TETRA TECH

PITT-06-8-018

June 11, 2008

Project Number 0182

Mr. Curt Frye
BRAC Program Management Office Northeast
4911 South Broad Street
Philadelphia, Pennsylvania 19112-1303

Reference: CLEAN Contract No. N62472-03-D-0057
Contract Task Order 041

Subject: Restoration Advisory Board (RAB) Meeting Minutes of May 14, 2008
Former Naval Air Warfare Center (NAWC) Warminster, Pennsylvania

Dear Mr. Frye:

Enclosed please find the minutes from the RAB meeting held on May 14, 2008. Copies of the minutes are being sent to the individuals identified on the distribution list.

Please contact me if you have any questions or comments.

Sincerely,

Jeffrey P. Orient
Project Manager

JPO/sic

Enclosure

c: Ron Sloto (USGS)
Charles Clark (PADEP)
Toby Kessler (Gilmore & Associates)
Dave Fennimore (Earth Data)
Garth Glenn (TtNUS)
Pat Schauble (ECOR)
Kathy Davies (U.S. EPA)
Russell Sirabian (Battelle)
Norm Kelly (RAB Co-Chair)
Dennis Orenshaw (U.S. EPA)
Charlene Creamer (U.S. EPA)
Bob Lewandowski (Navy BRAC PMO)
Mike Nines (MGKF Law)
Chris Candela (ATC Associates)
File: 112G0 0182

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FORMER NAVAL AIR WARFARE CENTER (NAWC) WARMINSTER
MEETING MINUTES

RESTORATION ADVISORY BOARD (RAB) MEETING NO. 110
REFERENCE: CLEAN CTO NO. 041

1. Meeting Date and Time: May 14, 2008, 9:40 AM to 11:00 AM
2. Location: Warminster Municipal Authority Board Room
3. Attendees: See Attachment 1 (attendance list)
4. Summary of Meeting Discussions: See below.

Administrative Update

Mr. Curt Frye, the Navy's Remedial Project Manager (RPM) for the project working out of the Navy's Base Realignment and Closure Program Management Office (BRAC PMO) in Philadelphia, opened the meeting by welcoming the attendees and providing an agenda for the meeting (Attachment 2). Mr. Charles "Chick" Clark was introduced as the new RPM for PADEP.

Comments were solicited on the January 30, 2008 RAB meeting minutes. No comments were offered by those in attendance and the meeting minutes were approved as-is.

Action items from the November 1, 2007 RAB meeting were reviewed. The action items from the November 2007 meeting are summarized below:

1. Mr. Tim Sheehan (PADEP) was to check into the status of the CRC investigation and get a PADEP point of contact to call the Navy.

- Mr. Clark indicated that he would be providing an update later in the meeting. Mr. Thomas Buterbaugh has been assigned as the PADEP hydrogeologist for the CRC investigation.

2. Ms. Kathy Davies (EPA hydrogeologist) was to get an update on the status of EPA site assessment activities along Louis Drive.

- Ms. Charlene Cramer (EPA Site Assessment) indicated that she would provide the update later in the meeting.

3. Mr. Dennis Orenshaw (EPA RPM) was to get a determination whether an Explanation of Significant Difference (ESD) is needed for the proposed treatment plant modifications and check with BTAG regarding the OU-10 Report.

- Mr. Frye indicated that BTAG provided comments on the OU-10 report, and the Navy has responded by proposing cleanout of a storm drain and catch basin along with periodic inspections of Sites 6 and 7 to ensure that erosion control is adequate. No word yet from Mr. Orenshaw regarding whether EPA feels that an ESD is necessary for the treatment plant modifications.

4. The Navy was to get a letter back to Warminster Municipal Authority (WMA) responding to their approval request letter for the municipal well treatment system upgrades.

- The letter has been submitted by the Navy and received by WMA.

5. Battelle was to get the draft source treatment evaluation report out by the end of February.

- The draft report has been sent out for review. Battelle will give a presentation summarizing it later in the meeting.

Off-Site Investigations

Ms. Creamer updated the RAB on recent EPA activities. The EPA Underground Injection Program is looking at the CRC situation and may elect to become involved. The EPA Site Assessment group has comments on the latest CRC submittal and will provide them to PADEP.

Mr. Clark updated the RAB on recent work at CRC. Five new wells and additional soil borings were drilled at the site in the March-April timeframe, with a significant source found adjacent to the waste solvent above-ground storage tank (AST). No date has been set yet for submittal of the supplemental site investigation report. Mr. Buterbaugh has been involved with the site for only the past few weeks so he is still coming up to speed with the project. More detailed information will be provided r.e. the CRC investigations at the next RAB meeting.

Area C Source Assessment

The due date of mid-February for providing review comments on the Area C Source Assessment report has passed with no review comments received. Mr. Ron Sloto (USGS) reviewed the report and sent out an email stating that he had no comments. Mr. Frye indicated that since there are no changes required to the current version of the report it will be considered the final report. Mr. Jeff Orient (Tetra Tech NUS) will send a letter out to the RAB documenting this.

Treatment Plant Operation/LTM

Mr. Will Torres (ECOR) indicated that the new NPDES permit for the plant has been received and this is the first month that they are operating under the new permit. Discharge limits are slightly lower under the new permit in comparison to the old one. ECOR is currently getting quotes on an upgraded air stripping unit. The third quarter FY 2008 round of sampling was completed last week. A few routine repairs are in progress for the Area C extraction system.

Post-ROD Monitoring at OU-10

Mr. Orient summarized the comments received from EPA's BTAG group on the draft OU-10 Sampling Report, along with the Navy's responses. BTAG had recommended that a catch basin and an outfall be cleaned of accumulated sediment, which the Navy will task ECOR to do. BTAG also recommended site inspections to verify that erosion controls were effective at Sites 6 and 7. The Navy will inspect the sites annually through the next 5-Year Review cycle and in addition is tasking ECOR with setting up formal inspections of land use controls across the base. The inspections are targeted for completion before the next RAB meeting. Mr. Frye also indicated that no revisions to the OU-10 report are required in response to the BTAG comments, thus the current version of the report will be considered final.

WMA Update

Mr. Tim Hagy, representing WMA, updated the RAB on the status of treatment system upgrades for wells WMA-13 and -26. The municipal authority is proceeding with the treatment system designs and anticipates that the project will be out for bid this summer, with construction to follow shortly after contractor selection. Mr. Bob Lewandowski (Navy BRAC PMO) asked that WMA provide the Navy with the actual costs once the bids are received for the treatment system upgrades. Mr. Hagy indicated that WMA-26 will be upgraded first, then WMA-13.

Area A Source Treatment Evaluation

Ms. Carolyn Scala (Battelle) gave a presentation regarding the source treatment evaluation that Battelle performed for Area A (see Attachment 3). The study focused on zones where TCE concentrations in groundwater exceeded 1,000 ug/l. A draft report documenting the study was sent out for review and comment in early April. Some notable discussion topics related to the presentation include:

Thermal treatment – Mr. Dave Fennimore (Earth Data, representing WMA) asked what media is being treated at Trenton (another Navy DNAPL site where pilot-scale source treatment activities are being considered) and to what depth treatment is being considered. Mr. Lewandowski indicated that the Trenton site is a fractured bedrock site and the pilot study there is targeting a depth of approximately 70-100 feet. Pilot-scale work at Trenton is scheduled to be initiated this year, with full scale application targeted for 2009 and an associated report released by 2010. Mr. Frye offered to provide Mr. Fennimore with a web link to the Department of Defense's Environmental Security Technology Certification Program (ESTCP) site for more information.

Enhanced bioremediation – This technology is not considered a good candidate for Area A as the data indicates minimal biodegradation activity ongoing at the site to date. Mr. Fennimore also expressed concerns regarding the toxicity of the daughter products formed through the TCE biodegradation process.

Discrete-depth groundwater sampling (recommended in the report as an initial activity to better delineate the treatment zone) – Mr. Fennimore suggested packer sampling instead of passive diffusion bag (PDB) sampling, especially if an injection-related remedy is under consideration. Mr. Sloto asked if the PDB sampling would be performed with or without the extraction wells operating, as the operation of the wells may locally dewater some fractures that contain significant amounts of contamination. Mr. Frye indicated that a work plan would be developed for review prior to any sampling related to this study.

Mr. Lewandowski asked the WMA representatives present how they felt about potential injection work within Area A, given the proximity to municipal well WMA-26. Mr. Hagy expressed some concern about it. Mr. Fennimore was comfortable with chemical oxidation and also thought that the thermal option would be OK. A due date of June 14 was set for providing Battelle with review comments on the draft source treatment evaluation report.

Upcoming Activities

Mr. Frye updated the RAB on some upcoming Navy activities related to remedial activities at the former NAWC:

- The planned treatment system stripper upgrade will be completed by ECOR.
- A work plan will be prepared by ECOR for the drilling/installation of the new extraction well near HN-69.
- A Land-Use Control Plan will be prepared by ECOR, as well as cleanouts of the catch basin and outfall in the Shenandoah Woods area.
- The long term groundwater monitoring plan will be updated and converted over to UFP-SAP format by Tetra Tech NUS.
- Additional well abandonment activities will be performed (the last round of well closures was performed by Foster Wheeler in 2000). The TEG will be tasked with making recommendations for additional well closures, and ECOR will be tasked with implementation. Mr. Sloto is to send a spreadsheet out to the RAB detailing the current status of the former NAWC monitoring wells.

Miscellaneous Topics and Issues – Action Items

Mr. Norm Kelly (RAB co-chair) informed the RAB that the Federal lands Reuse Authority (FLRA) for the former NAWC Warminster is now dissolved. Some funding remains, and Mr. Kelly solicited opinions on the disposition of it. He stated the options were to give it to the Navy or to the County (his understanding is that the money originally came from the County). Mr. Orient asked how much remains; Mr. Kelly indicated that approximately 4-5 million dollars is left over. Mr. Lewandowski offered to provide a Navy contact that Mr. Kelly can discuss the disposition of the money with.

Action Items identified at the conclusion of the meeting include:

- EPA and PADEP are to provide updates regarding offsite investigations at the next RAB meeting.

- Mr. Frye is to follow up with Mr. Orenshaw regarding the carry-over issue about the need for an ESD for the treatment plant modifications.

- Mr. Orient is to send out a letter documenting that the current version of the Area C Source Assessment Report is now considered the final document.

- Review comments on the Battelle Source Area Treatment Evaluation report are due by June 14.

- Mr. Frye is to provide the ESTCP website link to Mr. Fennimore.

- The TEG is to develop well closure recommendations.

Next Meeting Date

The next RAB meeting date was set for August 13, 2008 at 9:30 AM in the WMA Board Room.

The meeting was adjourned at approximately 11:00 AM.

ATTACHMENT 1
ATTENDANCE LIST

NAWC WARMINSTER
TECHNICAL SUBCOMMITTEE/RAB MEETING
DATE: 5/14/08

NAME	AFFILIATION	PHONE	EMAIL
Jeff Orient	Tetra Tech NUS	412/921-8778	jeff.orient@tetratech.com
Ron Sloto	US Geological Survey	610-321-2434 x212	rasloto@usgs.gov
Charles Clark	PADEP	484-250-5731	cha clark@state.pa.us
Bob Lewandowski	NAVY BRAC PMO	215-897-4908	robert.f.lewandowski@navy.mil
Russell Sirobian	Battelle	914-576-7713	sirobianr@battelle.org
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Dave Fennimore	EDR/WMA	610-524-9466	dfennimore@earthdata.ne.com
Curt Frye	NAVY BRAC PMO	215-897-4914	Curtis.Frye@navy.mil
Jen Good	ECOR	484-887-7510	good@ecor-solutions.com
Will Torres	ECOR	484-887-7510	torres@ecor-solutions.com
Matt Bailer	Gilmore & Associates, Inc	215-345-4330	mbailer@gilmore-assoc.com

ATTACHMENT 2
MEETING AGENDA

NAWC WARMINSTER
TECHNICAL SUBCOMMITTEE/RAB MEETING
14 May 2008 9:30 AM
WMA Board Room
415 Gibson Ave
Warminster, PA

MEETING AGENDA

Administrative Update
- Minutes of the Last Meeting
- Review Action Items **(see below)**

Off-Site Investigations
- EPA update on Louis Drive assessments
- PADEP update on CRC Chemicals

Area C Source Assessment
- Status of Draft Source Assessment Report reviews.

Treatment Plant Operation/LTM
- Plant operating status
- LTM update

Post-ROD Monitoring at OU-10
- Review/closeout discussion

WMA Update
- Status of Wells #13 and #26 treatment upgrades.

Area A Source Treatment Evaluation
- Presentation/discussion of findings

Upcoming Activities
- Navy briefing on plans for future work activities

Miscellaneous Topics and Issues – Action Items

Time and Location of Next Meeting: - Date to be determined

Action Items

The following action items were identified at the wrap-up of the January 2008 meeting:

- Mr. Sheehan is to check into the status of the CRC investigation and get a PADEP point of contact to call the Navy.
- Ms. Davies is to get an update on the status of EPA site assessment activities along Louis Drive.
- Mr. Orenshaw is to get a determination whether an ESD is needed for the proposed treatment plant modifications and check with BTAG regarding the OU-10 Report.
- The Navy is to get a letter back to WMA responding to their approval request letter for the municipal well treatment system upgrades.
- Battelle is to get the draft source treatment evaluation report out by the end of February.

Directions to the WMA Board Room:

From County Line Rd - instead of turning north (right) onto Jacksonville, continue west on County Line to York Rd. Turn north (right) onto York Rd. Continue to Henry Ave. Turn west (left) onto Henry Ave. Continue to Gibson Ave. Turn right into the parking lot shared by the Warminster Township and WMA. The WMA building in located towards the rear.

From the former NAWC - proceed to the intersection of Street and Jacksonville Rd. Turn west (right) onto Street Rd. Continue west to York Rd. Turn south (left) onto York Rd. Continue to Henry Ave. Turn west (right) onto Henry Ave. Follow directions as above to the WMA building.

ATTACHMENT 3
BATTELLE PRESENTATION

Battelle
The Business of Innovation

Area A Source Treatment Evaluation
NAWC Warminster, Pennsylvania

RAB Meeting Presentation

May 14, 2008

Outline

- Why evaluate source treatment?
- Objectives of source treatment
- Treatment technologies evaluated
- Recommendations

Why Evaluate Source Treatment

TI evaluation (2000) concluded:

- 75 to 374 gallons of TCE DNAPL present in Area A
- No remedial technology can achieve removal of DNAPL from the bedrock aquifer
- Cleanup would take over 100 years

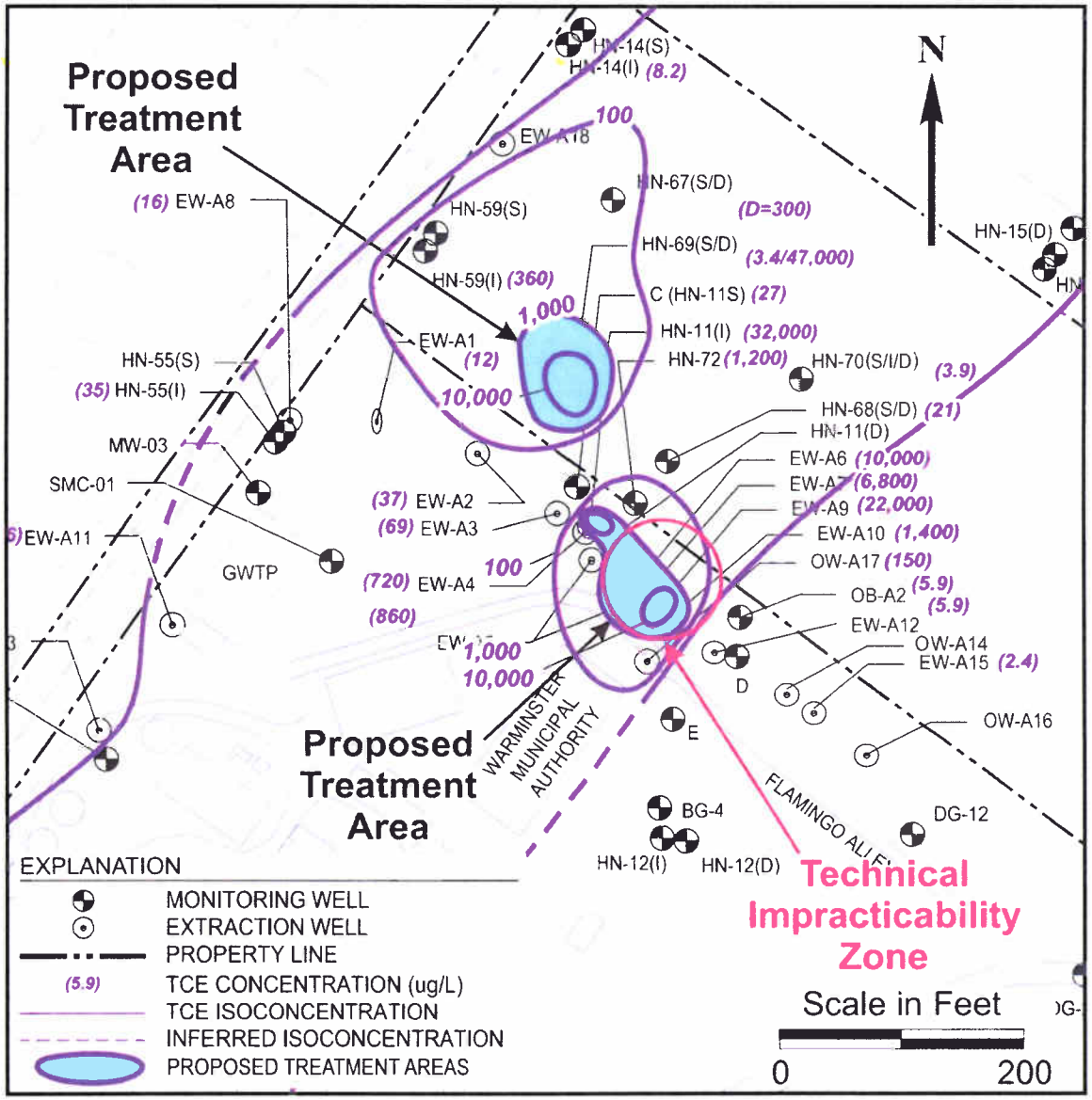
Therefore, this source treatment evaluation was prepared to:

- Review new technologies implemented for source treatment since 2000
- Optimize the overall remediation strategy in accordance with Navy guidance

Objectives of Source Treatment

- Reduce contaminant mass within the source zone
- Increase the reliability of long-term containment
- Reduce the overall timeframe and cost associated with the P&T remedy
  - P&T may still be needed after source-zone removal but with a reduced time frame and/or level of effort
  - MNA to be considered as part of the new approach at the appropriate point in time

Proposed Treatment Area



Treatment Technologies Evaluated

- **In-situ Chemical Oxidation**
  - Potassium permanganate
  - Sodium persulfate
  - Hydrogen peroxide
- **Thermal Treatment**
  - Thermal conduction heating
  - Steam-enhanced extraction
  - Electrical resistance heating
- **Zero Valent Iron**
  - Granular
  - microscale
  - nanoscale
  - Emulsified ZVI
- **Enhanced Bioremediation**
  - Anaerobic dechlorination
  - Aerobic co-metabolism

In-situ Chemical Oxidation (ISCO)

Advantages

- Peroxide and persulfate can effectively treat all contaminants in Area A
- Demonstrated at fractured bedrock sites
- Quick treatment timeframe relative to other technologies

Limitations

- Permanganate cannot treat CCl_4
- Permanganate produces colored drinking water which could exceed secondary MCLs
- Persulfate treatment may result in sulfate levels exceeding secondary drinking water standards
- Peroxide ineffective under moderately to strongly alkaline conditions
- Peroxide requires special health and safety precautions during handling and application, due to rapid and exothermic reactions
- ISCO may require the addition of iron, stabilizing agents, acid and/or heat.
- Rebounding is a common problem with ISCO

In-situ Chemical Oxidation

- Hydrogen peroxide and activated persulfate technically practicable and cost-effective options
- Bench test would determine
  - Soil oxidant demand
  - Need for catalyst, stabilizer, or activation agent
  - Rate of production of reaction byproducts (i.e., oxygen or sulfate)
  - Potential to solubilize naturally occurring metals

ISCO Cost Summary	
Bench Test	$23,000
Pilot Test	$152,000
Full Scale	$472,000

Zero Valent Iron

Advantages

- Effective for treatment of Area A contaminants
- Demonstrated at fractured bedrock sites
- Remains active in the subsurface for an extended period

Limitations

- Effective placement of the ZVI media into the fracture network could be difficult
- Fracturing, if necessary, could impact contaminant distribution
- ZVI may increase the dissolved iron concentration in groundwater, adversely impacting thee GWETS

Zero Valent Iron

- Proven technology and cost effective option
  - Granular iron is the preferred media due to its lower cost and ease of use
- Bench test would determine
  - Impact on dissolved phase iron concentrations
  - Potential concentration of daughter products

ZVI Cost Summary	
Bench Test	$30,000
Pilot Test	$194,000
Full Scale	$545,000

Thermal Treatment

Advantages

- Thermal treatment effective for Area A contaminants
- Thermal treatment does not rely on mass transfer of treatment materials to the contaminant
- Thermal Conductive Heating (TCH) effective for low or high permeability
- TCH provides the most efficient and even heat distribution in subsurface

Limitations

- Technology relies on increasing the mobility and volatilization of contaminants; difficult to predict migration in fractured bedrock
- SVE required; more complex remedial design
- TCH not yet field tested at fractured bedrock sites
- TCH not as effective with high groundwater flow rates

- ESTCP study at NAWC Trenton will provide additional effectiveness and implementability information for TCH at fractured bedrock sites.
- Cost ~$100/cy, or $1.8M for full scale treatment

Enhanced Bioremediation

Advantages

- Demonstrated technology for effectively treating Area A contaminants
- Can be implemented in fractured bedrock
- May be appropriate as a polishing step after other source treatment

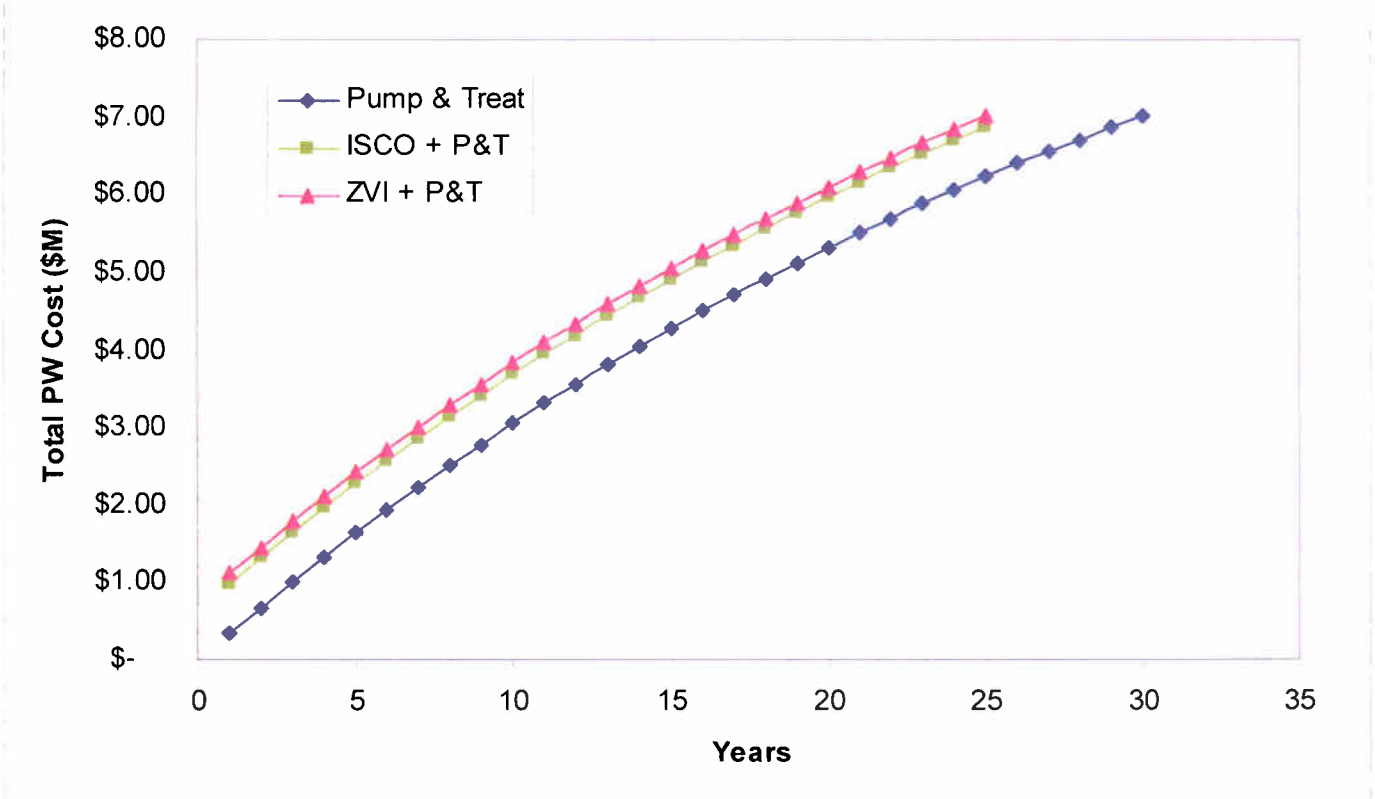
Limitations

- Insufficient site-specific data available to determine potential effectiveness of enhanced bioremediation
- Potential for accumulation of daughter products (i.e., *cis*-1,2-DCE and VC)
- Longer timeframe required for treatment

- Not recommended for further evaluation at this time

Cost Evaluation

- Eliminating 5 years of P&T makes source treatment with ISCO or ZVI cost effective
  - Annual O&M = $360,000; rate of return = 3%
- Additional annual O&M savings also likely realized



Alternate Treatment Train Approach

- Treating 30% of proposed treatment area (i.e. 10,000 ug/L contour) will target 80% of dissolved phase contaminant mass
  - May be much more than 80% if DNAPL is mostly contained within the smaller area
- TCH becomes more attractive if targeting smaller treatment area
  - TCH likely to be more effective in source zone than other technologies evaluated
  - Implementation cost of $540,000
- TCH could potentially be a cost-effective step in a larger treatment-train approach

Recommendations

- Perform discrete depth groundwater sampling
  - Sample collection with PDBs
  - Identify contaminant stratification and collect water quality data
  - Update conceptual site model for source treatment design
- Review TCH results at NAWC Trenton (ESTCP) and determine if appropriate for NAWC Warminster
  - Implement TCH testing/treatment
  - Evaluate data to determine if additional treatment train technologies necessary
- If TCH not appropriate for NAWC Warminster
  - Perform ZVI and ISCO bench testing
  - Perform pilot testing and full scale treatment using best technology
  - Evaluate data to determine if additional treatment train technologies necessary