JH Baxter - Arlington
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Corrective Action
correspondence
2016

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
AIR AND WASTE

OCT 4 2016

Ms. Georgia Baxter, Chief Executive Officer
J.H. Baxter and Co.
PO Box 5902
San Mateo, California 94402

Re: Optimization Technical Memorandum
Former J.H. Baxter & Co. (Baxter), Arlington Facility (Facility)
§ 7003 Administrative Order on Consent (Order)
Docket No.: RCRA-10-2001-0086
EPA ID No.: WAD 05382 3019

Dear Ms. Baxter:

Enclosed please find the Final Technical Memorandum from the Environmental Protection Agency, Office of Research and Development, Office of Science Policy, Site Characterization and Monitoring Technical Support Center (SCMTC) regarding the Facility. This Report was produced by the SCMTC in response to a request from EPA Region 10 for technical support and recommendations for optimization of the remediation work at the Facility.

EPA Region 10 would like to schedule a meeting with J.H. Baxter representatives to discuss the Technical Memorandum and a path forward for the remediation work at the Facility. Please contact me at (206) 553-6702 or at palumbo.jan@epa.gov if you have any questions, and to schedule the meeting.

Sincerely,

Jan Palumbo
Project Coordinator

Enclosure

cc: Mr James C. Hanken
Wolfstone, Panchot & Bloch

Mr. Edward C. Smith
McFarland Cascade Holdings Inc.
Stella-Jones Corp.

Ms. Heidi Blischke
GSI Water Solutions, Inc.

Ms. Rue Ann Thomas
Nattura Group

Mr. Dean Yasuda
Washington State Department of Ecology

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF RESEARCH AND DEVELOPMENT
OFFICE OF SCIENCE POLICY
SITE CHARACTERIZATION and MONITORING TECHNICAL SUPPORT CENTER
ATLANTA, GEORGIA 30303

September 15, 2016

MEMORANDUM

SUBJECT: OPTIMIZATION SUPPORT
FORMER J.H. BAXTER & CO. WOOD TREATING FACILITY SITE ARLINGTON, WASHINGTON

FROM: Felicia Barnett *Jan Szaro for Felicia Barnett*
Director, Site Characterization and Monitoring Technical Support Center (SCMTSC)

Dept of Ecology - NWRO
OCT 07 2016
Hazardous Waste & Toxics Reduction Program

TO: Janice Palumbo
RPM, U.S. EPA Region 10

cc: Kira Lynch
STL, U.S. EPA Region 10

William Hagel
Associate Director, Site Characterization and Monitoring Technical Support Center (SCMTSC)

Disclaimer: This memorandum contains scientific observations provided in response to a site technical support request with limited scope. The observations herein are intended to address specific scientific questions posed to researchers and/or consultants with applicable experience. Therefore, the observations are written for a specific scientific audience in EPA Region 10. The observations provided are intended to assist EPA Region 10 with relevant and innovative science and engineering to help meet site-specific environmental goals. The observations are provided in good faith, and due to the limited scope of technical support requests, include substantial uncertainty. This memorandum is not to be considered the only source of information for decision making, nor should the information provided here be parsed. It would be advisable to consider this memorandum in conjunction with multiple lines of evidence including history, experiences of site managers, and other pertinent information available to EPA Regional staff that retain the duties and responsibilities of all decisions and regulatory actions at the site.

Several documents were received pertaining to the Former J.H. Baxter & Co. Wood Treating Facility Site in Arlington, Washington. These were reviewed to assess Site conditions and understand the current direction of Site remediation decision making. Due to the large volume of Site-related information provided and the rapid turnaround for the support requested, the document review was not exhaustive in nature. Documents provided and reviewed included:

- Final Resource Conservation and Recovery Act (RCRA) Site Investigation (SI) Report (April 2005)
- Remedial Action (RA) Pilot Study Work Plan (September 2007)
- Supplemental Groundwater Investigation (2010) Technical Memorandum (March 2011)
- Draft RCRA Corrective Measures Study (CMS), Revision 3 (April 2013)
- Stand-Alone Data Document (2014) (December 2014)

- Source Area Investigation and Chemical Oxidation Bench Study (December 2014)
- Fourth Quarter 2014 Operations and Monitoring (O&M) Report, RA Pilot Study (March 2015)
- Work Plan for the Installation of Oxygen Infusers and Rehabilitation of Recirculation Trench (May 2015)
- Second Half 2015 O&M Report, Remedial Action Pilot Study (March 2016)
- First Quarter 2016 Data (select graphs and figures only) (April 2016)
- March 2016 Progress Report (April 2016)
- April 2016 Progress Report (May 2016)

Data collection and analysis protocols followed during investigation of the Site, or by other researchers relative to information in the applicable scientific literature, were not directly evaluated; therefore, the data and documentation reviewed in developing this technical memorandum were assumed to comply with relevant data quality criteria.

UNDERSTANDING OF THE PROBLEM

Site History and Operations

The Site covers approximately 57 acres in the City of Arlington, Snohomish County, Washington, and is actively involved in the manufacture and preservation of utility poles. Raw logs are imported to the Site and processed. Processing activities include debarking, trimming, seasoning, and chemical treatment.

The Site is bounded to the south by 180th Street SE, to the north by 188th Street NE, to the east by the Burlington Northern Railroad, and to the west by generally vacant or wooded land. The Site is located in an area zoned industrial. However, adjacent to the northwestern portion of the Site is reportedly nonconforming residential land use (i.e., a mobile home park). In addition, a nonconforming residence is located in the southeastern portion of the Site, surrounded on three sides by an operational area used to store untreated logs.

Processing and treatment operations have been active at the Site since approximately the mid-1960s, when Ted Butcher, Inc. (Butcher) developed the land to use as a wood treating facility. Baxter began acquiring portions of the Site in 1970 and acquired the final portion of the Site (i.e., the northwestern-most area) in 2003. Wood treating and other operations at the Site are currently conducted by McFarland Cascade Holdings, Inc. (a Stella-Jones Company) under a property lease arrangement with Baxter. Baxter retains property ownership and the responsibility to address environmental issues at the Site.

Figure 1 presents the layout of the Site. Untreated logs are stored in the southern portion of the Site. The eastern half of the northern portion of the Site is the location of the main wood treatment area and the treated utility pole storage area. West of the main treatment area is a closed on-site landfill that reportedly was used historically as a gravel pit and subsequently by

Baxter to contain wood shavings from log peeling operations. This former wood waste landfill is located on an approximately 7-acre portion of the Site. The northwestern portion of the Site is largely vacant, with the exception of abandoned residences that were transitioned into an office and a storage building.

In the main treatment area, logs are vacuum and pressure treated in retorts with a heated solution of pentachlorophenol (PCP) and a medium aromatic carrier oil. An in-ground butt tank is also present that is used to treat utility pole butts with a heated solution of PCP and copper naphthenate. The copper naphthenate process was added in 2003. Based on Site documentation, creosote mixtures were also historically used in the wood treating process. Other significant features of the main treatment area include drip pads, gas-fired kilns for drying utility poles, a PCP storage building, and a process water collection and treatment system. In the treated utility pole storage area, north of the main treatment area, treated utility poles are stored on skids.

Finished product is shipped from the Site to utilities and other users by truck or rail. Process upgrades and improvements were reportedly completed historically in the main treatment area, including replacement of tanks and installation of secondary containment and leak detection systems; however, the general nature of wood treatment operations has remained consistent at the Site over time.

Spills and releases have been observed at the Site (see Figure 2), generally consisting of overflows from the butt tank and observations of PCP and petroleum product in the septic system. In addition, process wastes were reportedly disposed in a pit during facility operations by Butcher (i.e., at the "Butcher Pit"). The precise location of this pit is not known.

Previous Environmental Investigations and Actions

In the 1980s, during facility expansion activities, Baxter reportedly excavated approximately 40 tons of a tar-like substance from an area near the kilns. This material was transported for off-site disposal. In 1988, an initial investigation of the former wood waste landfill was performed through the installation and sampling of four groundwater monitoring wells (BXS-1 through BXS-4; see Figure 3). In the early 1990s, the on-site landfill was covered with clean soil and reportedly certified as a closed monofill landfill by the Snohomish County Health District. Groundwater continues to be monitored around the former wood waste landfill in the network of four groundwater monitoring wells pursuant to post-closure requirements. The on-site landfill is reportedly not considered an area of concern. Also in the early 1990s, Baxter implemented a soil and groundwater investigation in response to a butt tank overflow. The investigation included a soil boring and three new groundwater monitoring wells. In 1991, additional groundwater monitoring was performed as a follow-up to the butt tank overflow investigation.

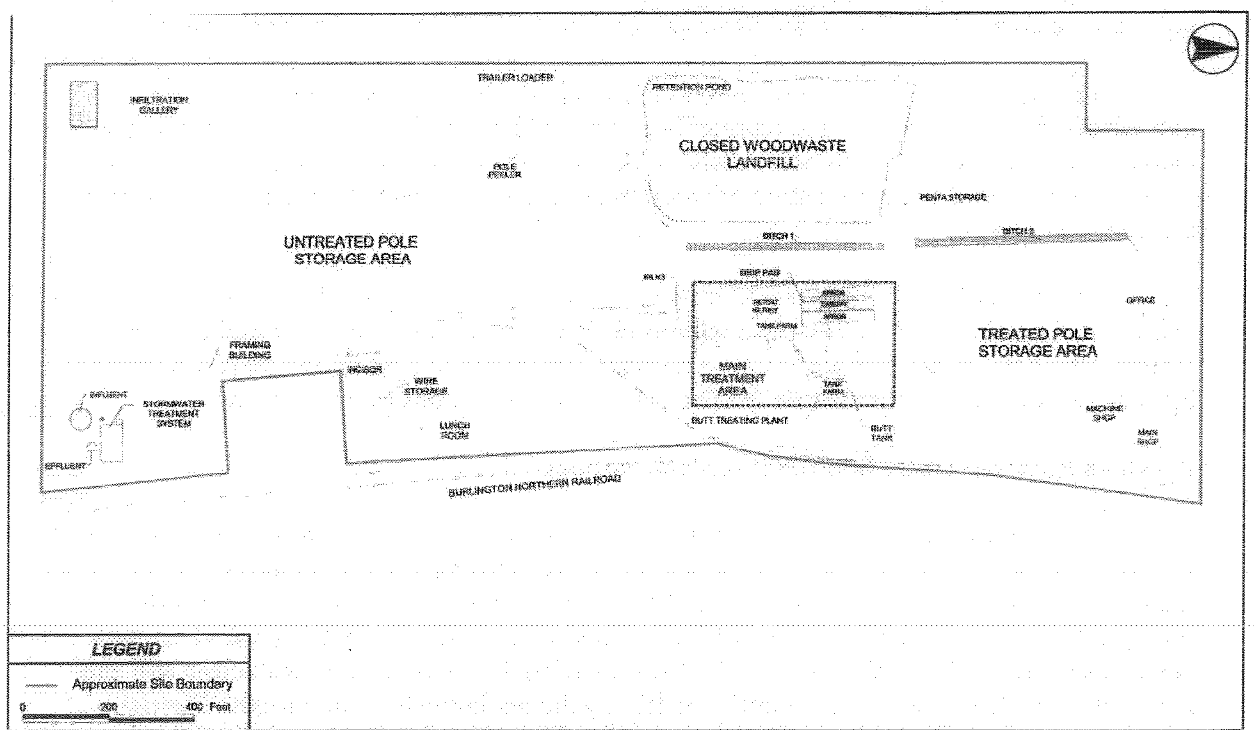

Figure 1. Site Layout (from RCRA SI Report)

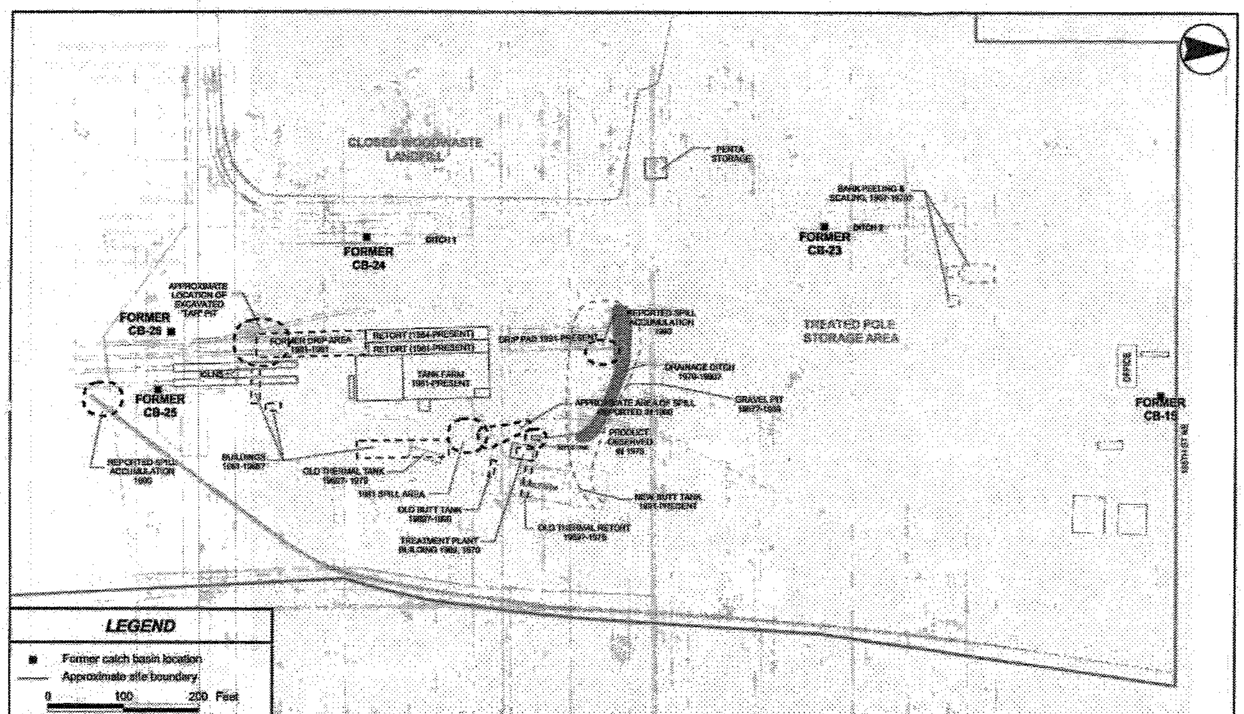

Figure 2. Historical Spill Locations at Site (from RCRA SI Report)

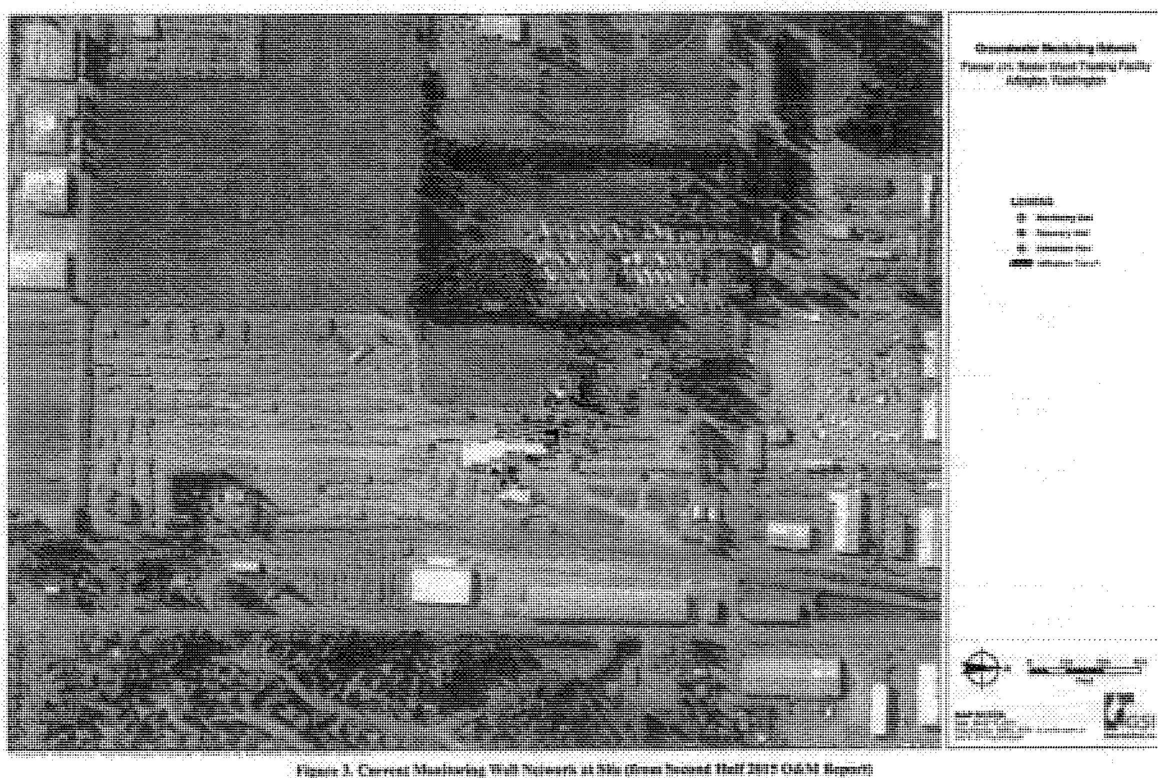

Figure 3. Current Monitoring Well Network at Site (from Second Half 2015 O&M Report)

The Washington State Department of Ecology (Ecology) collected surface soil samples as part of a Site hazard assessment in 1992. Beginning in 1994, Baxter began generating groundwater quality data in accordance with the National Pollutant Discharge Elimination System (NPDES) Permit for the Site. In 1997, Baxter conducted an analysis of methods of prevention, control, and treatment at the Site to comply with applicable groundwater quality standards. As part of that analysis, potential sources of PCP contamination were identified and methods of source control were evaluated. In 1997 and 1998, Baxter evaluated stormwater for potential impacts from dioxins and furans. In 1999, EPA performed an occupational exposure study at the Site under a PCP task force during which several workers were evaluated for direct chemical exposure using personal sampling pumps and sorbent tubes.

Beginning in 1999, Baxter conducted a field investigation to identify potential sources of PCP contamination in groundwater. The field investigation included numerous soil borings and the completion of additional groundwater monitoring wells, as well as a survey of potential water supply wells near the Site. With issuance of a State Waste Discharge Permit (SWDP) for the Site in 2000, Baxter began collecting stormwater quality data in addition to groundwater quality data under the NPDES Permit. Between 2000 and 2002, the network of catch basins that facilitated stormwater drainage and infiltration at the Site (the catch basins had been in place since approximately 1991) was closed in accordance with an Administrative Order from Ecology. Closure generally included removing the catch basins and capping associated drain pipes, and soil was excavated for certain catch basins. Particularly extensive removal action, including soil excavation and installation of clay and geotextile liners, was associated with catch basins in the main treatment area due to observed contamination. No catch basins reportedly remain at the Site.

In April 2001, Baxter and EPA signed a RCRA Administrative Order on Consent and work began on a SI Work Plan and a drinking water sampling program. Beginning in 2001, three lysimeters were monitored in the treated pole storage area. Drinking water in off-site drinking water wells was monitored semiannually beginning in 2001. Twenty-one off-site drinking water wells were monitored, having been identified through relevant City records and a door-to-door survey. Drinking water well sampling was discontinued after two years when no contamination (i.e., PCP and PCP degradation products) was identified in samples.

Between 2002 and 2004, Baxter performed an SI at the Site. During the SI, portions of the Site were consolidated into investigation areas based on past and present uses. The SI consisted of surface and subsurface soil sampling, investigation of sediment in drainage ditches, evaluation of non-aqueous phase liquid (NAPL) contamination, groundwater sampling through permanent monitoring wells and temporary grab sample locations, an off-site air quality assessment, and evaluation of soil background conditions. Numerous soil borings and groundwater monitoring wells were completed during the SI.

In 2004, Baxter performed excavation and post-excavation sampling in two drainage ditches in the northern portion of the Site in the vicinity of the main treatment and treated pole storage areas. These actions were reportedly performed to address concentrations of PCP observed in the ditches during SI sampling. Material removed from the ditches was disposed off-site, and post-excavation sampling reportedly confirmed that PCP concentrations were below the applicable cleanup levels. A stormwater treatment system was constructed at the Site in 2005 as a condition of the Site SWDP. Following completion of the stormwater treatment system at the facility, groundwater and lysimeter monitoring were reportedly no longer required. Effluent from the treatment plant is monitored regularly.

In 2007, a pilot enhanced biodegradation recirculation and NAPL recovery system was implemented at the Site, the intent of which was reportedly to address the dissolved plume of PCP migrating from the main source area. The pilot system consisted of a network of seven groundwater extraction wells installed downgradient of the principal region of contamination in the main treatment area, all of which were piped and routed to a common discharge at an upgradient infiltration trench (see Figure 3). The infiltration trench was constructed of coarse gravel and crushed limestone, reportedly to aerate the extracted groundwater and increase the pH to levels conducive for aerobic biodegradation of PCP. In conjunction with the construction of the pilot system, multiple groundwater monitoring wells were installed at the Site to further characterize conditions and evaluate the pilot approach. The NAPL recovery component of the pilot system included the use of sorbent socks in five monitoring wells to passively recover free phase contamination (see Figure 3). The pilot system was brought on line in 2008.

A supplemental groundwater investigation was performed at the Site in 2009 and 2010, and included the installation and sampling of additional groundwater monitoring wells and groundwater sampling from numerous temporary borings. In 2013, a source area investigation and bench treatability study were completed. The source investigation included the completion of four soil borings in the main treatment area, collection of groundwater samples from five existing Site monitoring wells, analysis of soil and groundwater samples for various constituents and parameters including microbial/enzymatic indicators, and testing of soil and groundwater at bench scale for the potential applicability of in situ chemical oxidation (ISCO).

In the second half of 2015, the pilot enhanced biodegradation recirculation system was rehabilitated. Prior to the rehabilitation efforts, only two of the seven extraction wells were in operation, reportedly due to diminished infiltration capacity at the infiltration trench. Rehabilitation efforts included the installation of vertical borings through the infiltration trench and backfilling the borings with gravel and limestone. After the rehabilitation was completed, the recirculation system was brought back online with four of the seven extraction wells operating at a higher cumulative extraction rate compared to prior to the rehabilitation program.

Also in the second half of 2015, three existing deep groundwater monitoring wells at the Site (MW-39, MW-40, and MW-41; see Figure 3) were retrofitted as in-situ submerged oxygen curtain (iSOC) infusion wells, reportedly to add oxygen to the deeper water-bearing zone and facilitate aerobic degradation of contamination in the dissolved plume area. The wells were fitted with oxygen infusion mechanisms deployed near the well bottom, connected to dedicated oxygen tanks housed within modified wellhead vaults.

Groundwater monitoring is performed on a regular basis at the Site, and has been performed comprehensively since at least January 2008 for the pilot enhanced biodegradation recirculation system and related wells. The pilot NAPL recovery and enhanced biodegradation recirculation system remains operational at the Site, and is reportedly considered a component of the ongoing

RCRA CMS. Based on available Site documentation, the oxygen tanks associated with the iSOC wells and the sorbent socks associated with the passive NAPL recovery system are replaced on an as-needed basis.

Site Contamination

Contamination is present in soil and groundwater at the Site (see Figure 4). Based on the more recent available Site data, the most significant contamination at the Site is confined to the main treatment area and southern portion of the treated pole storage area. NAPL has been observed in several borings in the main treatment area during various investigations, and is removed on a routine basis from permanent groundwater monitoring wells in this area (i.e., the five wells that are utilized for passive NAPL recovery under the ongoing pilot program). The NAPL material at the Site reportedly consists of PCP and a medium petroleum product similar to a weathered No 2 fuel oil. This NAPL material behaves as a light NAPL (LNAPL), occurring in the vadose zone and in the smear zone at the groundwater surface, generally from depths of approximately 10 feet below ground surface (bgs) to approximately 40 feet bgs. LNAPL also appears to be present in pockets of wood waste material buried historically in the main treatment area. A dissolved plume of PCP is present in groundwater. The dissolved PCP plume extends from beneath the main treatment area at and near the LNAPL area and downgradient from the source area in the dominant direction of groundwater flow towards the northwest or north-northwest.

The chemicals that have been identified as chemicals of concern (COCs) at the Site reportedly include PCP, petroleum hydrocarbons, and polycyclic aromatic hydrocarbons (PAHs). In general, NAPL material and PCP appear to be the primary COCs and the apparent drivers of Site remediation decision making. The target cleanup level for PCP in groundwater at the Site is the federal maximum contaminant level (MCL) of 1 microgram per liter (μg/L).

OBSERVATIONS AND RECOMMENDATIONS

The following observations and recommendations were developed during the independent review of Site-related documentation and data. These observations and recommendations are provided in the context of typical elements of a CSM, including contamination sources, the nature and extent of contamination, site risks, and applicable corrective action strategies.

Contamination Sources

Historical operations involving the use of wood treating chemicals have been largely confined to the main treatment area. Primary source impacts (NAPL and other impacts to soil from facility releases) appear to be concentrated in the main treatment area, with some impacts to soil apparently also associated with the southern portion of the treated pole storage area. Sources appear to include releases, discharges, and spills of PCP and/or petroleum materials during operations and the transport of such releases, discharges, and spills through facility infrastructure (e.g., drainage features). In addition, there does appear to have been deliberate placement of process wastes in the subsurface in the main treatment area, evidenced by anecdotal reference to the "Butcher Pit". The former wood waste landfill at the Site is also a potential source of

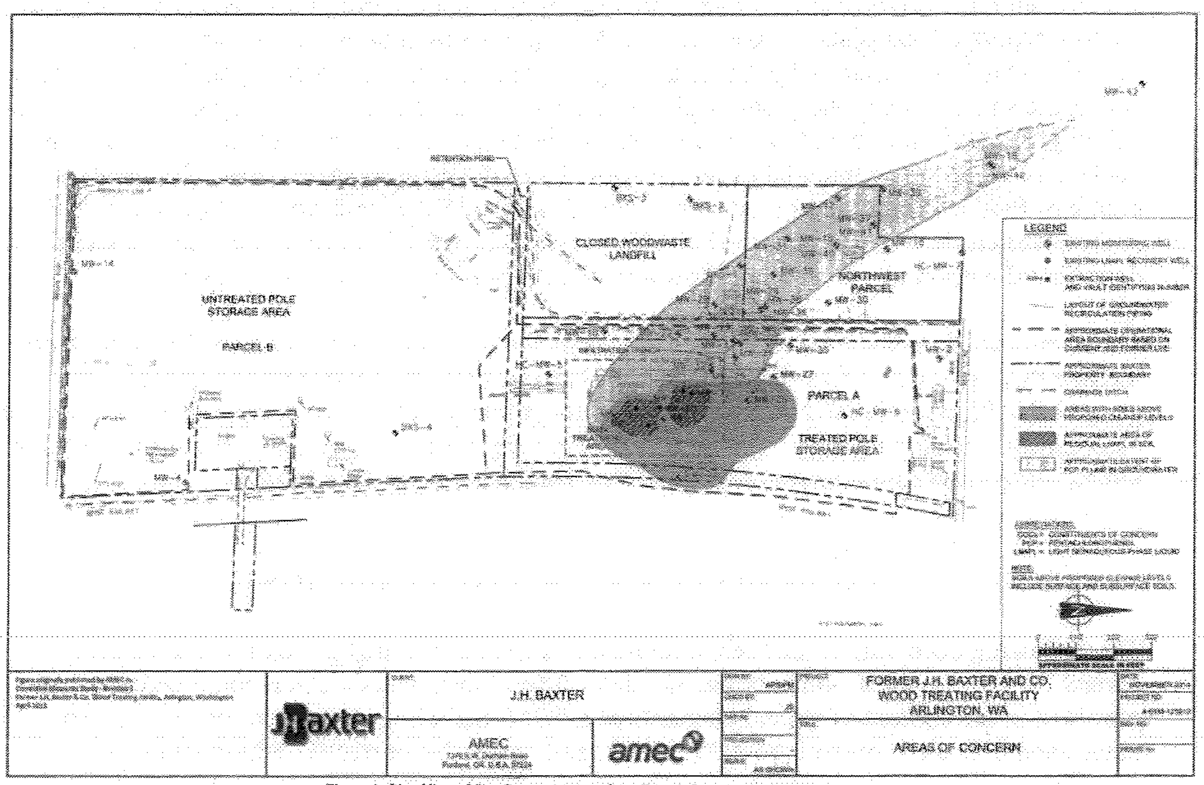

Figure 4. Plan View of Site Contamination (from Fourth Quarter 2014 O&M Report)

contamination; however, the wood waste landfill was reportedly used to contain only wood shavings and not process wastes, and while environmental data do not appear to have been collected from directly within or beneath the former landfill, the available data do appear to support that the former landfill is not an area of concern. The untreated pole storage area also does not appear to be an area of concern, as supported by available Site information and data.

Based on review of the Site documentation and data provided by EPA, the following uncertainty appears to exist in the understanding of contamination sources for the Site:

Additional Sources. Based on independent assessment of Site-related information, it appears likely that spills, releases, and/or discharges other than those specifically documented have also occurred over the course of the operational history of the Site. The occurrence of other spills, releases, and/or discharges historically at the Site, singularly or cumulatively could influence the presence and distribution of source material and an effective characterization and remediation strategy.

Nature and Extent of Contamination

Several investigations have been performed at the Site to evaluate environmental conditions and assess impacts from historical operations. Numerous soil borings have been completed and an extensive network of groundwater monitoring wells has been constructed. Certain groundwater monitoring wells have been installed to specifically evaluate conditions associated with particular Site features (e.g., monitoring wells BXS-1 through BXS-4 were installed to evaluate conditions associated with the former wood waste landfill). However, the majority of groundwater monitoring wells has been installed during iterative investigations aimed at characterizing conditions in the main treatment area and in downgradient areas where secondary impacts to groundwater have occurred. The direction of groundwater flow at the Site is well understood, and is consistently towards the northwest or north-northwest. As such, the axis of the dissolved PCP groundwater plume trends in the northwesterly to north- northwesterly direction.

Groundwater monitoring wells at the Site are screened in intervals reportedly defined as shallow, intermediate, and deep, corresponding to bottom of well screen elevations of greater than 90 feet, between 70 and 90 feet, and less than 70 feet, respectively, relative to the North American Vertical Datum of 1988. The majority of the permanent monitoring wells at the Site are screened in the shallow/intermediate intervals, but deeper wells have been completed along the axis of the dissolved PCP plume.

Figures 5 and 6 provide PCP plume maps for the shallow groundwater interval for the fourth quarter of 2014 and fourth quarter of 2015, respectively, and Figures 7 and 8 provide PCP plume maps for the deep groundwater interval for the fourth quarter of 2014 and fourth quarter of 2015, respectively. Figures 9 and 10 provide cross-sectional PCP plume maps from the fourth quarter of 2014 and fourth quarter of 2015, respectively. As shown on Figures 5 and 6, the PCP plume extends to the Site boundary and potentially off-site in the shallow/intermediate interval. As shown on Figures 7 and 8, the PCP plume extends to and beyond the Site boundary in the deep interval. As shown on Figures 5 through 10, concentrations of PCP reach several hundred µg/L

Figure 3. Fourth Quarter 2014 Shallow/Intermediate Zone PCP Plume (from Fourth Quarter 2014 O&M Report)

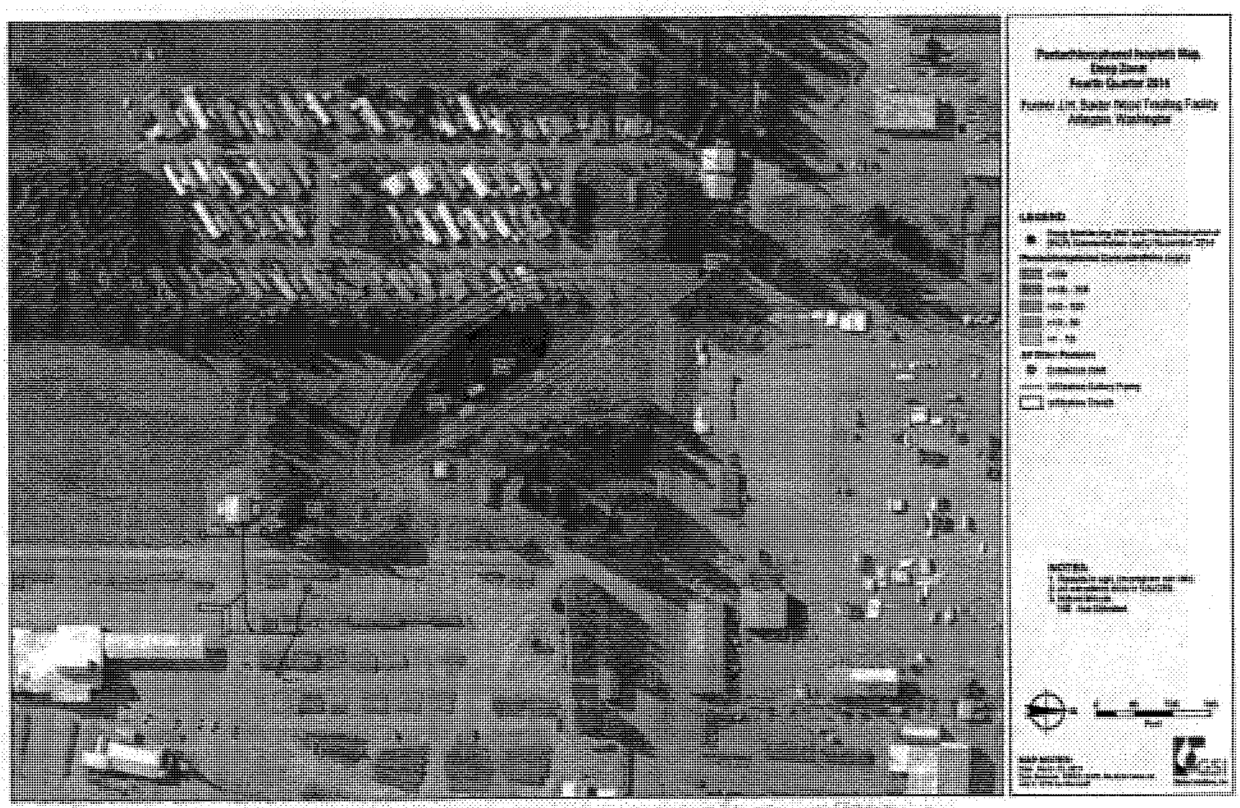

Figure 7. Fourth Quarter 2014 Deep Zone PCP Plume (from Fourth Quarter 2014 O&M Report)

Figure 6. Fourth Quarter 2015 Shallow-Intermediate Zone PCP Plume (From Second Half 2015 O&M Report)

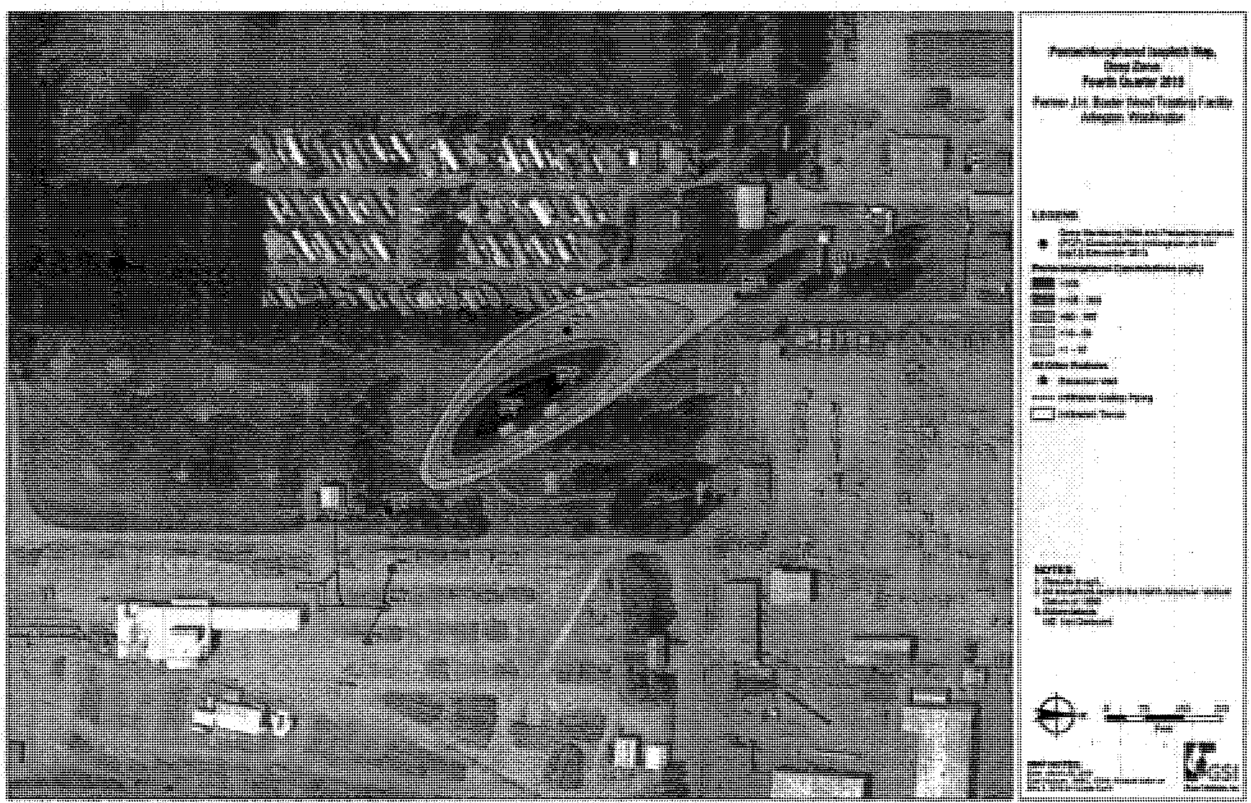

Figure 8. Fourth Quarter 2015 Deep Zone PCP Plume (from Second Half 2015 O&M Report)

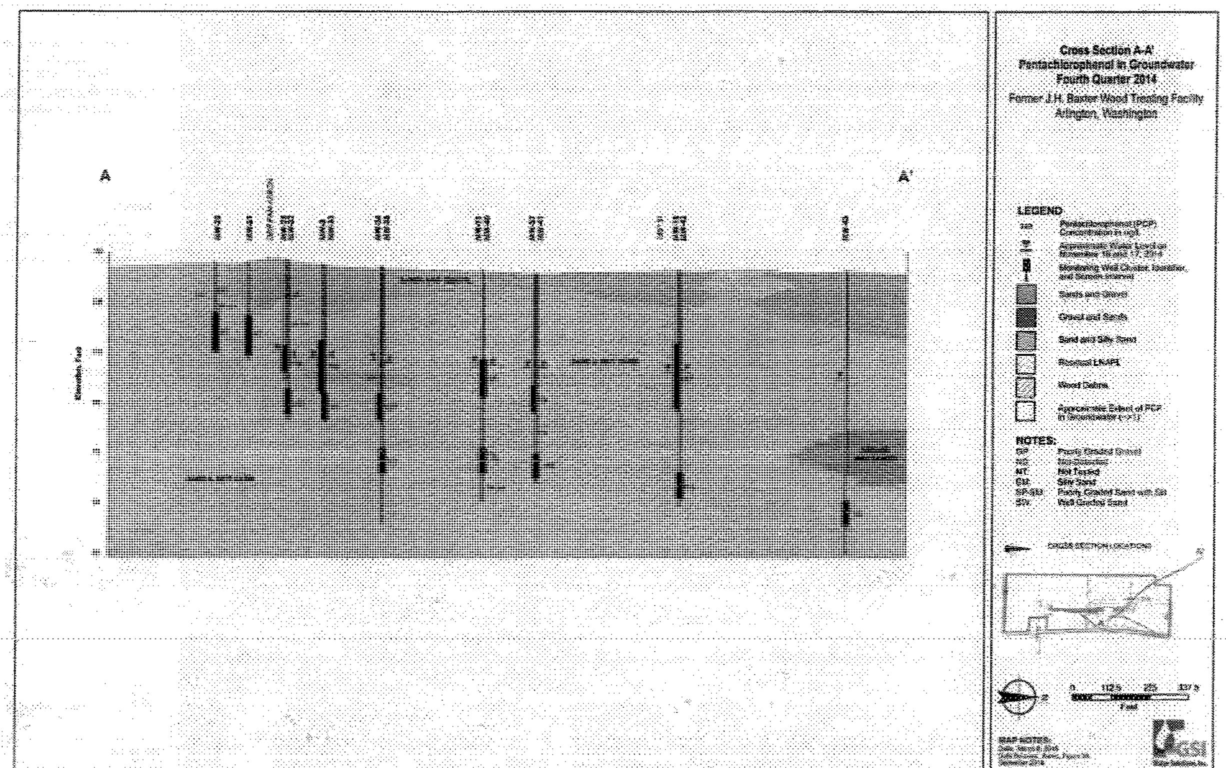

Figure 9. Cross-Sectional View of Site Contamination (from Fourth Quarter 2014 O&M Report)

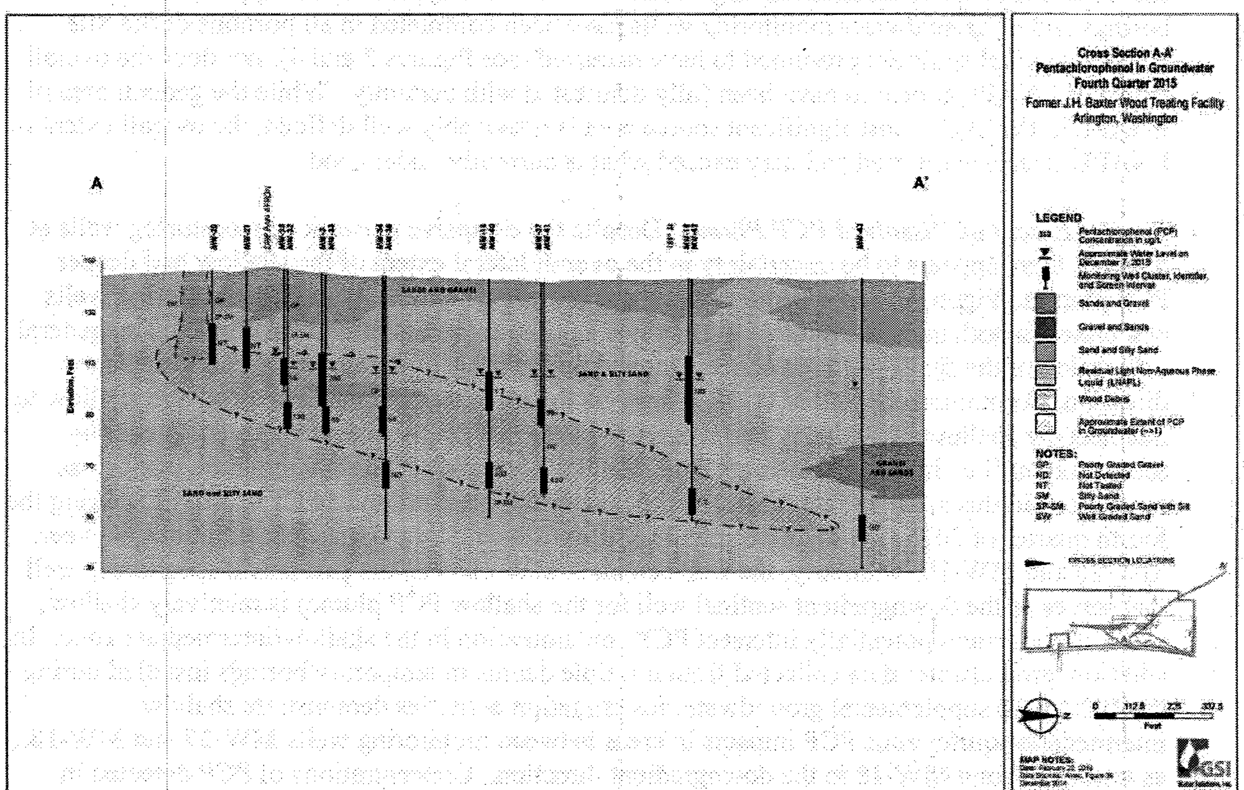

Figure 10. Cross-Sectional View of Site Contamination (from Second Half 2015 O&M Report)

in the shallow zone dissolved plume and in the deep zone dissolved plume.

Based on review of the Site documentation and data provided by EPA, the following uncertainties appear to exist in the characterization of the nature and extent of contamination at the Site:

Distribution of LNAPL. Numerous soil borings have been completed in the main treatment area in which observations of NAPL were recorded. LNAPL has been directly observed in (and is passively removed from) five Site monitoring wells in the main treatment area (MW-12, MW-13, MW-19, MW-20, and MW-21). LNAPL in the subsurface is certainly acting as a continuing source of dissolved contamination in groundwater. Ultimately, it does not appear that soil borings and/or groundwater monitoring wells have been completed in all portions of the Site where historical spills are presumed to have occurred (see Figures 2 and 4), nor does the overall extent of LNAPL appear to have been fully delineated with certainty. While the general area of LNAPL in the likely most significant source area is reasonably well defined, the overall extent of LNAPL is largely inferred and may exceed what is currently understood.

Lateral Extent of Dissolved PCP Plume. Despite the extensive network of monitoring wells at the Site, there appears to be uncertainty in the overall lateral extent of the shallow and deeper PCP plumes. Figures 5 and 6 demonstrate the shallow PCP plume, based on monitoring wells completed in both the shallow and intermediate aquifer zones as defined by Baxter. The general orientation of the shallow plume appears logical on the basis of the known groundwater flow direction. At monitoring well MW-15, it appears the screened interval is possibly too shallow to intersect the shallow PCP plume, and it is more likely that if this well screen were deeper by some amount (i.e., in the intermediate zone) that the shallow PCP plume might be mapped as continuous in this area. In fact, based on the detected concentration of PCP at MW-15 during the fourth quarter of 2015 (see Figure 6), the PCP plume should be mapped as continuous between MW-36 and MW-15. Similarly, the well screen at MW-18 (i.e., the permanent monitoring well that serves as the downgradient sentinel well for the shallow PCP plume) is relatively shallow, and if deeper could potentially intersect PCP contamination in the shallow/intermediate zone. In addition, groundwater data collected from multiple depths in temporary borings installed during the 2009/2010 supplemental groundwater investigation activities demonstrate shallow/ intermediate aquifer zone PCP impacts in areas between monitoring wells MW-37 and MW-18, as well as beyond MW-18 in the downgradient direction. Concentrations of PCP detected in shallow/intermediate zone samples at some locations in these areas during the 2009/2010 investigation were significantly greater than the cleanup level. Figures 7 and 8 demonstrate the deeper PCP plume. The deeper plume is highly inferred from relatively sparse permanent monitoring well data. There are no laterally bounding permanent sampling locations to the west or east of the plume axis, and data from the 2009/2010 supplemental investigation demonstrate elevated concentrations (in some cases, significantly greater than the cleanup level) of PCP in the deep zone in areas between monitoring wells MW-41 and MW-42, as well as downgradient of MW-42 and towards MW-43 (i.e., the permanent monitoring well that serves as the downgradient sentinel well for the deep PCP plume). For both the shallow and deep intervals, there are no permanent monitoring wells located off-site in the area of the nonconforming residential land use (i.e., the mobile home park) west of the Site. The overall lateral extent of the dissolved PCP plume in both the shallow and deep intervals could exceed what is currently absent at the Site and downgradient impacts (i.e., dissolved phase contamination in groundwater) are not a risk to ecological receptors, such that only impacts to human health are of concern. Based on evaluation of the Site documentation provided, it appears this is a reasonable position.

Cleanup levels for the Site were selected based on a hierarchical evaluation of available Washington Model Toxics Control Act (MTCA) and EPA standards and guidance. Soil cleanup levels were derived separately for the portion of the Site containing the main treatment and treated pole storage areas and for the untreated pole storage area. Both were derived on the basis of industrial land use and to be protective of impacts to groundwater. For the portion of the Site containing the main treatment and treated pole storage areas, the derivation of soil cleanup levels included specific partitioning calculations to yield soil concentrations protective of groundwater. The groundwater cleanup levels were derived based on the highest relevant use of groundwater beneath and downgradient of the Site being drinking water, and excluding the potential to impact surface water.

Based on evaluation of the Site documentation provided, it appears that the approaches for applying cleanup levels for soil and groundwater are reasonable and appropriate. Adopting the assumption of potable groundwater use at the Site is conservative, but in general is reasonable and appropriate on the basis of the Site documentation provided and reviewed as well as the Washington Administrative Code (WAC).

Based on review of the Site documentation and data provided by EPA, the following uncertainty appears to exist in the evaluation of risks at the Site:

Vapor Intrusion Risks. During the 1999 EPA PCP task force study, results demonstrated that workers were not exposed to airborne concentrations of PCP that exceeded applicable Occupational Safety and Health Administration (OSHA) standards. In addition, chemical concentrations in air at locations in the vicinity of the Site were historically evaluated through modeling. That assessment identified no modeled chemical concentrations that would exceed applicable EPA ambient air quality standards. The 2013 RCRA CMS for the Site determined that air emissions do not require consideration in a remediation strategy. PCP has a Henry's law constant of 3.4×10^{-6} atmospheres cubic meters per mole (atm-m^3/mol), and is therefore not considered sufficiently volatile to pose a vapor intrusion risk (EPA defines sufficiently volatile as a Henry's law constant greater than 10^{-5} atm-m^3/mol). However, it does not appear that the specific potential for vapor intrusion into on-site or off-site buildings or residences has been directly considered and determined/documented to be an unnecessary consideration for the Site.

Corrective Action Approaches

As documented in the 2013 RCRA CMS, the CMOs for the Site have been defined as follows:

- Minimize concentrations of COCs in soil and groundwater to achieve cleanup levels and protect human health and the environment
- Minimize the contaminant mass and area in subsurface soil, LNAPL, and groundwater
- Prevent human exposure to subsurface soil containing COC concentrations above cleanup

inferred in Site documentation.

Vertical Extent of Dissolved PCP Plume. Based on its density and other factors, PCP tends to sink in water in the free phase or as a dissolved plume. The dissolved PCP plume at the Site appears to behave in a manner consistent with this general characteristic, with the plume appearing to dive to deeper relative depths with increasing distance from the source area (see Figures 9 and 10). In the region containing the Site, subsurface geology consists of relatively coarse material made up of recessional glacial outwash, and these coarse materials can be up to or over 100 feet in thickness before encountering finer grained clay material. In the more immediate area of the Site, the subsurface consists of fill material overlying gravelly sands, fine to medium sands, coarse sands, and ultimately sand and silty sand. Groundwater monitoring wells screened in the deep interval at the Site are screened generally in sand and silty sand and it does not appear that any borings completed at the Site have encountered an underlying aquitard/ aquiclude. Based on the available groundwater data for the Site, PCP concentrations in the deepest well at several locations exceed the cleanup level by a significant amount. The only deep well on Figures 9 and 10 where PCP concentrations provide a lower boundary to the plume is MW-38, in the relatively mid-plume area along the plume axis. Beneath the primary LNAPL area, in near-source areas downgradient of the primary LNAPL area, and in more down-plume areas, there is no vertical bound to the depth of the dissolved PCP plume. It is possible that the overall vertical extent of the plume as inferred in Site documentation is underestimated, including the potential that the plume is dipping and migrating beneath the farthest downgradient deep sentinel well (MW-43).

Overall PCP Plume Geometry. The geometry of the PCP plume associated with the Site is influenced by the source magnitude and extent, general fate and transport mechanisms affecting PCP in the environment, the coarse-grained nature of the geologic formations underlying the Site, and the local hydrogeologic regime. Overall, while the general orientation of the PCP plume at the Site appears to be understood, it does not appear the PCP plume is entirely defined in all dimensions by the existing network of permanent groundwater monitoring wells, or by the combined permanent well and historical temporary well point data.

Site Risks

It does not appear from the Site documentation reviewed that formal, quantitative risk assessments have been completed to assess contamination and the relative potential for unacceptable risk. However, it appears that EPA has agreed that quantitative risk assessments are not needed at the Site, based on the following from the 2013 RCRA CMS:

> "As agreed between Baxter and EPA, no site-specific quantitative risk assessment needs to be conducted for this facility. Although EPA will determine final cleanup levels, media-specific concentrations will be compared to risk-based screening levels, the proposed cleanup levels developed…and corrective measure considerations…in order to identify those areas where corrective actions are warranted."

It also appears that there is agreement among the Site stakeholders that ecological habitat is

The 2007 RA Pilot Study Work Plan specifically indicates that the pilot enhanced bioremediation groundwater treatment and passive LNAPL recovery system was based on the preferred corrective measures alternative identified in a 2007 RCRA CMS for the Site. The 2007 RCRA CMS was not provided for review, but it appears from this statement in the 2007 RA Pilot Study Work Plan that at the time that particular iteration of the CMS was developed, the preferred corrective measure would have been identified as the enhanced biodegradation recirculation and LNAPL recovery system. Notably, this corrective measure is identified as an alternative (Alternative 4; see below) in the more recent 2013 RCRA CMS for the Site, but is not identified in the 2013 document as the preferred corrective measure. The preferred corrective measure identified in the 2013 RCRA CMS combines the enhanced biodegradation recirculation and LNAPL recovery system with a more aggressive ISCO treatment component (Alternative 6; see below).

In the 2013 RCRA CMS, Baxter assessed multiple remediation technologies for soil, LNAPL, and groundwater. For soil, the CMS evaluated the following technologies for their potential suitability for the Site:

- Excavation
- In situ stabilization
- Electrical resistive heating (ERH)
- ISCO

For LNAPL, the CMS evaluated the following for their potential suitability:

- Passive recovery
- Interceptor trench
- Dual-phase recovery
- Solvent-enhanced extraction
- ERH
- ISCO

For groundwater, the CMS evaluated the following:

- Monitored natural attenuation (MNA)
- Containment
- Pump and treat
- Funnel and gate barrier
- Surfactant flushing
- Air sparging

levels

- Prevent or minimize the migration of adverse concentrations of COCs from soil to groundwater
- Prevent migration of COCs in groundwater
- Prevent human exposure to groundwater COC concentrations above cleanup levels

The pilot enhanced biodegradation recirculation and LNAPL recovery system was brought online at the Site in 2008, and continues to operate. The pilot system consists of a network of seven groundwater extraction wells installed downgradient of the principal region of contamination in the main treatment area, with extracted groundwater routed to an upgradient infiltration trench. The infiltration trench is constructed of coarse gravel and crushed limestone, and was recently rehabilitated with the installation of vertical borings containing fresh gravel and limestone. The system is reportedly intended to aerate the extracted groundwater and increase the pH level, providing conditions more conducive to aerobic degradation of PCP in the dissolved plume migrating from the source area. Presently, it appears that only four of the seven extraction wells may be operational. The LNAPL recovery component of the pilot system includes passive recovery of LNAPL from five monitoring wells using sorbent socks that are replaced on an as-needed basis.

Based on evaluation of the Site documentation provided, including the analytical data and contaminant distribution maps, it does not appear the pilot enhanced bioremediation groundwater treatment and passive LNAPL recovery system is effectively achieving the CMOs. Based on LNAPL recovery information provided in the 2014 Stand-Alone Data Document, it does not appear that passive recovery has yielded an appreciable reduction in the amount of LNAPL encountered at the recovery wells. In fact, it appears the amount of LNAPL encountered at one recovery well (MW-12) increased. The general physical geometry of the PCP plume in both the shallow and deeper groundwater zones appears to have remained relatively consistent over time since startup of the enhanced bioremediation recirculation system. PCP concentrations in the shallow and deep dissolved plume downgradient of the LNAPL source area remain elevated relative to the cleanup level, with some fluctuation between sampling events. Visual assessment of time series data from shallow and intermediate zone permanent monitoring wells upgradient of, within, and downgradient of the recirculation area appear to largely indicate fluctuating but generally steady trends in the past several years. Visual assessment of the time series of PCP concentration data for specific shallow and intermediate monitoring wells (e.g., MW-3) does appear to show a downward trend; however, the wells immediately downgradient of the infiltration trench and in the direct vicinity of extraction wells may be highly responsive to the forces of physical extraction and redistribution of groundwater concentrations from the recirculation system. PCP concentration data for deep groundwater monitoring wells downgradient of the source area appear to demonstrate generally upward trends over time, even with the iSOC system in operation. Moreover, the available data do not appear to demonstrate a significant occurrence of PCP degradation products in groundwater in the area of the recirculation system. The rehabilitation project that was completed for the pilot system may improve its effectiveness; however, there are insufficient data available since the time of the rehabilitation to make a definitive assessment.

- Enhanced bioremediation
- ERH
- ISCO

Each of these remediation technologies was retained for consideration in developing corrective measures alternatives for the Site, with the exception of an interceptor trench and solvent-enhanced extraction for LNAPL and surfactant flushing for groundwater. Institutional controls (ICs) were retained as an administrative remedy element for all Site media.

In general, the list of potentially suitable remediation technologies and the more specific technology processes as identified in the 2013 RCRA CMS are appropriate for the Site.

For Site soils, an engineered cover could also be a potentially viable remedy element, as would soil vapor extraction (SVE). Notably, SVE was identified in the CMS as a process typically implemented along with air sparging for groundwater remediation. Similarly, SVE is a typical component of thermal groundwater treatment approaches to capture thermal off-gases. Therefore, SVE could potentially be compatible with other primary remedy elements. At the Site, SVE would be conceptually viable to address contamination in subsurface soil given the relative permeability of subsurface materials, but alone would not likely be an effective remedy given the co-occurrence of LNAPL with contaminated soils and the moderate volatility of PCP. An engineered cover system would prevent the potential for contact with contaminated soils, and is not a contaminant-specific technology, but would not reduce soil concentrations or the potential for secondary impacts from contaminated soils.

For LNAPL, specific free-phase extraction using product recovery pumps installed in wells could also be a potentially suitable remedy component. Free-phase extraction would be a more active approach to LNAPL removal relative to passive removal, and would generate only LNAPL material for disposition instead of also potentially large volumes of groundwater as with dual-phase (total fluids) extraction.

For groundwater, available scientific literature demonstrates some usefulness for remediation of PCP using in situ chemical reduction (ISCR). However, ISCR is generally not as rapid a process compared to ISCO, and is typically not implemented for heavily contaminated source zone treatment, particularly NAPL. In addition, ISCR is not characteristically suitable for petroleum organics.

For both LNAPL and groundwater, the 2013 CMS considered ERH and steam-enhanced extraction as potentially viable thermal treatment technologies, and selected ERH as the most appropriate thermal treatment option. Another potentially viable thermal treatment technology is electrokinetics, which induces contaminant movement through application of a direct current electrical field. However, electrokinetics generally requires a capture/containment element and is often more suitable in finer-grained soils.

The 2013 RCRA CMS assembled six corrective measures alternatives to address soil, LNAPL, and groundwater contamination at the Site. These alternatives, along with the net present value

(NPV) cost provided in the CMS document, were:

- 1 – Total Fluids Recovery, Air Sparging, MNA, and ICs (NPV cost = $4,309,600)
- 2 – Hydraulic Containment, MNA, and ICs (NPV cost = $4,847,800)
- 3 – Excavation, Offsite Disposal, MNA, and ICs (NPV cost = $40,179,300)
- 4 – Enhanced Biodegradation Recirculation System, Passive LNAPL Recovery, MNA, and ICs (NPV cost = $2,684,700)
- 5 – ERH, Total Fluids Recovery, Enhanced Biodegradation Recirculation System, MNA, and ICs (NPV cost = $4,287,500)
- 6 – ISCO, Enhanced Biodegradation Recirculation System, MNA, and ICs (identified as preferred approach; NPV cost = $2,484,700)

Ultimately, ICs at the Site would likely be effective to meet the CMOs associated with preventing human exposure to contamination in soil and groundwater. However, ICs would not be effective to meet the CMOs associated with achieving cleanup levels, minimizing contaminant mass, and preventing the migration of contamination. The pilot NAPL recovery and enhanced biodegradation recirculation system remains operational at the Site, and is reportedly considered a component of the ongoing RCRA CMS. The pilot system is reportedly intended to address dissolved phase contamination downgradient of the source. As discussed above, the available Site data do not indicate that the pilot system is effectively achieving the CMOs.

A corrective measure for the Site should incorporate both source remediation, given the ongoing contribution to secondary contamination from the source, and remediation of the dissolved phase PCP plume, which has migrated beyond the Site boundary. Based on the available Site documentation and independent assessment of potentially suitable corrective measures technologies and approaches, a corrective measures alternative consisting of the following elements would potentially be optimal for the Site (and would be largely consistent with Alternative 6 from the 2013 RCRA CMS):

- Active LNAPL Recovery
- ISCO
- Enhanced Bioremediation
- MNA
- ICs

Each of these corrective measures alternative elements is described below, followed by a brief description of the recommended and conceptually optimal corrective measures alternative.

Active LNAPL Recovery. Alternatives that remove NAPL sources are generally preferred by EPA, and active removal of NAPL material best achieves the statutory preference for corrective measures that reduce the toxicity, mobility, and volume of contamination. The coarse grained nature of the subsurface at the Site and the associated permeability would likely provide optimal product recovery conditions. Active LNAPL recovery would provide immediate contaminant mass reduction and typically has the ancillary benefits of reducing subsequent mobility and exposing residual NAPL material to more effective follow-up treatment.

ISCO. ISCO is a primarily destructive process in which chemical oxidants are utilized to chemically destroy COCs. The technology involves the conversion of COCs into benign end products through oxidation reactions, culminating generally in water and carbon dioxide as final products. ISCO is well suited to address high concentration source areas in a relatively rapid manner, including saturated and unsaturated horizons, and has been demonstrated to be effective even with NAPL sources. ISCO is suitable for the treatment of petroleum organics and PCP, and can easily be implemented using direct push borings and direct injection of reagents into the contaminated subsurface. The most common ISCO reagents are hydrogen peroxide (including Fenton's reagent), formulations of permanganate, and inactivated or activated persulfate solutions. Many vendors have developed unique and proprietary chemical oxidants for use in the environmental remediation industry, many of which have been proven highly effective in full scale applications. These vendors are adept at providing optimized treatment designs based on site-specific contamination profiles, physical conditions, and treatment objectives. An ancillary benefit of ISCO treatment is the creation of redox environments that further promote aerobic biodegradation after treatment has ended and beyond the immediate treatment area.

Enhanced Bioremediation. Enhanced bioremediation treatment involves creating appropriate conditions to stimulate microbial degradation of COCs to non-toxic end products. This is generally achieved either by adding a suitable electron donor/acceptor and/or by adding the specific microorganisms most likely to degrade the chemicals of interest (as well as possibly an appropriate nutrient amendment to further support biological activity). For anaerobic bioremediation, an electron donor is added to promote more strongly reducing conditions and to serve as an electron donor and possible source of carbon for microorganisms. Common electron donors include molasses, methanol, lactate, and vegetable oil. Aerobic bioremediation is typically accomplished by promoting oxidizing conditions through the addition of a source of molecular oxygen. Enhanced bioremediation is best suited to address more diffuse contamination areas outside of primary source zones. Enhanced bioremediation can easily be implemented using direct push borings and direct injection of reagents into the contaminated subsurface. As with ISCO technologies, many vendors have developed unique and proprietary bioremediation amendments for use in the environmental remediation industry, many of which have been proven highly effective in full-scale applications, and these vendors are adept at providing optimized treatment designs based on site-specific contamination profiles, physical conditions, and treatment objectives. PCP can be degraded anaerobically or aerobically, and petroleum hydrocarbons are typically degraded aerobically. Based on the available Site information, and based on the recommended application of ISCO as a primary corrective action element, enhanced aerobic bioremediation would be the most suitable bioremediation approach for the Site. An ancillary benefit of aerobic enhanced bioremediation is the creation of redox environments that further promote natural attenuation after treatment has ended and beyond the immediate treatment area.

MNA. Natural attenuation is those naturally-occurring processes in soil and groundwater environments that act without human intervention to reduce the mass, toxicity, volume, mobility, or concentration of chemicals. Natural attenuation works through non- destructive mechanisms such as dispersion, adsorption, dilution, volatilization, and stabilization, as well as destructive mechanisms such as natural biodegradation. MNA involves the natural attenuation of COCs with an appropriate monitoring program to verify that natural attenuation processes are occurring and COC concentrations are being attenuated.

ICs. ICs are restrictive measures placed on the use of land to prevent or limit exposure, to manage permissible uses to control unacceptable exposure, or to ensure effectiveness of a corrective action. Proprietary controls involve legal instruments, such as easements and covenants that are placed on the title of a property to restrict land uses. Governmental controls are restrictions placed on the use of land that are within the purview of a state or local authority to enforce. Governmental controls include zoning restrictions/ordnances and administrative orders or consent decrees available under RCRA to restrict the use of land. ICs would be required for the Site as a component of an effective corrective action.

Conceptually, the optimal corrective measures approach for the Site would include LNAPL recovery, ISCO, enhanced bioremediation, and MNA elements in a spatially and temporally staggered implementation. Figure 11 provides a highly conceptual two- dimensional representation of the recommended corrective measures approach.

LNAPL recovery would be implemented in the NAPL source area, where both petroleum and PCP contamination is present, removing the maximum amount of LNAPL possible until the constraints of NAPL mobility and capillary adhesion prevent further capture. LNAPL could be effectively recovered using product recovery pumps in recovery wells, either those existing wells with known LNAPL accumulation, new wells installed for this purpose, or a combination of both. Skimmer-type pumps with floating inlets could be utilized to track fluctuations in the groundwater surface and maintain product removal capacity. Recovered LNAPL would require conveyance, temporary storage, characterization, and disposal. Conveyance would likely be best accomplished with buried piping connecting product recovery wells to an accumulation area, and accumulation and temporary storage could be accomplished using aboveground tanks not likely to require a significant footprint and that could be accommodated within the operational area of the Site. Periodic disposal of accumulated free product would be required. It is possible that LNAPL recovered could be handled by existing treatment/recycling infrastructure at the Site that supports wood treatment operations.

After active LNAPL recovery has ceased to provide functional return on effort, or in conjunction with active LNAPL recovery, ISCO would be implemented in the residual NAPL source zone and an area downgradient of the LNAPL source. The ISCO element would use a suitable chemical oxidant to address remaining petroleum and PCP contamination in the source area and the relatively high concentration dissolved plume downgradient. ISCO could be accomplished with a commonly available, off-the-shelf chemical product. The bench test previously completed for the Site and documented in the Source Area Investigation and Chemical Oxidation Bench Study initially assessed the ability of permanganate and persulfate to chemically oxidize source area contamination at the Site through short duration total oxidant demand testing. This was followed by longer duration performance tests using three persulfate materials (alkaline

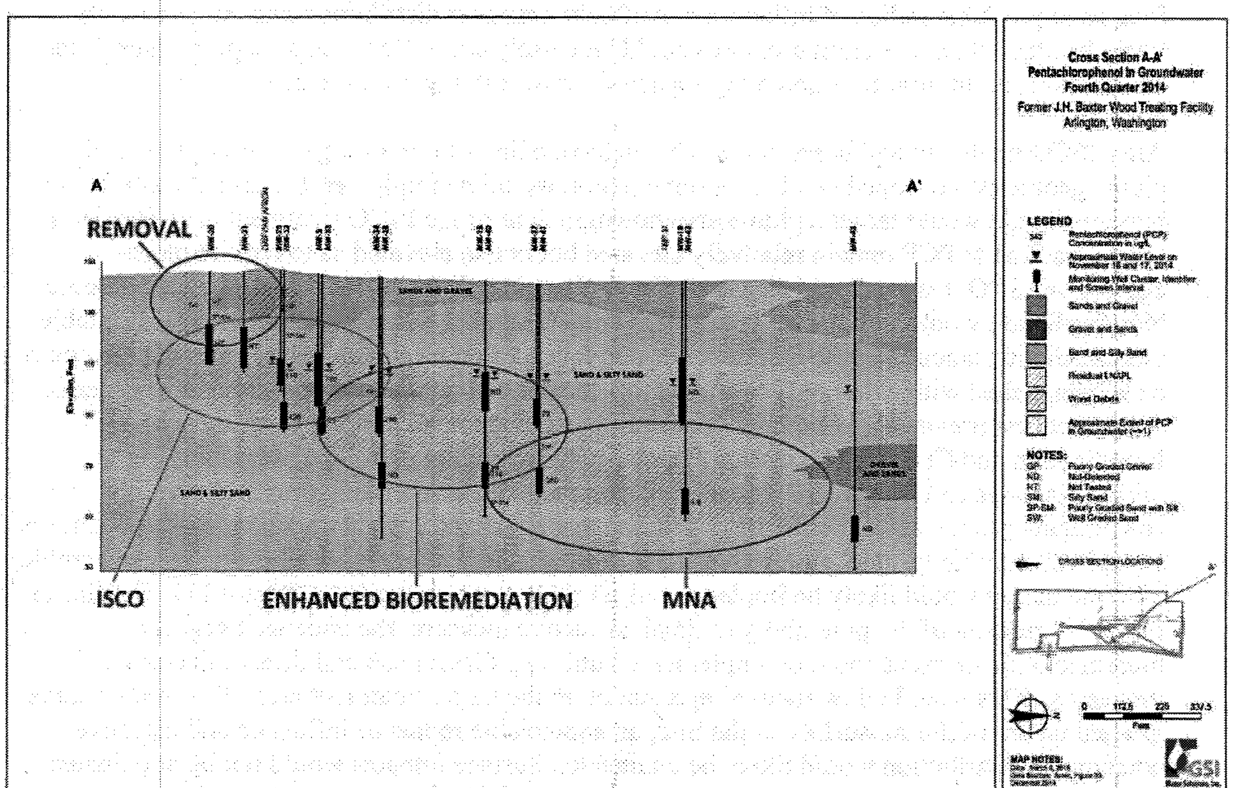

Figure 11. Conceptual Representation of Potentially Optimal Corrective Measures Alternative for the Site

activated sodium persulfate, iron activated sodium persulfate, and peroxide activated sodium persulfate) and sodium permanganate. A first round of performance testing concluded that PCP was susceptible to oxidation and determined that alkaline activated persulfate was the most effective oxidant. A second round of performance testing, focused on alkaline activated persulfate only, concluded that lower oxidant doses than were used in the first round of testing were effective in yielding significant destruction of PCP. Based on the cumulative results, the Source Area Investigation and Chemical Oxidation Bench Study recommended an ISCO pilot study should be designed for the Site. The ISCO element of the corrective measure could be implemented utilizing direct push and direct injection processes. This would allow focused application to the target treatment area. Given the coarse-grained nature of the subsurface at the Site, an appreciable radius of influence and effective reagent distribution and contact would likely be attainable. Injection pressures could be closely controlled to ensure proper subsurface distribution and to minimize potential impacts at or near the ground surface.

After ISCO treatment and based on refined understanding of remaining concentrations and plume geometry, enhanced aerobic bioremediation would be implemented. Enhanced aerobic bioremediation would target a plume area downgradient of the ISCO treatment area, in which concentrations of PCP remain relatively elevated but not so elevated as to require more aggressive ISCO treatment and also not effectively compatible with MNA. Enhanced aerobic bioremediation would utilize an oxygen-delivering treatment reagent and potentially a suitable bioremediation amendment to augment nutrient levels. Enhanced aerobic bioremediation could be accomplished with commonly available, off-the-shelf chemical materials and amendments. The bench test previously completed for the Site and documented in the Source Area Investigation and Chemical Oxidation Bench Study found that petroleum degrading microorganisms and aerobic PCP degrading microorganisms are likely present in the contaminant plume, and specifically concluded that enhanced natural attenuation is a potentially suitable alternative for mid-plume areas of the Site (i.e., the plume area where enhanced aerobic bioremediation would likely be implemented, as shown conceptually on Figure 11). Similar to the ISCO element of the potentially optimal corrective measure, the enhanced aerobic bioremediation element could be implemented utilizing direct push and direct injection processes. This would allow focused application to the target treatment area. Given the coarse-grained nature of the subsurface at the Site, an appreciable radius of influence and effective amendment distribution would likely be attainable. Surface impacts would not be anticipated given the relative treatment depths associated with the mid-plume area addressed through enhanced aerobic bioremediation and the nature of the amendments typically utilized in such applications.

After enhanced aerobic bioremediation is completed, or in conjunction with the enhanced bioremediation phase, MNA would be implemented for the downgradient and lateral margins of the plume (and potentially for other portions of the plume treated previously to a sufficient degree through other remedy elements to allow for MNA as a final polishing step). As noted above, the existing permanent groundwater monitoring well network at the Site does not appear to completely define the extent of the groundwater contamination plume. Therefore, additional monitoring wells would potentially be required to effectively implement the MNA element of the corrective measure. The installation of additional monitoring wells would be routine, utilizing commonly available drilling equipment, as would regular sampling and analysis.

The active removal of LNAPL would support subsequent residual source area and high contaminant concentration destruction through ISCO, ISCO would support the application of enhanced aerobic bioremediation, and enhanced aerobic bioremediation would support the use of MNA, by first reducing source mass and then creating aquifer conditions compatible with and directly supportive of subsequent treatment steps. Each technology would be implemented in the most appropriate spatial zone based on contaminant concentrations and plume geometry and the relative outcome of prior phases as assessed through monitoring.

Some benefit may be achieved by treating each spatial treatment zone through a recirculation approach that draws water from downgradient, introduces appropriate reagents through mixing, and then reinjects the treated groundwater upgradient. This would induce a treatment gradient and could provide better overall plume control relative to downgradient and off-site migration. Such an approach would require the installation of extraction wells or pumping from existing wells, the use of tanks at the surface to conduct reagent mixing, and a mechanism to reinject amended groundwater, as well as conveyance piping, valving, and human operator and electrical grid support.

ICs would be required for the recommended remedy to prevent activities that could lead to exposure to contamination in soil and groundwater, including restrictions against digging or use of groundwater. ICs could also include management plans defining mitigation strategies to address potential contamination encountered during construction or other necessary Site activities. ICs would be applied, at a minimum, over the areas characterized by contaminant concentrations exceeding cleanup levels.

Any corrective measure for the Site should go through a feasibility assessment and a detailed design phase to define the specific implementation approach, develop a specific project workflow, and develop the associated performance measurement basis, data collection requirements, and site management decision making framework supporting phase transition and ultimate evaluation of corrective measure success.

Based on review of the Site documentation and data provided by EPA, the following uncertainties appear to exist in the recommendation of an optimal corrective measure for the Site:

Buried Wood Waste. There appear to be pockets of wood waste buried beneath the main treatment area, potentially associated with an area that may have been used historically for gravel borrow and was subsequently backfilled with operational material (see Figure 2). This buried wood waste material appears to intersect the primary source area contamination and the immediate downgradient secondary impact zone, and it would appear at least possible that this buried wood waste material may contain some amount of LNAPL. This material itself may present a confounding influence on effective treatment with ISCO, and it may be prudent to integrate removal of the wood waste beneath the main treatment area into the corrective action approach. Removing subsurface wood waste could be accomplished through direct excavation or through an alternative method such as large diameter auger removal. Large diameter auger removal typically entails the removal of subsurface material using augers while backfilling the borehole with a flowable backfill material of suitable geotechnical design using a tremie. Large diameter auger removal could present the opportunity to introduce treatment reagents to the removal area with the backfill material. Alternatively, careful design and implementation of LNAPL recovery and ISCO/bioremediation treatment remedy elements could be sufficient to mitigate this uncertainty.

Overall Implementability. The optimal corrective measures alternative recommended and described in this technical memorandum considers the contamination sources, the current nature and extent of contamination, the general fate and transport of contaminants at the Site, and the CMOs defined in the RCRA CMS. The recommended approach is also cognizant that the facility is presently operational. The recommended optimal corrective measures alternative is summarized in a conceptual manner, and as described would be readily implementable and could be accomplished largely through direct injection techniques, similar to work previously performed at the Site. Ancillary features of the corrective measure strategy (e.g., the installation of additional wells, the installation of product recovery pumps, and the disposition of recovered NAPL material) could be accounted for in a non-disruptive manner using existing Site features and infrastructure or through readily deployable, short-duration, and minimally intrusive techniques. Accordingly, the recommended optimal corrective measures alternative described herein would minimize wastes generated and would likely have limited impact on operations of the active wood treating facility. Moreover, with a focused and generally aggressive source area treatment component and a temporally and spatially phased approach using compatible sequential stages, the recommended optimal corrective measures alternative would be efficient and of relatively short overall duration.