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Record of Decision:

ALLEGANY BALLISTICS LABORATORY (USNAVY)
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MINERAL COUNTY, WV
06/30/1998

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RECORD OF DECISION

SITE 10 GROUNDWATER

at the

ALLEGANY BALLISTICS LABORATORY, WEST VIRGINIA

INTERIM REMEDIAL ACTION

JUNE 1998

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1.0 THE DECLARATION

1.1 SITE NAME AND LOCATION

Site 10 Groundwater
Allegany Ballistics Laboratory
Rocket Center, West Virginia

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for Site 10 (the "site") Groundwater at the Allegany Ballistics Laboratory (ABL), Rocket Center, West Virginia. This determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this site.

The Department of the Navy (DoN) has obtained concurrence from the State of West Virginia with the selected remedy.

ASSESSMENT OF THE SITE

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

1.3 DESCRIPTION OF THE SELECTED REMEDY

The Navy will manage the remediation at Site 10 in two separate actions, based on media, or Operable Units (OUs). The remedial action selected in this Record of Decision (ROD) addresses contamination associated with groundwater and is to be implemented as Operable Unit Five (OU 5).

Operable Unit Six (OU 6), defined as the contaminated subsurface soils at Site 10, will undergo further evaluation and separate remediation alternatives will be studied.

The selected interim action remedy for OU 5 is focused-groundwater extraction and discharge to Site 1 Treatment Plant.

The major components of the selected remedy are:

- Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.
- Groundwater pumping from a minimum of three extraction wells to capture the hot spot of the VOC contaminant plume. The remainder of the VOC plume will be investigated to better define the extent of contamination and to determine if the groundwater may be remediated through natural attenuation.
- Installation of a pipeline to transport groundwater from Site 10 to the Site 1 treatment plant.
- Discharge to the North Branch Potomac River.
- Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

Implementation of the selected interim action remedy will address the principal threats at the site by reducing the potential risk to human health and the environment.

1.4 STATUTORY DETERMINATIONS

This interim action remedy for OU 5 is protective of human health and the environment in the short term and is intended to provide adequate protection until a final Record of Decision (ROD) is signed; complies with

Federal and State requirements that are legally applicable or relevant and appropriate to this limited-scope action, and is cost-effective.

This action is interim and is not intended to utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable, however this interim action does utilize treatment and thus is in furtherance of that statutory mandate. Because this action does not constitute the final remedy for operable unit 5, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by the conditions at this site.

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

Because this is an interim action ROD, review of this site and of this remedy will be ongoing as the Navy continues to develop final alternatives for this site.

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2.0 DECISION SUMMARY

2.1 SITE NAME, LOCATION, AND DESCRIPTION

2.1.1 Site 10 Description

Allegany Ballistics Laboratory (ABL) is located at Rocket Center, in the north central panhandle of West Virginia, about 10 miles south of Cumberland, Maryland. ABL consists of two plants and several additional sites (Figure 1). Plant 1 occupies approximately 1,572 acres and is owned by the United States, controlled by the Navy and operated, under government contract, by Alliant Tech Systems. Plant 1 was placed on the National Priorities List (NPL) on May 31, 1994. Plant 2, a 56-acre area adjacent to Plant 1, is owned exclusively by Alliant Tech Systems, and was not listed on the NPL. Plant 2 is located along the river on a floodplain separate from Plant 1. Plant 1 lies between the North Branch Potomac River to the north and west, and Knobly Mountain to the south and east. Several small towns and communities are located near Plant 1, including Pinto, Maryland, (1,500 feet to the northwest) and the community along McKenzie Road (750 feet north of Site 1) both located directly across the river from Site 1 (Figure 1). These Maryland communities include a total of approximately 30-40 residents, 15 of whom obtain all potable water from private residential wells. Other residents use a public water system. Short Gap, West Virginia, is located on the other side of Knobly Mountain, 5,000 feet to the southeast of Plant 1.

Site 10, shown in Figure 2, is approximately 4 acres in size and is situated in the south central portion of Plant 1. Site 10 is located on the alluvial plain above the North Branch Potomac River and has a range in elevation from 664 feet above mean sea level (msl) to 675 feet msl. No portion of Site 10 is located in the 100-year flood zone. Most of Site 10 is level, however there is lower topography and a man-made drainage in the center portion of the site.

The land use across the river from Site 10 is primarily agricultural. The land is used for growing corn and hay, and a dairy farm also exists at the eastern end of McKenzie road. In addition, an aeration basin treating wastewater from the unincorporated Maryland communities of Pinto, Bel Air, and Glen Oaks is located just west of Pinto and discharges to the river.

A limestone quarry and treatment works were formerly located to the northeast across the North Branch Potomac River. The operation has been abandoned for over 50 years. To the northwest of ABL, a former industrial operation was located on top of the bedrock terrace.

There are no ground water production wells currently active on the alluvial plain portion of Plant 1 at ABL. Several residences utilize ground water wells, within 1,500 feet of the site across the river. Springs have been identified on Plant 1 approximately 1,500 feet to the south of Site 10.

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The North Branch Potomac River is the closest major surface body of water.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 History of Site Activities

The following discussion of the site background is summarized from the Phase II Remedial Investigation at Allegany Ballistics Laboratory Superfund Site Report (August 1996) (Phase Il RI Report), and the Remedial Investigation of the Allegany Ballistics Laboratory Report (January 1996) (RI Report). Site 10 is referred to in the RI and Phase II RI reports as Site PWA, which refers to Production Well - A.

Building 157 at ABL was constructed in the late 1950's initially as a chamber preparation building for the A2 Polaris second stage rocket motor casing. Operations in the building included degreasing with trichloroethene (TCE). TCE use in the building involved a TCE solvent recovery still with both clean and used solvent tanks as part of the process in the building. TCE use, storage, and recovery was discontinued in Building 157 by the early 1960's. It is assumed that the TCE from this building was the source of the contamination detected in the groundwater at Site 10.

2.2.2 Previous Investigations

Several investigations have been conducted at ABL during which Site 10 was either directly or indirectly involved. Between 1984 and 1987, a Confirmation Study (CS) was conducted at several Plant 1 sites recommended for further investigation in the Initial Assessment Study, which was completed in 1983 under the Navy Assessment and Control of Installation Pollutants Program (NACIP) (January 1983). During the CS, production well PWA, which is located approximately 400 feet south of the former TCE still at Building 157, was evaluated and found to contain detectable concentrations of TCE, 1,1,1-trichloroethane (1,1,1-TCA), and several other volatile organic compounds (VOCs). The CS defined Site PWA as the former production well PWA.

As a result of the Superfund Amendments and Reauthorization Act (SARA) of October 1986, the Navy changed its NACIP terminology and scope under the IRP to follow the rules, regulations, guidelines, and criteria established by the United States Environmental Protection Agency (EPA) for the Superfund program. For this reason, the results of the CS are documented in the Interim Remedial Investigation (Interim RI) Report (October 1989). The Interim RI Report recommended further investigation at six of the seven sites, including Site PWA.

Following the recommendations of the Interim RI Report and in accordance with the Navy's changed IRP policy, an RI was contracted that would follow EPA's RI/FS format under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The RI, initiated in May 1992 and completed in October 1992 (final document dated January 1996), was conducted to define the nature and extent of contamination at a number of ABL sites. The RI defined Site PWA as the area around Building 157, including former production well PWA.

Activities conducted during the RI included a focused facility audit to determine possible sources of VOC contamination at a number of sites, including Site PWA. Soil sampling and well testing also were conducted at Site PWA during the RI.

The RI Report (January 1996) indicated additional investigation at Site PWA was necessary to better define the nature and extent of contamination and to support human health and environmental risk assessments. A Phase II RI at a number of ABL sites, including Site PWA was contracted by the Navy in 1994. The Phase II RI activities at Site PWA consisted of additional soil and groundwater sampling at Site PWA (August 1996).

In order to remain consistent with the designation of sites at ABL, Site PWA was renamed Site 10 in 1995. All further discussion will use the "Site 10" designation.

Because the results of previous investigations at Site 10 suggested that the former TCE still at Building 157 was a likely source of groundwater contamination, a Phase I Aquifer Testing program was conducted at Site 10 to further define the extent of groundwater contamination and to collect hydraulic information necessary for the potential design of a groundwater extraction system at the site. Specific activities conducted during Phase I Aquifer Testing included a Geoprobe R groundwater investigation to determine the direction and extent of VOC contaminant migration, well installation and testing, and groundwater sampling. The Phase I Aquifer Testing program is documented in the draft Phase I Aquifer Testing Report (October 1996).

A Phase II Aquifer Testing program was undertaken to evaluate the assumptions used in the groundwater-flow

modeling and for the design of a possible extraction system. Observations made during Phase II Aquifer Testing showed that the assumptions were not fulfilled and site conditions changed in an eastward direction. The Phase II Aquifer Testing Report (March 1998) documents the testing results.

Based on the results from the previous investigations a Focused Feasibility Study (FFS) was undertaken for Site 10. The FFS was conducted to assess several alternatives to address groundwater contamination identified at Site 10.

2.2.3 Enforcement Actions

No enforcement actions have occurred at Site 10.

2.2.4 Highlights of Community Participation

The Navy and ABL have had a comprehensive public involvement program for several years. Starting in 1993, a Technical Review Committee (TRC) met on average twice a year to discuss issues related to investigative activities at ABL.

The TRC was comprised of mostly governmental personnel, however a few private citizens attended the meetings.

In early 1996, the Navy converted the TRC into a Restoration Advisory Broad (RAB) and 8 - 10 community representatives joined. The RAB is co-chaired by a community member and has held meetings approximately every three months since. The Focused Feasibility Study for Site 10 and the Proposed Plan were both discussed at the RAB meetings.

Community relations activities for the final selected remedy included the following actions:

- The documents concerning the investigation and analysis at Site 10, as well as a copy of the Proposed Plan, were placed in the information repository at Fort Ashby and La Vale Libraries.

- Newspaper announcements on the availability of the documents and the public comment period/meeting date were placed in the Cumberland Times on March 30, 1998.

- The Navy established a 45-day public comment period starting March 31, 1998 and ending May 14, 1998 to present the Proposed Plan.

- A Public Meeting was held April 8, 1998 to answer any questions concerning the Site 10 OU 5 Proposed Plan. Approximately 20 people, including Federal, State and local government representatives, attended the meeting. A summary of comments received during the Public Meeting is attached as Appendix B.

2.3 SCOPE AND ROLE OF OPERABLE UNIT (OR RESPONSE ACTION) WITHIN SITE STRATEGY

The selected interim remedial action will address contamination associated with Site 10 groundwater, as identified in the RI Report, the Phase II RI Report, and the Phase I and II Aquifer Testing Reports.

The selected interim remedial action will capture the highest concentration of contaminants, as defined by the 100 ppb concentration of Volatile Organic Compounds (VOCs) in the groundwater plume at Site 10.

The best professional judgement of the Navy, EPA, and WVDEP is that the part of the contaminant plume containing VOCs above 100 ppb can be captured and treated through this interim action. The selected interim remedial action will also greatly reduce the migration of the entire plume.

This selected interim remedial action will be consistent with and a major component of any final remedial action selected at a later time for Site 10 groundwater. The selected interim remedial action (or selected alternative) for groundwater at Site 10 is identified and the rationale for the selection are described in Section 2.8.

The principal threats posed by conditions at Site 10 for this operable unit result from potential exposures to contaminated groundwater.

Contamination associated with Site 10 soil will be addressed in a future FFS and remedial alternatives for the soils will be presented in a future ROD for soils. The selected interim remedial action for groundwater considers the contaminated soils as a potential source area, and will be consistent with any separate, final

actions proposed for Site 10 soils.

This ROD presents response actions to address contaminated groundwater. The selected interim remedial action is a modification of the one of the response action alternatives presented in the Proposed Plan. Because of uncertainties in the extent of groundwater contamination and in the effectiveness of natural attenuation for Site 10 groundwater, a final remedial action could not be selected at this time.

The selected interim remedial action for groundwater at Site 10 is expected to lead to the compliance with the remedial action objectives (RAOs) identified in the FFS for groundwater which are:

Prevent or minimize exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 10.

Restore the contaminated aquifers to beneficial use, where practical.

The selected interim remedial action is expected to comply with applicable or relevant and appropriate requirements (ARARs) and "to be considered" (TBC) requirements, where possible. ARARs and TBC requirements are federal and state environmental statutes that are either directly applicable or are considered in the development and evaluation of remedial alternatives at a particular site. The selected interim remedial action will not meet maximum contaminant levels (MCLs) for groundwater at Site 10. Any final remedial action selected for groundwater at Site 10 at a later time must comply with the identified ARARs unless an ARAR is waived according to the criteria established in the NCP at 40 CFR 300.430(f)(1)(ii)(C). Complete ARAR and TBC listings for Site 10 can be found in Appendix A of the FFS and are attached as Appendix A to this ROD.

A final remedial action for Site 10 groundwater will be proposed and selected at a later time based on additional information developed from the selected interim remedial action.

2.4 SUMMARY OF SITE CHARACTERISTICS

Site 10 is underlain by two distinct lithologies: (1) unconsolidated alluvial deposits of clay, silt, sand, and gravel; and (2) predominantly shale bedrock.

Unconsolidated

Drilling activities at Site 10 indicated that the unconsolidated deposits overlying bedrock generally consist of two distinct layers of material: (1) an upper, or surficial silty clay, considered floodplain deposits and (2) a deeper sand and gravel layer (alluvium), with variable but typically significant amounts of clay and silt. The floodplain deposits have an average depth of approximately 12 feet below ground surface (bgs) and the alluvial materials have an average thickness of approximately 14.5 feet beneath Site 10.

The sand and gravel alluvium constitutes the shallow aquifer at Site 10. The approximate position of the water table is based on water-level measurements collected in December 1996 during the Phase II Aquifer Testing. The alluvial deposits are believed to be saturated through their entire thickness to within two feet of ground surface on Site 10.

Groundwater flow in the unconsolidated or alluvial aquifer at Site 10 is to the north-northeast. Based on the most recent groundwater monitoring data, there appears to be a convergence or channeling of groundwater flow in the northeast direction, which may be affected by the location of a set of sewer lines.

Bedrock

Below the sand and gravel alluvium lies bedrock consisting of mainly calcareous shale and minor limestone of Silurian age. The average depth to bedrock at Site 10 is approximately 22.5 feet.

During the RI and Phase II RI, separate investigations were conducted to identify bedrock fracture sets and orientations in the vicinity of Plant 1 that may control local bedrock groundwater flow. During the RI, field measurement of 96 fracture planes identified two predominant orientations: (1) N26!E; and (2) N39!W. The former measurement was the most common measurement recorded and is approximately parallel to the structural trend of the Wills Mountain Anticlinorium and the Appalachian folds in the region. The latter orientation is oblique to the Appalachian structural trend.

During the Phase II RI, aerial photographs were also studied and it was found that a number of probable fracture traces adjacent to the plant display orientations that are similar to the predominant fracture

orientations measured during the RI. It is assumed that fracture traces displaying these predominant orientations also exist beneath Site 10. The pattern or direction of groundwater flow in the bedrock aquifer is similar to that of the alluvial aquifer. However, unlike the alluvial aquifer, lateral groundwater flow in the bedrock aquifer is confined mainly to partings along bedding planes and fractures.
Bedrock groundwater beneath the central and eastern portion of Site 10 generally flows northeast.

Aquifer tests at Plant 1 and water-level data collected from monitoring wells at Site 10 suggest varying degrees of hydraulic interconnection exist between the alluvium and shallow bedrock.

Data collected from an alluvial and shallow bedrock well pair at Site 10 indicate that the vertical component of hydraulic gradient is slightly upward from the bedrock to the alluvial aquifer.

Sources of Contamination

NATURE AND EXTENT OF CONTAMINATION

Based on site history and previous remedial investigations, contamination from prior land use practices at Site 10 has impacted groundwater. A brief summary of the nature and extent of contamination follows.

Due to complex site geology and the level of investigation to date, an accurate estimate of the volume of the contaminated groundwater plume cannot be made. However, Figure 3 provides an approximate aerial extent of the contaminant plume. Figure 3 indicates the uncertainty in the extent of groundwater contamination in the northeast direction, along the groundwater flow direction.

This summary focuses on the primary constituents associated with groundwater contamination, and is not intended to address all of the sampling, analytical, and evaluation results contained in previous investigative documents. A detailed discussion of contaminant nature and extent at Site 10, as known to date can be found in the Phase II RI Report and the Site 10 Phase II Aquifer Study Report.

Groundwater Contamination

During the course of the RI Phase II RI, and the Aquifer Testing programs groundwater samples were collected from all Site 10 monitoring wells for various analyses to determine the nature and extent of contamination. The analytical results are discussed in detail in the various reports and are briefly summarized here.

Volatile Organic Compounds (VOCs)

Several VOCs were detected in Site 10 groundwater during the investigations, but the seven most prevalent VOCs were: trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), trans 1,2-dichloroethene (1,2-DCE), methylene chloride (MC), 1,1-dichoroethane (1,1-DCA), 1,1,1-trichloroethane (1,1,1-TCA), and tetrachloroethene (PCE).

Of the VOCs detected in Site 10 groundwater, TCE was the most prevalent and was detected at the highest concentrations. The highest concentrations of TCE [(up to 830 micrograms per liter (ug/1)] were found in a welt located hydraulically downgradient of the Building 157.

Similar to TCE, 1,2-DCE was detected at the highest concentrations (30 ug/1) in the well cluster located hydraulically downgradient of Building 157 TCE still. PCE was detected in both alluvial and bedrock monitoring wells at concentrations as high as 21 ug/l and 11 ug/l, respectively. The suspected source for the detected PCE may be Solid Waste Management Unit (SWMU) 24V, which is located hydraulically upgradient from the wells with PCE contamination. PCE was detected is the soils at SWMU 24V.

In general, the highest concentrations of the other VOCs are associated with samples containing the highest concentrations of TCE.

Inorganics

The results of inorganics analysis on the samples collected from wells 10GW1 and 10GW11 suggested that, in general, the concentrations of most inorganics at Site 10 are similar to or lower than those at Site 1 (August 1995). These results imply that the groundwater from Site 10 can be treated similarly to the groundwater from Site 1, which involves iron and manganese precipitation before UV Oxidation and Air Stripping.

Of the total inorganics of concern from a treatment standpoint, calcium was detected at similar

concentrations in both the alluvium (75,000 micrograms per liter [Ig/L]) and bedrock (85,000 Ig/L); approximately twice as much magnesium (Mg) and sodium (Na) was detected in the bedrock (16,000 Ig/L Mg and 17,000 Ig/L Na) than in the alluvium (7,000 Ig/L Mg and 9,000 Ig/L Na); and approximately four times as much iron was detected in the alluvium (5,000 Ig/L) than in the bedrock (1,400 Ig/L).

Of the total inorganics of concern from a human health or environmental risk standpoint, similar concentrations of arsenic (As) and barium (Ba) were detected in the alluvium (4 Ig/L As and 50 Ig/L Ba) and the bedrock (9 Ig/L As and 70 Ig/L Ba), but approximately seven times as much manganese was detected in the bedrock (210 Ig/L) than in the alluvium (30 Ig/L).

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Potential Routes of Contaminant Migration

Contaminated groundwater in the alluvial and bedrock aquifers at Site 10 is likely migrating away from Site 10 and toward the North Branch Potomac River.

2.5 SUMMARY OF SITE RISKS

The human health and ecological risks associated with exposure to contaminated groundwater at Site 10 were evaluated in the Phase II RI Report. The human health baseline risk assessment evaluated and assessed the potential health risks which might result under current and potential future land use scenarios. Cancer risks are presented as a number indicating the potential for an increased chance of developing cancer if directly exposed to contaminants. As an example, EPA's acceptable risk range for cancer is 1 x 10 -6 to 1 x 10 -4, which means there might be one additional chance in one million (1 x 10-6) to one additional chance in ten thousand (1 x 10 -4) that a person would develop cancer if exposed to the contaminants at the site. The risks evaluated for developing other health effects are expressed as a hazard index (HI). A hazard index of one or less indicates a very low potential to experience any adverse health effects from exposure to contaminants at the site. No ecological impacts were noted based on groundwater from Site 10. A summary of the human health associated with the site are summarized below.

2.5.1 Human Health Risks

Groundwater

The baseline risk assessment characterizes risks to human health at the site. This characterization is based on the assumption that site conditions will remain unchanged (contaminant concentrations will not increase or decrease in the reasonable foreseeable future). The risk assessment, primarily based on USEPA risk assessment guidance, is described fully in the Phase II RI Report and summarized here. It is important to note that the risk assessment was not revised using new data generated from the Phase I or
Phase II Aquifer Testing. This is because the basic conclusion that groundwater contamination exceeds maximum contaminant levels (MCLs) and therefore, must be addressed, would not change.

There is no current exposure to contaminated groundwater at Site 10 because groundwater is no longer used as a drinking water source at ABL. Groundwater risks for potential future exposure scenarios were calculated using the most likely residential water supply source and a reasonable maximum residential water supply source. The majority of the residences in the vicinity of the site are supplied by individual wells that are in the bedrock aquifer.

Therefore, the most likely future groundwater supply for Site 10 was assumed to be the bedrock aquifer. Although the alluvial aquifer may not be able to sustain a sufficient yield for use as a domestic or industrial groundwater supply, it was conservatively considered as a potentially complete future groundwater exposure pathway. Therefore, the alluvial aquifer was evaluated as a reasonable maximum exposure scenario.

Future adult resident exposure pathways for groundwater consist of ingestion of groundwater, inhalation of VOCs while showering, and dermal contact with contaminated groundwater while washing or bathing.

Future child resident exposure pathways for groundwater are ingestion of groundwater and dermal contact while bathing.

Risks for the Most Likely Water Supply Scenario. The adult noncancer hazard index and cancer risk associated with exposure to groundwater were below or within EPA's target levels. The child noncancer hazard index was

just above EPA's target value.

Child. The cumulative hazard index for ingestion is 0.83, which is below the threshold level of 1. The cumulative hazard index for dermal contact while bathing is 0.23. The cumulative hazard index across pathways is 1.06, just above the EPA threshold value of 1.

Adult. The cumulative hazard index for inhalation and ingestion with contaminated groundwater is 0.7, which is below the threshold value of 1.

Risks for the Reasonable Maximum Water Supply Scenario. The noncancer hazard index values for inhalation, ingestion, and dermal contact with groundwater at Site 10 were all above EPA recommended levels. Individual cancer risks associated with exposure to groundwater were within EPA recommended levels.

Child. The cumulative hazard index for ingestion is 3.0, which exceeds the threshold level of 1. TCE contributes 67 percent of the ingestion hazard. The cumulative hazard index for dermal contact while bathing is 1.2, which slightly exceeds the threshold level of 1. TCE contributes 88 percent of the dermal hazard due to bathing with groundwater.

Adults. The cumulative hazard indices for inhalation o f volatiles; from groundwater while showering (1.9) and ingestion of groundwater (1.3), are both above the threshold level of 1. TCE contributes 88 percent of the inhalation hazard and 67 percent of the ingestion hazard. The total age-adjusted cancer risk for groundwater exposure including inhalation while showering for the adult, dermal contact while bathing for the child, and ingestion is 1.4x10 -4, which is above the upper bound of the EPA target risk range.

No human health risk assessment was performed for a future construction worker exposed to groundwater, however the risks would be much lower than the residential risk evaluated above.

2.5.2 Environmental Evaluation

The Focused Feasibility Study and the Proposed Plan for Site 10 discuss the remedial actions for contaminated groundwater at Site 10. No ecological impacts were noted based on groundwater from Site 10. An ecological risk assessment will be reviewed when the contaminated soils at Site 10 are addressed.

2.6 DESCRIPTION OF ALTERNATIVES

A detailed analysis of the possible remedial alternatives for Site 10 groundwater is included in the Site 10 FFS report.

The detailed analysis was conducted in accordance with the EPA document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" and the National Oil Hazardous Substances Pollution Contingency Plan(NCP). A summary of the remedial alternatives that were developed to address contamination associated with Site 10 groundwater is presented below. Alternatives 2, 7, and 10 presented in the FFS did not pass the screening criteria, were not evaluated in detail and therefore are not summarized below.

GROUNDWATER ALTERNATIVE 1 - NO ACTION

Description: Under this alternative no further effort or resources would be expended at Site 10. Because contaminated groundwater would be left at the site, a review of the site conditions would be required every 5 years. The review is specified in the NCP. Alternative 1 serves as the baseline against which the effectiveness of the other alternatives is judged.

Cost: There are no costs associated with this alternative.

Time to Implement: Implementation would be immediate.

GROUNDWATER ALTERNATIVE 3 - SITEWIDE GROUNDWATER EXTRACTION AND DISCHARGE TO THE SITE 1 TREATMENT PLANT.

Description: The major components of this alternative include:

1. Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

2. Groundwater pumping from five extraction wells across Site 10.

3. Installation of a pipeline to transport groundwater from Site 10 to the Site 1 treatment plant.

4. Discharge to the North Branch Potomac River.

5. Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

Alluvial groundwater extraction will occur across the length of Site 10 with the focus of preventing the continued migration of contaminants from the site.

Based on preliminary groundwater modeling, the extraction flow rate is estimated to range from 30 to 90 gpm, depending on the transmissivity in the alluvial the aquifer.

The treatment plant flow rate will be revised based upon pump tests conducted on the extraction wells once they are installed and tested.

The pipeline that transports the extracted groundwater to the treatment plant will be double-walled to provide secondary containment of the transported groundwater.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program.

The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

The State of Maryland has the right to review the discharge limitations imposed by West Virginia, and may impose more stringent limitations at their discretion. The treatment plant will be designed to comply with the final discharge limits once they are established.

Cost: The estimated costs associated with this alternative are listed below.

Capital: $659,519
Annual operation and maintenance: $240,000 (Year 1)
$110,000 (Years 2-15)

Net present worth (30-year): $1,900,000

Time to Implement: Four months to implement.

GROUNDWATER ALTERNATIVE 4 - SITEWIDE GROUNDWATER EXTRACTION, AIR STRIPPING, AND DISCHARGE TO THE STORM SEWER.

Description: The major components of this alternative include:

1. Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

2. Groundwater pumping from five extraction wells across Site 10.

3. Construction of a treatment system at Site 10 and treatment of the groundwater by metals sequestration and air stripping. Establishment of an O&M program for the groundwater treatment plant and extraction system.

4. Discharge of the treated water to an existing storm sewer which runs adjacent to Site 10 and discharges to the North Branch Potomac River.

5. Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

The Site 10 treatment plant process consists of metals sequestration and air stripping. All the equipment included in the system is standard and readily available from a variety of vendors.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program.

The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

The integrity of the storm sewer will be investigated and any leaking portion of the pipe, especially the clay sections will be upgraded if necessary. A new 160-foot segment of storm sewer will be constructed in order to discharge Site 10 treated groundwater directly to the river. As part of the Site 10 monitoring program, the new discharge point will be monitored to comply with ABL's future NPDES permit requirements.

Cost: The estimated costs associated with this alternative are listed below.

Capital: $880,000

Annual operation and maintenance: $250,000 (Year 1)
$120,000 (Years 3-15)

Net present worth (30-year): $2,200,000

Time to Implement: Four to five months to implement.

GROUNDWATER ALTERNATIVE 5 - SITEWIDE GROUNDWATER EXTRACTION, CARBON ADSORPTION, AND DISCHARGE TO THE STORM SEWER.

Description: The major components of this alternative include:

1. Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

2. Groundwater pumping from five extraction wells across Site 10.

3. Construction of a treatment system at Site 10 and treatment of the groundwater by carbon adsorption. Establishment of an O&M program for the groundwater treatment plant and extraction system.

4. Discharge of the treated water to an existing storm sewer which runs adjacent to Site 10 and discharges to the North Branch Potomac River.

5. Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

The Site 10 treatment plant process consists of a bag filter, metals sequestration, and carbon adsorbers. All the equipment included in the system is standard and readily available from a variety of vendors.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program. The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

The integrity of the storm sewer will be investigated and any leaking portion of the pipe, especially the clay sections will be upgraded if necessary. A new 160-foot segment of storm sewer will be constructed in order to discharge Site 10 treated groundwater directly to the river.

As part of the Site 10 monitoring program, the new discharge point will be monitored to comply with ABL's

future NPDES permit requirements.

Cost: The estimated costs associated with this alternative are listed below.

Capital: $1,330,000
Annual operation and maintenance: $340,000 (Year 1)
$210,000 (Years 2-15)

Net present worth (30-year): $3,600,000

Time to Implement: Four to five months to implement.

GROUNDWATER ALTERNATIVE 6 - SITEWIDE GROUNDWATER EXTRACTION, UV/H 20 2 OXIDATION, AND DISCHARGE TO THE STORM SEWER.

Description: The major components of this alternative include:

1. Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

2. Groundwater pumping from five extraction wells across Site 10.

3. Construction of a treatment system at Site 10 and treatment of the groundwater by metals sequestration and UV/H 20 2 Oxidation. Establishment of an O&M program for the groundwater treatment plant and extraction system.

4. Discharge of the treated water to an existing storm sewer which runs adjacent to Site 10 and discharges to the North Branch Potomac River.

5. Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

The Site 10 treatment plant process consists of metals sequestration and UV/H 20 2 Oxidation. All the equipment included in the system is now considered standard and readily available from selected vendors.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program. The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

The integrity of the storm sewer will be investigated and any leaking portion of the pipe, especially the clay sections will be upgraded if necessary. A new 160-foot segment of storm sewer will be constructed in order to discharge Site 10 treated groundwater directly to the river. As part of the Site 10 monitoring program, the new discharge point will be monitored to comply with ABL's future NPDES permit requirements.

Cost: The estimated costs associated with this alternative are listed below.

Capital: $1,500,000

Annual operation and maintenance: $290,000 (Year 1)

$160,000 (Years 2-15)

Net present worth (30-year): $3,300,000

Time to Implement: Four to five months to implement.

GROUNDWATER ALTERNATIVE 8 - FOCUSED GROUNDWATER EXTRACTION, AIR STRIPPING, AND DISCHARGE TO THE STORM SEWER.

Description: The major components of this alternative include:

1. Institutional controls, including land use restrictions imposed through

appropriate administrative mechanisms to prevent groundwater use.

2. Groundwater pumping from three extraction wells to capture the hot spot of the VOC contaminant plume. The remainder of the VOC plume will be remediated through natural attenuation.

3. Construction of a treatment system at Site 10 and treatment of the groundwater by metals sequestration and air stripping. Establishment of an O&M program for the groundwater treatment plant and extraction system.

4. Discharge of the treated water to an existing storm sewer which runs adjacent to Site 10 and discharges to the North Branch Potomac River.

5. Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

The Site 10 treatment plant process consists of metals sequestration and air stripping. All the equipment included in the system is standard and readily available from a variety of vendors.

The majority of the VOC plume is composed of fairly low, less than 100 Ig/L(ppb)TCE concentrations, with a much smaller fraction containing significantly higher, up to 830 ppb TCE concentrations. This "hot spot" is located in the general vicinity of Building 157 and for purposes of design and planning, it has been assumed that the "hot spot" generally coincides with the 100 ppb VOC isopleth or contour.

Three extraction wells will capture the VOC hot spot and the assumption has been made that the hot spot will be remediated within 10 years, and groundwater extraction will cease at that time.

The remainder of the VOC plume will be remediated through natural attenuation. Institutional controls will be implemented, consisting of groundwater use restrictions and a groundwater monitoring program.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program.

The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

The integrity of the storm sewer will be investigated and any leaking portion of the pipe, especially the clay sections will be upgraded if necessary. A new 160-foot segment of storm sewer will be constructed in order to discharge Site 10 treated groundwater directly to the river. As part of the Site 10 monitoring program, the new discharge point will be monitored to comply with ABL's future NPDES permit requirements.

Cost: The estimated costs associated with this alternative are listed below.

Capital: $700,000

Annual operation and maintenance: $160,000 (Years 1-2)

$ 80,000 (Years 3-15)

$ 30,000 (Years 16-30)

Net present worth (30-year): $1,800,000

Time to Implement: Four months to implement.

GROUNDWATER ALTERNATIVE 9 - FOCUSED GROUNDWATER EXTRACTION AND DISCHARGE TO SITE 1 TREATMENT PLANT.

Description: The major components of this alternative include:

1. Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

2. Groundwater pumping from three extraction wells to capture the hot spot of the VOC contaminant plume. The remainder of the VOC plume will be remediated through natural attenuation.

3. Installation of a pipeline to transport groundwater from Site 10 to the Site 1 treatment plant.

4. Discharge to the North Branch Potomac River.

5. Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

The majority of the VOC plume is composed of fairly low, less than 100 Ig/L(ppb)TCE concentrations, with a much smaller fraction containing significantly higher, up to 830 ppb TCE concentrations.

This "hot spot" is located in the general vicinity of Building 157 and for purposes of design and planning, it has been assumed that the "hot spot" generally coincides with the 100 ppb VOC isopleth or contour.

Three extraction wells will capture the VOC hot spot and the assumption has been made that the hot spot will be remediated within 10 years, and groundwater extraction will cease at that time.

The remainder of the VOC plume will be remediated through natural attenuation. Institutional controls will be implemented, consisting of groundwater use restrictions and a groundwater monitoring program.

Based on preliminary groundwater modeling, the extraction flow rate is estimated to range from 20 to 30 gpm, depending on the transmissivity in the alluvial the aquifer.

The treatment plant flow rate will be revised based upon pump tests conducted on the extraction wells once they are installed and tested.

The pipeline that transports the extracted groundwater to the treatment plant will be double-walled to provide secondary containment of the transported groundwater.

Discharge of treated water to the North Branch Potomac River will comply with ARARs, governed primarily by the State of West Virginia's National Pollutant Discharge Elimination System (NPDES) program. The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits to be protective of human health and the environment.

Cost: The estimated costs associated with this alternative are listed below.

Capital: $602,368

Annual operation and maintenance: $150,000 (Years 1-2)

$ 70,000 (Years 3-15)

$ 30,000 (Years 15-30)

Net present worth (30-year): $1,600,000

Time to Implement: Three to four months to implement.

2.7 SUMMARY OF THE COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives presented in Section 2.6 were evaluated in the FFS against seven of the nine criteria identified in the NCP. Evaluation of all nine criteria are presented below.

Alternatives 2, 7 and 10 developed for the early screening during the FFS, did not pass the screening and were not evaluated in the comparative analysis.

2.7.1 THRESHOLD CRITERIA

Overall Protection of Human Health and the Environment

The Site 10 RAOs include:

- Preventing or minimizing exposure of potential future onsite residents and construction workers to contaminated groundwater originating from Site 10.

- Restoring the contaminated aquifers to beneficial use, where practical.

The No Action alternative will not meet either RAO. Annual groundwater monitoring is required in order to identify trends in contaminant reduction, and in order to make a better estimate of the time to remediation.

Alternatives 3 through 6 will meet both RAOs. These alternatives incorporate sitewide groundwater extraction, which will prevent offsite migration of groundwater contaminants. Each alternative incorporates a treatment component, which will reduce the toxicity of the groundwater contaminants, thereby preventing exposures of future site residents and construction workers to contaminant concentrations above preliminary remediation goals (PRGs).

Alternatives 8 and 9 will likely meet both of the RAOs during the 30-year study period. These alternatives incorporate focused groundwater extraction from the VOC hot spot, and allow the more dilute portion of the VOC plume to be remediated through natural attenuation. Groundwater monitoring will be used to confirm that offsite migration is not occurring, and natural attenuation processes are degrading the VOC contaminants so their concentrations are reduced to the PRGs.

In each of these alternatives, extracted groundwater will be treated, thereby minimizing the potential for future exposures to contaminants above PRGs.

Compliance with Applicable or Relevant and Appropriate Requirements

Chemical-Specific ARARs--Groundwater chemical-specific ARARs (MCLs) would likely be attained during the project life by each of the alternatives, except the No Action Alternative. Alternatives 3 through 6 will likely achieve the ARARs for groundwater within the 30-year study period.

Groundwater extraction will increase the hydraulic gradient, thereby increasing the rate of VOC movement. It is likely that chemical-specific ARARs will be met within 15 years. However, the presence of VOCs in the silty clay layer of the alluvium may complicate removal and lengthen the time of remediation.

In Alternatives 8 and 9, chemical-specific ARARs will likely be achieved in the VOC hot spot. Preliminary calculations performed during groundwater flow modeling indicated that much of the hot spot area can be pumped at a higher rate than what is planned for in the sitewide extraction alternatives.

Therefore, it is likely that the hot spot will be remediated more quickly in these alternatives, and the chemical-specific ARARs will be met sooner in this portion of the aquifers than with sitewide extraction alternatives. Natural attenuation is a slower process. Therefore, it will take longer for chemical-specific ARARs to be met on the remainder of the site, if natural attenuation is occurring at Site 10 at all.

However, hot spot extraction will prevent continued migration of contaminants from the site, so the natural attenuation process will only be required to remediate the more dilute portions of the contaminant plume. Therefore, it is likely that Alternatives 8 and 9 will meet the chemical-specific ARARs for groundwater within the 30-year study period.

Location-Specific ARARs--There are no location-specific ARARs for any of the alternatives except alternatives 3 and 9. In these two alternatives, extracted groundwater will be discharged to the Site 1 treatment plant. The location-specific ARARs for the Site 1 treatment plant were addressed in the Site 1 FFS.

Action-Specific ARARs--There are no action-specific ARARs for Alternative 1. The remainder of the alternatives rely on piping to convey water from the extraction wells to a treatment system. The State of West Virginia Groundwater Protection Act (°47CSR58-4.7 to 4.7.4) indicates that pipelines that convey contaminants shall preferentially be installed above ground where feasible. Above ground installation is not feasible either because pipelines will cross roads and because the potential for freezing exists.

In Alternatives 3 and 9, extracted groundwater will be conveyed to the Site 1 treatment plant through a double-walled pipe in order to provide additional safeguards against the spread of contamination to clean areas.

The State of West Virginia Groundwater Protection Act (º47CSR58-8.1.2) requires that cleanup actions shall not rely primarily on dilution and dispersion if active remedial measures are technically and economically feasible. Alternative 3 through 6 would satisfy this ARAR because the alternatives use active pumping to cleanup the site. Alternatives 8 and 9 rely on active pump and treat systems as well as natural attenuation processes to remediate groundwater contamination and should fulfill this requirement.

Alternatives 8 and 9 will also fulfill the USEPA OSWER policy directive entitled Draft Interim Final OSWER Monitored Natural Attenuation Policy (OSWER Directive 9200.4-17).

This policy indicates that monitored natural attenuation will be most appropriate when used in conjunction with active remediation measures (e.g. source control), or as a follow-up to active remediation measures that have already been implemented.

2.7.2 PRIMARY BALANCING CRITERIA

Long-term Effectiveness and Permanence

All of the alternatives (except the No Action alternative) will provide a minimal amount of residual risk following implementation of the alternative. Alternatives 3 through 6 and 8 and 9 minimize the risk associated with groundwater contaminants remaining at Site 10. Five-year site reviews are required for each alternative.

There is no significant distinction between Alternatives 3 through 6 in meeting this evaluation criterion. These alternatives incorporate sitewide extraction and treatment, and in doing so, will remediate the aquifer to PRGs. Alternatives 8 and 9 rely on focused groundwater extraction from the VOC hot spot, and natural attenuation for the remainder of the VOC plume. It is likely that only minimal residual risk will remain following completion of these alternatives. However, it will take longer for these alternatives to be completed than with Alternatives 3 through 6.

Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment

Alternatives 3 through 6 will provide an equal degree of reduction in toxicity, mobility, and volume.

In these alternatives, sitewide extraction will be used to capture the entire VOC plume, and treatment technologies will be used to reduce contaminant concentrations to chemical-specific ARARs.

Alternatives 8 and 9 will provide a lesser degree of reduction in toxicity, mobility, and volume of groundwater contaminants than Alternatives 3 through 6 in the short term because these alternatives rely on focused extraction and natural attenuation.

Alternative 1 provides no reduction in toxicity, mobility, or volume for groundwater.

Short-Term Effectiveness

Alternative 1 can be implemented most quickly, however it does not meet the remedial action objectives. Alternatives 3 and 9 can both be implemented in about the same amount of time, four to six months.

There will be no significant impacts to the ABL facility under any of the alternatives.

Alternatives 3 and 9 will likely produce the largest disturbance due to the installation of the Site 10 discharge pipeline that must be installed across facility roads. In these alternatives, the Site 1 treatment system must also be temporarily shut down for modifications. Alternatives 4, 5, 6, and 8 will have a minor impact on the facility, unless the storm sewer requires a major upgrade to handle the treated discharge. If an upgrade were required, the potential disruption to ABL would be the same as Alternatives 3 and 9. All construction will take place on ABL property.

The majority of the risk results from fugitive dust emissions that can be controlled. Alternative 1 will have virtually no impact on the facility.

Implementability

There are no significant technical difficulties associated with any of the alternatives.

Aquifer testing and monitoring will be necessary to evaluate how effective the well network will be in capturing the contaminant plume.

Alternatives 3 and 4 require the design and construction of an effective extraction well network for the entire sitewide contaminant plume and for Alternative 4, 5, and 6 the construction of a complex treatment facility. Alternatives 8 and 9 require the design and construction of a focused, limited extraction well network, and for Alternative 8 the construction of a complex treatment facility. Alternative 9 will rely on the Site 1 treatment system for treatment of the contaminated groundwater.

Five-year site reviews will be required in all of the alternatives because contaminated media will remain on site after implementation of each alternative.

Cost

The annual operating and maintenance (O&M) cost is estimated to be similar for Alternatives 3 and 8, while Alternative 5 has the highest O&M and Alternative 9 has the smallest O&M. On a present worth basis, Alternative 5 is the most costly, at $3,600,000.

The present worth of Alternative 3 is $1,900,000 and that of Alternative 8 is 1,800,000. Alternative 9 is the least expensive alternative (excluding the No Action Alternative), with a present worth of $1,600,000.

2.7.3 MODIFYING CRITERIA

State Acceptance

The West Virginia Division of Environmental Protection, on behalf of the State of West Virginia, has reviewed the information available for Site 10 Groundwater, OU 5 and has concurred with the selected remedy.

Community Acceptance

Community Acceptance summarizes the public's general response to the alternatives described in the Proposed Plan and the Focused Feasibility Study. No written comments were received during the forty-five day comment period, which began on March 31 and ended on May 14, 1998. The comments recorded at the Proposed Plan Public Meeting held April 8, 1998 and the responses are referenced in the Responsiveness Summary, Section 3.0 and included in Appendix B of the ROD.

2.8 THE SELECTED REMEDY

Not one of the alternatives discussed in Section 2.6 can be implemented at this time at Site 10. Because of the uncertainty in the effectiveness of natural attenuation at Site 10 and because the full extent of alluvial and bedrock contamination at Site 10 has not been defined, not one of the alternatives would be effective as a final remedial action for Site 10 groundwater at this time.

As an interim action, a modification of Alternative 9 - Focused Groundwater Extraction and Discharge to Site 1 Treatment Plant, is the selected interim remedial alternative. Based on available information and the current understanding of Site 10 conditions, a modified Alternative 9 appears to provide the best balance with respect to the nine NCP evaluation criteria.

In addition, this selected alternative is anticipated to approach meeting the following statutory requirements:

Protection of human health and the environment (groundwater). The selected interim remedial action will greatly reduce the migration of the entire plume and with institutional controls in-place, will be protective of human health.

Compliance with ARARs. While compliance with chemical-specific ARARs (MCLs) for the groundwater plume will not occur for the entire site, it is estimated that the greatest concentration of contaminants, as defined by the 100

ppb concentration of VOCs in the groundwater plume at Site 10 will be captured.

Cost-effectiveness.

Utilization of permanent solutions and alternative treatment or resource recovery technologies to the maximum extent practicable.

The major components of the selected interim action remedy are:

- Institutional controls, including land use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

- Groundwater pumping from a minimum of three extraction wells to capture the hot spot of the VOC contaminant plume. The remainder of the VOC plume will be investigated to better define the extent of contamination and to determine if the groundwater may be remediated through natural attenuation.

- Installation of a pipeline to transport groundwater from Site 10 to the Site 1 treatment plant.

- Discharge to the North Branch Potomac River.

- Groundwater monitoring on a timely basis, quarterly to semi-annually, will evaluate groundwater quality, contaminant migration, and degradation for inclusion in the 5-year site reviews.

This selected interim remedial action will be consistent with and a major component of any final remedial action selected at a later time for Site 10 groundwater.

The selected interim action alternative addresses contaminated groundwater at Site 10, but does not address contamination associated with surface and subsurface soil overlying the groundwater aquifers. As discussed previously, a separate FFS will be prepared which addresses soil contamination.

2.8.1 PERFORMANCE STANDARDS

The performance standards outlined below will be used to evaluate the overall performance of the selected interim action remedy.

Capture the Site 10 contaminant plume, which is defined by the 100 ppb VOC contaminant concentration contour as presented in the Phase 11 Aquifer Test Report.

Treat all extracted groundwater to levels meeting the substantive requirements of the Clean Water Act National Pollutant Discharge Elimination System (NPDES) regulatory program. The Ambient Water Quality Criteria (AWQC) for water and organisms will be considered further in the calculation of final discharge limits developed to be protective of human health and the environment.

Develop and implement groundwater investigation and monitoring plans that will define the extent of groundwater contamination in both the alluvial and bedrock aquifers and will demonstrate if natural attenuation is effective at Site 10.

Develop and implement institutional controls, including land-use restrictions imposed through appropriate administrative mechanisms to prevent groundwater use.

A site -specific land-use control implementation plan shall be developed by the Navy and incorporated in the Remedial Design. The implementation plan shall identify the land area under restriction and shall include a discussion of site access controls, site security, operation and maintenance activities necessary to maintain any physical access control features, drilling controls, groundwater use controls, notice filed on local property records, and site signs.

Within 30 days of completion of the installation of the pumps in the extraction wells at Site 10 signs shall be posted indicating hazardous substances are present. These signs shall be removed at the completion of the remedy.

Alliant Tech Systems prepares the planning documents that would affect the land use or future land use of the

property at ABL. These documents are usually submitted and any change to the existing land use to a specific area at ABL would be approved by the Navy. The planning documents for the facility, either those developed by Alliant Tech Systems (or other parties contracted to the Navy), or those developed by the Navy shall be updated with notations indicating the area of the Site 10 groundwater plume as an area where construction can not occur, residential development can not occur, and where groundwater can not be used.

As part of the yearly O & M Report, the Navy shall conduct a field inspection and certify that the institutional controls as outlined above are still in-place and effective. The Navy shall notify USEPA and WVDEP 60 days before planning changes in the use of Site 10 groundwater or any of the use restrictions in the planning documents referenced above in relation to Site 10. If the land use at Site 10 changes, the Navy shall immediately upon discovery notify the EPA and WVDEP. The Navy shall also notify WVDEP and EPA in advance, if the Navy contemplates any transfer, by sale or lease, of the land area including Site 10.

Additionally, a notice shall be filed in local property records with the documents indicating United States ownership of the property in question at the county courthouse which indicates that ABL Plant 1 is an NPL site, Site 10 groundwater is restricted from use according to requirements of this ROD, and that information specific to Site 10 groundwater can be reviewed in the administrative record for Site 10.

2.9 STATUTORY DETERMINATIONS

Remedial actions must meet the statutory requirements of Section 121 of CERCLA as discussed below.

Remedial actions undertaken at NPL sites must achieve adequate protection of human health and the environment, comply with applicable or relevant and appropriate requirements of both Federal and State laws and regulations, be cost effective, and utilize, to the maximum extent practicable, permanent solutions and alternative treatment or resource recovery technologies.

Also, remedial alternatives that reduce the volume, toxicity, and/or mobility of hazardous waste as the principal element are preferred. The following discussion summarizes the statutory requirements that are met by this preferred alternative.

2.9.1 Protection of Human Health and the Environment

The selected interim remedial action will protect human health and the environment in the short term and is intended to provide adequate protection until a final Record of Decision is signed.

The installation of extraction wells, the capture of the "hot spot" contamination, and the treatment at Site 1 groundwater treatment plant will prevent continued migration of highly contaminated groundwater from Site 10 and will reduce contaminant concentrations in the aquifer beneath Site 10.

Land use restrictions and site access restrictions will prevent future use of groundwater, therefore eliminating direct contact, ingestion and inhalation threats associated with groundwater contamination at the site.

2.9.2. Compliance with ARARs

The selected interim remedial action will be constructed to meet all applicable or relevant and appropriate requirements (ARARs) whether chemical, action, or location specific, where possible. The selected interim remedial action will not meet maximum contaminant levels (MCLs) for groundwater at Site 10.

Under this alternative, extracted groundwater will be treated and discharged to the North Branch Potomac River.

Chemical-specific ARARs require contaminant concentrations in discharged groundwater to be less than discharge limits established by the State of West Virginia and the federal government. The groundwater treatment system will be designed to meet these criteria.

Action-Specific ARARs - The State of West Virginia Groundwater Protection Act regulations (47CSR58-4.7 to 4.7.4) require that pipelines that convey contaminants should preferentially be installed above ground. All residuals from the groundwater treatment plant will be properly handled, characterized, and undergo proper disposal following federal and state regulations such as the Resource Conservation and Recovery Act (RCRA).

Section 121 of CERCLA, as amended by SARA, requires a periodic review of remedial actions at least every five years for as long as contaminants that pose a threat to human health and the environment remain onsite.

2.9.3 Cost-Effectiveness

The selected interim remedial action is the most cost-effective alternative in meeting the RAOs.

The "no action" and the other alternatives are less costly than the selected alternative, however these alternatives at this time can not be implemented.

2.9.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable ("M.E.P.")

The selected interim remedial action will greatly reduce dissolved contamination in the groundwater providing a permanent solution in these contaminated areas, and it will greatly reduce the migration of the hot spot. Finally, a portion of the treated groundwater will be utilized by the facility for plant operations. Although this selected interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus is in furtherance of that statutory mandate.

2.9.5 Preference for Treatment as a Principal Element

Because the selected interim remedial action does not constitute the final remedy for the groundwater at Site 10, this statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in the selected interim remedial action will be addressed by the final response action.

2.9.6 Documentation of Significant Changes

The selected remedy is the same alternative identified as the recommended alternative in the Proposed Remedial Action Plan and that was presented to the public at the public meeting held April 8, 1998.

There were no significant changes to the recommended remedial action alternative presented in the Proposed Plan.

3.0 RESPONSIVENESS SUMMARY

The selected interim action remedy for Site 10 OU 5 is the focused groundwater extraction and discharge to Site 1 treatment plant. No written comments, concerns, or questions were received by the Navy, EPA, or the State of West Virginia during the public comment period from March 31, 1998 to May 14, 1998. A public meeting was held on April 8, 1998 to present the Proposed Plan for Site 10 OU 5 and to answer any questions on the Proposed Plan and on the documents in the information repositories. Several questions were answered during the meeting. Based on the limited comments, the public appears to support the selected remedy. The transcript of the meeting is part of the administrative record for this Operable Unit. A summary of comments received during the Public Meeting is attached as Appendix B.

APPENDIX A
Applicable or Relevant and Appropriate Requirements
Site 10 Groundwater
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ARAR or TBC I. LOCATION SPECIFIC	Regulation	Classification	Requirement Synopsis
Endangered Species Act of 1978	16 USC 1531 50 C.F.R. Part 402	Applicable	Act requires federal agencies to ensure that any action authorized by an agency is not like to jeopardize the continues existence of any endangered or threatened species or adversely affect its critical habitat.
The Archaeological and Historical Preservation Act of 1974	16 U.S.C. º 469	Potentially Applicable	Requires actions to avoid potential loss or destruction of significant scientific, historical, or archaeological data. Construction on previously undisturbed land would require an archaeological survey of the area.
Rivers and Harbors Act of 1890	33 USC 403	Applicable	The North Branch Potomac River is classified as a navigable river. Permits required for structures or work in or affecting navigable waters
Migratory Bird Area	16 USC Section 703	Applicable	Protects almost all species of native birds in the U.S. from unregulated "take" which can include poisoning at hazardous waste sites. Migratory birds are encountered near the river at Site 1.

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Wild and Scenic Rivers Act	16 USC 1271 et seq. And section 7(a)	Potentially Applicable	Avoid taking or assisting in action that will have direct adverse effect on scenic rivers. Construction activities near the North Branch Potomac River may have an adverse effect on the river.
Fish and Wildlife Coordination Act, Section 662	16 USC 662	Potentially Applicable	Action taken should protect fish or wildlife. Response actions (treated discharge) will be protective of human health and the environment.
Resource Conservation and Recovery Act	40 C.F.R. 264.18(b)	Potentially Applicable or Relevant and Appropriate to removal and treatment activities.	Applicable to hazardous waste facilities constructed within 100-year floodplain. Relevant to construction of facilities for management of materials similar to hazardous waste. Facility must be designed, constructed, operated, and maintained to avoid washout.
Groundwater Protection Act	47 CSR 58 4.10	Relevant and Appropriate	Facility or activity design must adequately address the issues arising from locating in karst, wetlands, faults, subsidences, delineated wellhead protection areas determined vulnerable.

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Executive Order 11988, Protection of Floodplains	40 C.F.R. 6, Appendix A; excluding Sections 6(a)(2), 6(a)(4), 6(a)(6); 40 C.F.R. 6.302	Potentially Applicable	Facilities or activities located within the floodplain must comply with this order. Actions taken should avoid adverse effects, minimize potential harm, restore and preserve natural and beneficial values.
Executive Order 11990, Protection of Wetlands	40 C.F.R. 6, Appendix A	Applicable	Action to minimize the destruction, loss, or degradation of wetlands.
Procedures for Implementing the Requirements of the Council on Environmental Quality on the National Environmental Policy Act	40 C.F.R. Part 6 Appendix A	Applicable	This is EPA's policy for carrying out the provisions of Executive Order 11990 (Protection of Wetlands). No activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. If there is no other practicable alternative, impacts must be mitigated.

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Endangered and Threatened Fish Species	COMAR 08.02-12/ 08.03.08	Applicable	Actions will be performed to conserve endangered fish species and the habitats they depend on.
Construction on Nontidal Waters and Floodplains	COMAR 08.05.03	Applicable	Any remedial action that alters the waterway or floodplain in the State of Maryland will follow these regulations.
Nontidal Wetlands	COMAR 08.05.04/ 08.05.07	To Be Considered	Protect the nontidal wetlands of the State of Maryland.
II. ACTION SPECIFIC			
AIR			
Clean Air Act	CAA Section 101 and 40 C.F.R. 52	Relevant and Appropriate	File an Air Pollution Emission Notice (APEN) with the State to include estimation of emission rates for each pollutant expected. Design system to provide an odor-free operation.
Clean Air Act	40 C.F.R. 52	Applicable	Predict total emission of volatile organic compounds (VOCs) to demonstrate allowable emission levels from similar sources using Reasonably Available Control Technology (RACT).

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Clean Air Act	40 C.F.R. 60 Subpart WWW and CC	To Be Considered	New Source Performance Standard (NSPS): deals with non-methane organic compounds.
Clean Air Act	40 C.F.R. 61	Relevant and Appropriate	Verify that emissions of mercury, vinyl chloride, and benzene do not exceed levels expected from sources in compliance with hazardous air pollution regulation.
Clean Air Act	CAA Section 112(D)	Relevant and Appropriate	Emission Standards for new stationary sources.
Clean Air Act	CAA Section 118	Applicable	Control of pollution from Federal Facilities.
Air Pollution Control Act	º45CSR7-4.2	Applicable	Allowable mineral acids stack gas concentration.
Air Pollution Control Act	º45CSR25-3.2	Relevant and Appropriate	Adopts by reference Table 25-A of the Code of Federal Regulations
Air Pollution Control Act and the Hazardous Waste Management Act	º45CSR25-4.3	Relevant and Appropriate	Facility design, construction, maintain, and operate in a manner to minimize hazardous waste constituents to the air.

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Air Pollution Control Act	°45CSR27-3.1 thru °45-27-3.5	Applicable	Best Available Technology requirements for the discharge of emissions of toxic air pollutants.
Air Pollution Control Act	°45CSR27-4.1 thru 4.2	Applicable	Best Available Technology requirements for Fugitive Emissions of Toxic Air Pollutants.
Air Pollution Control Act	°45CSR30	Applicable	Requirements for the air quality permitting system.
Air Quality	COMAR 26.11	To Be Considered	Ambient air quality standards, general emissions standards, and restrictions for air emissions from construction activities, vents, and treatment technologies.
WATER			
Criteria for Classification of Solid Waste Disposal Facilities and Practices	49 C.F.R. 257.3-3(a)	Potentially Applicable	A facility shall not cause a discharge of pollutants into the waters of the U.S. that is in violation of the substantive requirements of the NPDES under CWA Section 402, as amended.

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Criteria for Classification of Solid Wage Disposal Facilities and Practices	49 C.F.R. 257.3-3(a)	Potentially Applicable	A facility or practice shall not cause nonpoint source pollution of the waters of the U.S. that violates applicable legal substantive requirements implementing an areawide or Statewide water qualify management plan approved by the Administrator under CWA Section 208, as amended.
Criteria for Classification of Solid Waste Disposal Facilities and Practices	49 C.F.R. 257.3-4 and Appendix I	Potentially Applicable	A facility or practice shall not contaminate an underground drinking water source beyond the solid waste boundary or a court- or State-established alternative.
Clean Water Act	40 C.F.R. 403	Applicable	Pretreatment Standards. Control the introduction of pollutants into POTWs.
Groundwater Protection Act	46 C.S.R. 12.3.1 thru 3.3	Applicable	Standards for purity and quality for groundwater in the State.
Monitored Natural Attenuation Policy	OSWER Directive 9200.4-17	TBC	Monitored natural attenuation most appropriate when used in conjunction with active remediation measures or as follow-up to active remediation measures.
Clean Water Act	40 C.F.R. 121	Relevant and Appropriate	Contaminated groundwater will be cleaned up to MCLs, except in a DNAPL-zone, if one exists, which will be exempt because it is technically impracticable based on engineering concerns.

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Clean Water Act	40 C.F.R. 122.44(a)	Applicable	Best Available Technology (BAT). Use BAT to control toxic and nonconventional pollutants. Use best conventional pollutant control technology (BCT) to control conventional pollutants.
Clean Water Act	40 C.F.R. 122.41(i)(j)	Applicable	Monitoring Requirements. Discharge must be monitored to assure compliance. Comply with additional substantive requirements.
Clean Water Act	40 C.F.R. 125.100	Applicable	Best Management Practices. Develop and implement a Best Management Practice program to prevent the release of toxic constituents to surface waters.
Groundwater Protection Act	°46CSR12-3.1 thru 3.3 plus Appendix A; °47CSR-58-1 to °47CSR58-12	Relevant and Appropriate	This establishes the minimum standards of water purity and quality for groundwater located in the state.
Groundwater Protection Act	°46CSR12-3.3	Applicable	Constituents in groundwater shall not cause a violation of the standards found at 46 CSR in any surface water.
Groundwater Protection Act	°47CSRS8-4.2	Relevant and Appropriate	Subsurface bores of all types shall be constructed, operated and closed in a manner which protects groundwater.

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Groundwater Protection Act	°47CSR58-4.3.2	Relevant and Appropriate	New areas used for storage shall be designed, constructed and operated to prevent release of contaminants.
Groundwater Protection Act	°47CSR58-4.4.1	Relevant and Appropriate	Loading and unloading stations including but not limited to drums, trucks and railcars shall have spill prevention and control facilities and procedures as well as secondary containment.
Groundwater Protection Act	°47CSR58-4.5.2	Relevant and Appropriate	New impoundments shall be designed and operated to prevent contamination of groundwater.
Groundwater Protection Act	°47CSR58-4.7 to 4.7.4	Relevant and Appropriate	Pipelines conveying contaminants shall preferentially be installed above ground. Ditches conveying contaminants must have appropriate liners. Pumps and related equipment must be installed to prevent or contain any leaks or spills.
Groundwater Protection Act	°47CSR58 4.8	Relevant and Appropriate	Requirements for secondary containment for sumps and above ground tanks.

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Groundwater Protection Act	º47CSR58-4.9.4 to 4.9.7	Applicable	Groundwater monitoring stations shall be located and constructed in a manner that allows accurate determination of groundwater quality and levels, and prevents contamination of groundwater through the finished well hole or casing. All groundwater monitoring stations shall be accurately located utilizing latitude and longitude by surveying, or other acceptable means, and coordinates shall be included with all data collected.
Groundwater Protection Act	º47CSR58-8.1.3	Applicable	Adequate groundwater monitoring shall be conducted to demonstrate control and containment of the substance. The director shall specify which parameters should be monitored in a remedial operation. Groundwater monitoring must continue until results assure adequate remedial action was taken.
Groundwater Protection Act	º47CSR58-8.1.2 to 8.1.3	Relevant and Appropriate	Clean up actions shall not rely primarily on dilution and dispersion if active remedial measures are technically and economically feasible.
Groundwater Protection Act	º47CSR58-4.10	Relevant and Appropriate	Facility or activity design must adequately address the issues arising from locating in Karst, wetlands, faults, subsidence, delineated wellhead ptotection areas determined vulnerable.
Groundwater Protection Act	º47CSR59-4.1 to 4.7	Applicable	Monitoring well Drillers certification.
Groundwater Protection Act	º47CSR 60-1 to 23	Applicable	Monitoring well design Standards.

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Groundwater Protection Act	º47CSR60-5 to 18 and º47CSR60-20 to 22	Applicable	Requirements and procedures governing the installation and development and/or redevelopment and reconditioning of temporary or permanent monitoring well(s), piezometer(s), recovery well(s), well(s), and boreholes.
Groundwater Protection Act	º47CSR60-19	Relevant and Appropriate	Abandonment requirements and procedures for temporary or permanent monitoring well(s), piezometer(s), recovery well(s), well(s), and boreholes.
Water Pollution Control Act	º46 CSR 1-1 to 9	Relevant and Appropriate	Rules establishing the requirements governing the discharge or deposit of sewage, industrial wastes and other wastes into the waters of the State and establishing water quality standards for the waters of the State standing or flowing over the surface of the State.
Water Pollution Control Act	º47CSR10	Applicable	Requirements for NPDES

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Hearing Procedures for Waterway Obstuction, Waterway Construction, and Water Appropriation and Use Permits	COMAR 08.05-06	Applicable	Requirements for public information/notification of the use of State of Maryland water resources.
Water Quality Discharge Limits Permits	COMAR 26.08.02/ 26.08.03/ 26.09.04	Applicable	Discharge of treated groundwater will meet State NPDES limits. There is an agreement between West Virginia and Maryland that the West Virginia NPDES limits could apply to discharges from the West Virginia shore.
Miscellaneous			
Public Health Laws of West Virginia	º64CSR42-4.3.3.20 to 4.3.3.20.2.3	Relevant and Appropriate	Abandonment criteria for test wells and groundwater sources.
Division of Environmental Protection	º38CSR11	Relevant and Appropriate	Requirements for spill prevention

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Erosion and Sediment Control; Stormwater Management	COMAR 26.09.0l/ 26.09.02	To Be Considered	Any land clearing, grading,other earth disturbances require an erosion and sediment control plan.
Resource Conservation and Recovery Act	40 CFR 262.10(a), 262.11	Applicable	Waste generator shall determine if that waste is hazardous waste.
Resource Conservation and Recovery Act	40 CFR 262.34	Potentially Applicable	Generator may accumulate hazardous waste onsite for 90 days or less or must comply with requirements for operating a storage facility. Accumulation of hazardous waste onsite for longer than 90 days would subject to the substantive RCRA requirements for storage facilities.
Resource Conservation and Recovery Act	40 CFR 262.171,172, 173	Potentially Applicable	Containers of RCRA hazardous waste must be: - Maintained in good condition. - Compatible with hazardous waste to be stored. - Closed during storage except to add or remove waste.
Resource Conservation and Recovery Act	40 CFR 264.111	Potentially Applicable or Relevant and Appropriate	General performance standard requires elimination of need for further maintenance and control: elimination of postclosure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products. May be relevant to active management of wastes which are sufficiently similar to hazardous wastes.

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Resource Conservation and Recovery Act	40 CFR 264.174	Potentially Applicable	Inspect container storage areas weekly for deterioration.
Resource Conservation and Recovery Act	40 CFR 264.175(a) and (b)	Potentially Applicable	Place containers on a sloped, crackfree base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.
Resource Conservation and Recovery Act	40 C.F.R. 264.176	Potentially Applicable	Keep containers of ignitable or reactive waste at least 50 feet from the facility property line.
Resource Conservation and Recovery Act	40 C.F.R. 264.177	Potentially Applicable	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.
Resource Conservation and Recovery Act	40 C.F.R. 264.179	Potentially Applicable	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers, liners.
Resource Conservation and Recovery Act	40 C.F.R. 268.40	Potentially Applicable	Movement and disposal of hazardous waste to new location and placement in or on land will trigger land disposal restrictions for the hazardous waste. Attain land disposal treatment standards before disposing of hazardous waste.

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Resource Conservation and Recovery Act	40 C.F.R 264.251 (except 251(j), 251(e)(11))	Potentially Applicable	Waste put into waste pile subject to land ban regulations.
U.S. Department of Transportation	49 C.F.R 171.2(f)	Potentially Applicable	No person shall represent that a container or package is safe unless it meets the requirements of 49 USC 1802, et seq. Or represent that a hazardous material is present in a package or motor vehicle if it is not.
U.S. Department of Transportation	49 C.F.R. 171.2(g)	Potentially Applicable	No person shall unlawfully alter or deface labels, package, or descriptions, packages, containers, or motor vehicles used for transportation of hazardous materials.
U.S. Department of Transportation	49 C.F.R. 171.300	Potentially Applicable	Each person who offers hazardous material for transportation or each carrier that transports it shall mark each package, container, and vehicle in the manner required.
U.S. Department of Transportation	49 C.F.R. 171.301	Potentially Applicable	Each person offering non-bulk hazardous materials for transportation shall mark the proper shipping name and identification number (technical name) and consignee's name and address.
U.S. Department of Transportation	49 C.F.R. 171.302	Potentially Applicable	Hazardous materials for transportation in bulk packages must be labeled with proper identification (ID) number, specified in 49 CFR 172.101 table, with required size of print. Packages must remain marked until cleaned or refilled with material requiring other marking.

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U.S. Department of Transportation	49 C.F.R. 171.303	Potentially Applicable	No package marked with a proper shipping name or ID number may be offered for transport or transported unless the package contains the identified hazardous material or its residue.
U.S. Department of Transportation	49 C.F.R. 171.304	Potentially Applicable	The marking must be durable, in English, in contrasting colors, unobscured, and away from other markings.
U.S. Department of Transportation	49 C.F.R. 171.400	Potentially Applicable	Labeling of hazardous material packages shall be as specified in the list.
U.S. Department of Transportation	49 C.F.R. 171.312	Potentially Applicable	Non-bulk combination packages containing liquid hazardous materials must be packed with closures upward, and marked with arrows pointing upward.
U.S. Department of Transportation	49 C.F.R. 171.504	Potentially Applicable	Each bulk packaging or transport vehicle containing any quantity of hazardous material must be placarded on each side and each end with the type of placards listed in Tables 1 and 2 of 49 CFR 172.504.

APPENDIX B

SUMMARY OF COMMENTS RECEIVED DURING
PUBLIC MEETING AND RESPONSES

The following represents the Department of the Navy's responses to all the comments received on the subject Proposed Plan. The Navy, WVDEP, or the EPA have received no written comments from the public. Consequently, the following is based on remarks made or questions posed that were recorded and transcribed during the public meeting held April 8, 1998 at Building 1 at ABL Plant 1. A complete copy of the transcript included in the Administrative Record which can be found in the information repositories located at:

Fort Ashby Public Library
Box 74, Lincoln Street
Fort Ashby, West Virginia 26719
Contact: Jean Howser
304/298-4493

La Vale Public Library
815 National Highway
La Vale, Maryland 21502
Contact: Sondra Ritchie
301/729-0855

Question 1: Is there any way that (Remedial Advisory)Board members can get this (Proposed Plan) earlier than just coming to the board (public) meeting and listening to the presentation?

Response: Yes. Anytime after March 31, 1998, RAB members and members of the public could have gotten a copy of the Proposed Plan by visiting either of two information repositories either at the Fort Ashby or La Vale libraries. We had hoped to be able to send all the RAB members copies of the Proposed Plan before the opening of the public comment period, which was March 31, 1998. However, for this Site, the Proposed Plan was not finalized until the day before (March 30th) it was sent out and the public announcement was issued in the papers.

Question 2: When was the latest groundwater data collected and have any recent samples been taken (at Site 10)? If the data is not all that recent, do we know if contamination has migrated further (then indicated on your map) or if it is less?

Response: The most recent sampling data and analytical results are from December 1996, a little more than a year and a half ago. The data, as presented on the map, indicates that we do not know the full extent of groundwater contamination or the potential for continued contaminant migration. We are fairly certain that we have outlined or defined the area of the greatest level of contamination, what we are calling the "hot spot" as defined by the 100 ppb VOC contour. Because we do not know the full extent of contamination we have proposed this groundwater remedy as an interim action. As more information is developed during the monitoring phase a final decision on how to clean-up the contaminated aquifers can be made.

Question 3: What is the existing evidence of natural attenuation (occurring in the groundwater at site 10)?

Response: The existing evidence for assuming some natural attenuation is occurring in the groundwater at Site 10 is that we are detecting some of the degradation or daughter products. For TCE in the groundwater at Site 10 a daughter product that we have detected is DCE. What we do not know is if the degradation reactions are going to completion, so that the contaminants are changed to relatively harmless compounds. Continued monitoring and investigation will answer this question.

Question 4: In there a finite amount of water in the water table or aquifer that is contaminated? Do you know if there is a source of TCE that is recontaminating the water?

Response TCE is no longer used at the facility and has not been used at Building 157 for more than thirty years. TCE concentrations in the soil beneath the former solvent recovery still at Building 157 are fairly low and the potential for that contaminated soil to be a continuing source for groundwater contamination is low. However, the soils are being evaluated as a separate operable unit and an assessment of the leaching potential of the contaminants in the soil will be performed.

It would be misleading to say that there is a finite amount of contaminated groundwater at Site 10. The problem is that organic contaminants, such as TCE, can adsorb to soils and other organics particles in the aquifer. These adsorbed contaminants tend to slowly desorb or dissolve in the moving groundwater and contaminate additional volumes of groundwater. A rule of thumb is that we would have to remove 10 times the pore volume of groundwater from an area to successfully remove organic contamination. There is not a simple answer to your question, especially if a dense, non-aqueous phase liquid (DNAPL) exists in the aquifers.

Question 5: Do you have DNAPL (at Site 10)?

Response: We are not certain. Some researchers are now saying that if you detect any TCE in groundwater you have DNAPLs somewhere nearby. At this time, unlike Site 1 at ABL, we do not think we have a DNAPL problem at Site 10. In the sampling of the monitoring wells at Site 10 we have not detected a separate phase material.

Question 6: Do you have estimates of your recharge rate at this aquifer, and if it is constant or subject to heavy precipitation or other events?

Response: The recharge for Site 10 comes mostly from rainfall, so whatever seasonal rainfall variations there are, that could change the infiltration rate and therefore the recharge rate. We do not have a recharge rate for the alluvial aquifer calculated from a specific rainfall amount.

Question 7: How long will it take (to pump out the contaminated groundwater) and what are the turnover rates going to be? Have you estimated turnover rates?

Response: We have estimated that pumping from three extraction wells, at pumping rates from 7 to 15 gallons per minute, would capture the contaminants in the "hot spot" as defined by the 100 ppb VOC concentration within 10 years. We expect that the entire contaminated groundwater plume could take 30 years or more to be remediated. We have not estimated any specific turnover rates.

Question 8: On the data (from the groundwater wells) you get, did it give you any sense as to how TCE concentrations, might have been stratified, (in) the depth of the wells? Or do you know? Or are you not able to collect that (kind of) data?

Response: There are two aquifers beneath Site 10, both contaminated with VOCs at different concentrations. The alluvial aquifer occurs at a depth of twenty-five to forty feet below the ground surface. It is composed of sand, clay and in some locations a cobble zone perhaps six to seven feet thick. Above this zone, to the ground surface is a silty clay to clay-rich material that is not a good aquifer.

The bedrock aquifer occurs below the alluvial aquifer, deeper than forty feet from ground surface. This aquifer is composed of fractured limestones and shales. The groundwater in the bedrock moves along these fractures.

We have a good, general understanding of the vertical distribution of groundwater contamination in the two aquifers. There is a much higher or greater concentration of contaminants in the alluvial aquifer than in the bedrock aquifer. TCE, for example, was detected at a concentration of 830 ppb in the alluvial aquifer and only at 300 ppb in the bedrock aquifer.

This constitutes the extent of the comments and responses on the Proposed Interim Remedial Action Plan for Site 10 Groundwater at the Allegany Ballistics Laboratory.