative, 3A, as described in the Summary of Remedial Alternative Selection. It should be emphasized that target and alternate concentration levels established for soils and ground water must be

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consistent with other environmental laws. Ground water and surface water monitoring will be performed as described in the Summary of Remedial Alternative Selection.

3. September 25, 1985 - At the request of Chrysler Corporation, O'Brien and Gere Engineers, Inc., submitted technical comments after reviewing the draft, August 1985, RI/FS.

It should be noted that the original comment period for the Harvey and Knott Feasibility Study lasted from August 26, 1985, to September 20, 1985. At the request of Chrysler Corporation, the comment period was extended by EPA to September 27, 1985.

II Comment A - Until it is established that potential receptors have been or are likely to be significantly affected by ground water contamination, and until a link is then shown between the source and potential human exposure, the RI/FS is significantly flawed; it provides no basis for evaluating whether remedial action related to ground water is required, or if so, what type of remedial action is appropriate.

Answer: Potential receptors (users of both the Upper and Lower Hydrologic Zones) have been identified as described in Section 7 of the RI/FS. The link between the source of contamination and the receptor is the pathway or route of transport. This pathway is the shallow aquifer (UH2) which is already contaminated. The plume(s) of contamination must be monitored and managed to prevent or mitigate its migration into a current source of drinking water.

Comment B - Although the RI/FS indicates that some upper level aquifers have been contaminated, it has failed to analyze the nature and extent (SIC) of any ground water contaminant plume(s). ✓

Answer: EPA disagrees with this comment and refers to Figure 6-8, 6-9, 6-11, 6-12 and 6-16 of the RI/FS. These figures identify the nature of ground water contamination. Although many of the peripheral wells are contaminated which would indicate the plume is more widespread than presently documented, the information in the RI/FS report was sufficient to establish remedial objectives and develop and evaluate remedial alternatives.

ANSWER:

Comment C - Type of Wastes - It is not the RI/FS report's sole purpose to define the generator or original source of contaminants identified in the field. It is the RI/FS reports responsibility to characterize the type of waste to assess the existing and potential threats to public health, welfare and the environment.

Comment D - Soil Contamination - The extent of soil contamination has not been determined or evaluated in the RI/FS. As a result, remedial costs associated with potential soil removal actions cannot be estimated nor can the need be evaluated.

Answer: See previous answer to Comment 1.

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Comment E - Additional Data Required

Answer: See previous answer to Comment 1.

III Risk Assessment

A. EPA believes it performed an adequate risk assessment which is referenced in Section 7 of the RI/FS report. EPA disagrees with the comment that the exposure likelihood from ground water contamination is virtually nil. The potential exists and the EPA is concerned that (1) the shallow aquifer contamination will spread and (2) the deeper aquifer may become contaminated.

In reaching a decision on the appropriate CERCLA response action, EPA considers other environmental laws and regulations for guidance and will attempt to comply with these statutes. In this instance, it is clear that there is sufficient information to assess RCRA Part 264 regulations. These regulations call for a corrective action program when hazardous substances have migrated beyond the waste management boundaries and final site closure actions in waste disposal areas.

The RI/FS has established that the direction of ground water flows and how the wetlands are hydraulically influenced by the shallow aquifer. It is imperative that any current or future degradation or environmental impact to these sensitive areas be prevented. Also, further wetlands assessment will be performed to address contaminants which may have already impacted these areas and evaluate remedies to prevent additional threats.

B. As far as only doing a primary surface cleanup at the site, the PRPs comment does not take into account existing ground water contamination and the potential impacts it may have on drinking water supplies and adjacent wetlands/surface waters.

IV. Remedial Alternatives

- A. Lack of Data or Analysis. See previous comment #1 and answer.
- B. Technology Issues. This can be performed during preliminary design.
- C. Treatment Level. The reader is referred to the Declaration section of the ROD.

V. Miscellaneous Deficiencies in Draft RI/FS

A. Cost Estimates. EPA believes it has selected the least cost alternative which meets all remedial objectives. Increases in volumes of soil, numbers of buried drums, etc., will be similarly reflected in all acceptable alternatives 3A, 3B, 3C, 4 and 5. Based on available data, EPA believes its cost estimates are accurate.

AR000202

B. Laboratory Procedures

1. Standard QA/QC procedures were followed and EPA will make this information available for review.
2. There were other contaminants which did not show up in their respective laboratory blanks. These contaminants were used for assessing environmental impacts at the site. All data was subjected to stringent validating procedures.

AR000203

EXHIBIT 3

REMEDIAL ACTION WORKPLAN
HARVEY AND KNOTT DRUM SITE
NEW CASTLE COUNTY - DELAWARE

JANUARY 1987

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1.0 INTRODUCTION

The Harvey and Knott Drum Site is located in New Castle County, Delaware, approximately one-half mile east of the Maryland-Delaware Border. The site is located in a remote rural area with light residential development to the north. Wetlands surround the southwest, south and southeast sides of the site, and Long Creek flows through the wet areas to the east of the site. Harvey and Knotts Trucking, Inc., operated an open dump and burning ground between 1962 and 1969 at the site. The facility accepted sanitary, municipal, and industrial wastes believed to include sludges, paint pigments, and solvents. Wastes were emptied onto the ground surface, into excavated trenches or left in drums (some of which were buried). A site map is provided in Figure 1-1.

The State of Maryland Waste Management Administration identified the site during an aerial overflight in 1981. The Delaware Department of Natural Resources and Environmental Control (DNREC) was notified and the DNREC subsequently requested EPA assistance. An investigation was conducted jointly by the Delaware DNREC and the USEPA to determine the immediate effects of the site conditions on the public health and the environment. The test results revealed that soils and shallow groundwater were contaminated with heavy metals and organic chemicals including some limited concentrations of PCBs.

Based upon the sampling results, the USEPA took emergency action to abate the threat posed by the site in the summer of 1982. A security fence was erected around the most visible areas of contamination. Additional sampling was conducted and 43 leaking drums were overpacked, removed from the site and disposed of at CECOS International. The DNREC installed seven monitoring wells and the USEPA subsequently installed ten additional wells. Samples were collected and analyzed and, based upon the results, the site was placed upon the National Priorities List (NPL). The performance of a Remedial Investigation/Feasibility Study (RI/FS) was authorized in April 1983.

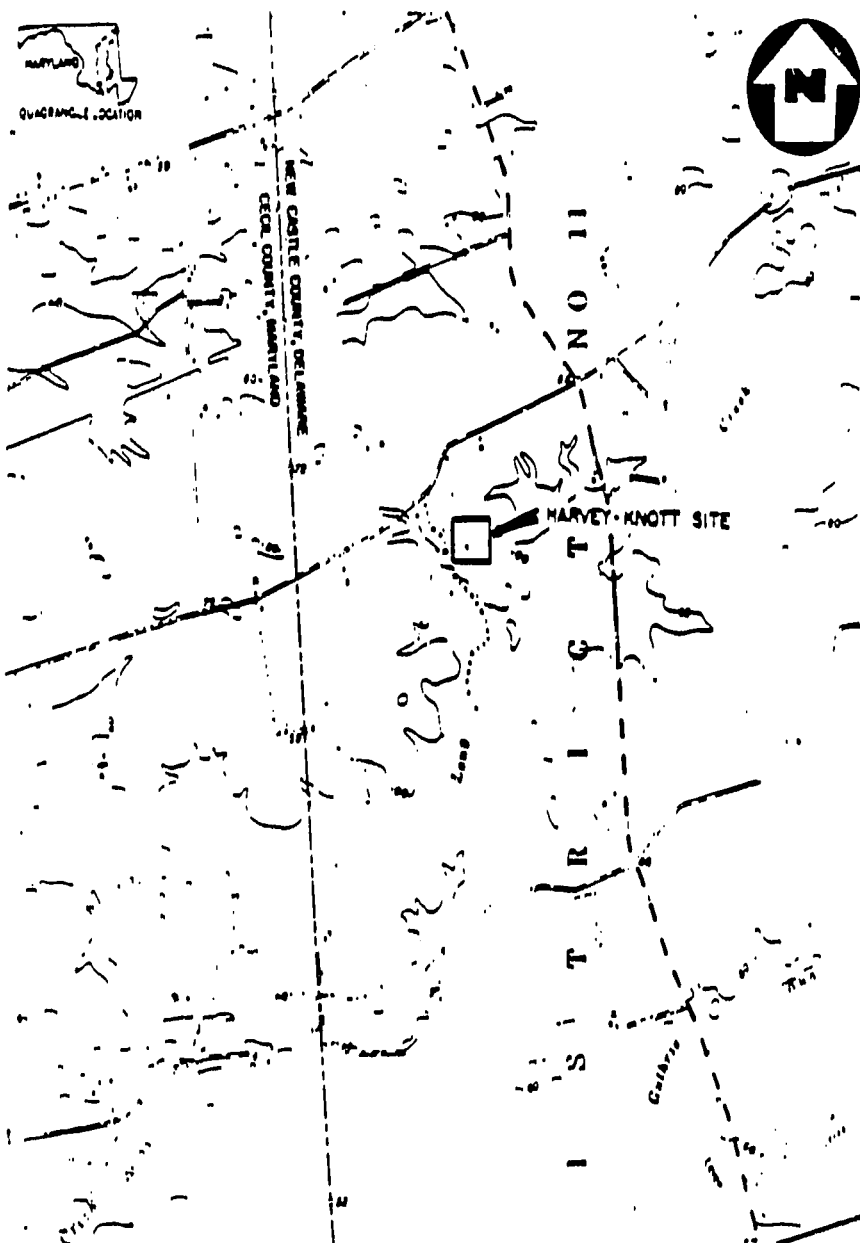
An RI/FS report was submitted to USEPA by NUS Corporation in August 1985. One of the goals of the RI was to provide a database from which the remedial action alternatives could be assessed in the FS. The work conducted at the site included monitoring well installation (18 during the Phase I investigation and six during the Phase II investigation) and test pit excavation (24 test pits). Extensive sampling was conducted in various media to determine the extent of contamination.

Findings showed the existence of soil and groundwater contamination. Specifically, it was shown that the upper hydrologic zone (UHZ) is contaminated with metals and organic compounds in the vicinity of the site. Contamination of the lower hydrologic zone (LHZ) has not been found.

Based on these findings, a Record of Decision (ROD) was issued by USEPA on September 30, 1985, in which a remedial alternative was selected.

This Work Plan has been prepared to specify the tasks required with the implementation of the selected cleanup alternative for the Harvey & Knott Drum Site, New Castle County, Delaware. As specified in the ROD, this alternative includes the following major elements:

- Initial Soil Grid Sampling
- Investigation of the Lower Hydrogeologic Zone (LHZ)
- Wetlands Assessment
- On-Site Pond Cleanup
- Removal of Crushed/Empty Drums
- Removal of Surface Debris/Metal
- Off-Site Disposal
- Surface Modifications/Erosion Control
- Development of ACLs for Soil/Groundwater
- Groundwater Extraction System
- Groundwater Treatment
- Soil Flushing
- Soil Flushing Evaluation
- Site Closure
- Operation & Maintenance



BASE MAP IS A PORTION OF THE U.S.G.S. ELKTON, MD - DEL. QUADRANGLE (7.5 MINUTE SERIES, 1963, PHOTOGRAPHIC 9701)
 CONTOUR INTERVAL 20'

SCALE 1" EQUALS 2000'

FIGURE 1-1
 SITE MAP
 HARVEY AND KNOTT SITE
 KIRKWOOD, DELAWARE

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These major elements have been developed into discrete tasks which specify the procedures and objectives to be utilized in the actual implementation of this alternative. A flow chart is provided in Figure 1-2 which summarizes this procedure. Figure 1-3 depicts a proposed schedule for project implementation.

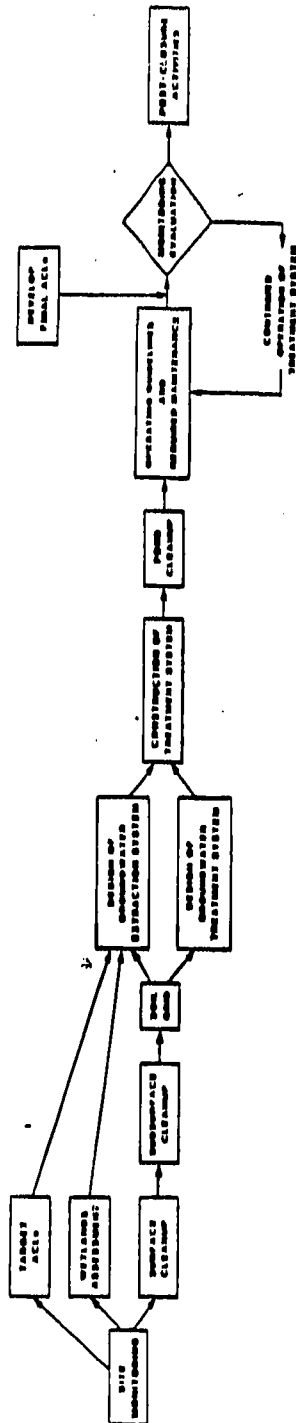
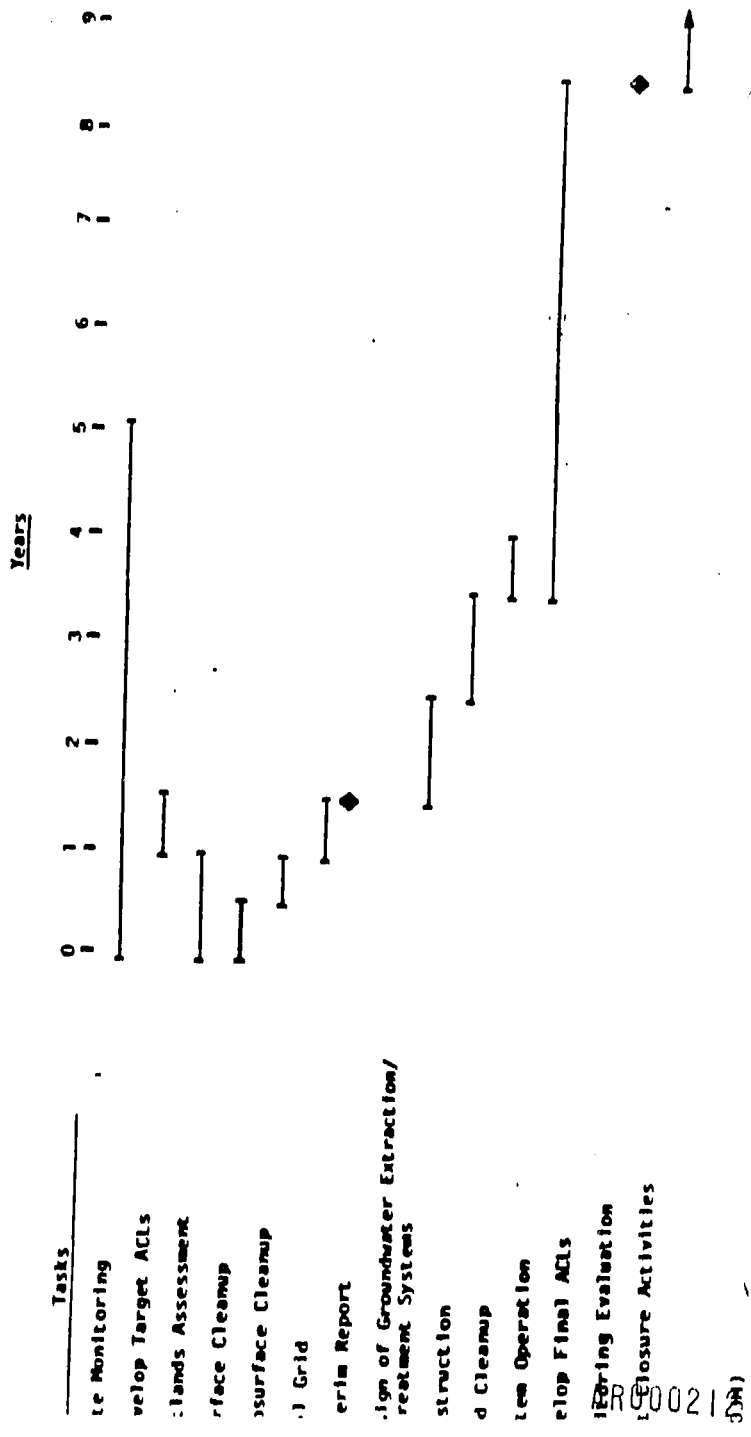
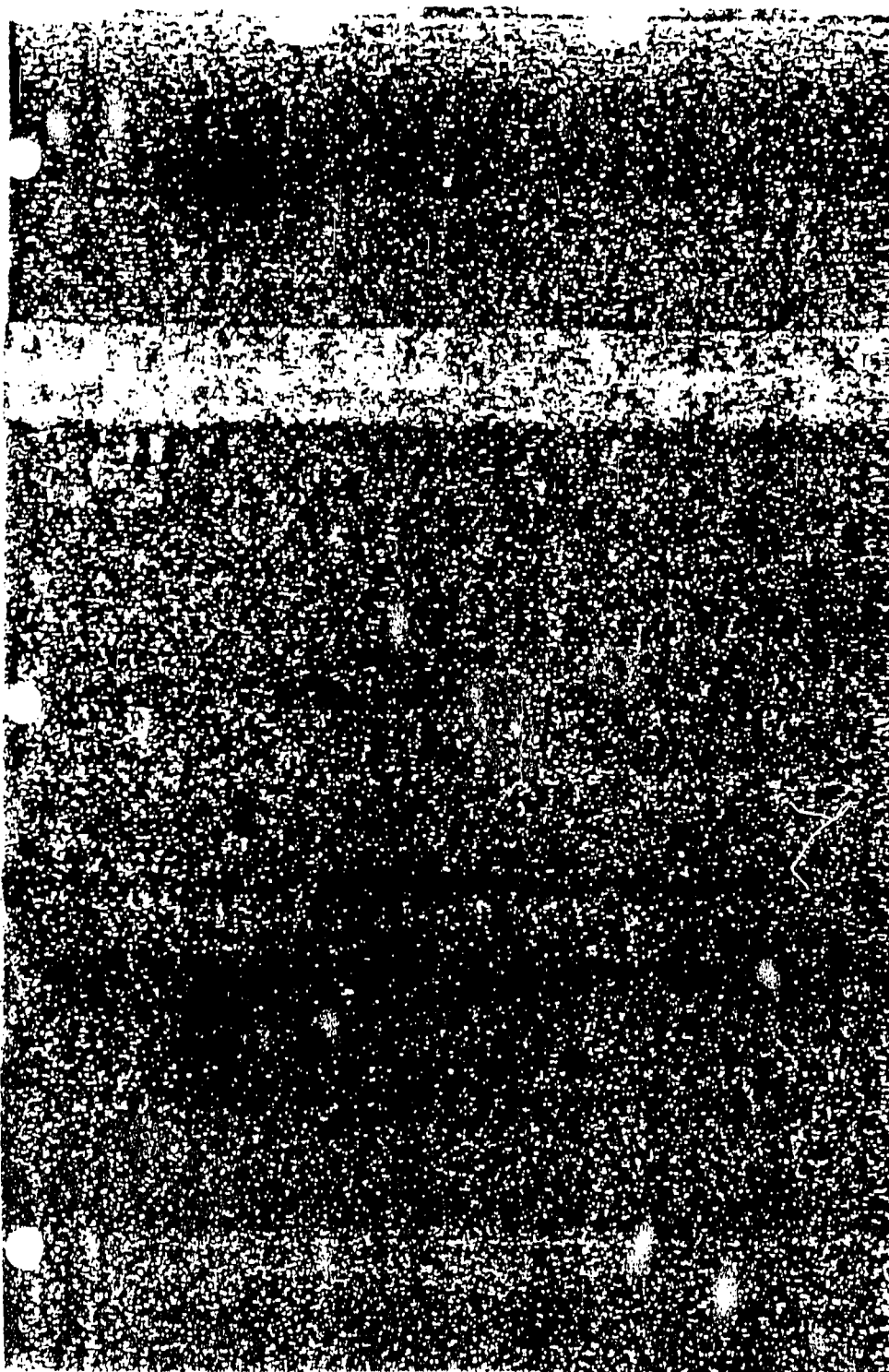


FIGURE 1-2
IMPLEMENTATION FLOWCHART
HARVEY AND KNOTT SITE
NEW CASTLE COUNTY, DELAWARE

FIGURE 1-3
PROJECT SCHEDULE



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2.0 PROJECT ORGANIZATION

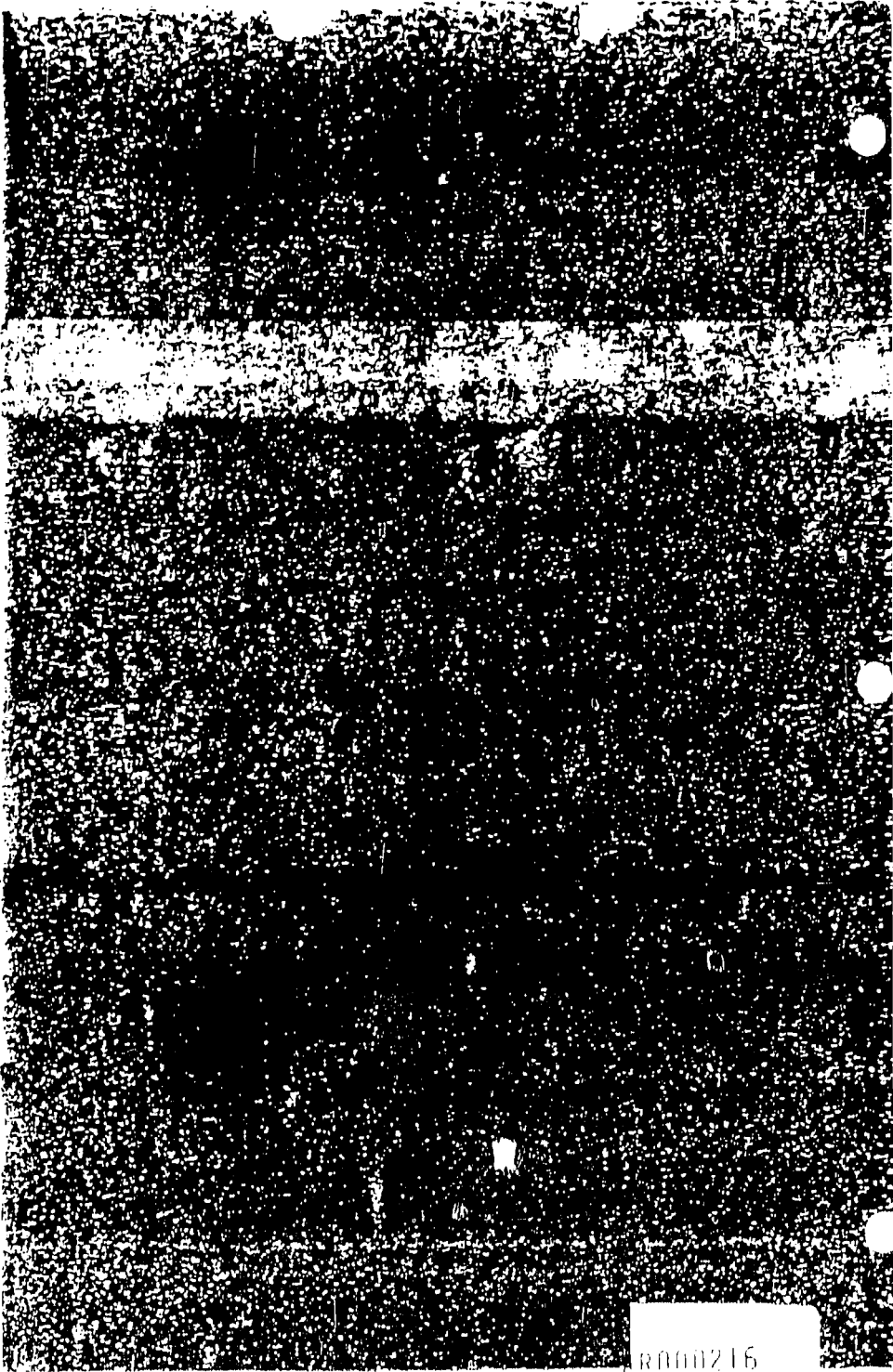
Complete and effective project management is essential for the proper execution of a project of this magnitude. While specific project personnel and management responsibilities cannot be established until selection of an appropriate remedial action contractor, general project responsibilities, management structure and roles of the various organizations can be established based on previous approaches to similar projects.

It is important that the contractor performing the engineering and construction of the remedial action establish a well-defined management structure at the beginning of the project. Because of the diversity and complexity of the tasks associated with a variety of engineering and scientific professionals. A project director should be identified whose responsibilities would include assessment of overall project progress and coordination, interaction with other interested parties (e.g., federal, state and local regulatory agencies, local citizen groups, and site committees) and representation of the project at critical meetings. A project such as this, which may require several diverse tasks to be performed simultaneously, would need several task managers responsible for individual segments. For example, engineering components, such as the treatment system design and piping hardware would require an engineering team, while additional soil explorations, groundwater extraction well system design and well installation would require geologists, soil scientists and hydrologists. These two major segments could each have projects, with overall coordination supplied by the project director. Project managers' responsibilities would include budget review, adherence to task schedules, direct coordination with technical staff and management of field tasks. Other general personnel required would be a health and safety officer, field team leader, a variety of technical disciplines, sampling specialists and field technicians.

AR000214

Also, a project of this size and complexity will involve many groups, organizations, agencies and contractors. It is important that their individual roles be established at the beginning of the project. For example, it is likely that EPA and state agencies will be closely involved with review of engineering plans, bench scale and pilot scale system testing and implementation. The contractor will have to coordinate several subcontractors, including laboratories, drillers, cleanup specialists, surveyors and waste haulers. Provisions must be made for local involvement and public participation.

Finally, a project such as this will generate volumes of data. A computerized data management system must be set up in order to effectively store and retrieve this data. Various computer data management software packages are available.



R000216

3.0 QUALITY ASSURANCE/QUALITY CONTROL
PROJECT PLAN

This section contains suggested quality assurance, quality control procedures for the Harvey and Knott Drum Site. Items such as sampling parameters, number of quality assurance samples, sample documentation, sample custody, instrument calibration, field documentation and reporting are addressed. However, certain parts of this plan cannot be completed until a contractor has been selected.

PROJECT NAME: Harvey and Knott Drum Site - Remedial Action
New Castle County, Delaware

PROJECT REQUESTED BY: (To be inserted)

DATE OF REQUEST: (To be inserted)

DATE OF PROJECT
INITIATION: [TO BE INSERTED BY CONTRACTOR]

PROJECT DIRECTOR: [TO BE INSERTED BY CONTRACTOR]

QUALITY ASSURANCE
OFFICER: [TO BE INSERTED BY CONTRACTOR]

3.1 Project Description

The major objective for the remedial action program at the site is to mitigate or eliminate environmental contamination and migration at the source area. After a review of several remedial alternatives, EPA has selected alternative No. 3A as identified in the Record of Decision dated September 30, 1985 to be implemented at the site based on the following criteria: technical feasibility; public health, environmental, institutional evaluation; and cost effectiveness. The selected alternative includes the following major elements:

- Cleaning the on-site drainage pond by collecting and treating surface water (estimated 200,000 gallons). After the pond is dewatered, removal and disposal of contaminated sediments, sludges and bulk wastes to a qualifying facility permitted under the Resource Conservation and Recovery Act (RCRA) 40 C.F.R. Part 264, Subpart H.
- Removal and disposal of all crushed or intact surface drums, debris, waste piles, and sludges to a qualifying RCRA facility.
- Installation of groundwater extraction and treatment facilities to collect and remove contaminants in the shallow groundwater. Treated groundwater will then be applied to flush contaminants from on-site surface and subsurface soils. It is estimated that this extraction/treatment/flushing program will operate for five years to restore the aquifer to drinking water quality or final EPA approved alternate concentration limits.
- Preparation of the site surface for installing the flushing pipe network will entail (a) grading the entire application area, (b) covering with a minimum of six to a maximum of 24 inch layer of soil, and (c) establishing permanent vegetation as a precaution against direct contact.

- Extensive environmental assessment of wetlands and surface water adjacent to the site to determine the impact the site has already had on these areas.

In addition, the selected remedial action includes a post-closure groundwater and surface water monitoring program. The monitoring program includes 19 sampling points for groundwater and 9 sampling points for surface water. The results of the monitoring program will be used to determine the effectiveness of the remedial action. Additionally, the monitoring well analyses will be used to establish target soil levels and alternate concentration levels (ACLs) for groundwater. Two rounds of soil grid sampling are also proposed to determine the extent and levels of soil contamination both prior to and following soil flushing. The data from the soil sampling will be used in the following ways:

Round 1 - Prior to Soil Flushing

- To establish the areas of soil contamination for design of the spray irrigation system.

Round 2 - After Soil Flushing

- To determine the contaminant levels in the soils after completion of the soil flushing operations.
- To provide a data base for evaluating capping requirements for residual soil contaminants based on cleanup standards set for soils.

Data collected from the wetlands assessment will be used to determine site impacts on the wetlands and the most feasible remedial alternative for the wetlands.

3.2 Monitoring Network Design and Rationale

The design and rationale of the monitoring network is discussed in Sections 5.1, 5.2, 5.5, and 5.11 of the Work Plan. Table 3-1 provides a list of the monitoring well parameters and their frequency of collection for each sample matrix.

3.3 Projected Sampling Program

Table 3-2 provides the projected sampling program. Table 3-3 shows the analytical methods and sample preservative techniques for each parameter and matrix, Table 3-4 lists QA sample parameters.

3.4 Project Organization and Responsibility

The contractor will identify key individuals responsible for the following:

- sampling operations
- sampling QC
- laboratory analysis
- laboratory QC
- data processing activities
- data quality review
- performance auditing
- systems auditing (on-site evaluations)
- overall QA
- overall project coordination

The contractor will provide an organizational chart for QA/QC purposes.

TABLE 3-1

MONITORING PROGRAM AND FREQUENCY OF COLLECTIONHarvey & Knott Drum Site

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6
UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

<u>Matrix</u>	<u>No. of Samples^a</u>	<u>Parameters</u>	<u>Frequency of Collection</u>
Surface Water	11	HSL (Organic & Inorganic) & RCRA GH Monitoring Parameters ^a	Year 1: Quarterly (4/Year)
	2	HSL Volatile Organics	Year 1: Quarterly (4/year)
	11	HSL (Organic & Inorganic) & RCRA GH Monitoring Parameters ^a	Years 2-5: Semi-Annually (2/Year)
	2	HSL Volatile Organics	Years 2-5: Semi-Annually (2/year)
	11	HSL (Organic & Inorganic) & RCRA GH Monitoring Parameters ^a	Years 6-30: Annually (1/year)
	2	HSL Volatile Organics	Years 6-30: Annually (1/year)
Groundwater Monitoring Wells	22	HSL (Organic & Inorganic) & RCRA GH Monitoring Parameters ^a	Year 1: Quarterly (4/year)
	3	HSL Volatile Organics	Year 1: Quarterly (4/year)
	22	HSL (Organic & Inorganic) & RCRA GH Monitoring Parameters ^a	Year 2-5: Semi-Annually (2/Year)
	3	HSL Volatile Organics	Years 2-5: Semi-Annually (2/Year)
	22	HSL (Organic & Inorganic) & RCRA GH Monitoring Parameters ^a	Years 6-30 Annually (1/Year)
	3	HSL Volatile Organics	Years 6-30: Annually (1/Year)

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TABLE 3-1
(Continued)

MONITORING PROGRAM AND FREQUENCY OF COLLECTION

Harvey & Knott Drum Site

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6
UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

<u>Matrix</u>	<u>No. of Samples*</u>	<u>Parameters</u>	<u>Frequency of Collection</u>
Subsurface Soil (Grid Sampling)	34	HSL (Organic & Inorganic)	Round 1: One Event
	3	HSL Volatile Organics	Round 1: One Event
	34	HSL (Organic & Inorganic)	Round 2: One Event
	3	HSL Volatile Organics	Round 2: One Event
Surface Water Wetlands	5	HSL (Organic & Inorganic) + BOD + DO	One Event
	1	HSL Volatile Organics	One Event
Sediment Wetlands	6	HSL (Organic & Inorganic)	One Event
	1	HSL Volatile Organics	One Event
Animal Tissue Samples (Bio- accumulation)	**	PCBs & Metals ^b	One Event
			One Event
Leachate & Juvenile Fish (Bioassay)	**	LC50	One Event

HSL	Hazardous Substance List (to include only those substances found to be present at the site as reported in the RI/FS)
RCRA	Resource Conservation and Recovery Act
GW	Groundwater
"	Includes QA Samples
a	RCRA Groundwater Monitoring Parameters include: chloride, sodium, sulfate, manganese, pH, total organic halogen, phenols (total), specific conductance, iron, total organic carbon, fluoride, nitrate, cyanides (total).
b	Metals for bioaccumulation include: lead, chromium, arsenic, cadmium and mercury.
**	To be determined
BOD	Biological Oxygen Demand
DO	Dissolved Oxygen
LC50	Lethal Concentration - 50

TABLE 3-2

PROJECTED SAMPLING PROGRAM
HARVEY & RHOULI BRWAL SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

Matrix	No. of Samples	Parameters	Laboratory ^{aa}	Field Replicates	Field Blanks	Trip Blanks
Surface Water ^a	11	MSL (Organic & Inorganic) & RCRA CM Monitoring Parameters ^a		1	1	0
	2	MSL Volatile Organics		0	0	2
Groundwater Monitoring Wells ^a	22	MSL (Organic & Inorganic) & RCRA CM Monitoring Parameters ^a		2	1	0
	3	MSL Volatile Organics		0	0	3
Subsurface Soil ^b (Grid Sampling)	34	MSL (Organic & Inorganic)		3	1	0
	3	MSL Volatile Organics		0	0	3
Surface Water Wetlands	5	MSL (Organic & Inorganic) + BOD + DO		1	0	0
	1	MSL Volatile Organics		0	0	1
Sediment Wetlands	6	MSL (Organic & Inorganic)		1	1	0
	1	MSL Volatile Organics		0	0	1
Animal Tissue Samples (Bioaccumulation)	***	PCBs and Metals ^b				
Leachate & Juvenile Fish (Biosay)	***	LC50				

AR000223

TABLE 3-2

PROJECTED SAMPLING PROGRAM
HARVEY & KNOX DRUM SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

MSL	Hazardous Substance List (to include only those substances found to be present at this site as reported in the RI/FS).
RCRA	Resource Conservation and Recovery Act
GW	Groundwater
a	Includes QA Samples
---	To be determined by the contractor
---	To be determined
a	RCRA Groundwater Monitoring parameters include: chloride, sodium, sulfate, manganese, pH, total organic halogen, phenols (total), specific conductance, iron, total organic carbon, fluoride, nitrate, cyanides (total).
b	Metals for bioaccumulation include lead, chromium, arsenic, cadmium and mercury.
BOO	Biological Oxygen Demand
DO	Dissolved Oxygen
LC50	Lethal Concentration - 50
A.	Frequency of Sampling for Groundwater and Surface Water
	Years
	Quarterly (4/year) 1
	Semi-annually (2/year) 2-5
	Annually (1/year) 6-30
B.	Frequency of Subsurface Soil Sampling: 2 Events

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TABLE 3-3

PARAMETER TABLE
HARVEY & KNOXII DRUM SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

Parameters	No. of Samples	Frequency of Collection	Sample Matrix	Analytical Method Reference	Sample Preservation	Holding Time	Container
HSL Volatiles	20	Year 1: 4/Year Years 2-5: 2/Year Years 6-30: 1/Year	Aqueous	CLP Protocols ^a	Cool, 4°C	7 days	40 ml glass vials, Teflon lined septum
HSL Semi-Volatiles	20	Year 1: 4/Year Years 2-5: 2/Year Years 6-30: 1/Year	Aqueous	CLP Protocols ^a	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L amber glass bottles Teflon lined cap
HSL Pesticides and PCBs	20	Year 1: 4/Year Years 2-5: 2/Year Years 6-30: 1/Year	Aqueous	CLP Protocols ^a	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L amber glass bottles Teflon lined cap
HSL Inorganics	20	Year 1: 4/Year Years 2-5: 2/Year Years 6-30: 1/Year	Aqueous	CLP Protocols ^a	Filter ground-water samples on-site, acidify all samples with HNO ₃ to pH 1.2	6 months	500 or 1 L linear polyethylene bottles
HSL Volatiles	30	2 events	Soils	CLP Protocols ^a	Cool, 4°C	None	8 oz glass bottles
HSL Semi-Volatiles	30	2 events	Soils	CLP Protocols ^a	Cool, 4°C	None	Teflon lined cap
HSL Pesticides and PCBs	30	2 events	Soils	CLP Protocols ^a	4°C	None	8 oz glass bottles
HSL Inorganics	30	2 events	Soils	CLP Protocols ^a	None	None	Teflon lined cap

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TABLE 3-3 (CONTINUED)

PARAMETER TABLE
HARVEY & RHOIT DRUM SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

Parameters	No. of Samples	Frequency of Collection	Sample Matrix	Analytical Method/Reference	Sample Preservation	Holding Time	Container
HSL Volatiles	4	One event	Aqueous (Met-Lands)	CLP Protocol ^a	Cool, 4°C	7 days	40 ml glass vials, Teflon lined septum
HSL Semi-Volatiles	4	One event	Aqueous (Met-Lands)	CLP Protocol ^a	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L amber glass bottles Teflon-lined cap
HSL Pesticides and PCBs	4	One event	Aqueous (Met-Lands)	CLP Protocol ^a	Cool, 4°C	7 days until extraction, 40 days after extraction	1 L amber glass bottles Teflon-lined cap
HSL Inorganics	4	One event	Aqueous (Met-Lands)	CLP Protocol ^a	Filter GU samples on-site, acidity all samples w/HNO ₃ to pH 11.2	6 months	500 or 1 L linear polyethylene bottles
BOD	4	One event	Aqueous (Met-Lands)	Ref. 3	Cool, 4°C	48 hours	300 ml glass BOD bottles
DO	4	One event	Aqueous (Met-Lands)	Ref. 3	None required	Analyze immediately	300 ml glass bottle and top

AR000226

TABLE J-3 (CONTINUED)
PARAMETER TABLE
HARVEY & MOBILE DEPT. SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEARS 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

Parameters	No. of Samples	Frequency of Collection	Sample Matrix	Analytical Method References	Sample Preservation	Holding Time	Container
MSL Volatiles	4	One event	Sediment (wet-lands)	CLP Protocol ^a	Cool, 4°C	None	8 oz glass bottles, Teflon-lined cap
MSL Semi-Volatiles	4	One event	Sediment (wet-lands)	CLP Protocol ^a	Cool, 4°C	None	8 oz glass bottles, Teflon-lined cap
MSL Pesticides and PCBs	4	One event	Sediment (wet-lands)	CLP Protocol ^a	Cool, 4°C	None	8 oz glass bottles, Teflon-lined cap
MSL Inorganics	4	One event	Sediment (wet-lands)	CLP Protocol ^a	None	None	8 oz glass bottles
ACMA OR Monitoring Parameters							
pH	20	Yr 1: 4/Yr Yrs 2-5: 2/Yr Yrs 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Field determined	2 hours	T, P, G
Specific Conductance	20	Yr 1: 4/Yr Yrs 2-5: 2/Yr Yrs 6-30: 1/Yr	Aqueous	Ref. 1, 3, 4	Field determined	None	T, P, G

(CONTINUED)

AR000227

TABLE 3-3 (CONTINUED)
PARAMETER TABLE
HARVEY & RHOEL DRUM SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

Parameter	No. of Samples	Frequency of Collection	Sample Media	Analytical Method Reference	Sample Preservation	Holding Time	Container
TOC	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool, 4°C, NCL to pH LT 2	28 days	G. Teflon-lined cap
ION	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool 4°C, add 1 ml 1.1 M Sodium sulfate	7 days	G. amber, Teflon-lined cap
Chloride	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool 4°C	28 days	T, P, G
Iron	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Field Acidified to pH LT 2 w/HNO ₃	6 months	T, P
Manganese	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Field Acidified to pH LT 2 w/HNO ₃	6 months	T, P
Sodium	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Field Acidified to pH LT 2 w/HNO ₃	6 months	T, P
Phenols	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool, 4°C/N ₂ SD, 28 days pH LT 2	6	

TABLE 3-3 (CONTINUED)
PARAMETER TABLE
HARVEY & KNOX DRUM SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

Parameter	No. of Samples	Frequency of Collection	Sample Matrix	Analytical Method References	Sample Preservation	Holding Time	Container
Sulfate	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool, 4°C	28 days	T, P, G
Fluoride	28	Years 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Field Acidified to pH LT 2 with HNO ₃	28 days	T, P
Nitrate	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool, 4°C	48 hours	T, P, G
Cyanide	28	Year 1: 4/Yr Years 2-5: 2/Yr Years 6-30: 1/Yr	Aqueous	Ref. 1, 2, 3	Cool, 4°C, NaOH to pH GT 12	14 days	P, G

- * From USEPA Contract Laboratory Programs, "Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration."
- ** From USEPA Contract Laboratory Programs, "Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration."
- 1. "Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020, March 1979.
- 2. "Standard Methods for the Analysis of Water and Wastewater," 16th edition, 1985
- 3. "Test Methods for Evaluating Solid Waste - Physical/Chemical Methods," SM-806, 2nd edition, 1982.

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TABLE 3-3 (CONTINUED)

PARAMETER TABLE
HARVEY & KNOX, DRUM SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30
WILL BE RE-EVALUATED EVERY FIVE YEARS

Container Types:

P - Plastic (polyethylene)
G - Glass

T - Teflon
PP - Polytetrafluorene

MSL - Hazardous Substance List (to include only those substances found to be present at this site as reported in the RI/FS).
CW - Groundwater
LT - Less than
GT - Greater than
BOD - Biological Oxygen Demand
RCD - Resource Conservation and Recovery Act
DOC - Total Organic Carbon
DO - Dissolved Oxygen
TOX - Total Organic Halogens

TABLE 3-4
QA PARAMETER TABLE
HARVEY AND MOULT DOWN SITE

MONITORING FREQUENCY AND PARAMETERS FOR YEAR 6 UP TO YEAR 30 WILL BE RE-EVALUATED EVERY FIVE YEARS

QA Sample	Parameter	No. of Samples	Frequency of Collection	Sample Matrix	Analytical Method/Reference	Sample Preservation	Storage Time	Container
Field Replicate	HSL (Organic and Inorganic) and HCLA Of Monitoring Parameters HSL (Organic and Inorganic) and BOD and DO	3 3 3 1	Year 1: 4/year Years 2-5: 2/year Years 6-30: 1/year One Event	Aqueous		Refer to Table 3-3		
Field Blank	HSL (Organic and Inorganic) and HCLA Of Monitoring Parameters	2 2	Year 1: 4/year Years 2-5: 2/year Years 6-30: 1/year	Aqueous				
Trip Blank	HSL Volatile Organics	5	Year 1: 4/year Years 2-5: 2/year Years 6-30: 1/year One Event	Aqueous				
Field Replicate	HSL (Organic and Inorganic) HSL (Organic and Inorganic) Inorganic	3 1 1	Two Events One Event One Event	Soil Sediment Sediment				
Field Blank	HSL (Organic and Inorganic) HSL (Organic and Inorganic)	1 1	Two Events One Event	Soil Sediment				
Trip Blank	HSL Volatile Organics HSL Volatile Organics	3 1	Two Events One Event	Soil Sediment				

HSL - Hazardous Substance List (to include only those substances found to be present at this site as reported in the RI/FS).

HCLA - Resource Conservation and Recovery Act

CA - Groundwater

NCMA Of Monitoring Parameters include: chloride, sodium, sulfate, manganese, pb, total organic halogen, phenols (total), fluoride, nitrate, cyanides (total), iron, total organic carbon, specific conductance.

3.5 Data Quality Requirements and Assessments

3.5.1 Precision and Accuracy. The QA targets for the precision and accuracy of the data will meet the specific QA/QC conditions stipulated in EPA's Contract Laboratory Program and recent revisions to Chapter 40 C.F.R. Part 136 (Vol. 49 No. 109 Federal Register, October 26, 1984). Required detection limits for Hazardous Substance List (HSL) analyses are provided in Appendix A. The contractor shall supply a copy of the selected analytical laboratory's QA/QC program which shall be consistent with the requirements of EPA's Contract Laboratory Program (CLP).

3.5.2 Data Representativeness. Monitoring wells will be flushed a minimum of three to five well volumes prior to collecting the sample to ensure that a representative sample has been obtained from the aquifer.

An upstream surface water and sediment sample will be collected and compared to downstream samples. Grab surface water samples will be collected from midstream. Prior to and following soil flushing, soil samples will be collected from a grid system at a depth of 3 feet at each location to ensure representativeness. Background soil samples will be included in the grid system to determine representative background soil characteristics. Animal tissues for bioaccumulation and leachate samples for bioassay will be collected at random sampling locations.

3.5.3 Data Comparability. All aqueous sample data will be reported in ug/l (ppb). All soil sediment samples will be reported in ug/kg (ppb) or mg/kg (ppm). Concentrations of PCBs and metals in animal tissue will be reported in parts per million (ppm). Sampling protocol will be strictly adhered to.

3.5.4 Data Completeness. The valid data required from the laboratory will be 90 percent of the samples submitted.

3.6 Sampling Procedures

Sampling procedures are provided in Sections 5.1, 5.2, 5.5, and 5.13 of the Work Plan.

3.7 Sample Custody Procedures

Sampling team personnel will perform all sampling and will retain custody until shipment to the laboratory. One chain-of-custody form will be used for each sample shuttle shipped to the laboratory for analysis. The contractor will provide examples of chain-of-custody forms in this QA plan.

The field activities will be recorded daily during active site operations in a serialized field logbook. The following information will be recorded in the logbook used at this site:

1. Where, exactly, was the sample taken?
2. Who took the sample, and who witnessed it?
3. Date and time of sample collection.
4. Sample number, airbill number, seal number.
5. All sampling conditions, i.e., type of material, weather on-site, type of sampling container and preparation, description of sampling procedure, preservation, and shipping.
6. Field measurements of pH, temperature, specific conductance, volumes and characteristics of water removed during the development and flushing of wells, diameter of casing and riser pipe, distance from top of casing to bottom of well screen, distance from top of casing to water table, pumping rate.

The laboratory will provide the field personnel with sample shuttles containing all sample containers necessary for completing field sampling and QC requirements. Each lot of sample containers are checked for cleanliness by the laboratory and closed to prevent contamination. Each bottle will be labeled to indicate sample number and the type of analyses to be performed on the sample and packaged to prevent breakage. Field blanks, preservatives, etc. will be added as required by the analytical procedures.

Samples will be received at the laboratory by the sample custodian who will examine each sample to ensure that it is the expected sample, inspect the sample containers for possible damage, and ensure that the documentation is complete and adequate. The sample custodians will ensure that each sample has been preserved in the manner required by the particular test to be conducted and stored according to the correct procedure. Preservation and storage will require maintenance at 4°C until analysis begins.

3.8 Calibration Procedures, Preventive Maintenance, and Decontamination

A maintenance, calibration, and operation program will be implemented to ensure that routine calibration and maintenance is performed on all field instruments. The program will be administered by the Quality Assurance Officer and team members. The Quality Assurance Officer performs the scheduled monthly and annual calibration and maintenance; and trained team members perform field calibrations, checks, and instrument maintenance prior to use.

Team members are familiar with the field calibration, operation, and maintenance of the equipment, maintain proficiency, and will perform the prescribed field operating procedures outlined in the Operation and Field Manuals accompanying the respective instruments. They will keep records of all field instrument calibrations and field checks in the field log-books. If on-site monitoring equipment should fail, the Site Safety Officer will be contacted immediately. He/she will either provide replacement equipment or have the malfunction repair immediately.

The Century Systems OVA Model 128, to be used at the site, will be calibrated by the manufacturer prior to shipment to the job site. A trained team member will perform daily field calibration with Span gas, checks, and instrument maintenance prior to use. The pH meter and conductivity meter will be calibrated using standard calibration solutions by a trained team member. Maintenance, calibration and equipment operation follow the procedures outlined in EPA's "Technical Methods for Investigation Sites Containing Hazardous Substances."

3.9 Documentation, Data Reduction, and Reporting

All field data will be entered into bound serialized notebooks. Field notebooks, chain-of-custody forms, field data sheets, and lab reports will be filed and stored at the contractor's office. These documents are tracked by periodically inventorying them on a Document Control Sheet (Figure 3-1) which is submitted as part of the QA/QC report.

3.9.1 Data Reduction and Reporting. The contractor will describe data reduction at the Laboratory level after selecting the laboratory data reduction in the contractor's office will be effected by providing to the Quality Assurance Officer periodically updated summary tables with the headings:

Sample Collection Date	Identification Number	Sample Description	Lab No.	Parameter	Concentration	Analysis Date
------------------------------	--------------------------	-----------------------	------------	-----------	---------------	------------------

Data will be reported in a report prepared by the contractor.

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FIGURE 3-1

PROJECT NO.

DOCUMENT CONTROL SHEET
SITE:
LOCATION:

<u>Document No.</u>	<u>Title</u>	<u>In Custody of</u>	<u>Dates</u>	<u>Comments</u>
1				
2				
3				
4				
5				
6				
7				

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3.10 Data Validation

The precision of the data submitted to the contractor by the analytical laboratory will be checked by comparison of the analytical results from the replicate field samples. Accuracy will be monitored with the use of field and method blanks, spikes and surrogate spikes. The data validity also will be assessed by comparison of field blank and background samples with downgradient and on-site samples. The laboratory will critique its own analytical program by the use of spike addition recoveries, establishing detection limits for each matrix, precision and accuracy control charts, and keeping accurate records of instrument calibrations. The laboratory establishes average recoveries for surrogates over time, standard deviations, control and warning limits. When a sample recovery is outside the control limit, the sample analysis is repeated. If upon repetition the sample recovery is outside the control limits, the sample will be deemed unsuitable for the method and no further analysis will be conducted on the sample. Data validation will be the responsibility of the contractor's QA/QC officer in conjunction with the laboratory's QA officers. A QA/QC evaluation of laboratory data and sampling and analytical procedures used for each sample obtain will be completed and submitted to EPA.

3.11 Performance and Systems Audits

The contractor shall select a laboratory who has analyzed recent performance evaluation samples from the EPA and/or the State of Delaware. The dates, source of the performance evaluation samples, and parameters analyzed will be provided by the Contractor as follows:

<u>Contract No. and Source</u>	<u>Date</u>	<u>Parameters</u>
--------------------------------	-------------	-------------------

[TO BE INSERTED BY CONTRACTOR]

The selected laboratory's QA plan shall be consistent with the requirements of EPA's Contract Laboratory Program where appropriate.

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Corrective actions for laboratory analyses will be handled by consultation between the Laboratory QA/QC Officer and the Contractor's QA/QC Officer. The Project Manager will make immediate decisions on new protocols to be followed. All changes in laboratory procedures will be documented and reported in the final report.

Two performance audits will be conducted during the investigation. The initial audit will be performed to ensure proper procedures and that subsequent data will be valid. A follow-up audit will be performed near the end of the investigation to show consistency. The contractor will identify the individual responsible for audits of the field team.

The audits will focus on the details of the QA program. This audit will evaluate:

- Project Responsibilities
- Sample Custody Procedures
- Document Control
- Sample Identification System
- QC Corrective Action Procedures

The audits will evaluate the implementation of the project QA program. The audit checklist for field procedures is shown in Figure 3-2. This document will serve as the guide for the audit. In addition, an evidence audit, presented in Figure 3-3, will be performed. The contractor will identify the individual responsible for the audits. A written summary performance audit will be submitted to the EPA's Technical Project Officer.

FIGURE 3-2
PERFORMANCE AUDIT CHECKLIST

Field Investigation Audit

Project No.: _____ Date: _____

Project Location: _____ Signature: _____

Team Members: _____

- | | | |
|------------------------------|-----------------------------|--|
| Yes ☐ | No ☐ | 1) Has a project coordinator been appointed?
Comments _____
_____ |
| Yes ☐ | No ☐ | 2) Was a project plan prepared?
Comments _____
_____ |
| Yes ☐ | No ☐ | 3) Was a briefing held for project participants?
Comments _____
_____ |
| Yes ☐ | No ☐ | 4) Were additional instructions given to project participants?
Comments _____
_____ |
| Yes ☐ | No ☐ | 5) Is there a written list of sampling locations and descriptions?
Comments _____
_____ |
| Yes ☐ | No ☐ | 6) Is there a list of accountable field documents checked out to the project coordinator?
Comments _____
_____ |

- Yes ☐ No ☐ 7) Is the transfer of field documents from the coordinator to field participants documented in a logbook?
Comments _____

- Yes ☐ No ☐ 8) Are samples collected as stated in the project plan or as directed by the coordinator?
Comments _____

- Yes ☐ No ☐ 9) Are samples collected in the type of containers specified in the project plan or as directed by the coordinator?
Comments _____

- Yes ☐ No ☐ 10) Are samples preserved as specified in the project plan or as directed by the coordinator?
Comments _____

- Yes ☐ No ☐ 11) Are the number, frequency, and type of samples collected as specified in the project plan or directed by the coordinator?
Comments _____

- Yes ☐ No ☐ 12) Are the number, frequency, and type of measurements and observations taken as specified in the project plan or as directed by the coordinator?
Comments _____

- Yes ☐ No ☐ 13) Are samples identified with sample tags?
Comments _____

- Yes ☐ No ☐ 14) Are blank and duplicate samples properly identified?
Comments _____

- Yes ☐ No ☐ 15) Are sample and serial numbers for samples split with other organizations recorded in a logbook or on a chain-of-custody record?
Comments _____

- Yes ☐ No ☐ 16) Are samples listed on a chain-of-custody record?
Comments _____

- Yes ☐ No ☐ 17) Is chain-of-custody documented and maintained?
Comments _____

- Yes ☐ No ☐ 18) Are quality assurance checks performed as directed?
Comments _____

- Yes ☐ No ☐ 19) Are photographs documented in logbooks as required?
Comments _____

- Yes ☐ No ☐ 20) Have any accountable documents been lost?
Comments _____

- Yes ☐ No ☐ 21) Have any accountable documents been voided?
Comments _____

- Yes ☐ No ☐ 22) Have any accountable documents been disposed of?
Comments _____

FIGURE 3-3
EVIDENCE AUDIT CHECKLIST

Document Control Audit

Project No.: _____

Project Location: _____

Date: _____

File Location: _____

Signature: _____

Yes ____ No ____ 1) Have the individual files been assembled (field investigation, laboratory)?

Comments _____

Yes ____ No ____ 2) Is there a list of accountable field documents?

Comments _____

Yes ____ No ____ 3) Are all accountable field documents present or accounted for? (Fill out additional checklist.)

Comments _____

Corrective action on a day-to-day basis for field sampling will be handled by consultation between the team members and the Team Leader. The Team Leader will make immediate decisions with the team members on new protocols to be follows. All changes in field sampling procedures will be documented in the field logbook and reported in the final report.

3.12 Quality Assurance Reports

A QA/QC evaluation of laboratory data and sampling and analytical procedures used for each sample obtained will be completed and submitted to EPA.

Monthly reports will be issued by the Project Manager in consultation with the contractor's Quality Assurance Officer. The reports will include assessment of the status of the project in relation to the agreed upon timetable. The reports will also include, as appropriate, the results of the performance audit and document audits, when they are completed, and any necessary corrective action procedures. A data quality assessment, using field blanks, will be incorporated into a report.

4.0 HEALTH AND SAFETY PROJECT PLAN

4.1 Introduction

This Health and Safety Program exists to protect employees from the hazards encountered during remedial action activities at uncontrolled hazardous waste sites. It is the result of experience gained from working on hazardous waste sites and handling hazardous materials, as well as consideration of all applicable government regulations and guidelines, and consultation with health and safety experts.

Personnel engaged in field investigations of hazardous waste storage, treatment, and disposal sites and remedial action activities encounter a wide variety of hazards, including potential exposure to toxic chemicals and radiation, fire and explosion hazards, and other physical hazards due to unstable, deteriorating structures. There is a great degree of uncertainty about an abandoned or uncontrolled site at all stages of an investigation, and there may always be a significant risk encountered at these sites.

This Health and Safety Program is intended to comply with the Occupational Health and Safety Act (OSHA) of 1970, 5 U.S.C. 7902(c)(1), Section III (c) of CERCLA, EPA Order 1440.1 - Respiratory Protection, and EPA Order 1440.3 - Health and Safety Requirements for Employees Engaged in Field Activities.

4.2 Safety Considerations For Remedial Investigation

This section describes the administrative policies and procedures applicable to remedial action activities.

Although the degree and type of hazard encountered by field team varies greatly depending on the type of site (e.g. abandoned hazardous waste site or active facility) and the detail of field activity (e.g., preliminary site inspection, multimedia sampling or site cleanup, certain

administrative policies and procedures must be adhered to. These include use of properly trained personnel, specific criteria for field team organization and size, site characterization to establish hazard level, proper selection, use and maintenance of personal protective equipment, and basic safety procedures.

4.3 Field Team Organization

A field team must be organized to efficiently and safely carry out the objectives of the project. These objectives may include such activities as sampling of hazardous wastes, monitoring well installation, site mapping, metal detection, performing geophysical surveys, or drum excavation. The team will typically include individuals with many different technical skills, such as chemists, geologists, and engineers. In addition to performing its task objectives, the team must provide for its own safety to prevent injury or exposure to hazardous materials. This can be accomplished by assignment of specific roles and responsibilities to members of the field team and by assuring that the proper team size is used to effectively accomplish specific objectives.

There are a number of roles which are required for the safe and competent operation of a field investigation team. The five roles which are necessary at every site where a field team will be working are: Project Manager, Field Team Leader, Site Safety Officer, Equipment Specialist, and the Work Party. Additional roles, such as Command Post Supervisor, Personnel Decontamination Station Operator and an Emergency Response Team, are added to the field team when the scope, magnitude, or hazard of the investigation justifies the need for them. A team member may take on more than one role, but the roles must be clearly assigned and must cover all those required rather than describe one team organization for all the different types of field investigations. Guidelines are presented here for assignment of responsibilities to team members to assure safety and for establishing the team size. The contractor shall provide an organizational chart which shows the delegation of authority for health and safety purposes.

4.3.1 Project Manager. The Project Manager is responsible for the overall effectiveness of remedial action activities. The specific responsibilities of the Project Manager include preparing and organizing all project work assignments, briefing team personnel on specific duties, obtaining permission for site access from the owner or responsible party, completing reports and maintaining the evidentiary file, complying with chain-of-custody procedures, and coordinating with government representatives and subcontractors.

4.3.2 Field Team Leader. The Field Team Leader is accountable for the organization, operation, and safety of the field team. This role may be filled by the Project Manager. The Field Team Leader is responsible for proper field operations, completion of the objectives of the site work plan, compliance with document control procedures, proper field documentation of activities and operating procedures, and determining the level of personal protection necessary to insure the health and safety of the field team. If subcontractors or outside observers are present, the Field Team Leader must enforce health and safety procedures.

4.3.3 Site Safety Officer. The Site Safety Officer has primary responsibility for all safety procedures and operations on-site. This role may be filled by the Project Manager. The Site Safety Officer is responsible for preparing the site safety plan; upgrading, if necessary, the level of personal protection based upon observations and changing circumstances during the field investigation; enforcing the buddy system (personnel working in pairs); posting and briefing the field team of an approved safety plan which outlines locations, routes, and telephone numbers of the closest medical facilities and poison control centers; posting other emergency telephone numbers, such as the fire and police department and Health and Safety Director; notifying local public emergency personnel; verifying that team members have met the health and safety requirements for field assignment; controlling site entry and exit at the personnel decontamination station; and monitoring the work party for signs of stress such as changes in complexion, lack of coordination,

changes in demeanor, and changes in speech pattern through visual observation. During adverse weather conditions, the Site Safety Officer will implement special precautions to guard against heat stress or cold exposure as described in EPA's "Standard Operating Safety Guides" (November 1984). The Site Safety Officer has the authority to halt any operation that threatens the health or safety of the team.

4.3.4 Equipment Specialist. The Equipment Specialist is responsible for obtaining, inspecting, and maintaining all equipment in proper operating order. This requires specialized training in maintenance of equipment, such as self-contained breathing apparatus. The Equipment Specialist is responsible for preparing all sampling equipment.

4.3.5 Work Party. The work party is ultimately responsible for the safe and successful completion of the work assignment. The members of the work party share many active and important functions which are necessary to fulfill the objectives of the investigation. These include setting up the personnel decontamination station, performing site hazard characterization, taking photographs, collecting samples of various media, decontaminating sample containers, packaging and shipping the samples in accordance with chain-of-custody procedures, and decontaminating the entire work party prior to leaving the site.

4.4 Field Investigation Team Size

The size of an investigation team is determined by the hazard level of the investigation, the level of protection employed, the objectives of the investigation, and the site characteristics and type of wastes. The team must be large enough to assure safety, but not so excessively large as to sacrifice economy.

4.4.1 Three-Person Team. A minimum of a three-person team will be used at the Harvey and Knott Drum Site to perform remedial actions. A three-person team is appropriate for sites where extensive personal decontamination is not required and where the likelihood of emergency rescue is

minimal. The three-person team is suitable when up to Level C protection is required. One team member remains outside the exclusion area and acts as Site Safety Officer and Equipment Specialist, as well as assisting with decontamination. In the event of an emergency, the team member can summon outside assistance. During level B activities, particularly the sampling of hazardous wastes in open or closed containers, a four-person team may be necessary. With a four-person team, one team member functions as Site Safety Officer and assists in decontamination. A second team member is assigned the role of command-post supervisor. The others constitute the work party. The contractor shall identify the responsibilities of each team member.

4.5 Selection, Use, and Maintenance of Personal Protective Equipment

Proper selection, use and maintenance of respiratory protective equipment and other personal protective equipment is extremely important in protecting the health and safety of field investigation personnel. An inadequate level of protection may result in unnecessary exposure to toxic chemicals or other hazards. An excessively high level of protection may encumber field personnel unnecessarily and result in decreased efficiency, fatigue, and other hazards. Improper use or maintenance of protective equipment also exposes field personnel to unnecessary risks.

The site hazard assessment will be based on a complete site characterization obtained from previous site visits. Once the site hazard assessment is completed, the Site Safety Officer will recommend the level of protection. This level must be approved by both the Office Safety Director and Corporate Health and Safety Director. The level of protection will be selected in accordance with EPA's "Standard Operating Safety Guides" (November, 1984). The selection is based on the potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done, the toxicity of the suspected or measured chemical substances, and professional experience and judgment. Criteria used to determine the level of protection are discussed below.

4.5.1 Respiratory Protection. The selection of adequate respiratory protection depends primarily on the type of hazardous substances to be encountered. Proper respirator use requires formal training and continued maintenance of the equipment, in accordance with 30 CFR Part 11 and provisions of the National Institute for Occupational Safety and Health. OSHA regulations pertaining to respiratory protection require a training program that encompasses user responsibilities, training for proper use, and respirator maintenance. OSHA also requires qualitative fit testing of face-pieces. Facial hair (beards) and wearing contact lenses is prohibited. The following factors will be used to select adequate respiratory protection: exposure limits, oxygen level, warning properties, protection factor, maximum use limit and service concentration limit. These factors are discussed in Section 4.4.1.2.

4.5.1.1 Self-Contained Breathing Apparatus (SCBA). The positive-pressure SCBA, which will be used at the Harvey and Knott Drum Site during drum excavation, sampling and removal activities, and soil dredging, provides the highest level of protection against air-borne toxic hazards and oxygen deficiency.

SCBAs will be used:

- when hazardous chemicals are known or suspected to be present in the air in potentially harmful concentrations;
- when containers of unknown or known hazardous materials are being opened;
- In enclosed spaces where hazardous materials are present or suspected, such as in abandoned waste chemical storage buildings or manholes which have received spilled chemicals; or
- At the Site Safety Officer's discretion.

In the donning and use of SCBA, the following precautions must be observed:

- SCBAs must be NIOSH-approved.
- SCBAs must provide positive pressure in the mask area.
- SCBAs must provide a tight face seal. Qualitative fit testing is required.
- Users of SCBAs must obtain formal hands-on training to guarantee operator proficiency and equipment maintenance.
- Users of SCBAs must follow the manufacturer's instructions for the donning and use of the equipment, in addition to formal training.

4.5.1.2 Air-Purifying Respirator (APR). The APR, which will be available to team members and will be used at the Harvey and Knott Drum Site during soil sampling, removes contaminants from the atmosphere to some degree and can be used only in atmospheres containing sufficient oxygen to sustain life (this is usually not a problem in open air) and when other criteria, discussed below, are met.

Specific concentration limitations exist for specific devices. The chemical-cartridge respirator provides respiratory protection against certain gases and vapors in concentrations not in excess of that labeled on the cartridge. It can only be used in an area where minimal concentrations might occur and where self-contained breathing apparatus (SCBA) has been determined unnecessary. Ambient air concentrations at the site will be determined by constant monitoring with the organic vapor analyzer. Many types of cartridges are available and field personnel will select the appropriate one for the contaminants expected.

Air-purifying respirators or cartridge respirators are worn when:

- Any unidentified and potentially hazardous odor is detected.
- Hazardous materials in the air are not greater than 10 times the permissible exposure limit (PEL), and have good warning properties.
- The Project Manager judges that respirators are needed as a precaution against generation of low levels of toxic substances in air due to sampling, handling, decontaminating, or other operations.
- The capacity of the cartridge will not be exceeded by extended periods of use on-site. (If used for extended periods, cartridges must be changed.)

Users of air-purifying respirators must comply with the following:

- At least 19.5 percent oxygen must be present for respirator use or unprotected breathing, since cartridge respirators do not supply oxygen. They are of no use in oxygen-deficient atmospheres.
- Air-purifying respirators provide less protection than SCBAs and other supplied air devices.
- Air-purifying respirators must be NIOSH-approved.
- Cartridges also must be NIOSH-approved and must be matched to the respirator according to the manufacturer.
- Cartridges must not be used past the expiration date.

- Air-purifying respirators will provide adequate protection only if they have good face seals. A qualitative fit test is required for each employee using these respirators.
- Upon experiencing any warning property such as difficulty breathing, eye irritation, headache, strong taste, or smell, the user must immediately leave the site. The Field Team Leader or Site Safety Officer may require that a user of an air-purifying respirator carry an emergency escape air mask.
- Users of air-purifying respirators (APR) must follow the manufacturer's instructions on the donning and use of the equipment.
- Constant air monitoring is required when using APR.

4.5.2 Protective Clothing. Protective clothing must be worn by all personnel at hazardous waste sites to prevent skin exposure and to minimize spread of contamination. All on-site operations require protective clothing. Protective clothing may include, but is not limited to chemical-resistant pants and jackets or disposable tyvek coveralls, steel toe and shank boots, protective gloves, hard hats, face shields, and chemical safety glasses or splash goggles for splash protection. Once adequate protective clothing is chosen, employees must also note that alertness is a significant safety factor. Since protective clothing is cumbersome, it hastens the onset of fatigue and heat exhaustion, it can decrease alertness, and it limits stay-time.

The following section describes Levels B, C, and D protective equipment which are appropriate for different tasks at the Harvey and Knott Drum Site.

4.5.2.1 Level B. Level B protection will be worn on-site during drum excavation, sampling and removal, and sediment dredging. Level B protection is used when the highest level of respiratory protection is judged to

be needed, but hazardous material exposure to the few unprotected areas of the body (i.e., the back of the neck) is unlikely with Level B protective clothing.

Level B protection consists of:

- Open-circuit pressure-demand SCBA
- Chemical protective overalls and long-sleeved jacket, or tyvek coveralls
- Gloves, inner, surgical type
- Gloves, outer, chemical protective
- Boots, chemical protective steel toe and shank
- Booties, chemical protective
- Butyl rubber apron.

During level B activities, the ambient air will be constantly monitored with the Organic Vapor Analyzer to determine the concentration of non-methane hydrocarbons. If non-methane hydrocarbons are consistently detected at low levels during a particular activity, the Site Safety Officer may choose to downgrade the operation to Level C.

4.5.2.2 Level C. Level C will be worn on-site during soil sampling. Level C protection is used when the required level of respiratory protections is known, or reasonably assumed to be, not greater than the level of protection afforded by air-purifying respirators. During Level C activities, the ambient air will be constantly monitored with the Organic Vapor Analyzer (OVA) to determine concentrations of non-methane hydrocarbons.

Level C protection consists of:

- Air-purifying respirator (previously described) with appropriate cartridges for organic vapors and dusts.
- Tyvek coveralls
- Boots/shoes, safety, with steel toe and shank
- Hard hat with optional faceshield
- Gloves, inner, surgical type
- Gloves, outer, chemical protective

4.5.2.3. Modified Level D. Modified Level D protection will be adequate during drilling of monitoring wells, sampling of groundwater, surface water and sediment, and non-soil disturbance activities such as geophysical surveys and grid layout. Level D is the basic work uniform and is used where significant exposure to hazardous materials is unlikely. Field personnel must not be permitted to work in civilian clothes. During drilling and sampling in Level D, the ambient air will be constantly monitored with an OVA to determine non-methane hydrocarbon concentrations. Should non-methane hydrocarbon concentrations consistently exceed background concentrations by 5 ppm, the work party will don air-purifying respirators.

Modified Level D protection consists of:

- Coveralls, cotton
- Boots/shoes, safety with steel toe and shank
- Safety glasses or chemical splash goggles*
- Hard hat with optional face shield
- Air-purifying respirator (readily available)

4.6 Basic Safety Practice

Field personnel will observe basic safety practices. The Health and Safety Director will be responsible for informing all field personnel of these practices. They will include, but not be limited to, the following:

- Observe the buddy system (work in pairs)
- Eating, drinking, and smoking are prohibited on-site
- Alcohol consumption is prohibited 24 hours prior to and 24 hours after being on a hazardous waste site
- Contact lenses will not be worn
- Avoid obvious contaminated objects/areas and do not sit or kneel on the ground.
- Do not climb over drums or obstacles
- Maintain contact with the Site Safety Officer

4.7 Site Safety Plans

A written site safety plan must be prepared prior to any field operation. The purpose of the form is to provide information about the site being investigated, an evaluation of the hazards present, and the plan developed to protect the field personnel and to prepare for emergency action. The plan is prepared by the Site Safety Officer and submitted to the Health and Safety Director for review and approval prior to the operation.

A standard form is used for the site safety plan. The site safety plan has five parts. The first part provides general information, including the name and location of the site and the objective(s) of the investigation. The second part provides information on the site and waste

characteristics, including a description of the facility and its history. The third part of the form is a hazard evaluation, which assesses the potential hazards to site inspection personnel, based on available information. The fourth part of the form is the work plan itself. It establishes the work area, the personal protection (level of protection and equipment) to be used, decontamination procedures, site entry procedures, the site entry team members and their responsibilities, and work limitations. The last part of the form provides emergency information, including emergency contacts and resources, and emergency routes to hospitals or other facilities.

The site safety plan must contain specific information describing the safety precautions and procedures to be used and justification for them. The hazard evaluation is a key part of the form, since the plan must be developed on the basis of the evaluation of known or potential hazards. If hazard information (e.g. possibility of explosive or toxic atmospheres) is not available, the site safety plan must include a procedure for obtaining the necessary information or for protecting personnel from unknown but potential hazards.

4.7.1 Reporting Incidents Involving Personal Injury or Exposure to Hazardous Materials. All incidents involving personal injury or exposure to potentially hazardous materials during any field activity must be documented and reported immediately to the Health and Safety Director. A standardized incident report is used for this purpose.

It is important to report all exposures and injuries, even though the incident is not considered serious or no adverse health effects or symptoms are apparent at the time. Often exposure to a toxic agent may have delayed or latent effects which may only be detected by specific diagnostic tests. Documenting an exposure may aid in identifying the cause of symptoms or changes in health status indicators (diagnostic blood tests or pulmonary function, for example) at a later time. Likewise, an injury, such as an eye injury caused by dust particles, may result in delayed damage to the eye.

4.7.2 Site-Specific Safety Plan. The site-specific safety plan for the Harvey and Knott Drum site is detailed in Table 4-1. The safety plan provides information on site/waste characterizations, hazards, work plan, investigation-derived material disposal plan, and emergency/ contingency information.

Level B protection will be adequate on-site during drum excavation, sampling and removal activities, and sediment dredging. If ambient air concentrations of non-methane hydrocarbon obtained with the OVA do not exceed 5-10 ppm above background, Level C may be worn. Level C is expected to be adequate on-site during soil sampling. Modified Level D is expected to be adequate during drilling of monitoring wells, sampling of groundwater, surface water and sediment, and non-soil disturbance activities such as geophysical surveys and grid layout. However, during drilling and sampling, the ambient air will be monitored constantly with the OVA to determine non-hydrocarbon concentrations. The work party will upgrade to level C if non-methane hydrocarbons consistently exceed 5 ppm above background.

Field investigations and sampling activities may result in the generation of contaminated materials. Proper sampling planning must include a management plan for the disposal of materials encountered during field investigations in order to minimize the impact to the environment and the risk to public health. The contaminated materials which may be generated include waste groundwater, decontamination rinse water, drained pond water, and used disposable clothing. Disposable clothing will be containerized for proper disposal. Decontamination rinse water, waste groundwater, and drained pond water will be collected and held for treatment at the groundwater treatment facility.

TABLE 4-1

SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: Harvey and Knott Drum Site PROJECT NO.:

LOCATION: New Castle County, Delaware

PREPARED BY: [to be filled in by Contractor] DATE:

APPROVED BY: [to be filled in by Contractor] DATE:

OBJECTIVE(S): Site remediation including cleaning the on-site drainage pond by collecting and treating surface water; removing and disposing of all surface drums, debris, waste piles and sludges; and installing a groundwater extraction/treatment/flushing program.

PROPOSED DATE(S) OF INVESTIGATION

BACKGROUND REVIEW: COMPLETE: X PRELIMINARY:

DOCUMENTATION/SUMMARY: OVERALL HAZARD: SERIOUS

MODERATE X

LOW

UNKNOWN

B. SITE/WASTE CHARACTERISTICS

WASTE TYPE(S): LIQUID X SOLID X SLUDGE X GAS

CHARACTERISTIC(S): CORROSIVE IGNITABLE RADIOACTIVE

VOLATILE X TOXIC X REACTIVE UNKNOWN OTHER (NAME):

FACILITY DESCRIPTION: Open dump and burning ground. Facility accepted sanitary, municipal and industrial wastes believed to be sludges, paint pigments, and solvents.

PERSONNEL PROTECTION

LEVEL OF PROTECTION: A B X C X D X

MODIFICATIONS: Level B will be required during drum excavation, sampling and removal activities, and sediment dredging. Level C will be required during on-site soil sampling. Level D will be adequate during drilling of monitoring wells, non-soil disturbance activities such as geophysical surveying, establishing grid system, and groundwater and surface water monitoring unless greater than 5 ppm non-methane hydrocarbons above background are detected by the organic vapor analyzer.

SURVEILLANCE EQUIPMENT AND MATERIALS: Organic Vapor Analyzer

DECONTAMINATION PROCEDURES: Washing boots and gloves with detergent and water; steam cleaning of drilling equipment between borings at separate established site. Field clean-up with Alconox, tap water rinse, deionized water rinse, methanol rinse, and air-dry or deionized water rinse.

SPECIAL EQUIPMENT, FACILITIES, OR PROCEDURES:

A treatment facility will be constructed and used to treat drained pond water and extracted groundwater.

SITE ENTRY PROCEDURES: All site personnel will enter site by the Access Road and sign in and out with security guard.

<u>TEAM MEMBER</u> (Major)	<u>RESPONSIBILITY</u>
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[to be inserted by Contractor]

WORK LIMITATIONS (time of day, etc.): Daylight hours

INVESTIGATION-DERIVED MATERIAL DISPOSAL: Disposable clothes will be drummed and properly disposed. Decontamination water, waste groundwater, drained pond waters, will be collected and held for treatment at the treatment facility. All removed material, such as automobile scraps, drums, and miscellaneous wastes, from the site will be disposed at a RCRA HHMF.

PRINCIPAL DISPOSAL METHOD (type and location): Waste were emptied onto ground surface, into excavated trenches or left in drums. Some drums were buried. Some wastes were either burned or allowed to seep into the soil.

UNUSUAL FEATURES (dike integrity, power lines, terrain, etc.) Site is surrounded by wetlands to the southwest, south and southeast as a result of beaver dams in bordering tributaries.

STATUS (active, inactive, unknown): Inactive

HISTORY (worker or non-worker injury; complaints from public; previous agency action): DNREC and EPA conducted a preliminary assessment in December 1981. Sampling results indicated the soils and groundwater were contaminated with heavy metals and organics including PCBs. EPA instituted immediate removal measures including installation of a security fence, over-packing leaking drums, and further sampling. Seventeen monitoring wells were installed by DNREC and EPA. Site was placed on NPL and an RI/FS was approved in April 1983. As an IRM, 43 drums containing PCBs have been overpacked and removed from the site, and 700 drums have been staged in a fenced area.

C. HAZARD EVALUATION

Preliminary and Remedial Investigation have revealed extensive contamination as a result of past waste disposal activities. Surface and subsurface soils and sediments are contaminated with organic compounds including PCBs, and inorganic trace elements (i.e., cadmium, chromium and lead). Shallow groundwater and surface water are contaminated with organic and inorganic substances. The potential for inhalation of volatilized contaminants and contaminated inhalable particulates, and dermal exposure to site contaminants exists during site remediation activities.

D. SITE SAFETY WORK PLAN

PERIMETER ESTABLISHMENT: MAP/SKETCH ATTACHED: Yes SITE SECURED? Yes

PERIMETER IDENTIFIED: No ZONE(S) OF CONTAMINATION IDENTIFIED? Yes
Will be further identified after 1st round of soil sampling.

EXHIBIT 5

PROJECT SCHEDULE

This schedule may require alteration to reflect time of year/weather.

Time Frame in Months From Entry of Consent Decree

TASK	ESTIMATED COMPLETION
1. Site Monitoring	63
2. Develop Target cleanup levels	17
3. Wetlands Assessment	12
	6
4. Surface Cleanup [1]	12
5. Subsurface Cleanup [2]	15
6. Soil Grid	18
7. Interim Report	
8. Design of Extraction/ Treatment (ET&R) System	31
9. Construction	46
10. Pond Cleanup	108[4]
11. System Operation	--
12. Monitoring Evaluation	108[4]
13. Final cleanup levels	78
14. Post-Closure Activities (Operation & Maintenance)	--

NOTES:

[1] Based upon number/distribution of drums estimated in NUS/RI/FS:

500 Empty/Crushed
200 Characterized
300 Uncharacterized
150 CY Waste Piles and Debris

[2] Based upon an estimated 300 buried drums as follows:

100 in DOT Transportation Condition
100 Requiring Repackaging
100 Empty

[3] Requires USEPA approval of Target ACLs in 60 days.

[4] Based on 60-month operational period.

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E. EMERGENCY INFORMATION

LOCAL RESOURCES

AMBULANCE: 911
HOSPITAL EMERGENCY ROOM: Christiana Hospital 733-1000
POISON CONTROL CENTER: Christiana Hospital 733-1000
POLICE: New Castle County Police 571-7930
FIRE DEPARTMENT: For Emergencies 911
AIRPORT: Wilmington Airport
EXPLOSIVES UNIT: N/A

SITE RESOURCES

WATER SUPPLY: (to be inserted by Contractor)
TELEPHONE: (to be inserted by Contractor)
RADIO: (to be inserted by Contractor)
OTHER:

EMERGENCY CONTACTS

CORPORATE SAFETY DIRECTOR: (to be inserted by Contractor)
OFFICE SAFETY DIRECTOR: (to be inserted by Contractor)
PROJECT MANAGER: (to be inserted by Contractor)
CLIENT CONTACT: (to be inserted by Contractor)
EPA SITE MANAGER: (to be inserted by Contractor)
STATE SITE MANAGER: (to be inserted by Contractor)
CHEMTREC (CHEMICAL
EMERGENCIES - 24 HOURS) (to be inserted by Contractor)

F. EMERGENCY ROUTES

(give road or other directions; attach map)

HOSPITAL: Follow 301N to Route 4. Go East on Route 4 to Christiana Hospital.

OTHER:

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5.0 SCOPE OF WORK:
HARVEY AND KNOTT DRUM SITE
SELECTED REMEDIAL ALTERNATIVE

The following section describes, in detail, the tasks and subtasks considered necessary to properly design, construct and operate the selected remediation at the Harvey and Knott Drum Site. These tasks have been organized in accordance with the discrete work elements that compose the remediation. The sequence of tasks discussed in this work plan will allow a rational and cost-effective implementation of the remediation. Table 5-1 is a list of tasks and subtasks addressed in this scope of work.

5.1 - TASK 1: SITE MONITORING PROGRAM

5.1.1 Introduction

The purpose of this task is to initiate and provide means for conducting a site monitoring program designed to provide information on the extent of contaminant migration as a function of time. The monitoring program developed by EPA consists of 28 sample points, 19 of which will monitor groundwater and 9 of which will monitor surface water. Analyses will be performed for EPA HSL compounds and will include RCRA groundwater monitoring parameters, as well. These analytical parameters are listed in Chapter 3. The analysis of the results of the monitoring program are intended to provide information for ongoing operation of the remedial action and for the monitoring evaluation identified in Task 11, Section 5.11. An assessment of the adequacy of the number of monitoring wells will be made during Task 6, Data Evaluation and Interim Report.

5.1.2 Monitor Well Installation

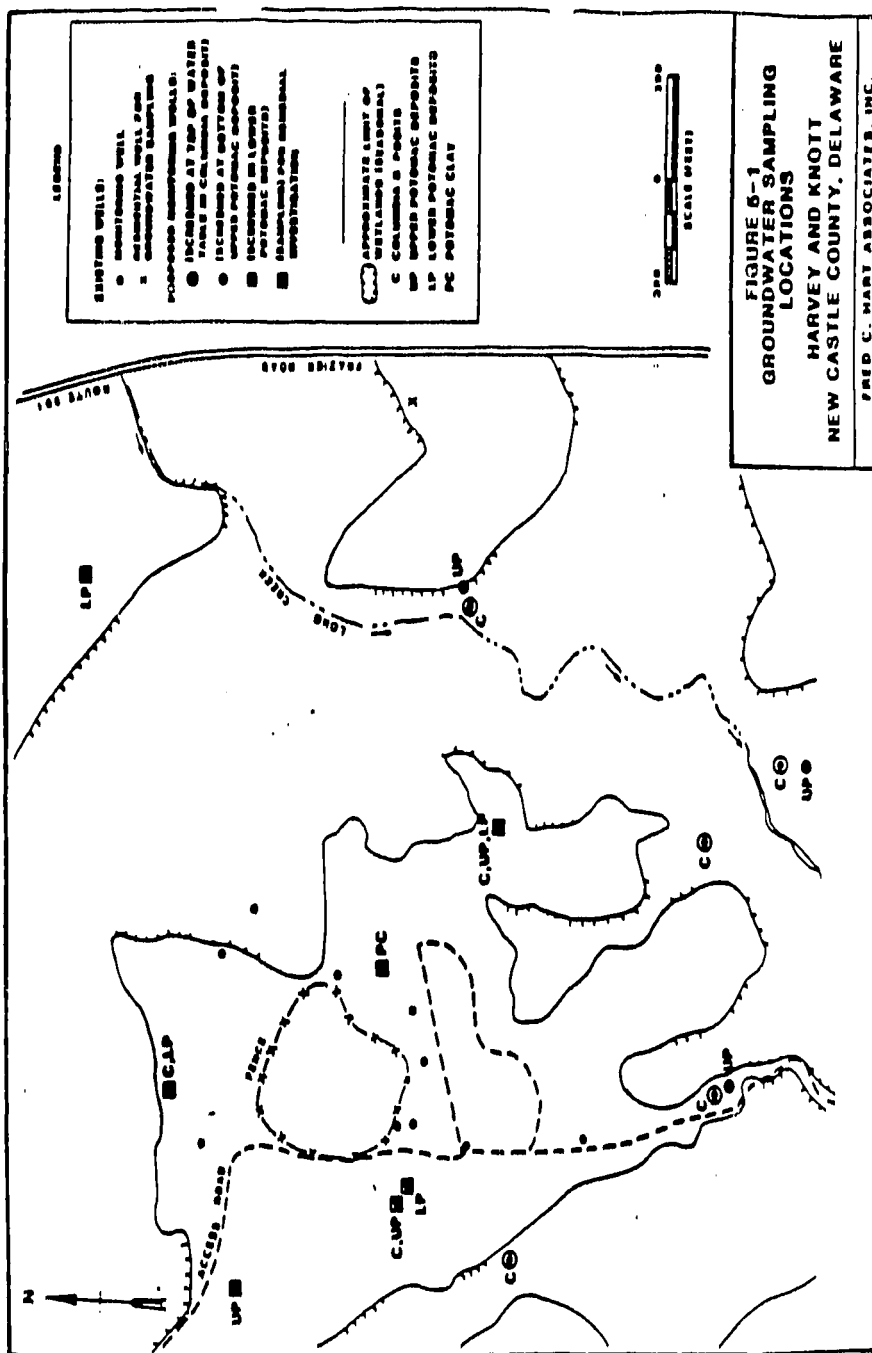
5.1.2.1 Monitoring Locations. Locations of the 19 wells to be utilized as groundwater sampling points are provided in Figure 5-1. Nine of these nineteen wells will be newly installed for the site monitoring program. (Construction details are provided in Section 5.1.4.).

TABLE 5-1
List of Tasks Involved with
Implementing the Selected Remedial
Alternative for the Harvey and Knott
Drum Site Cleanup

Task	Sub Task	Title
1		SITE MONITORING
	1.1	Monitoring Well Installation
	1.2	Sampling Point Elevation Survey
	1.3	Sample Collection
2		WETLANDS ASSESSMENT
	2.1	Definition of Boundary
	2.2	HQ Testing
	2.3	GH Testing
	2.4	Resource Inventory
	2.5	Bioaccumulation
	2.6	Bioassay
3		SURFACE CLEANUP
	3.1	Drum Removal
	3.2	Waste Pile Removal
	3.3	Debris Removal
4		SUBSURFACE CLEANUP
	4.1	Geophysical Survey
	4.2	Subsurface Drum Removal
5		SOIL GRID SAMPLING
	5.1	Establish Grid
	5.2	Conduct Sampling (First Round)
	5.3	Data Reduction and Analysis
6		DATA EVALUATION AND INTERIM REPORT
7		DESIGN OF GROUNDWATER EXTRACTION SYSTEM
	7.1	Development of Extraction System Design Criteria
	7.2	Groundwater Extraction System Design
	7.3	Field Tests

TABLE 5-1 (CONTINUED)
List of Tasks Involved with
Implementing the Selected Remedial
Alternative for the Harvey and Knott
Drum Site Cleanup

Task	Sub Task	Title
8		DESIGN OF GROUNDWATER TREATMENT AND SOIL FLUSHING SYSTEM
	8.1	Groundwater Treatability Studies
	8.2	Soil Flushing Treatability Studies
	8.3	Preliminary Design of Groundwater Treatment and Soil Flushing System
	8.4	Final Design
9		CONSTRUCTION OF THE GROUNDWATER EXTRACTION/TREATMENT AND/OR SOIL FLUSHING SYSTEM
10		POND CLEANUP
	10.1	Drain Pond and Treat Water
	10.2	Dredge Pond Sediments and Dispose
	10.3	Backfill Pond Area
	10.4	Evaluation and Implementation of Additional Pond Area Remediations
11		OPERATING GUIDELINES/REQUIRED MAINTENANCE
	11.1	Maintenance of Monitoring Systems
	11.2	Maintenance of Soil Cover/Cap
	11.3	Operation and Maintenance of GM Treatment
12		MONITORING EVALUATION
	12.1	Groundwater and Surface Water Monitoring
	12.2	Post Flushing Soil Grid Sampling
13		FINAL ACLs
14		POST CLOSURE ACTIVITIES



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In addition to the 9 new wells, 10 of the remedial investigation monitoring wells have been selected as part of the monitoring system. Groundwater samples from monitoring wells 109S, 105SA, 105D, 104D, 101D, 108SA, and 108SB will be used to determine the extent of migration and distribution of contaminants in the UHZ and the sand lens (101D) in the middle of the Potomac clay. Wells 107D, 108D, and 109D will be monitored to identify any contaminants that may migrate into the LHZ.

5.1.2.2 Monitoring Well Construction. Nine new monitoring wells will be installed as part of the long-term monitoring program. All of these wells will be located near Long Creek and the wetlands. Eight downgradient wells will be constructed in the Columbia and Upper Potomac deposits and one will be placed in the Lower Potomac deposits. Groundwater monitoring of selected existing and proposed wells will provide data to determine the following:

- The long-term effectiveness of groundwater treatment and soil flushing.
- The characteristics of upgradient background water over time in the Columbia, Upper Potomac, and Lower Potomac aquifers.
- The extent and character of contaminants that may discharge from the Columbia deposits into the surface waters.
- The potential for contaminant migration beneath surface drainage elevations to downgradient potable water users (in Upper and Lower Potomac aquifers).

To monitor the migration of contamination, three cluster sites, with two wells being constructed at each site, and three single well sites are proposed. The cluster wells will monitor the Columbia and Upper Potomac deposits downgradient of the site and will provide data to establish the recharge/discharge relationship with the adjacent stream and wetlands. The three single well sites will monitor the Columbia formation and downgradient in the Lower Potomac formation. Groundwater sample analyses from

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these wells will provide data to assess the extent and migration of contaminants.

Monitoring well installation will proceed as follows. Boreholes will be advanced to depth utilizing the mud rotary drilling method. Only pure bentonite drilling fluid shall be used. All drilling apparatus will be properly decontaminated between borings in order to prevent cross-contamination. This "decon" process will consist of steam cleaning of all apparatus in order to remove bulk solids. Split spoon samples will be collected continuously while drilling boreholes for wells to be screened in the UHZ. Split spoons will be collected every five feet while drilling boreholes for LHZ wells. Split spoon samplers will be decontaminated between samples by washing in a mild soap solution and rinsing with methanol followed by distilled water. Depth of completion of the borehole will be based on field conditions at the discretion of the on-site coordinator.

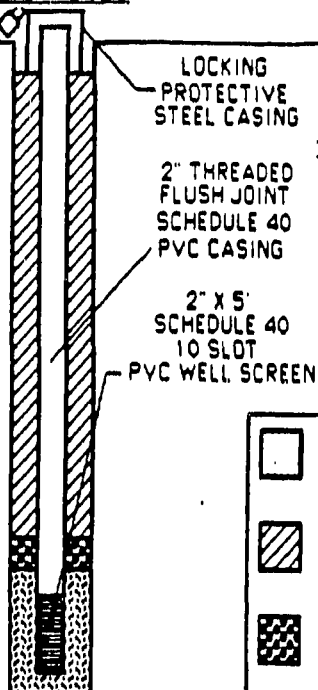
UHZ Wells. Boreholes in which UHZ wells will be installed will be completed to depth in the formation desired to be screened as determined by the field geologist. The well screen and riser pipe will then be installed in the open borehole, and the annulus gravel packed, sealed, and grouted to the surface. The gravel pack (Morrie No. 2 Gravel) shall extend to a height of 2 feet above the top of the well screen. Overlying the gravel pack will be a 2 foot layer of bentonite pellets, overlain by a cement/bentonite grout. A locking protective casing and cement collar will be provided at the surface. Well screen and riser shall be constructed of 2.0" diameter schedule 40 PVC of the flush joint variety. A 0.010-inch slotted well screen 5 feet in length will be used. A typical well construction diagram for the UHZ wells is provided as Figure 5-2.

LHZ Wells. The borehole in which the LHZ well will be installed will be drilled to upper interface of the Potomac clay unit with an eight inch (or larger) roller-bit. An eight-inch diameter temporary steel casing

HARVEY AND KNOTT SITE

UPPER HYDRAULIC ZONE WELL CONSTRUCTION DIAGRAM

UHZ WELLS



-  CEMENT GROUT
-  GRANULAR BENTONITE SLURRY
-  BENTONITE PELLET LAYER
-  GRAVEL PACK

FIGURE 5-2

UHZ WELL CONSTRUCTION DIAGRAM

Prepared by Fred C Hart Associates Inc.

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will then be emplaced into the borehole, and driven or pushed hydraulically several feet into the clay unit. This will serve to case off the upper aquifer with relative assurance of a good seal at the clay interface. Drilling fluid remaining in the borehole will be floated from the inside of the casing with fresh water, and new drilling fluid introduced to continue the boring. Drilling will then resume utilizing a 7-3/4 inch (approximate) roller-bit to the desired depth. Monitoring well installation will then follow the same procedure utilized in the installation of the UHZ wells with the exception that screen and riser pipe will be of a 4-inch diameter rather than 2-inch. A typical well construction diagram for the LHZ wells is provided as Figure 5-3.

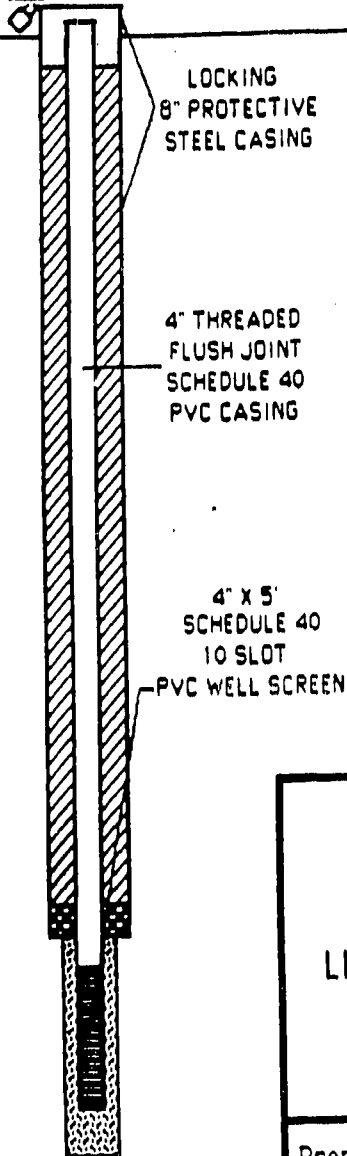
5.1.2.3 Well Development. Wells will be developed upon completion by blowing with air and/or flushing with water until a clear sample is obtained. This will serve to disperse formation fines adjacent to the well screen and assure a good flow of water into the well.

5.1.3 Sampling Points Elevation Survey

Groundwater elevation information obtained during sampling will be used to construct contour maps of the potentiometric surface. Surface water sampling location elevations will also be obtained in order to determine the discharge/recharge relationship with the groundwater system. Groundwater elevations will be collected as previously mentioned from a point of known elevation on the well casing. Surface water elevations will involve the construction of elevation gauges at each location. A length of 2-inch galvanized steel casing will be seated firmly into the sediment bottom. A "tee" fitting attached to the casing below water level will allow charging of the gauge from the surface water body. The top of the gauge will be surveyed to determine the elevation relative to mean sea level using a technique similar to that used for the monitoring wells. The elevation survey of the gauges will be tied into the monitoring well elevations to assure accuracy.

HARVEY AND KNOTT SITE LOWER HYDRAULIC ZONE WELL CONSTRUCTION DIAGRAM

LHZ WELLS



-  CEMENT GROUT
-  GRANULAR BENTON SLURRY
-  BENTONITE PELLET LAYER
-  GRAVEL PACK

FIGURE 5-3

LHZ WELL CONSTRUCTION
DIAGRAM

Prepared by Fred C Hart Associates Inc

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5.1.4.1 Monitoring Frequency. Groundwater and surface water sampling and analysis will be performed quarterly for the first year and semi-annually for the second through fifth years.

The need for continued monitoring will be determine in the following manner. At the end of the fifth year, an evaluation of the monitoring program will be made to include parameters, frequency and number of samples. Re-evaluations will be performed at five-year intervals as needed to determine the need for continuing monitoring up to a maximum of 30 years.

5.1.4.2 Sampling. Each round of groundwater and surface water sample collection will be conducted within as short a time frame as possible to assure uniformity of sampling conditions. Sample collection techniques follow.

Groundwater. Groundwater samples will be collected at the locations previously mentioned. The first step in the collection is to measure the depth from the top of well casing to the top of the water in order to determine the volume of water present. The field personnel will use either the chalked tape technique or an electrical water level indicator. Measurements will be made to ± 0.01 feet. The measuring device will be washed with distilled water between wells to avoid cross-contamination of wells. All measurements will be recorded in the field log book.

The next step is to evacuate the standing water in the well so that a representative sample of the groundwater can be obtained. A volume of water equal to three to five times the standing water volume will be removed through the use of a conventional suction pump or submersible pump. If the well goes dry during pumping, the pump will be turned off and the well will be allowed to recover. Monitoring wells that recover very slowly will be evacuated with a bailer.

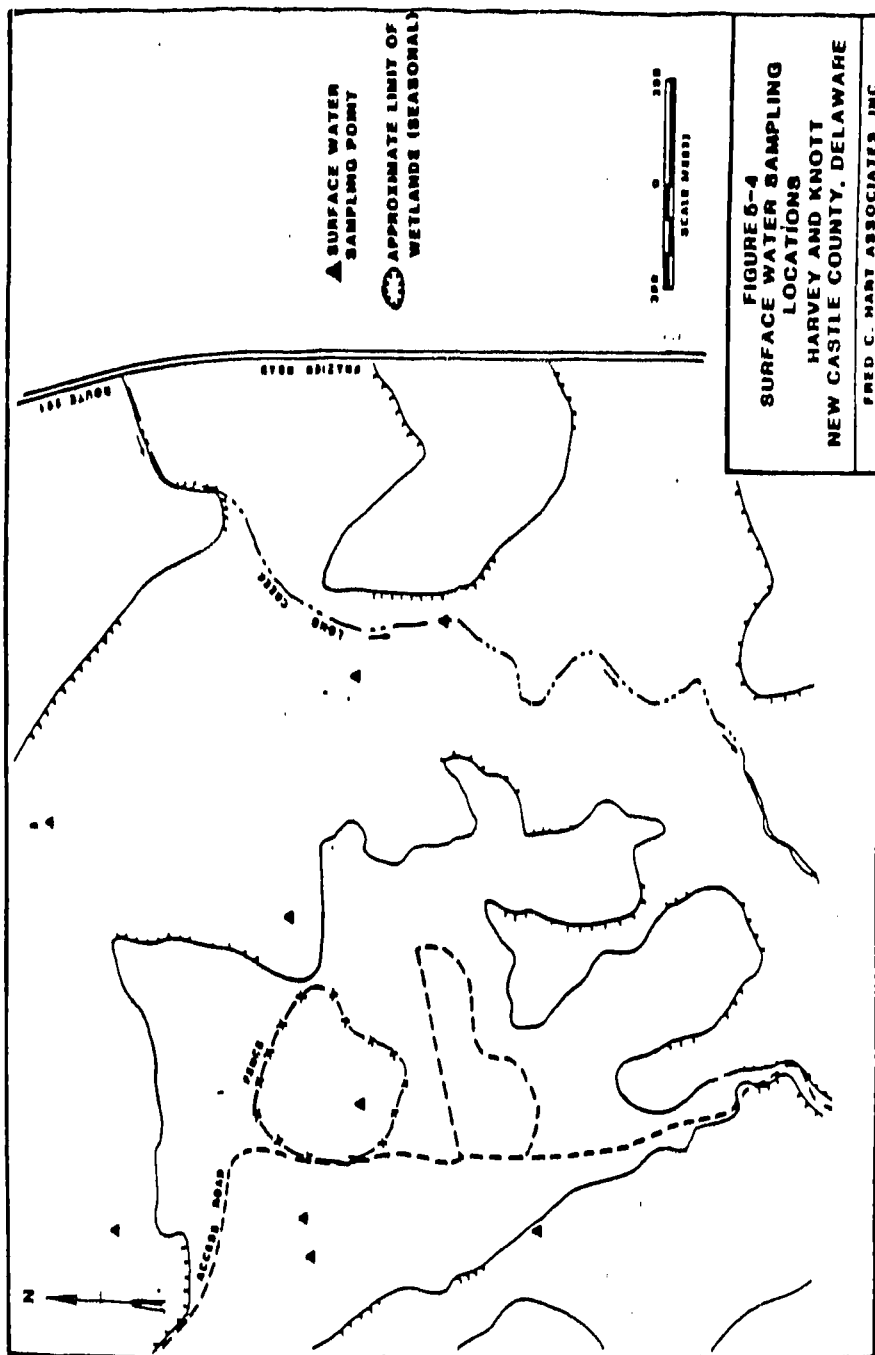
Once the well is adequately evacuated, a groundwater sample will be collected by lowering a stainless steel bailer into the well to obtain the sample. A bailer will be provided for each of the monitoring wells. Prior to sampling, each bailer will be prepared by washing with soap and water followed by a methanol and distilled water rinse. A new nylon cord will be used for each bailer in collecting the sample. Samples will be poured directly from the bailer into sample jars. All samples for volatile organic analysis will be placed in 40 ml glass vials fitted with a threaded cap and teflon-coated septa. The samples will then be immediately placed in a temperature-controlled chest (4°C) and delivered to the laboratory.

Accurate records will be kept during all sample collection procedures, and will include the following:

1. Date, time and personnel present.
2. Sample location and number.
3. Depth to water measurement prior to sampling.
4. The volume of water removed during well evacuation.

Surface Water. The nine surface water sampling locations are shown in Figure 5-4. The proposed locations will serve to characterize potential contaminant migration via surface runoff to wetlands and stream receptors. Surface water samples will be collected from the predetermined locations as a grab sample with the laboratory glassware. All samples for volatile organic analysis will be placed in 40 ml glass vials fitted with a threaded cap and teflon-coated septa. The samples will then be immediately placed in a temperature-controlled chest (4°C) and delivered to the laboratory.

Accurate records will be kept during all sample collection procedures, and will include the following:



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1. Date, time and personnel present.
2. Sample location and number.
3. Visual observations of surface water quality.

5.2 - TASK 2: ENVIRONMENTAL ASSESSMENT OF WETLANDS AND SURFACE WATERS

Executive Order 11990, Protection of Wetlands (1977), requires Federal Agencies to take action to minimize the destruction, loss and degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The order emphasizes the importance of avoiding undertaking new construction (or, in this case, actions which would cause destruction of the wetlands such as soil removal, landfilling or groundwater pumping) in wetlands unless there is no practicable alternative. If there is no practicable alternative, harm to the wetlands must be minimized.

EPA policy does not require an environmental impact statement (EIS) for remedial actions if a functional alternative, such as an environmental assessment, is conducted for the wetlands.

An environmental assessment of the Harvey and Knott Drum Site wetlands should include an assessment of Long Creek and its tributaries. Long Creek could potentially be affected by the pollutants in the disposal site and its waters feed directly into the wetlands.

The Environmental Assessment will utilize the Wetlands Assessment guidelines provided by EPA Region III, as listed in the RI/FS conducted by NUS Corporation (August 1985). These guidelines require that the assessment will consist of a description of the proposed remedial action, a discussion of its effect on the wetlands system, and measures to minimize potential harm to the wetlands system, if there are no practicable alternatives to locating in or affecting the wetlands. The specific scope of

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work of the Environmental Assessment is presented in the following sections.

5.2.1 Definition of Wetland Boundaries

Wetland boundaries have been identified by the US Army Corps of Engineers as part of the functional assessment. These data, as provided by USEPA Region III, will be utilized as the definition of the wetland boundaries of the site.

5.2.2 Water Quality Testing

Four water quality sampling stations will be established in the wetlands system. Two of the sampling stations will be located in Long Creek (one upstream of the disposal site and one downstream), and two will be located in the wetlands (one near the northern boundary and one near the beaver dam). At each of the four stations, a surface water and sediment sample will be collected. All samples will then be analyzed for HSL organics and HSL inorganics. In addition, the water samples will be analyzed for dissolved oxygen and biochemical oxygen demand.

5.2.3 Groundwater Sampling Wells

Groundwater sampling will be taken from a minimum of four wells on the site. These sample wells will be chosen from the system of wells which will be installed during the full groundwater monitoring program. For the purposes of the wetlands assessment, two wells will be located upgradient of the wetlands system and two will be located downgradient of the first set, in the wetlands. The groundwater samples will be analyzed for HSL compounds and RCRA groundwater parameters.

5.2.4 Floral and Faunal Resource Inventory

An inventory of the vegetative communities will be conducted in and around the wetlands. The existing flora will be identified and cataloged

as to species and location on-site, including any rare or endangered species.

An inventory of the fauna will also be conducted on the site, including any rare or endangered species. Small mammals will be collected with pitfall traps and live-traps. Larger mammals will be identified by field observation. Frogs, salamanders and turtles, etc., will be collected by hand and identified by field sightings. All fauna will be cataloged as to species and estimated distribution throughout the site.

5.2.5 Bioaccumulation Assay

To ascertain if any major toxic pollutants found on the site are entering the food chain, bioaccumulation assays will be conducted on animals captured on the site. A maximum of five species of animals will be chosen to represent a range of trophic levels (e.g., from detritus feeders and herbivores to carnivores).

EPA Region III guidelines on sampling and tissue analysis (Smith, 1985) will be followed. A composite of five individuals of each species will be analyzed for PCBs, lead, chromium, arsenic, cadmium and mercury. Replicates will be conducted for two of the species. Individuals will be adults of the same species and of similar size. To document the possible effects of pollutants on the aquatic environment, Smith (1985) recommends that the whole organism be analyzed.

Vegetation from the wetlands and surrounding area will be analyzed in a similar manner to the animal tissue to determine if there is assimilation of any pollutants.

An examination of the above assay results will be conducted to determine possible food-chain links, including possible danger of ingestion or use of area by game species or recreational use of area.

5.2.6 Bioassay

Fathead minnow (pimephales promelas) will be exposed to six concentrations of the extracted groundwater to determine the LC_{50} . A mobile lab will be brought to the site and hooked up to one of the groundwater wells with the highest concentration of pollutants. Samples will be drawn from the well and continuously pumped through the test tanks for 96 hours. The analysis will consist of six concentrations and one control, each will be done in duplicate for a total of 14 test tanks. The analysis methodology will be from Standard Methods, Section 810.

5.3 - TASK 3: SURFACE CLEANUP

5.3.1 Introduction

The surface cleanup at the Harvey and Knott Drum site will include the removal of all crushed and intact drums, drum fragments, debris, metal, waste piles and sludges from the site.

5.3.2 Drum Removal

There are three classification of surface drums present at the site.

1. Empty drums. These drums (approximately 500) are either intact or crushed and are staged within the fenced area of the site.
2. Characterized drums containing wastes. These drums (approximately 200) are partially or entirely full of wastes and are staged separately from the empty drums within the fenced area.
3. Uncharacterized drums. The central zone of the fenced area contains a number of drums which have not yet been staged or characterized.

The following sections identify the procedures which will be utilized to remove all drums from the surface of the site.

5.3.2.1 Empty Drums. Crushed drums in the staging area in the northern portion of the site will be placed into a roll-off container or lined dump truck and transported to a RCRA HMMF. Crushed drums may be placed into the roll-off by hand or by using a front-end loader. Empty drums in the staging area will be crushed prior to loading into the roll-off container.

5.3.2.2 Characterized Drums Containing Wastes. Prior to the movement or sampling of any of the staged drums, the condition and integrity of the containers will be assessed to determine if any drums are leaking, in danger of rupturing or leaking, or are otherwise unsuitable for transport. Any such drums will be immediately overpacked so as to allow for safe sampling, handling and transport.

All staged drums will then be labeled, recorded in a drum log and categorized into three (3) discrete groups prior to sampling: solids, liquids, and sludges. This preliminary categorization will allow for better preparation for sampling.

Wastes will then be sampled and analyzed for compatibility so that the individual wastes can be bulked together, if appropriate, prior to transport and disposal. If samples cannot be obtained through existing holes and openings, the drums will be opened with the use of non-sparking hand tools (brass hand punch and mallet). Depending upon the situation and available equipment, a brass barrel punch attached to a backhoe may be used. Samples will then be collected by using hollow glass tubes or stainless steel trowels. Field data and visual characteristics will be recorded in the field drum log (i.e., appearance, viscosity, multi-phase, solid, liquid, etc.). Rudimentary compatibility testing will then be performed on the samples so that no incompatibles are mixed together during bulking. Following the results of the initial compatibility analyses, compatible wastes will be bulked together (solids into drums and/or

roll-off containers; liquids and sludges into drums and/or tanks) and composite samples will be taken from each bulk load for detailed analysis in order to determine the characteristics of the waste and appropriate treatment and disposal alternatives. These alternatives will be based upon the waste characteristics, volume, and proximity to treatment and disposal facilities. Sample parameters may include, but will not be limited to, percent solids, specific gravity, flash point, heavy metals, PCBs, and a laboratory scan for halogenated and non-halogenated solvents.

Following waste bulking, empty drums will be crushed and placed into a roll-off container for disposal.

5.3.2.3 Uncharacterized Drums. A large number of uncharacterized drums is located in the central section of the fenced-in area of the Harvey and Knott site. These drums will be characterized, restaged, and sampled, and following analysis their contents will be bulked for treatment and/or disposal if appropriate.

The initial phase of this work effort calls for the investigation of the condition and contents of the drum prior to restaging within the fenced area. Because these drums have not been previously characterized, field personnel will consider four options for handling these drums: 1) drums which are intact and determined to be structurally sound for handling will be moved to the staging area "as-is" using a barrel grapple; 2) drums which are visibly damaged or leaking will be placed into an overpack drum (85 gallon) by the barrel grapple, and the overpack will then be moved to the staging area; 3) if the drums are deteriorated to the point where on an attempt to move the drum will cause a rupture or a leak, a portable transfer pump will be used to transfer the material to a new drum. If the material is a solid, it will be transferred to a new DOT-approved container by an appropriate technique, and, 4) drums which are determined to be RCRA-empty (less than 1" of residue) will be crushed by the backhoe or grapple and transferred to the crush pile. Drum fragments will also be transferred to the crush pile. The on-scene coordinator will

be responsible for making field decisions concerning movement of drums, over-packing, transfer of contents and drum crushing.

The staging area may be located in either of two areas within the fenced-in portion of the site: the existing drum staging area or a new staging area located in the central portion of the site. The staging area will be cleared of all debris and uncharacterized drums and lined with sheet polyethylene to avoid new soil contamination from spilled wastes. A soil berm will be constructed around the staging area to control run-on/run-off and act as a containment barrier. Drums will be staged using the grappler or backhoe in rows of two to accommodate sampling.

Sampling, recording and analytical procedures for the staged drums will follow those procedures described above for the characterized drums. Compatibility testing will be performed to determine acceptable bulking procedures for ease of selecting treatment and/or disposal options.

Spill residues and contaminated soils resulting from leaks, spills or ruptures during drum handling will be cleaned up and placed in DOT-approved containers within the staging area. These wastes will be disposed of along with the staged drums.

All activities at the Harvey and Knott site relating to the handling, sampling, staging and bulking of drums will be under the supervision of the on-site coordinator. The on-site coordinator will be charged with making all field decisions concerning site operations.

5.3.3 Waste Piles

Several soil/waste piles are located within the fenced-in portion of the Harvey and Knott site. Waste piles will be sampled in accordance with the procedures set forth by USEPA in SH-846. Following analysis to determine disposal options, the waste piles will be transferred using a backhoe

or loader to roll-off containers or suitably lined dump trucks for disposal at an appropriate facility or considered for inclusion as on-site fill material.

5.3.4 Debris

Debris found at the Harvey and Knott site is composed of drum fragments, metal, wood and other rubbish. Drum fragments and metal will be transferred to the crushed drum pile within the fenced portion of the site. Following completion of surface drum removal activities these crushed drums and fragments will be transported off-site for disposal. Non-metal debris may be placed in a temporary stockpile prior to transport off-site, or placed on an existing waste pile at the discretion of the on-site coordinator.

5.4. - TASK 4: SUBSURFACE CLEANUP

5.4.1 Introduction

It is suspected that buried drums are present at the site. However, because of the extensive surface drums and other debris, the type of survey required to detect the presence of underground metal was not conducted during the Remedial Investigation. Therefore, upon completion of the surface drum and debris cleanup, the remedial action requires that geophysical surveys be conducted to determine if buried metal is present. If buried objects are detected then excavation will be performed to identify the objects and if they are determined to be hazardous, they will be properly handled and disposed.

5.4.2 Magnetometry Survey

Geophysical surveys are proposed to determine if additional metal drums and waste containers are buried at the site. The surveys will be performed after completion of the pond and surface debris cleanup and the

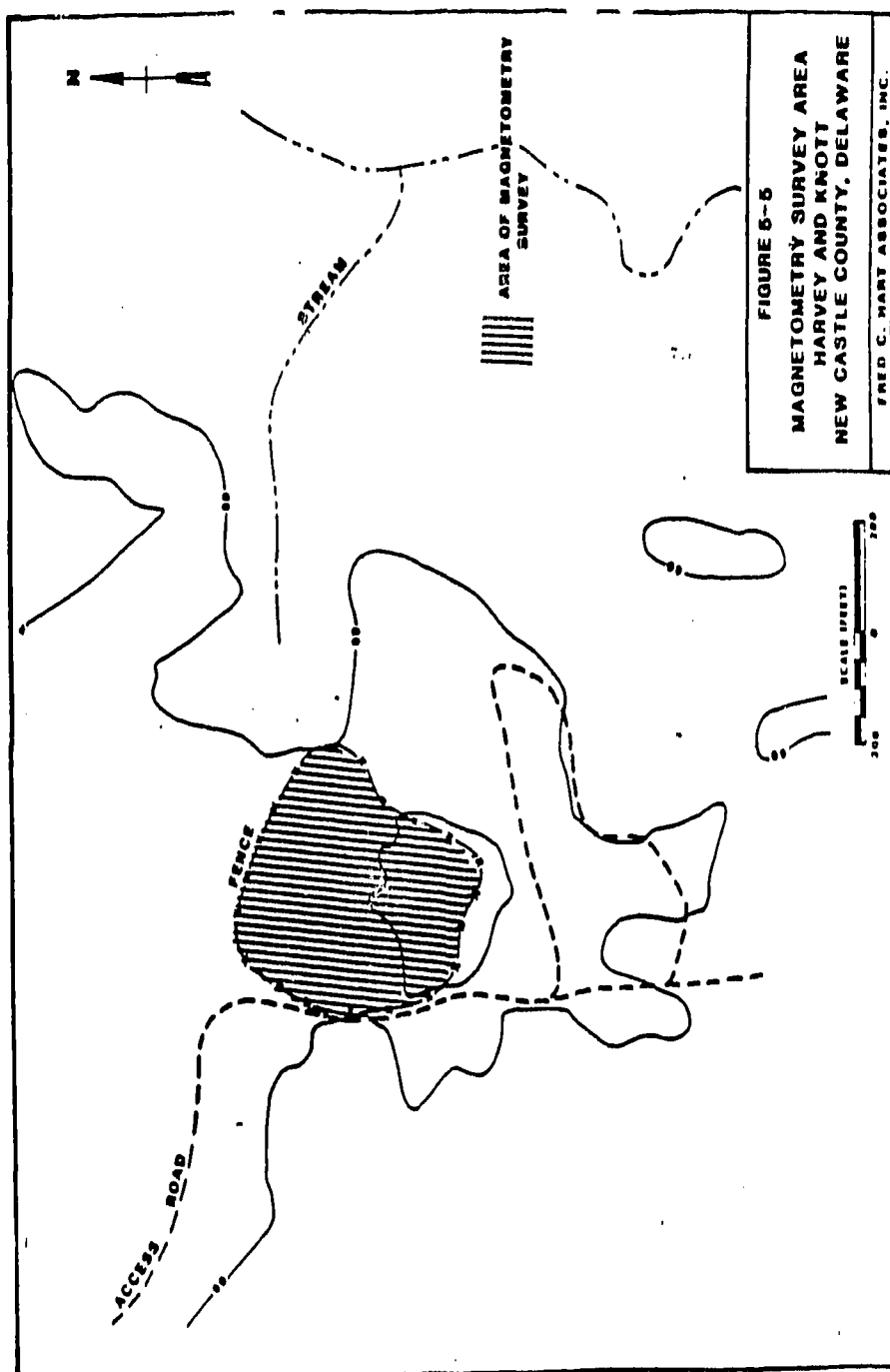
removal of surface drums. The existing metal fence will also require removal prior to any geophysical surveys.

The area of the survey will be, at a minimum, the contaminated soil area defined in Figure 5-5. This area may be expanded depending upon results of the study. A grid system, specifically developed for the geophysical survey, will be established in this area. Development of this grid system will be coordinated with establishment of the larger grid system required for the soil sampling program (Section 5.5).

A magnetic survey detects minute changes in the earth's magnetic field caused by the presence of ferromagnetic material. The instrument to be employed for this survey will be a Geometric G-846 Unimag II Proton precession magnetometer or equivalent. Also, a base station magnetometer is required to provide background magnetic field measures for calibration and data reduction. If the quality of data permits, the relationships between shape, depth and mass of a ferromagnetic target will be used to estimate the number and depths of drums.

Data reduction and analysis is required with magnetometry before target locations can be mapped. Because the magnetometer can be adversely affected by interference from surface metal, it is essential that the surface debris be cleaned before this survey.

The instrument operator will calibrate the instrument for the earth's total magnetic field. A portable magnetometer and a base stratum magnetometer will be required for accurate and continuous calibration. A location known or thought to be free from local disturbance will be chosen as a reference point for measurement of diurnal variations in the earth's magnetic field. Frequent measurements will be made at the reference point to adjust for any changes in the earth's magnetic field during the course of the survey. Traverses will be made over the study area at a spacing of 20 feet. Magnetic measurements will be corrected for any diurnal change detected, plotted and contoured.



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5.4.3 Subsurface Drum Removal

Following the completion and interpretation of the magnetometry studies, areas shown to contain buried drums will be excavated to remove any drums and contaminated soils.

Results of the magnetometry studies will be interpreted and the grid system developed for this study will be retained for use in the excavation phase. The nodes of the grid system where significant changes in the magnetic field were detected will be used as reference points for excavation. These points will be identified by the contractor performing the magnetometry study.

Excavations will be made using a backhoe. The excavations will be advanced to a depth which is sufficient to identify and remove all drums at each node where drum burial is suspected. The backhoe will be utilized to remove as much soil as possible to allow easy access to the drum by a barrel grapppler. The actual removal of the drums from the excavation will be under the direction of the on-site coordinator. The on-site coordinator will determine if the drum may be cleanly removed with the barrel grapppler or whether it should be taken out in the bucket of the backhoe along with soils. In any situation where the potential exists for drum rupture or leakage, the drum will be removed by the backhoe bucket.

Soils removed during the excavation will be temporarily placed adjacent to the excavation so as not to block access to any portion of the excavation. Once all drums have been removed from the excavation, any soils which are not visibly contaminated will be placed back into the hole.

Following removal from the hole, the excavated drums will be placed in a staging area within the fenced portion of the site. At the discretion of the on-site coordinator, this staging area may be the same as the one used for the surface removal operations or may be a new area. The staging area will be lined with polyethylene to contain spillage or leakage and

the area will be bermed with soil to control run-on and run-off and act as a secondary containment barrier. Placement of the drums within this staging area will be in rows of two to facilitate inspection and sampling.

As the drums are removed from the soil, site personnel, in conjunction with the on-site coordinator, will characterize and determine the condition and integrity of each drum and record this data into the drum log. Four options for handling these drums will be considered: (1) drums which appear structurally intact and suitable for further handling will be left as-is and labeled; (2) drums which are visibly damaged or leaking will be placed into an overpack drum (85 gallons) by the barrel grapppler; (3) if the drums are deteriorated to the point where any further attempt to move or handle the drum will cause a rupture or a leak, a portable transfer pump will be used to transfer the material to a new drum. If the material is a solid, it will be transferred to a new DOT-approved container by another appropriate technique; and (4) drums which are determined to be RCRA-empty (less than 1 inch of residue) will be crushed by the backhoe or grapppler and transferred to a crush pile. This pile will be in an area adjacent to the staging area. The exact location will depend upon the areas of excavation and will be determined by the on-site coordinator. The on-scene coordinator will be responsible for making all field decisions concerning movement of drums, over-packing, transfer of contents and drum crushing.

All of the excavated staged drums will then be sampled and analyzed for compatibility so that the individual wastes can be bulked together with other compatible wastes prior to transport and disposal.

If samples cannot be obtained through existing holes and openings, the drums will be opened with the use of non-sparking hand tools (brass hand punch and mallet). Depending upon the situation and available equipment, a brass barrel punch attached to a backhoe may be used. Samples will then be collected by using hollow glass tubes or stainless steel trowels. Field data and visual characteristics will be recorded on the field drum log (i.e., appearance, viscosity, multi-phase, solid, liquid, etc.).

Preliminary compatibility testing will then be performed so that no incompatibles are mixed together. Following the results of the initial compatibility analyses, compatible wastes will be bulked together (solids into drums and/or roll-off containers; liquids and sludges into drums and/or tanks) and composite samples will be taken from each bulk load for detailed analysis in order to determine the characteristics of the waste and appropriate treatment and disposal alternatives. These alternatives will be based upon the waste characteristics, volume and proximity to treatment and disposal facilities. Sample parameters may include, but will not be limited to, percent solids, specific gravity, flash point heavy metals, PCBs, and a solvent scan for halogenated and non-halogenated solvents. Based upon the results of these analyses, approval for disposal at an appropriate RCRA HWMF will be sought and transportation via a licensed hauler will be arranged.

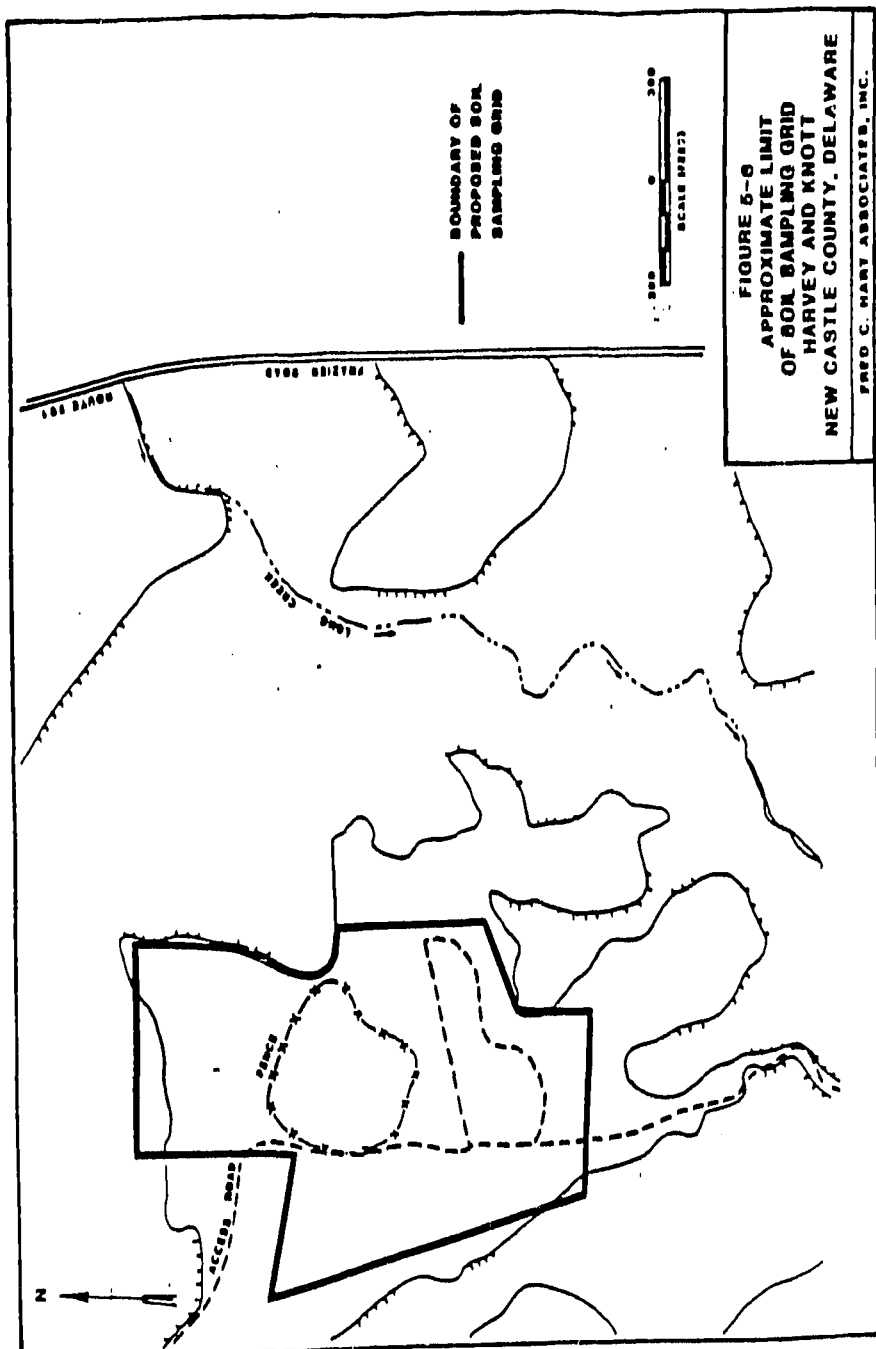
Following waste bulking, empty drums and drum fragments will be crushed and placed into a roll-off container for transport and disposal.

5.5 - TASK 5: SOIL GRID SAMPLING (PRE FLUSHING SAMPLES)

5.5.1 Introduction

The contractor shall establish a soil sampling grid system within the area designated in Figure 5-6. The purpose of the soil grid sampling is to determine the extent of soil contamination beyond the presently known areas and to define background soil characteristics for design of the soil flushing system. The approximate area of the grid system is 35 acres.

The soil grid sampling program will consist of two rounds of sampling. The initial round will be performed prior to construction of the ground-water extraction and treatment system and the data will be used to define the limits of the soil flushing. The second round of sampling will be used to determine the contaminant levels remaining in the soil after



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completion of the soil flushing and provide a database for evaluating capping requirements for residual soils contaminants that exceed cleanup standards set for soil. The second round of sampling will be performed after approximately five years of soil flushing operations. Both soil sampling programs will utilize the same grid boundaries and the same sample a real density.

This section addresses requirements for the first round of soil sampling. Second round sampling requirements are addressed in Section 5.12.2.

5.5.2 Establish Grid System

The contractor shall survey and mark a soil sampling grid system within the designated boundaries. Initially, the contractor shall establish the boundaries of the soil grid system in accordance with those defined in Figure 5-6. These boundaries shall be clearly marked and properly defined by a licensed land surveyor. Once the grid system boundaries have been established, the contractor shall establish the internal grid layout. Grid lines shall be established on 200-foot centers and run approximately north-south/east-west. Grid nodes shall be marked with an appropriate flag and clearly defined on a map. Because the grid will have to remain for at least five years, nodal markers should be durable and clearly labeled with the nodal point identification. Upon completion of the grid, the contractor shall prepare a map of the grid on a scale of 1" = 100 feet with an appropriate nodal point identification system.

5.5.3 Conduct Soil Sampling

Soil samples will be obtained at grid nodal points. A total of 30 samples (not including QA/QC samples) is estimated for one round of sampling. Samples should be taken at a depth of three feet at each location in accordance with the RI/FS report.

The method for acquiring the soil sample at the three foot depth is left to the contractor's discretion and based on existing conditions. However, the contractor must follow proper soil sampling techniques. Soil sampling devices must be decontaminated between each sample. The decontamination method to be used shall be an initial cleaning with detergent (Alconox) and water, followed by a distilled water rinse, a methanol rinse, followed by a distilled water rinse.

Prior to implementation of this sampling program a detailed description of the proposed sampling methodologies will be submitted to USEPA for approval.

Samples will be placed in properly prepared teflon sealed glass containers and utilize a numbering system referenced to the grid nodal points. Each sample shall be described in the field for soil properties, presence of unusual odor, discoloration and water content. Sample containers shall be properly marked and referenced to a master list of sample identification numbers.

Samples shall be analyzed for organic and inorganic compounds contained on the Hazardous Substance List (HSL).

5.5.4 Data Reduction and Analysis

The contractor shall tabulate all data determined from the first round of the soil sampling program. The purpose of this sampling program is to identify additional areas with soil contamination and define background characteristics. Therefore the contractor shall develop an understanding of average concentrations of parameters of concern for soils of this type.

Contour maps of soil concentrations will be prepared for select chemicals. In particular these will include those organic and inorganic contaminants previously determined to be present at the site. The contractor shall identify these areas where contaminants exceed background concentrations. Maps shall be prepared indicating these areas. The contractor shall make estimates of areas and identify them in the field.

5.6 - TASK 6: DATA EVALUATION AND INTERIM REPORT

Upon completion of tasks 1 through 5, available data will be analyzed and a comprehensive report will be prepared, containing the following elements:

- Results of environmental assessment of wetland and surface waters
- Results of Task 1, Site Monitoring Program
- Updated discussion on geology, hydrogeology
- Updated discussion of groundwater contamination
- Results of Task 3, Surface Cleanup
- Results of Task 4, Subsurface Cleanup
- Results of Task 5, Soil Grid Sampling
- Evaluation of the need for and the extent of the off-site recovery well system.

If the results of this analysis identify the need for an off-site recovery well system, Tasks 7 and 8 of the Work Plan (design of the groundwater extraction and treatment systems) should be amended to consider this need. If the results of the report do not indicate a need for the off-site recovery well system, Tasks 7 through 13 will be completed as outlined.

5.7 - TASK 7: DESIGN OF GROUNDWATER EXTRACTION SYSTEM

5.7.1 Introduction

The Contractor will design and submit plans and specifications for the construction and operation of a groundwater extraction system. The groundwater extraction system is the first step in the groundwater extraction/treatment/flushing program required in the ROD. The operation of this system will cycle contaminated groundwater through an above ground treatment system, and return the treated effluent to the water table in a fashion which will leach existing contaminants from the in-situ soils

(spray irrigation system). Proper design of the groundwater extraction system must incorporate a pumping scheme which establishes radial flow in the aquifer toward the site, in order to contain contaminant plumes.

5.7.2 Development of Extraction System Design Criteria

Design of a groundwater extraction system consists of a number of variable features such as the number of pumping wells, locations of pumping wells, and operating pumping rates. The selection and combination of these variables should be designed to address site specific conditions and meet the desired engineering and environmental constraints. Due to the complex site conditions at the Harvey and Knott Site, the well system design should incorporate broad flexibility which may be required to meet the desired constraints. Groundwater modeling will be utilized to establish the desired range of variables necessary for this purpose and to optimize well locations and pumping rates and to avoid adverse effects on wetlands and residential wells.

5.7.2.1 Hydrogeologic Site Conditions Which Will Influence Design Criteria Selection. Complex hydrogeological conditions which exist at the site preclude the use of simple analytical solutions in the design phase. Typical analytical solutions involve making assumptions regarding hydrogeologic parameters, such as:

- Homogeneity of aquifer materials
- Isotropic permeability of the aquifer
- The-absence of recharge to the aquifer
- Homogeneity of aquifer confining characteristics

Existing site conditions which preclude making these assumptions include the following:

- Non-homogeneity of aquifer materials. The aquifer of concern is made up of two formations, the Columbia formation (coarse sands and gravels) which overlies the upper Potomac formation (sorted fine sand with interbedded lenses of silt and clay, and coal fragments). Measured (pump test) permeability of the Columbia formation ranges from 5,800-100,000 gallons per day/foot. Permeability of the upper Potomac is not known, however, it is assumed to be less than the Columbia.
- Non-proven isotropic permeability of the aquifer.
- The presence of recharge to the aquifer due to spray irrigation above the pumping area.
- Non-homogeneity of aquifer confining characteristics. The water table aquifer is confined in the site area, and semi-confined off site as shown in test boring information provided in the RI/FS.

Additionally, the environmental constraint posed by the adjacent wetlands adds to the complexity of the situation by creating a "boundary" condition in terms of groundwater hydraulics.

5.7.2.2 Modeling. Numerical modeling will be used to simulate hydraulic scenarios which meet the desired engineering and environmental constraints. Due to the complexity of the site conditions, this process will involve modeling various hydraulic situations by altering the variables (number of pumping wells, locations, and rates) in order to optimize the efficiency of the system. A careful "fit" will have to be modeled for the anticipated cone of depression caused by draw down of the pumping wells. The adjacent wetlands (an area where the surface of the water table is at or above the ground surface) pose a "boundary condition" to the radius of influence (horizontal extent of the cone of depression) of the pumping wells. Wetlands are classified as ecological areas of concern and are protected by law. A lowering of the water table in the wetlands would have significant environmental and ecological impact.

Despite the close proximity of this boundary condition, a significant radius of influence will have to be created at the site area to prevent the migration of contaminant plumes in the aquifer. The system design will most likely include a greater number of wells than that suggested in the RI/FS, which will pump at relatively lower rates. This will provide greater flexibility in the system and allow for the pumping of multiple wells to meet various conditions, which may change over time. It will also provide a means for any necessary adjustment which is anticipated due to the percent error normally associated with modeling. The extraction system design will also include the construction of piezometers necessary to monitor the radii of influence of the system in operation. Existing monitoring wells will be taken into account for their usefulness as piezometers, with special attention paid to locations near the wetlands area. Information regarding depth and location of the wells, as well as aquifer characteristics and other information necessary to the extraction system design, is provided in the RI/FS report.

Initial modeling efforts will be directed toward developing a flow model that simulates site conditions. This will most likely require several "runs" utilizing a variety of site hydraulic parameters in order to identify those parameters that will allow the "best fit" to existing site conditions. This will also include a sensitivity analysis, in which certain parameters are held constant while others are varied in order to isolate these hydraulic and solute transport parameters that are most significant for the site. Following development of site-specific modeling parameters and verification and calibration of the model, the model can be used to simulate the effects of various extraction well configurations and pumping rates. Extraction system alternatives range from low pumping rate well point systems to high pumping rate single wells. Once the optimum configuration and pumping rates have been established, a technical memorandum will be prepared to describe the proposed extraction system.

5.7.3 Engineering Design of Groundwater Extraction System

5.7.3.1 Development of Plans and Specifications for Extract Wells.

Upon determination of the pumping rates, well placement, and type of extraction system (well points vs. single recovery wells), the contractor shall develop plans and specifications for construction of the extraction well. These plans shall specify well depths, casing diameter, casing and screen materials, screen length, screen type, screen slot size, screen diameter, gravel pack designs, backfill for annulus, and protective seal at the surface.

The contractor must also specify drilling techniques, well installation techniques, and development techniques. At least two pump tests will be necessary in order to verify the performance capabilities of the wells. It is recommended that step draw down type tests be performed on two wells to measure their performance and verify the extent of the cone of depression.

5.7.3.2 Development of Plans and Specifications for Pumps and Collection Pipes.

The design tasks described below refer to the design of the pumps and pipes comprising the groundwater extraction system. The groundwater extraction system pumps the groundwater from the wells and/or well points through pressurized pipes (force mains) to the groundwater treatment system, discussed in a later section. The site conditions which affect the design of the groundwater collection system are also described.

5.7.3.2.1 Site Conditions.

There are several site conditions which must be considered in the design of the pumps and pipes needed to convey groundwater from the site to the treatment plant. These are:

- Groundwater Wells. The number of wells (and well points from which groundwater is to be extracted, the depth of water in the wells during pumping (i.e., draw-down) and the location of the

wells over the site affect the type of pumps to be used and the location of the piping system. These factors will be determined during the Well System Design.

- Location of Groundwater Treatment System. The groundwater, once collected, must be brought to the on-site treatment system. The hydraulic design of the treatment (described later) will determine the minimum allowable pressure of the groundwater as it enters the treatment plant. The information will be used in the choice of pumps and the sizing of collection pipes.
- Contaminants. Materials used in the construction of the groundwater extraction system must be compatible with the contaminants found at the site. For example, organic contaminants in high enough concentrations may soften plastic system components such as pump impellers. Consequently, materials considered during system design will also be evaluated for potential effects from contaminants on performance and structural integrity.
- Freezing. The location of the collection pipes and protective measures for the pumps and well heads will be designed to reflect potential problems with cold weather and freezing.
- System Compatibility. The pumps, control systems and the layout of the collection pipes will be compatible with other components of the remedial work such as the location of site roads and irrigation system pipes.

5.7.3.2.2 . Pump Design. Submersible pumps will be used to extract groundwater from the wells. Submersible pumps are commonly used to extract groundwater for water supply or irrigation uses. Submersible pumps would be lowered into the wells from the well heads and operated from the bottom of the well. They pump groundwater under pressure from the bottom of the well to collection pipes connected to the well head.

The pumps are driven by water-tight electric motors. Insulated cables from the motors to a motor control center located at the surface provide the power needed to operate the pump motor.

Submersible pumps used to extract groundwater have a history of reliability and their location at the bottom of the well dispels problems with freezing and vandals. On the other hand, organic pollutants may impair the integrity of the pumps; pollutant concentrations as reported in the RI will be evaluated for such effects.

Submersible pumps are available from several manufacturers. Each offers numerous pump and motor combinations. Pumps will be chosen to fit the groundwater flow rate developed during well system design and the pressure required by the treatment plant. Types of well pumps to be considered include propeller, mixed flow, and turbine pumps.

An essential part of the design of pumps for the collection system is the choice of measures to control pump operation. First, the pressure in the collection pipes (the design of which is described below) must be maintained close to design conditions. This can be accomplished by either:

- Designing flow control valves for each well head which operates hydraulically and which can be set for various flows and pressures. These valves can be used to adjust the pump rates and pipe pressures to approximate design conditions.
- Designing the size of the collection pipes to maintain the flow and pressure from the well heads to the treatment plant, as sought in the original design.

A second control function to be considered during the design of the site groundwater collection system is control of the operation of the well pumps in case of a malfunction at the treatment plant. This control system will be connected to the motor control centers for each well pump;

its function will be to shut well pump motors off if pumps or process units at the treatment plant are not operating properly.

5.7.3.2.3 Design of Collection Pipes. The groundwater wells will be connected by a series of pipes to the proposed on-site treatment plant. Small (four to six inch) diameter pipes will be designed to lead from each well pump to larger collection pipes -- called headers -- which will be designed to carry the total flow of extracted groundwater under pressure and are called force mains. The design of the pipe materials to be used in the collection system will depend on their compatibility with pollutants found in the groundwater. Typical materials used in the pipes of this sort include polyvinyl chloride (PVC) and ductile iron pipe (DIP). The pipes will be designed to be buried at least four feet underground from the well heads to the treatment plant. This depth of soil cover is necessary to prevent freezing during winter months. The diameter of each pipe segment will vary depending on the flow and the number of well heads it services. Pipe size will be designed using empirical relationships (such as Hardy-Cross) to determine an optimum system configuration.

5.7.4 Field Tests of Groundwater Extraction System

Following determination of well pumping rates, well depths and well construction specifications, field tests will be conducted in order to determine actual performance of the extractor wells. This will include drilling and installing an extraction well (in accordance with design specifications) in the area proposed for the groundwater removal system. Once the well is installed, small diameter piezometers should be installed at varying distances and depths in an array around the extraction wells.

Pump tests, at a varying pumping rate and pumping periods, will be performed to verify model output and initial system design. Plots of log-log and semi-log drawdown curves should be plotted to determine aquifer properties and well performance. The well should be pumped at a variety of pumping rates in order to define well efficiency and maximum allowable drawdown at the well.

5.8 - TASK 8: DESIGN OF GROUNDWATER TREATMENT AND SOIL FLUSHING

5.8.1 Introduction

Soils and groundwater at the site are contaminated with: volatile organics (halogenated aliphatic, monocyclic aromatics and ketones); semi-volatile organics, including acid and base neutral extractables (phthalate esters, phenols, and amines); pesticides; and heavy metals (cadmium, chromium and lead). Groundwater recovered from the site will contain varying concentrations of these substances; they must be removed from the groundwater before it can be reapplied to the contaminated area through the proposed irrigation system. Site soils above the groundwater table are contaminated with the same substances listed above for groundwater. PCBs are an additional contaminant found in the soils above the groundwater table. The proposed soil flushing system, then, must be designed to remove these contaminants from the soil by dissolving or suspending them in the treated groundwater applied to the contaminated soil area by the irrigation system. The purpose of the work described below is (1) to conduct laboratory and pilot scale studies to determine soil flushing parameters and treatment process design criteria and limitations and (2) to design an effective irrigation system and groundwater treatment plant.

5.8.2 Soil Flushing and Groundwater Treatability Studies

The Harvey and Knott Drum Site ROD requires that treatment facilities to remove contaminants from extracted groundwater be designed and installed and that treated groundwater be applied to flush contaminants from on-site surface and subsurface soils. The design of groundwater treatment and site flushing systems is site-specific. Laboratory and pilot scale tests are necessary to determine design parameters. These studies -- described below -- will be conducted as part of this work plan.

5.8.2.1 Soil Flushing Treatability Study. The first step in implementing the soil flushing study is to review the existing data on site conditions to determine where contamination has been detected and which pollutants are present. Subsurface characteristics local to the study area will also be identified. The data to be reviewed will include test boring logs, laboratory test results for soils and groundwater, and engineering and hydrogeological reports specific to the site.

The Treatability Study will consist of simulating the proposed irrigation/flushing system by passing uncontaminated water (comparable to effluent from the proposed groundwater treatment system) through representative samples of contaminated site soils.

5.8.2.1.1 Field Sampling and Testing. In order to obtain representative soils to perform leaching and infiltration tests, a test boring and sampling program specific to the soil flushing treatability study must be performed. These test borings must be drilled in the areas of known soil contamination and therefore will require particular attention to decontamination and health and safety requirements. Five borings will be drilled to collect representative samples of the soil in the areas designated Area 3 in the RI/FS. The borings should be continuously sampled from the surface to the top of the water table. If feasible, a portion of these samples will be obtained by a thin walled sampler in order to provide undisturbed samples for column sorption/desorption tests. All soil samples will be analyzed for porosity, grain size distribution and moisture content. The borings will be advanced to 10 feet below the water table with samples collected every five feet. Samples below the water table will be analyzed for porosity and grain size distribution.

Sampling and test procedures will be in accordance with the Health and Safety and Quality Assurance/Quality Control Plans defined earlier in the Work Plan. In particular, ambient air will be monitored with an Organic Vapor Analyzer (OVA) to insure compliance with health and safety requirements. Sampling procedures will follow applicable ASTM guidelines (e.g., ASTM D420-69; D1452-80). Drilling and sampling equipment will be decontaminated prior to and before sample collection.

In addition to the borings, five surface infiltration tests will be performed. Additionally, laboratory permeability tests on undisturbed subsurface samples will be performed.

5.8.2.1.2 Laboratory (Bench) Scale Studies. In order to assess contaminant migration behavior in the unsaturated zone and the amount of flushing required to reduce contaminant concentration to desired concentration, laboratory column sorption/desorption tests must be performed. These tests require establishing soil contaminant concentration in the samples before and after test operation. Column tests will be conducted under controlled laboratory conditions. The purpose of these tests is to define the number of pore volume flushings required to reduce concentrations to desired limits and time required for attainment of soil clean-up objectives.

Part of the soil will be removed from the boring sample and tested for contaminants; the rest of the sample will be used in the flushing study. Uncontaminated water will be flushed through the relatively undisturbed soil sample by gravity or with a slight vacuum in order to stimulate on-site conditions. An amount of water equal to the pore volume of the soil will be applied to the sample at a single pass (flush). Test series varying the number of flushes will be conducted. Contaminant concentration will be determined at the end of each test series. Test results will be reported and analyzed to determine ability of the proposed irrigation system to remove contaminants in the soils.

5.8.2.2 Groundwater Treatability Studies. The groundwater treatment system will be designed to remove the contaminants which will be present in the groundwater to be extracted by the planned recovery wells. As stated, groundwater at the site is presently contaminated with volatile and other organics, pesticides, and heavy metals, and may also contain PCBs. A laboratory treatability study will be conducted on site groundwater samples to determine the effect of treatment processes on removing contaminants. Groundwater samples will be taken from site location known to contain the pollutants listed above. Samples will be tested to determine pollutant concentrations and will then be treated by unit processes

considered for the full-scale plant. These unit processes are conventional treatment methods for the pollutant groups reported in the RI as present in site soils and groundwater. These will include the following:

1. Equalization. Samples will be mixed to simulate the effects of an equalization tank planned to normalize concentrations and flow rates.
2. Addition of lime followed by polymer followed by settling. Lime raises the pH of the groundwater. Consequently, heavy metals will form insoluble hydroxides which will settle out of solution in a clarifier. The polymer increases the settling rate of the metal hydroxides. It also increases the settling rate of other suspended, particularly soil particles to which PCBs may be attached. Optimum lime (pH) and polymer concentrations will be determined using jar tests.
3. Air-Stripping. This is a common treatment process to remove volatile organics (VOCs) from contaminated water. Site groundwater samples will be tested by passing diffused air at varying air-water ratios through the sample; pollutant concentration (VOCs) measured before and after air-stripping will provide treatment performance parameters (efficiency). Known VOC concentrations and study results will be used to determine the need for and design parameters for an activated carbon air pollution control system for the air discharges from the air-stripper columns.
4. Carbon Adsorption Column. The use of activated carbon to remove organics and inorganics remaining in the groundwater after precipitation and air-stripping will be evaluated by passing similarly treated groundwater through lab scale carbon adsorption columns. Tests will be designed to provide the information (isoclines) necessary for process design.

Additionally, other unit processes may be considered. Such processes may include biological treatment, deionization, reverse osmosis and other methodologies.

The results of the treatability studies described above will be used to design the treatment processes for the full-scale facility. This information may be augmented with pilot scale tests, if necessary, of particular process equipment.

5.8.2.3 Interim Reports. Technical memorandum will be prepared at the completion of both the groundwater treatment soil flushing treatability studies. This memorandum will describe the study methods, evaluate results and present conclusions and recommendations with regards to the treatability of contaminated groundwater and soils. These memorandum will be instrumental in defining initial ACLs and soil cleanup standards and provide a basis for designing pilot and full-scale operations. These memoranda will be submitted to EPA for review.

5.8.3 Preliminary and Final Design

5.8.3.1 Introduction. This section describes the preliminary and final design of the proposed groundwater treatment plant and system. The soil flushing system will distribute the treated groundwater to contaminated soil areas to flush contaminants from the soil and into groundwater recovery wells for subsequent extraction, treatment reapplication to the contaminated soils areas. Information needed for design and the source of that information are described.

5.8.3.2 Controlling Design Parameters. The parameters which must be defined to design a groundwater treatment system are (1) the volume of water to be treated, (2) the concentration of pollutants entering the plant, and (3) the maximum concentration of pollutants which will be allowed to leave the plant (effluent concentration). This information will be provided by previous tasks.

- The volume of water to be treated will be determined by the groundwater extraction modeling study;
- The concentration of pollutants entering the plant will be determined from RI information and from groundwater treatability study results; and
- The effluent concentration is related to the site ACLs, the determination of which has been described earlier.

The information needed to design the irrigation system includes permeability of soils at various depths and contaminant behavior during flushing operations; both of these parameters will be determined by the Soil Flushing Study described previously.

5.8.3.3 Design Considerations. Key items of the groundwater treatment process and irrigation system design may include the following:

1. Flow Equalization. A consistent rate of groundwater flow through the proposed plant is advantageous to maintain treatment efficiencies and effluent quality. A holding tank will be designed to modulate pumping rates to provide a uniform treatment plant flow. An equalization tank in operation usually contains some volume of water and as such will, incidentally, serve to modulate contaminant concentrations as well. Tank design will take into account anticipated variations in groundwater pumping rates, plant design flows and structural and material considerations.
2. Chemical Feed Systems. The chemicals to be added as part of the treatment processes considered for the on-site treatment plant may be lime and polymer. The amount of each chemical to be added to the groundwater undergoing treatment will be determined from the treatability and pilot studies range of operating conditions. Other chemical feed system issues which will be considered during design include the grade of chemical to be used, the handling methods (e.g., dry, liquid, bulk, packaged), the equipment to be used to feed the chemical into the wastewater stream and the location with wastewater flow where chemicals will be added.
3. Reaction Tank. Chemicals added to the wastewater must be given sufficient time to react for insoluble particles to be formed. The need for a separate reaction tank to provide this required detention time will be evaluated. It is possible that static in-line mixers feeding chemicals directly into wastewater feed liner from the equalization tank will be sufficient and a reaction (or flocculator) tank will not be needed.

4. Clarifier. Different clarifier designs will be evaluated using overflow rates suggested by treatability and pilot scale studies. Conventional, upflow and parallel plate clarifiers will be considered. Generally, parallel plate settlers provide the most cost-effective and efficient method of settling metal hydroxides from suspension.
5. Sludge Pumping. The amount of sludge which will have to be handled by the proposed treatment plant will be determined by the chemical dosing and sludge generation rates observed during the lab and pilot scale tests. Positive displacement (and diaphragm pumps will be evaluated.
6. Sludge Dewatering. The sludge removed from a clarifier normally contains 80 to 85 percent water. Methods to dewater the sludge--resulting in less sludge to be handled--will be evaluated during design; the methods to be evaluated include:
 - belt filter presses
 - vacuum filter presses
 - sludge drying beds
 - disposable paper sludge dewatering press
7. Air-Stripping. Lab and pilot scale tests will give the design parameters needed for the VOC removal air-stripping system. The parameters to be determined include the amount of contact area between diffused air bubbles and wastewater, the depth of water in the column, the concentration of pollutants in the wastewater to be treated, the temperature range of the wastewater, the detention time and the diffusivity of the contaminants to be removed. Design will include a review of available systems; they generally only vary in the packing material used to increase diffused air/wastewater contact. The VOCs emanating with the diffused air leaving the air-stripping columns will be estimated; the need for an activated carbon system to remove VOCs will be evaluated and a system will be designed, if needed.

8. Carbon Adsorption. A carbon adsorption unit will be evaluated to give the design parameters needed to remove pesticides, PCBs and other organics and inorganics.
9. Biological treatment, deionization, reverse osmosis and other processes may also be evaluated to determine their applicability to this treatment process, and if applicable, to generate the design parameters.
10. Discharge Pump. The treated effluent must be discharged to the irrigation system at a rate to be determined by the flushing study. Booster pumps will be designed to provide this function.
11. Irrigation System. The areas of the site to be covered by the irrigation system will be determined by the results of the Soil Grab Sampling Program described earlier. The amount of water and the rate with which it is to be delivered to the contaminated areas to be irrigated will be determined by the Soil Flushing Treatability Study. The area will be graded to a fairly level surface, the contaminated soils will be covered with a minimum 6-inch layer of soil and the area will be revegetated to maintain the soil cap and prevent human contact with contaminated soils. Subject to final determination, the depth of this soil cap may be increased to a total of 24 inches. These items will be included in the design of the irrigation system. The irrigation system to be designed will also include pipes and spray diffusers to distribute treated ground water from the treatment plant to contaminated areas. Operations may have to be suspended during freezing winter-months; a compressed air system to clear irrigation system lines of water and prevent cracking will be evaluated.

The output from this effort will be a preliminary design report to be submitted to EPA for review and comment and a final design consisting of plans and specifications for the construction of the nine major remedial action components described above. The final design plans and specifications will be submitted to EPA for approval prior to construction.

5.9 - TASK 9: CONSTRUCTION OF THE GROUNDWATER
EXTRACTION/TREATMENT/SOIL FLUSHING SYSTEM

The ground water extraction system, groundwater treatment plant and soil flushing program will be constructed as designed. A construction quality assurance/quality control (QA/QC) plan will be submitted before construction begins. Methods to assure material quality and proper construction techniques will be developed and incorporated into the construction QA/QC Plan. An engineering consultant(s) will be engaged to provide construction management, construction inspection, design support and shop drawing review services during construction, in order to insure that elements of the QA/QC Plan are adhered to. Appropriate performance bonds specified in the final bid documents will be required.

5.10 - TASK 10: POND CLEANUP

5.10.1 Introduction

Following completion of full scale construction and operation of the groundwater extraction/treatment/soil flushing system, the on-site pond will be drained and dredged to remove contaminated sediment and debris. The purpose for implementing this task after the treatment system has been constructed is because it is much more cost effective and efficient to pump the pond water directly into the treatment system, rather than storing the water on site until a treatment system is built. The additional handling required by storing the water is not justified when only a slight delay will allow the water to be pumped directly to the treatment process. Therefore, it is recommended that this task be implemented after construction of the groundwater remediation, rather than before.

5.10.2 Drain Site Pond.

Conventional methods of removing ponded surface water can be used to remove the contaminated surface water found on site. The pond is located within the fenced limit of the site and contains various types of

solid waste, automobile scrap and drums. The depth of water in the pond is estimated to be 0 to 10 feet, depending on seasonal variations. The total volume of standing water to be drained could be as high as 250,000 gallons. The RI/FS anticipates pumping rates between 50 and 75 gpm will be necessary to remove standing water as well as the groundwater inflow estimated to enter the pond during the dewatering processes. However, if the pond is drained after the water table has been lowered by the groundwater extraction system, inflow to the pond should be minimized. This is another reason to conduct the pond cleanup after operation of the groundwater cleanup system has begun. The water will be piped directly to the groundwater treatment facility for removal of dissolved metals.

5.10.3 Dredge Pond Sediment and Dispose.

Upon completion of dewatering, bulk wastes presently on the bottom of the pond will be allowed to dry for a period of three (3) weeks and excavated using appropriate earth moving equipment. Materials removed from this area (estimated at five tons) will be loaded directly into lined semi-dump trailers for transportation to and disposal at a RCRA HMMF. Following excavation of these bulk materials, testing of underlying soils will be performed using five (5) composite samples analyzed for EP Toxicity and ICAP Scans for total metals.

5.10.4 Backfill Dredge Area and Pond.

The area of sediment excavation and remaining depression of the former pond will be backfilled with soil to grade and revegetated where appropriate.

5.10.5 Evaluation and Implementation of Additional Pond Area Remediations.

Upon completion of the pond cleanup and re-grading activities, data obtained from sampling underlying soils will be evaluated to determine the need for soil flushing. Should remaining contaminant levels require soil

flushing, the existing spray irrigation system will be extended to cover this area.

5.11 - TASK 11: OPERATING GUIDELINES/REQUIRED MAINTENANCE

5.11.1 Introduction

Operation and Maintenance (O&M) elements associated with the implementation of this alternative consist of the following major elements:

- Maintenance of Monitoring System
- Maintenance of Soil Cover/Cap
- Groundwater Treatment
- Maintenance of Spray Irrigation System
- Maintenance of Groundwater Extraction System

5.11.2 Monitoring System.

O & M requirements for the monitoring well system consist of inspection by two technicians once every five years for the 30-year operating period. Additionally, well casing elevations will be resurveyed once every fifteen years by a licensed land surveyor.

5.11.3 Maintenance of Soil Cover/Up.

Requirements associated with this element of the remedial action include annual inspection and service by two field technicians, replacement of 1% of topsoil and appropriate revegetation, and administration.

5.11.4 Groundwater Treatment.

Operation of the groundwater treatment facility will require a full-time operator/technician on a 7 day/week, 10 hr./day basis for the 5-year operating life of the facility. Additional elements required in this would include maintenance materials (3% of capital cost), chemicals (lime, polymer, acid, carbon), electricity, compliance monitoring and off-site sludge disposal.

5.11.5 Maintenance of Spray Irrigation System.

A site technician will be provided to perform periodic maintenance of the effluent irrigation system over the five year operating period. Operational duties will include surveying of re-injection system elements, cleaning of injectors, and prevention of damage from freezing conditions. Power for the irrigation pumps/motors is also required.

5.11.6 Maintenance of Groundwater Extraction System.

The site technician will be responsible for daily operation/service of the extraction system including pump maintenance, well sequencing and routine/non-routine service.

5.11.7 Operation and Maintenance Manual.

An operation and maintenance manual will be developed following final system design. The manual will also include personnel health and safety instructions.

5.12 - TASK 12: MONITORING EVALUATION

5.12.1 Groundwater and Surface Water Monitoring

At the end of the fifth year of the treatment system operation, an evaluation of the monitoring program and its results will be made to

include parameters, frequency and number of samples. This evaluation will identify one of the following scenarios:

- Media concentrations are equivalent to or lower than the ACLs. Extraction and treatment of groundwater will cease at this time, and post-closure care will be initiated.
- Media concentrations indicate that a reduction in contaminant levels is occurring, but the ACLs have not been reached. Groundwater extraction and treatment will continue.
- Media concentrations show no change or an increase in concentration. A re-evaluation of the remedial action will be performed, and alternate methodologies considered.

Subsequent re-evaluations of the monitoring program will be performed at five-year intervals as needed up to a maximum of 30 years.

5.12.2 Post Flushing Soil Grid Sampling

In order to determine the effectiveness of the soil flushing program, a second round of soil samples will be acquired after approximately five years of flushing operations. These soil samples will be obtained at positions adjacent to samples acquired during the first round (see Section 5.3). Samples will be obtained at three foot depth using the same techniques and procedures used during the first round. Data will be used to determine:

- 1) The contaminant levels remaining in the soils after completion of the soil flushing operation.
- 2) A data base for evaluating capping requirements for residual soil contaminants based on the cleanup standards set for soil.
- 3) The volume of selected soil area excavation and limits of the cap, if required.

The contractor will evaluate the results of the second round soil sampling and prepare appropriate contour maps of soil contaminant distribution. The contractor shall compare the results of the second round of sampling to the first and identify these areas where contaminant concentrations have decreased below the soil cleanup standards. The contractor shall also evaluate the feasibility of capping and/or excavation for those areas where soil concentrations continue to exceed the soil cleanup standards.

5.13 - TASK 13: FINAL ACLs

Final cleanup of the site is expected to be based on Final Alternative Concentration Limits ("ACLs") established for the groundwater as set out in the ROD and RI/FS.

Determination of ACLs for groundwater and/or cleanup standards for soil will be performed in two phases: target ACLs and final ACLs. Utilizing data obtained from laboratory simulations of soil flushing and bench-scale groundwater treatability, target ACLs will be developed. These target ACLs will represent the best estimate of the projected performance of the extraction/treatment system under field conditions. Final ACLs will be developed based on the data presented in the RI/FS (baseline conditions), identified trends in groundwater quality, results of the wetlands and LHZ assessments, final soil grid analyses, re-evaluation of potential for endangerment of human health, the environmental setting, and documented performance/efficiency of the groundwater extraction/treatment/ reapplication system. The use of ACLs, as described here, is contingent upon the condition that there is no hydraulic connection between the UHZ and the LHZ.

There are known points of entry of groundwater from the site into the surface waters. Additionally, there are projected points of entry of groundwater into the wetlands adjacent to the site. The Consent Decree to be entered regarding the cleanup contains enforceable measures to prevent

human exposure to contaminated groundwater between the facility boundary and all known or projected points of entry of such groundwater into the surface waters and the wetlands.

Final ACLs will be developed, on the basis of measurements or projections, to ensure there will be no statistically significant increase above baseline conditions of hazardous constituents in the surface waters and the wetlands and there is no reason to believe accumulation of constituents may occur downstream. "Baseline conditions" and the "points of entry" will be determined based on information on the surface water developed in the RI/FS and additional monitoring of surface water to be undertaken during the first year as part of Task 1 (Site Monitoring) and monitoring of the wetlands to be undertaken in Task 2 (Wetlands Assessment). Baseline conditions will be established using the mean of each individual constituent concentration over the nine sampling locations sampled during the RI/FS and during year one of Task 1 (Site Monitoring) and Task 2 (Wetlands Assessment). During the subsequent four years of the site monitoring program, mean constituent concentrations from the nine surface water sampling locations will be compared to the mean background constituent concentrations in order to assess whether a statistically significant increase has occurred. Constituent concentrations will be compared to the baseline data using the mean of the nine sampling points rather than comparing constituent concentrations from discrete sampling locations.

5.14 - TASK 14: POST-CLOSURE ACTIVITIES

After the monitoring evaluation determines that the groundwater extraction and treatment system is no longer needed, post-closure activities will be initiated.

Post-closure activities at the Harvey and Knott Site will include, but will not be limited to, the following:

- Dismantling and removal of the treatment system;

- Inspection and maintenance of the soil cap and vegetative cover;
- Maintenance of restricted access barriers;
- Other periodic site inspections and maintenance activities as needed; and
- Appropriate post-closure groundwater monitoring based on the results of the monitoring evaluation in Task 12.

Post-closure care activities will be designed so as to ensure that all risks to the environment and the public health and welfare are minimized or eliminated following the cessation of the remedial action.

EXHIBIT 4

Re. Harvey & Knotts Site
Ref. CERCLA 86-004

DECISION DOCUMENT

PREAUTHORIZATION OF A CERCLA §111(a) CLAIM

Harvey & Knotts Site - New Castle County, Delaware

STATEMENT OF AUTHORITY

Section 111 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), authorizes persons (other than the U.S. Government, State and local governments, or Indian tribes) to seek reimbursement for response costs incurred in carrying out the National Contingency Plan (NCP). Section 112 of CERCLA directs the President to establish the forms and procedures for filing claims against the Hazardous Substances Superfund (the Superfund). Executive Order 12580 delegates to the Environmental Protection Agency (EPA) the responsibility for such claims. Executive Order 12580 delegates to EPA the authority to reach settlements pursuant to section 122. The Assistant Administrator for Solid Waste and Emergency Response (AA/OSWER) is delegated authority to evaluate and make determinations regarding claims (EPA Delegation 14-9 "Claims Asserted Against the Fund," April 16, 1984).

REMEDY SELECTED BY EPA AND SUBSEQUENT ACTION

On September 30, 1985, James M. Seif, EPA Regional Administrator for Region III, signed the Record of Decision (ROD) for the Harvey & Knotts site (Attachment 1). The ROD selected as a remedy Alternative 3A, on-site pond cleanup; off-site drum, debris and waste pile disposal; and contaminated ground water extraction, treatment and reapplication of the treated water (soil flushing). The ROD deferred selection of remedial response measures, if any, for the wetlands and surface waters adjacent to the site, and also deferred decisions regarding final closure of the site and the level of ground water quality to be achieved.

In the Fall of 1985, General Motors Corporation (GM) initiated settlement discussions with EPA. These discussions followed EPA's issuance of notice letters to five potentially responsible parties (PRPs), including GM, and resulted in GM's participation in the Remedial Investigation and Feasibility Study (RI/FS) conducted by EPA. GM hired Fred C. Hart Associates to prepare the Remedial Action Work Plan which EPA approved in April 1986. Following several discussions between Region III and GM, in January 1986 GM submitted a draft Consent Decree. In early May of 1986, EPA and GM entered into agreement in principle which provided that GM would carry out the remedy selected by EPA and that EPA would reimburse GM for a portion of the costs of the remedy. In July 1986, EPA provided GM with a copy of 'GUIDANCE ON REQUESTS FOR PREAUTHORIZATION BY POTENTIALLY RESPONSIBLE PARTIES'. In October 1986, GM submitted its formal request for preauthorization. A Consent Decree between EPA, the State of Delaware and GM is being executed simultaneously with this Decision Document.

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FACTORS CONSIDERED IN PREAUTHORIZING

Preauthorization (i.e., EPA's prior approval to submit a claim against the Superfund for necessary response costs incurred as a result of carrying out the NCP) does not entail the setting aside of monies from the Superfund in an amount to satisfy future claims. However, it does represent the Agency's commitment that if the response action is conducted in accordance with the preauthorization and costs are reasonable and necessary, reimbursement, subject to any maximum amount of money set forth in the preauthorization decision document, will be had from the Superfund, subject to the availability of appropriated monies.

In evaluating GM's request for preauthorization of a response claim, EPA has considered four general criteria:

- (1) The significance of the threat to public health, welfare, or the environment posed by the release of hazardous substances or pollutants and contaminants;
- (2) Whether the proposed remedy cost-effectively addresses the threat posed by the release;
- (3) Whether the applicant for preauthorization demonstrates engineering expertise and a knowledge of the NCP and attendant guidance; and
- (4) Whether the applicant demonstrates evidence of State cooperation.

FINDINGS

(1) Based on the analytical results from the preliminary assessment and site investigation conducted by EPA, the Hazard Ranking System score for the site was set at 30.77. The site was placed on the National Priorities List (NPL) in 1982. While EPA has conducted a removal action (1982) and an Initial Remedial Measure (1984) in an effort to minimize immediate and obvious hazards to the public, surface and subsurface contamination remain at the site, as well as numerous drums that have not been staged and characterized to determine whether they contain any hazardous substances. These findings satisfy the first criterion: the release poses a significant threat to public health, welfare or the environment.

(2) The remedy which GM proposes to implement at the site (i.e., on-site pond cleanup; off-site drum, debris and waste pile disposal; and contaminated groundwater extraction, treatment and reapplication of the treated water) is the remedy selected by EPA. EPA's ROD dated September 30, 1985 certifies that off-site transport and disposal of contaminated material is far more cost-effective than other remedial actions and is necessary to protect public health, welfare and the environment.

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EPA has also determined that the preauthorized remedy is a remedy which will reduce the mobility and toxicity of the hazard substances at the site to the maximum extent practicable.

(3) GM's request for preauthorization was evaluated for consistency with the NCP and to determine if it supplied the information identified in the Guidance on Preauthorization and other relevant Agency guidance.

(4) The State of Delaware is a party to the Consent Decree and has therefore agreed that the remedy selected by EPA is appropriate, that GM is capable of carrying out the remedy, and has further agreed to participate in the funding for operation and maintenance (see State's letter to EPA dated May 15, 1986).

Analysis of Consistency with the NCP

Section 111(a)(2) of CERCLA authorizes the payment of claims for costs incurred as a result of carrying out the NCP. In order for such costs to be considered within the meaning of section 111(a)(2) of CERCLA, the person undertaking the response action must comply with relevant provisions of the NCP. The provisions of the NCP that are relevant to the remedy under consideration are:

- (1) 300.25(d) (seeking Superfund reimbursement)
- (2) 300.38 (worker health and safety);
- (3) 300.68 (remedial actions), except for subsections (a), (b), (e)(2)(xvi), and (f)(iv); and
- (4) 300.69 (documentation and cost recovery), except for subsection (d), which applies to Federal agencies.

GM filed a preauthorization request with EPA in advance of undertaking work at the site. This satisfies point (1) of the NCP provisions listed above.

GM has developed a comprehensive Health and Safety Project Plan for the Harvey & Knotts site. This Plan was submitted as a part of GM's Workplan and was approved by EPA in April 1986. This satisfies point (2) of the provisions of the NCP listed above. As a term and condition of preauthorization, GM shall implement the plan as approved by EPA or any subsequent revisions to the Plan which may be approved by EPA.

The ROD forms the conceptual framework of the cleanup and states the goals for the design work. On-site conditions often determine how the cleanup goals and objectives can be best achieved. While GM's Workplan contains specific activities, grouped in 14 Tasks, designed to implement EPA's ROD, GM must constantly evaluate the sequence of tasks and activities throughout cleanup. To ensure that GM complies with the NCP and implements a cost-effective remedy, as a term and condition of preauthorization, GM shall

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during design and cleanup consider treatment of contaminated surface and subsurface soils associated with the drums and contaminated soils and sediments associated with the pond by reapplication of the treated ground water. GM shall implement the more cost-effective option (i.e., treatment by reapplication or off-site treatment and disposal). If off-site treatment or disposal is selected, such treatment or disposal shall be conducted in compliance with section 121(d)(3) of CERCLA.

With regard to contamination of the wetlands, the ROD defers selection of remedial response measures, if any, for the wetlands and surface waters adjacent to the site. Section 111(a)(2) provides for the payment of "claims for necessary response costs...." Such costs do not include costs for restoration, rehabilitation, or replacement or acquiring the equivalent of any natural resource (hereinafter referred to as "restoration costs"). Response costs may include the costs of cleaning up soil and ground water contamination, but not the costs of restoring the natural vegetation, beyond that required to prevent soil erosion or control sediment transport. Therefore, eligible costs which GM may recover from the Superfund do not include restoration costs for the adjacent wetland.

The ROD provides for the selection of target and final end-point levels of residual ground water and soil contaminants for soil flushing. As a term and condition of preauthorization GM must implement a detailed quality assurance/quality control plan and obtain EPA's prior approval to modify environmental or performance standards. The decision on whether to cap the site is deferred until the final soil and ground water levels are met in the field during operation. Because a decision to cap the site affects the cost of the remedy, the terms and conditions provide that GM may submit a revised application for preauthorization upon EPA's determination of the requirements for final closure of the site. The costs of operation and maintenance, subsequent site management and the purchase of the property are not eligible for reimbursement. The operating costs necessary to ensure that all or a portion of the remedy is operational and functional (i.e., shake down costs) are eligible if such costs are incurred within one year of completion of such remedy or portion thereof.

The terms and conditions also provide that if GM finds it necessary to modify the actions that EPA preauthorized, or if it becomes apparent that the project's costs will exceed the approved costs, a revised application may be submitted to EPA. The Consent Decree provides that EPA will consider such requests for preauthorization in a timely manner and will preauthorize 33 1/3 percent of reasonable and necessary costs to implement the approved remedy. The information submitted by GM when supplemented by the terms and conditions above satisfy point (3) of the provisions of the NCP listed above.

Section 300.69 of the NCP requires documentation of all phases of response actions. GM's application proposed the collection of documents for all phases and identified the flow of information

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between EPA and GM. The terms and conditions reiterate the requirements necessary to support and document claims, and include documentation that: 1) any response activities conducted were preauthorized by EPA, 2) any deviation from the terms and conditions of this preauthorization decision document was approved in advance by EPA, 3) all claimed costs are well documented in accordance with generally accepted accounting principles and practices consistently applied, and 4) all claimed costs were preauthorized and are reasonable and necessary. In determining whether costs are reasonable and necessary, EPA will rely on the appropriate Federal cost principles (non-profit organizations - OMB circular A-122; profit making organizations - 48 CFR Subparts 31.1 and 31.2). All cost documentation and any records relating to claims shall be maintained for a period of not less than six years from the date of the final claim and EPA shall be provided with access to such records. At the end of six years GM shall notify EPA of the location of the records and allow EPA the opportunity to take possession of the records before they are destroyed. This satisfies point (4) of the NCP provisions listed above. The Consent Decree specifies the required regular and periodic reports to EPA. In addition, as a part of EPA's oversight role, GM shall provide necessary site access and shall immediately notify the Agency if it is unable to initiate or complete the preauthorized response action.

Additional Considerations

EPA has evaluated GM's proposal to implement EPA's remedy and the proposed level of Superfund participation and has determined that a settlement with GM for the remedy is appropriate under the EPA Interim Settlement Policy.

GM's application for preauthorization, in accordance with the Guidance, proposes procurement procedures which are designed to ensure maximum open and free competition. The terms and conditions specify the requirements to ensure such maximum open and free competition and to ensure that goods and services are secured at a reasonable cost. These terms and conditions include the use of a Differing Site Conditions clause equivalent to that found at 40 CFR Part 33.1030(4); the use of bid evaluation procedures that provide for the award of contracts to the lowest, responsive, responsible bidder, where the selection can be made principally on the basis of price; the settlement and satisfactory resolution of all contractual and administrative issues arising out of preauthorized actions, in accordance with sound business judgement and good administrative practice; the issuance of invitations for bids or requests for proposals, selection of contractors, approval of subcontractors and the management of contracts in a manner to minimize change orders and prevent claims; and the settling of protests, claims disputes, and other related procurement matters. GM shall not contract with persons currently debarred or suspended by EPA pursuant to 40 CFR Part 32.

GM's application for preauthorization proposes a schedule for submitting claims against the Superfund. Following discussions

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between EPA and GM, the Consent Decree and the terms and conditions provide a schedule for the filing of 5 claims.

In summary, GM's preauthorization request demonstrates a knowledge of relevant NCP provisions and EPA guidance for the conduct of a remedial action. This finding, supplemented by the terms and conditions above, satisfies the third criterion for preauthorization.

In determining whether or not claimed costs are reasonable and necessary, EPA may use the facilities and services of private insurance and claims adjusting organizations or Federal personnel. In making a determination whether costs are allowable, the claims adjuster will rely upon the appropriate Federal cost principles (non-profit organizations - OMB circular A-122; profit making organizations - 48 CFR Subparts 31.1 and 31.2).

DECISION AND TERMS AND CONDITIONS

I preauthorize General Motors Corporation to submit a claim(s) against the Superfund in an amount not to exceed the lesser of three million eighty-six thousand dollars (\$3.086 million), or thirty-three and one third percent (33 1/3%) for reasonable and necessary eligible costs incurred in carrying out the remedy set forth in EPA's Record of Decision for the Harvey & Knotts site (Attachment 1 hereto), subject to the following terms and conditions:

- 1) GM shall implement the worker health and safety plan which was approved by EPA or any subsequent revisions to the Plan which may be approved by EPA.
- 2) GM shall, except where EPA has determined that a waiver is appropriate, comply with the substantive requirements of applicable or relevant and appropriate Federal and State public health and environmental statutes and regulations.
- 3) Modification of design elements or performance requirements contained in the design report shall require approval by the AA/OSWER or his designee.
- 4) If EPA subsequently determines that it is necessary to install a cap to ensure adequate protection of public health, welfare and the environment, and either GM agrees to install the cap or GM is ordered to do so pursuant to the provisions of the Consent Decree, GM shall submit a revised application for preauthorization, as provided below, and will implement that portion of the remedy for the site.
- 5) GM must provide for site management sufficient to ensure continuing protection of human health and the environment.

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- 6) GM shall develop a remedial design plan which complies with EPA's Remedial Design and Remedial Action Guidance. The remedial design to be developed by GM shall contain an analysis of applicable or relevant and appropriate Federal and State public health and environment requirements and how the remedy will comply with such requirements.
- 7) GM shall demonstrate, during design and cleanup, that it considered treatment of contaminated surface and subsurface soils associated with the drums and contaminated soils and sediments immediately associated with the pond by reapplication of the treated ground water, sequencing of the pond cleanup, and on-site storage of treated ground water during the winter months. GM shall implement the more cost-effective option. The results of GM's analyses shall be submitted to EPA.
- 8) GM shall develop and implement:
 - a) Bid evaluation procedures which provide maximum open and free competition, do not unduly restrict or eliminate competition, provide for the award of contracts to the lowest, responsive, responsible bidder, where the selection can be made principally on the basis of price.
 - b) Contracts for construction which include a Differing Sites Conditions clause equivalent to that found at 40 CFR §33.1030(4).
 - c) Procedures to settle and satisfactorily resolve, in accordance with sound business judgement and good administrative practice, all contractual and administrative issues arising out of preauthorized actions. GM shall issue invitations for bids or requests for proposals, select contractors, approve subcontractors, manage contracts in a manner to minimize change orders and prevent contractor claims, settle protests, claims disputes, and other related procurement matters, and handle subcontracts to assure that work is performed in accordance with terms, conditions and specifications of contracts.
 - d) Detailed quality assurance/quality control plans for design activities (e.g., sampling, monitoring, etc.) and construction activities (e.g. sampling, operations, etc.) in accordance with relevant guidance.
 - e) A financial management system that consistently applies generally accepted accounting principles and practices and at least includes an accurate, current and complete accounting of all financial transactions for the project, complete with supporting documents, and a systematic method to resolve audit findings and recommendations.

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- 9) GM shall provide EPA and its agents with site access and shall immediately notify the Agency if it is unable to initiate or complete the preauthorized response action.
- 10) In submitting claims to the Superfund, GM shall
 - a) document that response activities were preauthorized by EPA;
 - b) substantiate all claimed costs through a financial management system, and
 - c) document that all claimed costs were eligible for reimbursement pursuant to this preauthorization and are reasonable and necessary in accordance with the appropriate Federal cost principles.
- 11) GM shall maintain all cost documentation and any records relating to its claim for a period of not less than six years from the date on which the final claim has been submitted to the Superfund, and shall provide EPA with access to its records. At the end of six years GM shall notify EPA of the location of all records and allow EPA the opportunity to take possession of records before they are destroyed. GM shall cause to be inserted in all agreements between itself and contractors performing work at the site a clause providing for the same requirement to maintain records and to provide access to records as that required of GM.
- 12) Claims may be submitted by GM only while it is in compliance with the terms of the Consent Decree and no more frequently than the following as documented by appropriate Major Milestone Reports:
 - a. Completion of the design phase (costs incurred for installation of monitoring wells (Task 1), and Workplan Tasks 2,3,4,5,6,7 and 8)
 - b. Completion of construction (costs incurred for Workplan Task 9)
 - c. 50 percent of operation (costs incurred for Workplan Tasks 1, but not recovered in Payment 1, and Task 10, and 50% of Task 11)
 - d. Completion of operations (costs incurred for remainder of Workplan Task 11, and Tasks 12 and 13)
 - e. Completion of post closure activities (Task 14).
- 13) If GM finds it necessary to modify the actions that EPA preauthorized, or if it becomes apparent that the project's costs will exceed the approved costs, GM may submit to EPA a revised application for preauthorization. Further,

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GM may submit to EPA a revised application for preauthorization upon EPA's determination of the requirements for final closure of the site.

- 14) EPA shall consider requests for preauthorization from GM in a timely manner and will preauthorize 33 1/3 percent of reasonable and necessary costs to implement the approved remedy.
- 15) Claims shall be submitted to the Administrator, EPA, Washington, D.C., Attention Director, Office of Emergency and Remedial Response. EPA shall provide the appropriate form(s) for such claims.
- 16) EPA may adjust claimed costs using the facilities and services of private insurance and claims adjusting organizations or Federal personnel. In making a determination whether costs are allowable, the claims adjuster will rely upon the appropriate Federal cost principles (non-profit organizations - OMB circular A-122; profit making organizations 48 CFR Subparts 31.1 and 31.2). Where additional costs are incurred due to acts or omissions of the claimant, payment of the claim will be adjusted accordingly. EPA may require the claimant to submit any additional information needed to determine whether the actions taken were reasonable and necessary.
- 17) Payment of any claim shall be subject to GM subrogating to the United States its rights as claimant to the extent to which its response costs are compensated from the Superfund. Further, GM shall assist the United States in any cost recovery action which may be initiated. As a part of this assistance, GM and all GM's contractors shall furnish the personnel, services, documents, and materials needed to assist EPA in the collection of evidence to document work performed and costs expended by GM or GM's contractors at the Harvey & Knotts site in order to aid in cost recovery efforts. Assistance shall also include providing all requested assistance in the interpretation of evidence and costs and providing requested testimony. All of GM's contracts for implementing the Consent Decree shall include a specific requirement that the contractors agree to provide this cost recovery assistance.
- 18) Eligible costs

GM may request reimbursement for up to 33 1/3 percent of reasonable and necessary eligible costs incurred, consistent with the NCP, in carrying out the remedy above, with the following limitations:

 - a) Costs may be incurred only after the date of this preauthorization;

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- b) Costs incurred for the purpose of restoring the wetlands or surface waters are not eligible for reimbursement from the Superfund;
 - c) Costs incurred for the payment of persons listed on the EPA Master List of Debarred, Suspended or Voluntary Excluded Persons at the time that the contract is awarded shall not be eligible for reimbursement unless the claimant obtains approval from EPA pursuant to 40 CFR Part 32 prior to incurring the obligation.
 - d) Interest accrues on amounts due Settlers pursuant to this agreement where EPA fails to pay the amount within sixty (60) days of EPA's receipt of a completed claim from the Settlers. A completed claim is a demand for a sum certain which includes all documentation required to substantiate the appropriateness of the amounts claimed. Where the Settlers submit a claim which is technically complete but for which EPA requires additional information in order to evaluate the amount claimed, interest will not accrue on the claim until sixty (60) days after EPA's receipt of the requested additional information. The rate of interest paid on a claim is the rate of interest on investments of the Superfund established by subchapter A of chapter 98 of the Internal Revenue Code of 1954.
 - e) Costs incurred for operation and maintenance are not eligible for reimbursement from the Superfund.
- 19) If any material statement or representation made in the application for preauthorization is false, misleading, misrepresented, or misstated and EPA relied upon such statement in making its decision, the preauthorization by EPA may be withdrawn following written notice to GM. Disputes arising out of EPA's determination to withdraw its preauthorization shall be governed by Paragraph XII of the Consent Decree. Criminal and other penalties may apply (see Attachment 3).
- 20) The Superfund is not hereby obligated to reimburse the claimant for subsequent remedial actions if those remedial actions are necessary as a result of the failure of the claimant, his employees or agents, or any third party having a contractual relationship with the claimant to properly perform activities under the Work Plan or any modification thereto approved by EPA and in conformance with the terms and conditions of this preauthorization decision document. EPA may require the claimant to submit any additional information needed to determine whether the actions taken were reasonable and necessary.

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- 21) This preauthorization shall be effective as of the date of entry of the attached Consent Decree.

J. Winston Porter 5/6/87
J. Winston Porter Date
Assistant Administrator,
Solid Waste and Emergency Response

ATTACHMENTS

1. EPA Record of Decision for the Harvey & Knotts Site
2. Consent Decree
3. Civil and Criminal Penalties

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ATTACHMENT 3

CERCLA PENALTY FOR PRESENTING FRAUDULENT CLAIM

Any person who knowingly gives or causes to be given false information as a part of a claim against the Hazardous Substances Superfund may, upon conviction, be fined in accordance with the applicable provisions of title 18 of the United States Code or imprisoned for not more than 3 years (or not more than 5 years in the case of a second or subsequent conviction), or both. (42 USC 9612 (b)(1).)

CIVIL PENALTY FOR PRESENTING FRAUDULENT CLAIM

The claimant is liable to the United States for a civil penalty of \$2,000, and an amount equal to two times the amount of damages sustained by the Government because of the acts of that person, and costs of the civil action. (31 USC 3729 and 3730.)

CRIMINAL PENALTY FOR PRESENTING FRAUDULENT CLAIM
OR MAKING FALSE STATEMENTS

The claimant will be charged a maximum fine of not more than \$10,000 or be imprisoned for a maximum of 5 years, or both. (See 62 Stat. 698, 749; 18 USC 287, 1001.)

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