Prepared for:
City of Oshkosh
Oshkosh, Wisconsin

Analysis of Brownfield Cleanup Alternatives

Former Wisconsin Automated Machinery
Jackson Street/Marion Road
Oshkosh, Wisconsin

AECOM, Inc.
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August 31, 2009

Mr. Jon Peterson
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Subject: Analysis of Brownfield Cleanup Alternatives, City of Oshkosh Brownfields Assessment Cleanup Grant, Former Wisconsin Automated Machinery, City of Oshkosh, Wisconsin - - AECOM Project No. 13090-002

Dear Mr. Peterson,

On behalf of the City of Oshkosh (City), AECOM, Inc. has prepared the attached Analysis of Brownfield Cleanup Alternatives (ABCA) consistent with requirements of the US EPA Brownfields Cleanup Grant for the former Wisconsin Automated Machinery parcel. This ABCA provides an overview of site conditions, site cleanup objectives, and provides a review of remedial options. In addition, this ABCA includes an analysis of green cleanup criteria.

If you have any questions regarding the ABCA, please contact Mr. Andrew Mott (920.235.0270). We appreciate your review of this document and support of the redevelopment efforts of the City of Oshkosh.

Respectfully,

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1.0 Introduction

On behalf of the City of Oshkosh, Wisconsin (City), AECOM, Inc. (AECOM) has prepared this Analysis of Brownfield Cleanup Alternatives (ABCA) for the former Wisconsin Automated Machinery (WAM) parcel located within the Marion Road/Pearl Avenue Redevelopment Area northwest of the intersection of Marion Road and Jackson Street in Oshkosh, Wisconsin (site). The Marion Road/Pearl Avenue redevelopment area is a former industrial riverfront corridor that essentially links the University of Wisconsin-Oshkosh campus to downtown Oshkosh. The Brownfield properties within the redevelopment area have significant redevelopment potential, but are hindered by the challenges related to environmental contamination and unsuitable nature of fill material to support surface features. The project site can be located on the attached Figure 1.

To attract redevelopment opportunities consistent with the prime location of the site, the US Environmental Protection Agency (EPA) has awarded a Brownfield Cleanup Grant to offset the expenses related to environmental management of subsurface soils and waste fill material. The EPA Brownfield Cleanup Grant will specifically be applied to the planned redevelopment of the site consisting of a retail pharmacy located on the former WAM Parcel. This private development will be located on the eastern portion of the WAM parcel and includes part of a proposed 14,000 square foot retail building with paved parking surrounding the building.

The remainder (west portion) of the WAM parcel is currently not planned for immediate development, but conceptually is proposed to be developed into green space, commercial, retail, and/or residential property.

2.0 Site Description and History

2.1 Site Location and Description

The site is located northwest of the intersection of Marion Road and Jackson Street in the City of Oshkosh, Wisconsin. The site encompasses approximately 3.95 acres and is located in the Southeast ¼ of the Northeast ¼ of Section 23, Township 18 North, Range 16 East, in the City of Oshkosh, Winnebago County, Wisconsin. The site encompasses the former WAM facility which includes portions of Parcels I and H. The property is owned by the City and has street frontage of approximately 350 feet along Marion Road; 200 feet along Jackson Street; and is comprised of approximately 3.6 acres of land. The subject property is bound to the north by vacant land; to the east by Jackson Street and commercial properties; to the south by Marion Road, vacant land, and to the west by an industrial facility and a municipal water tower. Former industrial buildings that once occupied the site have been razed.

The northern portion of the proposed pharmacy is located on the former WAM site and is the subject property of the cleanup grant. The southern portion of the proposed pharmacy building is located on property formerly occupied by Zion Eldercare and is not included in the cleanup grant. However, the estimated site development costs and Green Remediation analysis were performed on both the WAM site and Zion Eldercare due to the continuous nature of the development.

2.2 Site History

The WAM site was historically used for a variety of industrial purposes dating back to at least 1890. Sanborn Fire Insurance (Sanborn) maps from the years 1890, 1903, 1949, and 1957 were reviewed. The 1890 Sanborn map indicates Radford Lumberyard was located on the west side of the subject property and the Williamson Lumberyard was located on the east side of the property. The 1903 Sanborn map indicates that a sash, door, and blind factory had replaced the Radford Lumberyard on the west side of the property. Three large drying kilns are depicted next to this factory. A lumberyard storage area is located on the east end of the property. Reliance Boiler Works is shown at the location between the former Zion Eldercare site (located to the south of the subject property) and the former Triangle Bar property (located to the southeast), where a parking lot is now located. The 1949 Sanborn map indicates that the Bell Machine Company occupied the west and east ends of the property. By 1949, the Reliance Boiler Works had been replaced by the Morrison Brass and Aluminum Foundry.

The most recent development was the WAM facility. Operations at the facility included: welding, fabrication, painting, and assembly of woodworking and printing machinery. The former WAM parcel was eventually combined with several other parcels (Oshkosh Community Credit Union, Jackson Glass, Zion Eldercare, University Parking Lot, former railroad corridor, Hildebrandt Service Station, and Stadtmueller Manufacturing) to form Parcel H. .Parcel H was incorporated into the Wisconsin Department of Natural Resources (WDNR) Voluntary Party Liability Exemption (VPLE) program in 2003. The former WAM building was razed in 2004 and the site is currently vacant.

A Phase I Environmental Site Assessment (Phase I ESA) was completed on the site in June 2002. The purpose of this Phase I ESA was to identify, to the extent feasible, recognized environmental condition (REC) and historical RECs in connection with the subject property and to satisfy one of the requirements to qualify for the innocent landowner defense under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) liability as part of the property purchase. The following RECs at the site were identified:

- Staining on the wood floors were observed throughout the manufacturing areas within the building, especially at the base of the machinery. A crawl space with a dirt floor was reportedly located immediately beneath the wood floors.
- An underground “oil reservoir” was observed adjacent to a planer mill located in the manufacturing portion of the building. The oil reservoir was reportedly concrete-lined and used to store waste oil from the adjacent planer mill machine.
- Piles of scrap metal shavings were observed along the north central exterior portion of the subject property.
- Staining near the north central exterior portion of the subject property was observed. This staining appeared to consist of oil from air compressor blow-off.
- Apparent oil staining was observed within an elevator pit located in the manufacturing area of the main building on the subject property.
- A former railroad spur was present on the north side of the subject property

To address the RECs identified as having the greatest potential for environmental impact, a Phase II Environmental Subsurface Assessment (Phase II ESA) was performed in July 2002. The limited Phase II ESA consisted of two soil borings converted into monitoring wells with the collection of soil and groundwater samples. Additional ESA was performed in June 2007 to address comments and recommendations made by the WDNR following their review of previous work performed on WAM. The additional investigation was part of an assessment of Parcel H and intended to obtain a VPLE Certificate of Completion (COC) for the property.

2.3 Subsurface Assessment Findings

Several subsurface investigations have been performed on the site to further characterize the contamination at the WAM site. The investigations were comprised of the July 2002 Phase II ESA, 2003 geotechnical investigation, July 2007 Additional ESA, and June 2008 groundwater sampling event. Soil borings and monitoring well locations are depicted on Drawing 2007-1. Findings of the ESA’s are further described in the subsection below.

<u>WAM Phase II ESA</u>

In July 2002, two soil borings were advanced and converted to groundwater monitoring wells: one on Parcel H labeled WM-SB-2 and another on the adjoining Parcel I WM-SB-1 for assessment of soil and groundwater. Up to seven feet of fill material was identified in the borings. Analytical tests conducted on collected fill samples indicated low-level concentrations of polynuclear aromatic hydrocarbons (PAHs); along with lead and arsenic concentrations above State of Wisconsin Administrative Code NR 720 direct contact residual contaminant levels (RCLs) for a non-industrial property. Low-level volatile organic compounds (VOC) concentrations were also identified in a limited number of soil samples. Groundwater samples from the monitoring well installed on Parcel H (WM-SB-2) had no PAH detections. A few VOCs and metals were detected; however, the concentrations did not exceed a Wisconsin Administrative Code (WAC) NR 140 Preventive Action Limit (PAL).

<u>2003 Geotechnical Investigation</u>

To assist with planning and engineering of future city roads, twelve geotechnical soil borings (B-1 through B-12) were advanced throughout the WAM parcel. Soil samples were collected from each boring for the laboratory analysis of lead. Eleven of the borings had lead detected above the State of Wisconsin Administrative Code NR 720 direct contact residual contaminant levels (RCLs) for a non-industrial property.

Parcel H Additional ESA and June 2008 Groundwater Sampling Results

In July 2007, four soil borings (PH-SB-5, PH-SB-6, PH-SB-8, and PH-SB-9) were advanced in the former WAM site as part of an overall assessment of parcel H. PH-SB-5 and PH-SB-6 were converted into monitoring wells. A summary of the investigation results are as follows:

- Soil Boring PHSB-5 was advanced along the south central portion of the former WAM building. Sample S05 (8 to 10 feet) collected from native silty clay soil was analyzed for VOC, PAH, arsenic, and lead. The sample had results above the detection limits for two VOCs, arsenic, and lead. PAHs were not detected above method detection limits (MDLs) in the sample. The lead concentration was below the non-industrial direct contact standard. Arsenic was detected above the non-industrial direct contact standard but below the industrial direct contact RCL. One of the VOCs detected was bromomethane, at a concentration above a calculated generic groundwater pathway site specific level (SSL). The only other detected VOC was methylene chloride at a concentration above a calculated groundwater pathway RCL. However, methylene chloride is a common laboratory contaminant and accordingly is attributed to laboratory contamination.

  The August 13, 2007 groundwater sample from Monitoring Well PH-SB-5 had detections of lead and arsenic but at concentrations below the NR 140 PALs. No PAHs were detected in the August 13, 2007 sample. Only three VOCs were detected in the August 13 sample. Cis-1,2dichloroethene was detected in the sample at a concentration of 0.49 ug/L well below its NR 140 PAL of 7 ug/L. The other two VOCs, 1,1-dichloropropene and 4-isopropyltoluene were detected at concentrations of 0.37 and 0.85 ug/L, respectively, and do not have NR 140 standards. Bromomethane was detected in the June 10, 2008 sample from Monitoring Well PH-SB-5 at a concentration of 1.10 ug/L above the NR 140 PAL but well below the ES of 10 ug/L.

- Soil Boring PHSB-6 was advanced in the area of the southeast corner of the former WAM building. Sample S04 (7.9 to 9 feet) was collected from the native silty clay soils. Only one PAH, benzo(b)flouranthene was detected, but at a concentration well below the suggested non-industrial direct contact RCL. Only one VOC, methylene chloride was detected but was attributed to laboratory contamination. Arsenic was not detected in the sample. A detection of lead was below the non-industrial direct contact RCL.

  The August 10, 2007 groundwater sample from Monitoring Well PH-SB-6 had no detection of PAHs or lead. The only VOC detected in the sample was a 4-isopropyltoluene concentration of 44.1 ug/L which, as mentioned, has no NR 140 standards. A detected arsenic concentration of 2.98 ug/L exceeded the NR 140 PAL of 1.0 ug/L. Arsenic was not detected in the June 10, 2008 sample from Monitoring Well PH-SB-6.

- Soil Boring PHSB-8 was advanced in the central portion of the north edge of the former WAM building. Sample S04 (7.5 to 9 feet) was collected from the native silty clay soils. A detection of lead was below the non-industrial direct contact RCL. The arsenic detection exceeded the industrial direct contact RCL but was of comparable level to other arsenic detections on site. Two VOCs were detected in the sample. One of the VOCs detected was bromomethane, at a concentration above a calculated groundwater pathway RCL. The only other detected VOC was methylene chloride again attributed to laboratory contamination. Eight PAH compounds were detected in the sample [benzo(a)anthrancene, benzo(b)fluoranthene, benzo(ghi)perylene, chrysene, fluroanthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene] but at concentrations below RCLs.

- Soil Boring PHSB-9 was advanced in the northeast corner of the former WAM building. Sample S04 (7.5 to 9 feet) was collected from the native silty clay soils. A detection of lead was below the non-industrial direct contact RCL. The arsenic detection exceeded the industrial direct contact RCL but was of comparable level to other arsenic detections on site. Again, methylene chloride was detected but attributed to laboratory contamination. Five PAH compounds were detected in the sample [benzo(b)fluoranthene, benzo(ghi)perylene, chrysene, fluroanthene, indeno(1,2,3-cd)pyrene] but the concentrations were below RCLs.

Depth of fill soils can be observed on Drawing 2007-2. Soil and groundwater analytical results are summarized on Tables 1 through 3 and on Drawing 2007-3 and Drawing 2007-4.

2.4 Subsurface Assessment Conclusions

Elevated VOC, metals, and PAH concentrations were detected in fill soils at the site. Fill soils apparently extend beneath the entire site and range from 3 to 7 feet thick. Lead, arsenic, and several PAH concentrations exceeded generic direct contact RCLs in several soil samples collected within the fill soils. VOCs (benzene, bromomethane, and/or trichloroethene) and/or metals (chromium, cadmium, and/or mercury) were detected in several soil samples above the NR 720 Groundwater Pathway RCL in soil.

Monitoring wells have been installed at various locations on the site and on the former Zion Eldercare property. Elevated levels of arsenic and/or lead have been detected in six of the monitoring wells at concentrations which exceed applicable NR 140 PAL (during the most recent sampling event at the well).

Elevated levels of VOCs have been detected in three of the monitoring wells at concentration which exceed the applicable NR 140 PAL and/or ES. Monitoring well ZESB-2 had elevated concentrations of benzene and vinyl chloride. Concentrations of benzene exceeded NR 140 PAL and concentrations of vinyl chloride exceeded NR 140 ES. Bromomethane was detected in monitoring wells PHSB-5 and PHSB-6 at levels that exceeded the NR 140 PAL.

Based on results of the subsurface assessments, the concentration of lead, arsenic and several PAH compounds represent a potential direct contact risk to human health. Additionally, VOCs (benzene, bromomethane, and trichloroethene) were detected in several soil samples at concentrations that represent a potential risk to groundwater quality. Because of the elevated lead, arsenic and PAHs, fill soils at the site should be managed as impacted material during site redevelopment and excess fill soils generated during redevelopment should be managed as solid waste. While not anticipated, fill materials may be considered a hazardous waste depending on specific chemical characteristics.

Groundwater quality is not expected to be impacted significantly and active groundwater remediation is not anticipated. If construction dewatering is necessary during redevelopment, discharge will be monitored and directed to the sanitary sewer.

3.0 Potential Exposure Pathways

3.1 Soil

Potential exposure pathways were evaluated by comparing analytical data collected at the site with Soil Cleanup Standards established under Chapter NR 720, Wisconsin Administration Code. These standards were established for the remediation of soil contamination, which result in restoration of the environment to the extent practicable; minimize harmful effects to the air, lands, and waters of the state; and are protective of public health, safety and welfare, and the environment. These soil cleanup standards apply to all remedial actions taken by responsible parties to address soil contamination after an investigation has been conducted at a site that is subject to regulation.

Soil cleanup standards are established based on one of the following controlling criteria:

1) Soil quality that would cause a violation of a groundwater quality standards;
2) An impact on soil quality or groundwater quality that would cause a violation of a surface water quality standard contained on Chapters NR 102 to 106,
3) Soil quality that would cause a violation of an air quality standard contained in Chapters NR 400 to 499, and
4) Soil quality that represents a risk to human health as a result of direct contact, including ingestion. The controlling criteria depend, in part, on the physical and toxicological characteristics of the chemicals of concern. For the chemicals of concern identified at the site, non-industrial direct contact Residual Contaminate Levels (RCLs) were used as soil cleanup objectives for this site.

Based on soil analytical results from previous subsurface investigations at the site, a potential exposure pathway for direct contact exists at the site. Drawing 2007-3 indicates soil sample locations and corresponding soil analytical test results.

3.2 Groundwater

Potential exposure pathways were evaluated by comparing analytical data collected at the site with Chapters NR 140 and NR 160 of the Wisconsin Administrative Code which establish groundwater quality standards for substances detected in or having a reasonable probability of entering the groundwater resources of the state. Two sets of standards are established: 1) enforcement standard (ES) and 2) Preventive Action Limit (PAL). The ES is a health-risk based concentration and when exceeded, usually results in further subsurface investigation, remedial action requirements, or monitoring. ES concentrations are generally based on federal drinking water quality standards. The PAL is typically established at 10% of the ES for substance with carcinogenic mutageneric or teratogenic properties. The PAL is established at 20% of the ES for substances of public health concern. Groundwater quality ES concentrations outlined in Chapter NR 140 represents groundwater cleanup criteria for this site.

Based on results of groundwater samples collected from monitoring wells installed on the former WAM and Zion Eldercare properties, arsenic, lead, benzene, bromomethane, vinyl chloride, benzo(a)pyrene and/or benzo(b)fluoranthene concentrations exceed groundwater cleanup objectives at several locations. Drawing 2007-4 indicates locations of the monitoring wells and corresponding groundwater analytical test results. Results of groundwater monitoring suggest that impacts will not limit redevelopment of the site but groundwater will need to be managed properly during construction. Accordingly, this ABCA is limited to soil cleanup alternatives, with the understanding that by addressing impacted soil, the source of groundwater quality degradation will be mitigated and environmental closure can be granted.

3.3 Vapor Intrusion

Vapor intrusion or the migration of volatile chemicals from the subsurface into overlying buildings was evaluated for the site by comparing analytical data collected at the site with generic site specific screening levels (SSLs) calculated using the EPA Soil Screening Level website (http://risk.lsd.ornl.gov/epa/ssl1.htm). The EPA Risk Assessment Guidance website allows users to carry out algorithms to determine SSLs. The EPA website is linked to current toxicological data and chemical/physical properties for various compounds. EPA default values in the calculations were replaced with WDNR default values for non-industrial sites as outlined in WDNR guidance Document PUB-RR-682.

Analytical results from soil samples collected at the WAM site do not indicate analyte levels in exceedance of generic SSLs for volatile inhalation. The volatile inhalation generic SSL for trichloroethene is exceeded in soil samples collected from ZE-SB1 and ZE-SB2, which were collected on Zion Eldercare property, south of the proposed pharmacy building. In addition, benzene, bromomethane, and/or vinyl chloride concentrations in groundwater exceed cleanup levels in several wells in the vicinity of proposed pharmacy. The groundwater table has been measured at approximately 3 feet below the current ground surface in the vicinity of the proposed pharmacy.

Due to the presence of biodegradable materials (i.e. wood) encountered in the fill soils at the site, the potential exists for methane gas to be generated during decomposition. Methane levels were measured in on-site groundwater monitoring wells by AECOM using a four-gas meter. Methane was not detected in the gas samples collected. Based on VOC concentrations in the groundwater near the proposed building and the potential for methane gas accumulation, vapor barriers and/or a passive vapor extraction system will be installed below the proposed building during redevelopment activities.

4.0 Analysis of Soil Cleanup Alternatives

4.1 Site Redevelopment Plans

The City Redevelopment Authority has executed a final development agreement with Oshkosh River Development, LLC for the riverfront portion of Marion Road/Pearl Avenue including the former WAM property. Specifically, development plans for the site include a retail pharmacy. Conceptual redevelopment plans for the site are indicated on the attached drawings. Oshkosh River Development anticipates initiating construction in October 2009.

The City proposes to implement corrective action concurrent with site redevelopment. In this manner, constructed features (i.e. buildings, parking areas, and landscape features) can be integral components of the remedy.

Four potential cleanup alternatives were selected for the site. These alternatives are subsequently discussed and EPA Citizen Guides, which provide general information on the different alternatives appended to this report.

4.2 Potential Cleanup Alternatives

4.2.1 No Action

The No Action Alternative would involve no remedial activities at the site and leave the site in its current condition. This alternative is not practical because it constrains and potentially eliminates any practical redevelopment of this property.

4.2.2 Off-Site Landfilling

The off-site landfilling alternative would involve the transfer of all impacted soil to an off-site licensed landfill. The impacted soil at the site would be excavated, temporarily stockpiled if necessary, loaded into trucks, and transported to a landfill. Backfill from off-site sources would be brought into the site to raise the grade following removal of impacted soils.

Under this alternative, the proposed building would be constructed over a conventional foundation. Building footings would be constructed to design depth and width along the perimeter and along load-bearing areas of the building footprint. All fill material generated during construction would be managed as a solid waste. Samples of fill would be collected and analyzed for waste characteristics, as necessary, to obtain landfill approval. Potential solid waste disposal facilities include Winnebago County Landfill or the Waste Management Valley Trail Landfill located in Berlin, Wisconsin.

4.2.3 On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling

This alternative would involve reusing soil excavated during construction as fill material in other areas of the site, incorporating all alternative building foundation to reduce soil excavation, and utilizing performance barriers over impacted soils at the site to address direct contact concerns. It is anticipated that the excavation of impacted fill material will be primarily limited to the area below the proposed building to a depth of 3 feet below the current ground surface. The bulk of the remaining impacted soils are expected to be covered with imported fill material to raise grade of the site. Performance barriers would include the proposed senior apartment buildings, parking lot, and imported soil fill in landscaped areas. Performance barriers that do not consist of hardscape (pavement or building components) will be constructed with an engineered barrier consisting of a geotextile warning layer, 6 inches of clean soil, and at least 6 inches of topsoil. The barriers would substantially reduce the potential for the public or site occupants to come into contact with the underlying impacted soil. Off-site landfilling may be required for excess impacted soils that would be excavated during construction and could not be reused on site due to space or structural suitability limitations.

Under this alternative, the building would be constructed over an alternative foundation, likely a deep pile or geopier foundation. As indicated on the fill Isopach map, there may be over 10 feet of fill in some areas below the building footprint. Use of an alternative foundation would allow most of the material to stay in place and the building would essentially span the impacted soil. The cost of the deep foundation exceeds that of the conventional foundation in the previous alternative; however, this cost is offset by the reduced volume of soil, which would require transportation and landfilling.

4.2.4 Ex-Situ Thermal Treatment and Solidification/Stabilization

The ex-situ thermal treatment and solidification/stabilization alternative would involve combining two remediation technologies to address the different types of contaminants identified at the site. Ex-situ thermal treatment technology consists of incinerating impacted soil that has been excavated from the site to treat organic contaminants. An air pollution control typically treats the incinerator off gases.

Because thermal treatment does not treat inorganic compounds (metals), the incinerated soil would also be required to undergo solidification/stabilization to address lead impacts detected at the site. Stabilization involves altering contaminants to a less harmful or less mobile state. Solidification binds the impacted soil to prevent future migration of contaminants. Treatability studies are generally required to determine if soils are compatible with these technologies.

Under this alternative, soil would be excavated from the site and transported to and stockpiled at on-site or nearby location for incineration. Impacted soil would be loaded into high temperature incinerator(s) for treatment. Incinerated soil would then be stockpiled for solidification/stabilization. The solidification/ stabilization process would include conveying the incinerated soil into a weight feeder, followed by a homogenizer where the soil would be mixed with water, followed by a pug mill where the soil would be mixed with a reagent. Treated soil would be would be reused on site as fill material.

4.3 Evaluation of Cleanup Alternatives

4.3.1 Evaluation Criteria

Potential cleanup alternatives to mitigate the risk to human health and environment due to chemical characteristics of the subsurface fill material present throughout the redevelopment site were comparatively evaluated based on the following criteria:

- Technical simplicity
- Effectiveness in protecting human health and the environment
- Cost of implementation including costs related to long-term monitoring or any operating and maintenance costs
- Implementation schedule

Each alternative was compared to the evaluating criteria and a numerical score assigned. Results of comparative scoring are summarized on Table 4. On the basis of technical simplicity, all alternatives rated equal with the exception of the ex-situ thermal treatment and solidification/stabilization alternative. In terms of effectiveness and protecting human health and the environment, the No Action Alternative rated lowest while the other three alternatives were equally effective. Arguably, ex-situ thermal treatment/stabilization and the use of performance barriers may not be as effective as off-site landfilling. Under the landfilling alternatives, impacted fill material would be excavated and removed from site; while with the other two alternatives, engineering controls or chemical treatment are being used to reduce direct contact and environmental risk while leaving material in place.

A summary of probable costs related to each of the cleanup alternatives is summarized on Table 5. Cost information presented on Table 5 is intended to be used for comparative purposes only and does not represent a formal budget to implement a specific alternative. The costs summarized on Table 5 were calculated for the entire pharmacy redevelopment which includes property formerly occupied by Zion Eldercare. This was completed due to the continuous nature of the development. However, the former Zion Eldercare property is not included in the EPA cleanup grant. Actual costs will depend on details of site development plans including grading plans, pavement plans, utilities, and landscaping. Economically, the No Action Alternative could be implemented for the least cost; however, from a broader perspective, without implementing corrective action, the former industrial property could not be redeveloped and the economic benefit related to improved property value and public access to the waterfront would not be realized. Costs are largely controlled by the volume of fill material that must be treated or landfilled at an off-site location. Based on the anticipated volume of soil generated under each cleanup alternative, on-site reuse of soil with performance barriers and limited off-site landfilling appears to be the least expensive alternative. That alternative includes implementing a cap maintenance plan to maintain the condition of the parking lot and other performance barriers. Cap maintenance plans for the purposes of environmental remediation should be consistent with building and grounds maintenance commonly practiced for a development such as this.

The anticipated schedule to implement each of the cleanup alternatives will depend, in part, on the volume of soil required to be excavated and transported off site or treated prior to reuse. We anticipate that off-site landfilling, which largely consists of mass excavation and backfilling, could be accomplished in less time than constructing performance barriers and limiting off-site landfilling. Excavation and landfilling would largely occur prior to any significant construction effort while performance barriers would be constructed concurrent with other site improvements. Ex-situ thermal treatment and solidification/stabilization is expected to take longer than excavation and landfilling due to the time required to mobilize specialty thermal and mixing equipment.

4.3.2 Green Remediation Criteria

Green Remediation is defined by the US EPA as the practice of considering all environmental effects of remedy implementation and incorporating options to maximize net environmental benefit of cleanup actions. Green Remediation focuses on establishing and utilizing management practices which consider the broader impact of proposed environmental mitigation, including societal benefits, while preserving the effectiveness of the selected remedy. The following six core elements of green remediation have been established by the US EPA:

1. Minimize total energy use and maximum use of renewable energy
2. Minimize air pollutants and greenhouse gas emissions
3. Minimize water use and impacts to water resources
4. Optimize future land use and enhance ecosystem
5. Reduce, reuse, and recycle materials of waste
6. Optimize sustainable management practices during stewardship

In general, these green remediation core elements have been established to evaluate the net environmental impact of remediation by recognizing collateral impact to air, water, land, and social systems. Potential management practices, which can be included as elements of proposed cleanup alternatives, are summarized on Table 6 along with the relative implementation difficulty and the corresponding relationship to each green remediation core element. As indicated on Table 6, there are several practices that could be employed or modified to enhance green remediation concepts. Some of these practices may influence other evaluation criteria such as technical practicability, effectiveness, cost, and implementation schedule. Occasionally, practices have competing influences on core elements and other evaluation criteria. For example, the use of low sulfur diesel fuel will reduce air emissions but may increase total energy usage and total project cost.

Green remediation criteria were also evaluated utilizing a sustainability metric evaluation tools. The US Air Force's Sustainable Remediation Tool (SRT) was used to compare remediation approaches on the basis of sustainability metrics. The tool allows users to estimate sustainability metrics for specific remedial action technologies. The SRT was used to compare off-site landfilling of all impacted fill material versus limited off-site landfilling associated with on-site reuse and performance barriers. The SRT quantifies carbon dioxide emissions to the atmosphere, energy consumption, technology cost, and safety/accident risk. An AECOM developed sustainability tool (LDW) was used to evaluate the thermal treatment technology. The LDW tool quantifies air emissions, safety/accident risk, and energy consumption.

Both the SRT and LDW tools utilize similar computational approaches. Estimated carbon dioxide emissions are calculated from emissions factors for specific equipment and processes along with estimated activity data such as hours of operation. These worksheets include emissions factors and activity data for three different types of sources; Stationary Internal combustion, Stationary external combustion and mobile combustion. Safety/accident risk results are based on workplace accident rates provided by the U.S. Department of labor (Industry Injury and Illness Data, 2007 – Supplemental News Release Table SNR05). Energy consumption results are based on the average heating value for diesel fuel and the amount of diesel fuel consumed during each activity. The sustainability metrics were calculated for the entire pharmacy redevelopment which includes property formerly occupied by Zion Eldercare due to the continuous nature of the development. However, the former Zion Eldercare property is not included in the EPA cleanup grant. Results of the sustainability metric evaluation are summarized in Table 7 and details are provided in Appendix B of this report.

Results of the sustainability metric evaluation along with the qualitative evaluation summarized in Table 6 were used to score each of the green remediation core elements relative to proposed corrective action alternatives. These comparative scores are provided in Table 4. As indicated in Table 4, the green remediation criteria are weighted such that collectively, the green remediation criteria have the same influence as each of the other feasibility criteria.

4.3.3 Comparative Results

As discussed previously, the No Action Alternative is not considered practical because it does not prepare the site for redevelopment or achieve the objectives of the City and other stakeholders.

The off-site landfilling alternative would remove the bulk of the impacted soil from the site, thereby reducing risk to the public and environment. A licensed landfill (Winnebago County Landfill) is located approximately 5 miles north of the site. The proximity of the landfill to the site reduces trucking costs and associated air emissions from the trucks. Disadvantages of off-site landfilling the entire mass of impacted soils at the site include high costs, fugitive air emissions during operations, and potential community concerns regarding trucking large quantities of impacted soil through downtown Oshkosh.

The on-site reuse with performance barriers and limited off-site landfilling alternative would address hazards to the public and environment at the site. This alternative would reduce soil excavation and off-site landfilling activities, thereby reducing air emissions. Performance barriers will be required to address direct contact issues with the impacted soils. These barriers will require future maintenance.

The ex-situ thermal treatment and Solidification/Stabilization alternative would address hazards to the public and environment at the site. The disadvantages of this alternative include high costs and relatively long implementation time. Thermal treatment is generally more cost-effective when treating hazardous waste, which has not been identified at the site.

4.4 Recommended Cleanup Alternative

The on-site reuse with performance barriers and limited off-site landfilling alternative is the preferred remedy for achieving environmental closure at the WAM property due to the effectiveness, implementation feasibility, green remediation rating, and cost. This alternative consists of managing as much of the impacted fill material on site as practical and disposing the remainder of the material at a licensed solid waste landfill. A key element of this alternative is the use of an alternative foundation for the proposed structures; a foundation that would allow most of this material to remain in place. This foundation system will have the greatest impact to limit the volume of solid waste removed from the site. Additionally, site grading plans, utility plans and paving plans should be prepared recognizing the characteristics of the fill materials. Landscaping berms, stormwater infiltration areas, and other greenspace areas should incorporate the fill material to the extent practical. Utility corridors should include barriers where they enter and exit the site to control potential vapor migration through the granular backfill. To the extent the fill material can be used as structural fill, it should be considered to raise grades below parking areas and other proposed pavement. The use of performance barriers, alternative foundations and limited landfilling supports the core elements of green remediation largely because components of the environmental remedy leverage site improvements and infrastructure needs of the new development.

Tables

TABLE 1
SOIL ANALYTICAL RESULTS - DETECTED ANALYTES
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Parameters	Generic RCLs			Inhalation of Volatiles Soil Screening Levels	NR 746 Soil Screening Levels	ZE-SB-1	ZE-SB-2	ZE-SB-5		WM-SB-2	ZE-HA-1	ZE-HA-2	ZE-HA-3	ZE-HA-4	B-1		B-2	B-3		B-4		B-5	B-6		B-7		B-8	B-9	B-10	B-11		B-12	PH-SB-5	PH-SB-6	PH-SB-7	PH-SB-8	PH-SB-9
	Direct Contact Pathway		Groundwater Pathway			SO1	SO2	SO1	SO5	SO1	SO1	SO1	SO1	SO1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	SO5	SO4	SO4	SO4	SO4
	Non-Industrial	Industrial				0 - 2'	2 - 4'	0 - 2'	8 - 10'	0 - 2'	1'	1'	1'	1'	2-4'	8-10'	2-4'	2-4'	8-10'	2-4'	8-10'	0-2'	0-2'	6-8'	0-2'	8-9.5'	2-4'	2-4'	2-4'	2-4'	8-9.5'	2-4'	--	--	--	--	--
						4/29/2002	4/29/2002	4/29/2002	4/29/2002	7/3/2002	9/25/2002	9/25/2002	9/25/2002	9/25/2002	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	7/16/2007	7/17/2007	7/16/2007	7/18/2007	7/18/2007
Metals (mg/kg)																																					
Antimony						35	9.1	10	<1.29	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.039 [E]	1.6 [E]	0.58	--	--	**1.62** [B]	**6.67** [B]	**3.95** [B]	**1.37** [C]	**4.7** [B]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**0.842** [C]	<0.439	**2.02** [B]	**4.07** [B]	**1.62** [B]
Barium	3,130	2.4×10^5	3,300	--	--	50	141	630	101	67.1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	8.0 [E]	510 [E]	1.5	--	--	0.61	0.576	**4.0** [C]	<0.0434	0.851	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	16,000 [E]	1.53×10^6	0.36	--	--	**8.0** [C]	**17** [C]	**13** [C]	**22** [C]	**14.1** [C]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	--	--	--	--	--	39	83	89	0.433	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	50 [E]	500 [E]	--	--	--	**95** [A]	**397** [A]	**17000** [B]	5.0	**113** [A]	**80** [A]	26	**96** [A]	**180** [A]	**110** [A]	7.7	**110** [A]	**65** [A]	10	**97** [A]	32	**120** [A]	**93** [A]	**120** [A]	**230** [A]	7.2	**84** [A]	**83** [A]	**84** [A]	42	9.9	14	9.89	9.5	8.68	7.3	8.43
Selenium	78.2	5,110	1.0	--	--	<0.766	<0.737	<0.979	<0.703	<0.709	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Silver	78.2	5,110	1.67	--	--	<0.128	0.172	<0.163	<0.703	<0.118	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	--	--	0.42	4,000	--	0.083	0.612	**0.454** [C]	0.095	0.285	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	--	--	--	--	--	6.0	14	14	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Detected VOCs (µg/kg)															NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Benzene	1,100 [E]	52,000	5.5 [E]	170 [V]	8,500	<25	**89.6** [c]	<100	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<10	<10	<10	<10	<10
Bromomethane	21,900	1,430,000	4.0	4,000	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**41.7** [C]	<17	<17	**29.9** [C]	<17
sec-Butylbenzene	--	--	--	--	--	<25	42	<100	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<19	<19	<19	<19	<19
Ethylbenzene	1,560,000	102,000,000	2,900 [E]	2,200,000 [V]	4,600	49.9	61.1	<100	NA	44.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<13	<13	<13	<13	<13
Isopropylbenzene	--	--	--	--	--	<25	33.2	<100	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<13	<13	<13	<13	<13
p-Isopropyltoluene	--	--	--	--	--	<25	41.9	<100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	8,520	382,000	1.6	2,700	--	<25	<25	<100	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	**82** [C]	**66.7** [C]	**67** [C]	**89.7** [C]	**81.5** [C]
Naphthalene	60,000 [E]	4,000,000 [E]	400 [E]	68,000 [V]	2,700	51.7	52.5	<100	NA	64.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<7.0	<7.0	<7.0	<7.0	<7.0
Toluene	1,250,000	81,800,000	1,500 [E]	8,200,000 [V]	38,000	71.1	77.8	<100	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<12	<12	<12	<12	<12
Trichloroethene	160	7,150	3.7	14	--	**79.3** [CV]	**49.9** [CV]	<100	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<8.0	<8.0	<8.0	<8.0	<8.0
Trichlorofluoromethane	--	--	--	410,000	--	<25	<25	1700	NA	<25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Trimethylbenzene	782,000	51,100,000	7,573	--	--	45.2	144.3	<100	NA	36.6	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<29	<29	<29	<29	<29
Total Xylenes	3,130,000	204,000,000	4,100 [E]	280,000 [V]	42,000	129	82	<100	NA	31.7	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<34	<34	<34	<34	<34
Detected PAHs (µg/kg) [F]															NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA					
Acenaphthene	900,000	60,000,000	38,000	--	--	<60	111	<76.7	NA	<1.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<7.0	<6.2	<6.0	<5.6	<6.7
Acenaphthylene	18,000	360,000	700	--	--	<84.3	<81.1	<10.8	NA	<5.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<9.8	<8.7	<8.5	<7.8	<9.4
Anthracene	5,000,000	300,000,000	3,000,000	--	--	122	<12.3	119	NA	97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.7	<4.2	<4.1	<3.8	<4.8
Benzo(a)anthracene	88	3,900	17,000	--	--	**327** [A]	**1470** [A]	**313** [A]	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<6.1	<5.4	<5.3	5.1	<5.8
Benzo(a)pyrene	8.8	390	48,000	--	--	**290** [A]	**1660** [B]	**486** [B]	NA	<73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.4	<3.0	<3.0	<2.7	<3.3
Benzo(b)fluoranthene	88	3,900	360,000	--	--	**506** [A]	**1790** [A]	**530** [A]	NA	<1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.1	7.1	<2.7	4.8	5.2
Benzo(ghi)perylene	1,800	39,000	6,800,000	--	--	252	**9510** [A]	341	NA	<2.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5.9	<5.3	<5.1	6.8	11.2
Benzo(k)fluoranthene	880	39,000	870,000	--	--	227	**7090** [A]	212	NA	<2.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.3	<3.8	<3.7	<3.4	<4.1
Chrysene	8,800	390,000	37,000	--	--	236	1430	290	NA	<0.73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.4	<3.0	<3.0	7.0	6.0
Dibenzo(a,h,)anthracene	8.8	390	38,000	--	--	**432** [B]	**1330** [B]	**99** [A]	NA	<1.2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.0	<3.6	<3.5	<3.2	<3.8
Fluroanthene	600,000	40,000,000	500,000	--	--	2150	6220	954	NA	500	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.9	<3.4	<3.3	10.9	7.3
Fluorene	600,000	40,000,000	100,000	--	--	<25.5	5090	53.2	NA	<91	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.9	<4.4	<4.2	<3.9	<4.7
Indeno(1,2,3-cd)pyrene	88	3,900	680,000	--	--	**255** [A]	**1000** [A]	**302** [A]	NA	<1.0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<3.3	<2.9	<2.8	5.4	5.6
1-Methylnaphthalene	1,100,000	70,000,000	23,000	--	--	<44.7	2780	80.3	NA	31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<5.5	<4.9	<4.8	<4.4	<5.3
2-Methylnaphthalene	600,000	40,000,000	20,000	--	--	<52.4	160	<66.9	NA	56	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<6.1	<5.4	<5.3	<4.9	<5.8
Naphthalene	20,000	110,000	400	68,000	--	41.9	213	63	NA	49	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<6.8	<6.1	<5.9	<5.4	<6.6
Phenanthrene	18,000	390,000	1,800	--	--	648	**4620** [C]	594	NA	300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<6.1	<5.4	<5.3	12.4	<5.8
Pyrene	500,000	30,000,000	8,700,000	--	--	820	5910	1160	NA	430	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<4.2	<3.7	<3.6	5.1	<4.0

Notes:
[1] Standards are for 1,2,4- and 1,3,5-Trimethylbenzene combined.
[3] Standards are for Total PCBs.
[A] Parameter exceeds NR 720 Generic RCL for Non-Industrial Direct Contact.
[B] Parameter exceeds NR 720 Generic RCL for Industrial Direct Contact.
[C] Parameter exceeds NR 720 Generic RCL for Groundwater Pathway.
[D] Parameter exceeds NR 746 Table 1 Soil Screening Levels
[V] Parameter exceeds Soil Screening Levels for Inhalation of Volatiles
[E] Generic RCL is established under NR 720 or NR 746
[F] Generic RCLs provided in *Soil Cleanup Levels for PAHs Interim Guidance*, WDNR RR-5 1997
-- No Generic RCL established.
Generic RCLs not included in Wisconsin Administrative Code or Guidance are calculated from the US EPA Soil Screening Level Web Page and the default values contained in *Determining Residual Contaminant Levels using the EPA Soil Screening Level Web Site* WDNR PUB-RR-682 on May 12, 2006

DRO = Diesel Range Organics
GRO = Gasoline Range Organics
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
PAHs = Polynuclear Aromatic Hydrocarbons
PCBs = PolyChlorinated Biphenyls

TABLE 2
GROUNDWATER FIELD DATA
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Date	Well I.D.	Ground Surface Elevation (Feet)	TPVC Elevation (Feet)	Screen Interval (Feet below grade)	Screen Interval Elevation (Feet)	Depth to Water below TPVC (Feet)	Groundwater Elevation (Feet)	Temp (C)	pH (Units)	Conductivity (umhos/cm)	Color	Odor
07/26/07	PH-SB-1W	750.81	753.25	5 - 15'	745.81 - 735.81	7.23	746.02	--	--	--	--	--
08/09/07						7.40	745.85	--	--	--	--	--
08/27/07						6.30	746.95	--	--	--	--	--
12/17/07						7.11	746.14	--	--	--	--	--
06/10/08						6.22	747.03	13.6	6.53	880	None	Slight
07/26/07	PH-SB-5	749.62	751.95	10 - 15'	739.62 - 734.62	5.59	746.36	--	--	--	--	--
08/09/07						5.74	746.21	--	--	--	--	--
08/27/07						5.12	746.83	--	--	--	--	--
12/17/07						5.91	746.04	--	--	--	--	--
06/10/08						4.91	747.04	12.9	6.81	1084	Grey	Slight
07/26/07	PH-SB-6	751.16	753.54	5 - 15'	746.16 - 736.16	7.44	746.10	--	--	--	--	--
08/09/07						7.62	745.92	--	--	--	--	--
08/27/07						7.06	746.48	--	--	--	--	--
12/17/07						7.74	745.80	--	--	--	--	--
06/10/08						6.74	746.80	13.9	6.65	3220	Grey	None
07/26/07	PH-SB-7	750.68	753.32	10 - 15'	740.68 - 735.68	7.17	746.15	--	--	--	--	--
08/09/07						7.34	745.98	--	--	--	--	--
08/27/07						6.81	746.51	--	--	--	--	--
12/17/07						7.49	745.83	--	--	--	--	--
06/10/08						6.50	746.82	13.9	6.87	1431	Grey	Slight
07/26/07	PI-SB-1	750.12	752.67	5 - 14.5'	745.12 - 735.63	6.63	746.04	--	--	--	--	--
08/09/07						6.75	745.92	--	--	--	--	--
08/27/07						5.09	747.58	--	--	--	--	--
12/17/07						5.97	746.70	--	--	--	--	--
06/10/08						5.16	747.51	12.6	5.66	1074	Grey	Slight
07/26/07	PI-SB-3	750.13	752.20	5 - 15'	745.13 - 735.13	6.01	746.19	--	--	--	--	--
08/09/07						6.11	746.09	--	--	--	--	--
08/27/07						5.10	747.10	--	--	--	--	--
12/17/07						5.94	746.26	--	--	--	--	--
06/10/08						4.91	747.29	11.9	5.61	1151	Brown/grey	Slight

Notes:
-- = Not Sampled

TABLE 3
GROUNDWATER ANALYTICAL RESULTS
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

	NR 140 Standards		Well Name	**ZE-SB-1**	**ZESB-2**		**WMSB-2**		**PHSB-1W**		**PHSB-5**		**PHSB-6**		**PHSB-7**		**WMSB-1**		**PI-SB-1**		**PI-SB-3**		**MW-6**	
			Sample ID	ZE-SB-1W	ZE-SB-2W		WM-SB-2		WP-H-SB-1W		WP-H-SB-5		WP-H-SB-6		WP-H-SB-7		WM-SB-1		WP-I-SB-1		WP-I-SB-3		WMW-6	
Parameters	**ES**	PAL	Date	5/9/2002	5/9/2002	5/9/02 (Dup)	7/4/2002	7/8/2002	8/10/07	6/10/08	8/13/07	6/10/08	8/10/07	6/10/08	8/13/07	6/10/08	7/4/2002	7/8/2002	8/10/07	6/10/08	8/13/07	6/10/08	8/13/07	6/10/08
Metals (µg/L)																								
Arsenic	**10**	1.0		9.6	<1.3	<1.3	4.39	4.39	<0.60	NA	0.72	NA	2.98	<0.60	6.29	1.53	2.02	2.02	5.14	<0.60	4.53	2.20	3.15	<0.60
Lead	**15**	1.5		3.37	1.39	1.89	<1.00	<1.00	<0.30	NA	0.45	NA	<0.30	NA	0.38	NA	<1.00	<1.00	<0.30	NA	<0.30	NA	<0.30	NA
VOCs (µg/L)																								
Benzene	**5.0**	0.5		<0.31	0.499	0.514	<0.31	<0.31	<0.20	<0.20	<0.20	<0.20	<0.20	NA	<0.20	<0.20	<0.31	<0.31	<0.20	NA	<0.20	NA	<0.20	NA
Bromomethane	**10**	1.0		NA	NA	NA	NA	NA	2.32	<1.0	<1.0	1.10	<1.0	NA	<1.0	1.64	NA	NA	<1.0	NA	<1.0	NA	<1.0	NA
Vinyl chloride	**0.2**	0.02		<0.2	**0.661**	**0.632**	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	NA	<0.20	<0.20	<0.2	<0.2	<0.20	NA	<0.20	NA	<0.20	NA
PAHs (µg/L)																								
Benzo(a)pyrene	**0.2**	0.02		<0.017	<0.017	<0.017	<0.022	<0.022	<0.020	NA	<0.020	NA	<0.020	NA	<0.020	NA	<0.022	**0.76**	<0.020	NA	<0.020	NA	<0.020	NA
Benzo(b)fluoranthene	**0.2**	0.02		<0.4	<0.4	<0.4	<0.036	<0.036	<0.020	NA	<0.020	NA	<0.020	NA	<0.020	NA	**0.22**	0.16	<0.020	NA	<0.020	NA	<0.020	NA

Notes:
- VOCs = Volatile Organic Compounds
- ES = NR 140 Enforcement Standard
- PAL = NR 140 Preventive Action Limit
- **Bold value** = NR 140 Enforcement Standard Exceedance
- Underline value = NR 140 Preventive Action Limit Exceedance
- -- No NR 140 ES or PAL established.
- NA = Not analyzed
- ND = Not detected

TABLE 4

EVALUATION OF POTENTIAL SOIL REMEDIAL ALTERNATIVES
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Feasibility Criteria		Weight	No Action	Off-Site Landfilling	On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling	Ex-Situ Thermal Treatment and Stabilization
Technical simplicity		5	3	3	3	2
Effectiveness in protecting human health and the environment		6	1	3	3	2
Affordability		6	3	1	2	1
Implementation time frame savings		7	3	3	2	3
Green Cleanup Evaluation	Minimizes Total Energy Use and Maximizes Use of Renewable Energy	1	3	1	2	1
Green Cleanup Evaluation	Minimizes Air Pollutants and Greenhouse Gas Emissions	1	3	1	3	2
Green Cleanup Evaluation	Minimizes Water Use and Impacts to Water Resources	1	3	1	2	1
Green Cleanup Evaluation	Reduces, Reuses and Recycles Material and Waste	1	0	1	3	1
Green Cleanup Evaluation	Optimizes Future Land Use and Enhances Ecosystems	1	0	0	2	1
Green Cleanup Evaluation	Optimizes Sustainable Management Practices During Stewardship	1	0	1	2	1
TOTAL UNWEIGHTED SCORE			19	15	24	15
TOTAL WEIGHTED SCORE			**69**	**65**	**73**	**56**

<u>Scoring</u>
1 = Low
2 = Medium
3 = High

TABLE 5

OPINION OF PROBABLE COSTS OF POTENTIAL REMEDIAL ALTERNATIVES
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

	Estimated Costs			
	No Action	Off-Site Landfilling	On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling	Ex-Situ Thermal Treatment and Solidification/Stabilzation
Community Involvement	$0	$10,000	$10,000	$10,000
Treatability Study	$0	$0	$0	$30,000
Preparation of Work Plan	$0	$10,000	$10,000	$20,000
Site Remedial Activities	$0	$1,800,000	$200,000	$38,200,000
Alternative (Deep) Foundation	$0	$0	$185,000	$0
Confirmatory Sampling	$0	$25,000	$15,000	$35,000
Preparation of Corrective Action Completion Report	$0	$20,000	$20,000	$20,000
Contigency (5%)	$0	$93,000	$22,000	$1,916,000
Total Estimated Cost	**$0**	**$1,958,000**	**$462,000**	**$40,231,000**

Note: Estimated costs are for the entire proposed pharmacy redevelopment. A portion of the proposed redevelopment is located on property formerly occupied by Zion Eldercare, which is not included in the EPA cleanup grant.

Table 6

Environmental Benefits of Green Remediation Best Management Practices

Best Management Practice	Applicability			Green Remediation Core Element						Impact on other feasibility criteria			
	Landfill	Performance Barriers	Soil Treatment	Minimize total energy use	Minimize air pollutants and greenhouse gas emissions	Minimize water use and impact to water resources	Optimize future land use and enhance ecosystems	Reduce, reuse, recylce waste material	Optimize sustainable management practices during stewardship	Technical practicability	Effectiveness in protecting human health and environment	Cost of implementation	Implementation schedule
Impose idle restrictions on construction equipment	⇧	⇧	⇧	+	+	o	o	o	+	o	+	o	-
Impose restrictions to minimize noise disturbance	⇧	⇧	⇧	o	+	o	o	o	+	o	+	o	-
Use low-sulfur diesel fuel	⇔	⇔	⇔	-	+	o	o	o	o	o	+	-	o
Use alternative fuels, E85, Biodiesel	⇔	⇔	⇔	-	+	o	o	+	+	o	o	-	o
Use enhanced emissions controls on construction equipment	⇧	⇧	⇧	-	+	o	o	o	o	o	+	-	o
Sequence work to minimize material handling	⇧	⇧	⇧	+	+	o	o	o	+	o	o	+	-
Cover stockpiles to control dust and sediment in runoff	⇧	⇧	⇧	o	+	+	+	o	o	o	+	o	o
Collect rainwater for use as dust control	⇔	⇔	⇔	o	o	+	o	+	o	o	o	-	o
Crush existing floor slab and asphalt pavement for use as construction material	⇩	⇧	⇩	-	-	o	o	+	+	o	o	-	-
Minimize contruction dewatering	⇩	⇧	⇩	+	o	+	+	o	o	o	o	+	-
Segregate wood waste from fill material, use as fuel source	⇩	⇩	⇩	-	o	o	o	+	o	o	o	-	-
Use energy efficient equipment in job trailer	⇧	⇧	⇧	+	+	o	o	o	o	o	o	o	o
Integrate anticipated future site use into cleanup strategy	⇩	⇧	⇩	+	+	o	+	o	+	o	o	-	+

⇧ Easy to apply to remediation alternative

⇩ Difficult to apply to remediation alternative

⇔ Medium difficulty in applying to remediation alternative

+ Advances core element of green remediation

- Negative impact on core element of green remediation

o Little or no impact on core element of green remediation

+ Positive impact on feasibility criterion

- Positive impact on feasibility criterion

o Little or no impact on feasibility criterion

TABLE 7

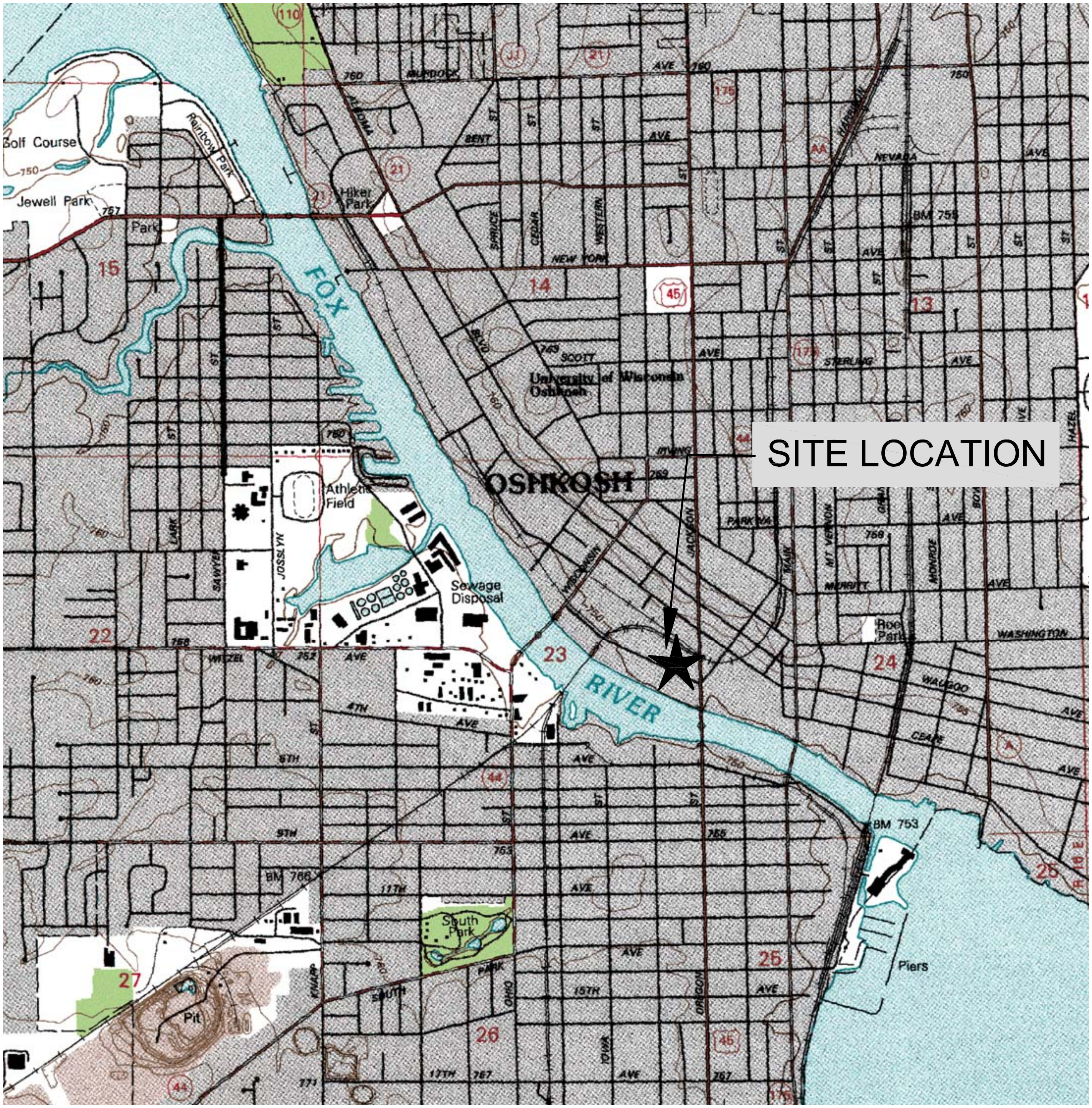
SUMMARY OF SUSTAINABILITY METRICS
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Remedial Alternative	Atmospheric Carbon Dioxide Emissions (Tons)	Total Energy Consumption (Megajoules)	Lost Hours Due to Accidents
No Action	0	0	0
Off-Site Landfilling	210	2,700,000	4.5
On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling	20	260,000	0.5
Ex-Situ Thermal Treatment and Stabilization	27,070	5,430,000	3.9

Figure

Figure 1 Site Location Map

N



NOTE: PREPARED FROM 7.5 MINUTE U.S.G.S. QUADRANGLE MAP OF OSHKOSH, WI. DATED 1992.

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SITE LOCATION MAP
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Drawn :	ALB	06/12/2009
Checked:	ECS	06/12/2009
Approved:		
PROJECT NUMBER	13090002	
FIGURE NUMBER	1	

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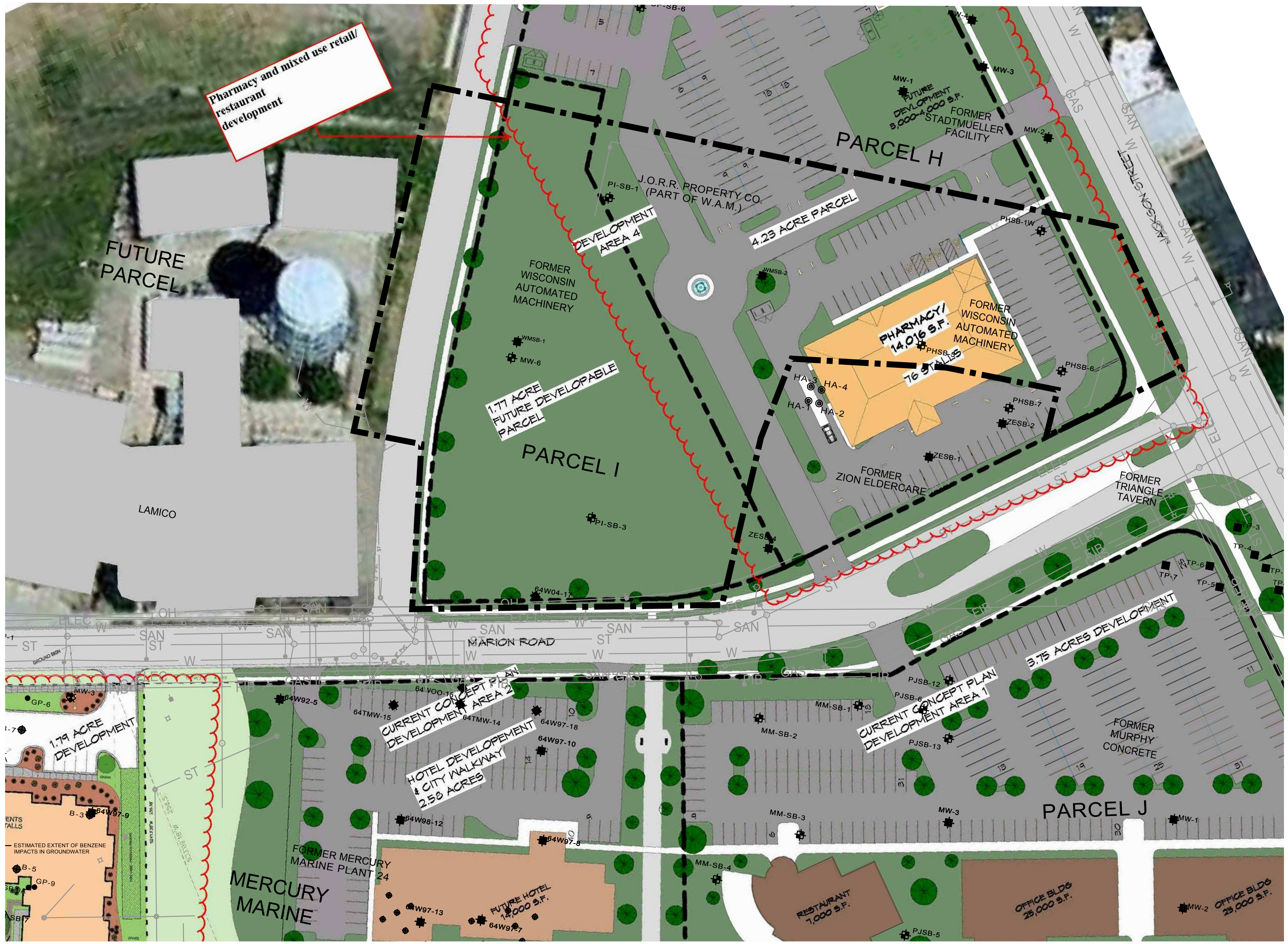
Drawings

0 100

1" = 100'



LEGEND

	FORMER WISCONSIN AUTOMATED MACHINERY BOUNDARY
	FORMER PARCEL LINES
	FORMER RIGHT OF WAY LINE
	FORMER ROAD CENTERLINE
	EXISTING BUILDING
B-3	STS SOIL BORING LOCATION
MMSB-4	STS MONITORING WELL LOCATION
MW-3	STS ABANDONED MONITORING WELL
HA-4	STS HAND AUGER LOCATION
MW-4	SIGMA MONITORING WELL LOCATION
64W97-18	SIGMA ABANDONED MONITORING WELL

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SITE DIAGRAM
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Drawn :	ALB	06/11/2009
Checked:	ECS	06/11/2009
Approved:		
PROJECT NUMBER	13090002	
FIGURE NUMBER	1	

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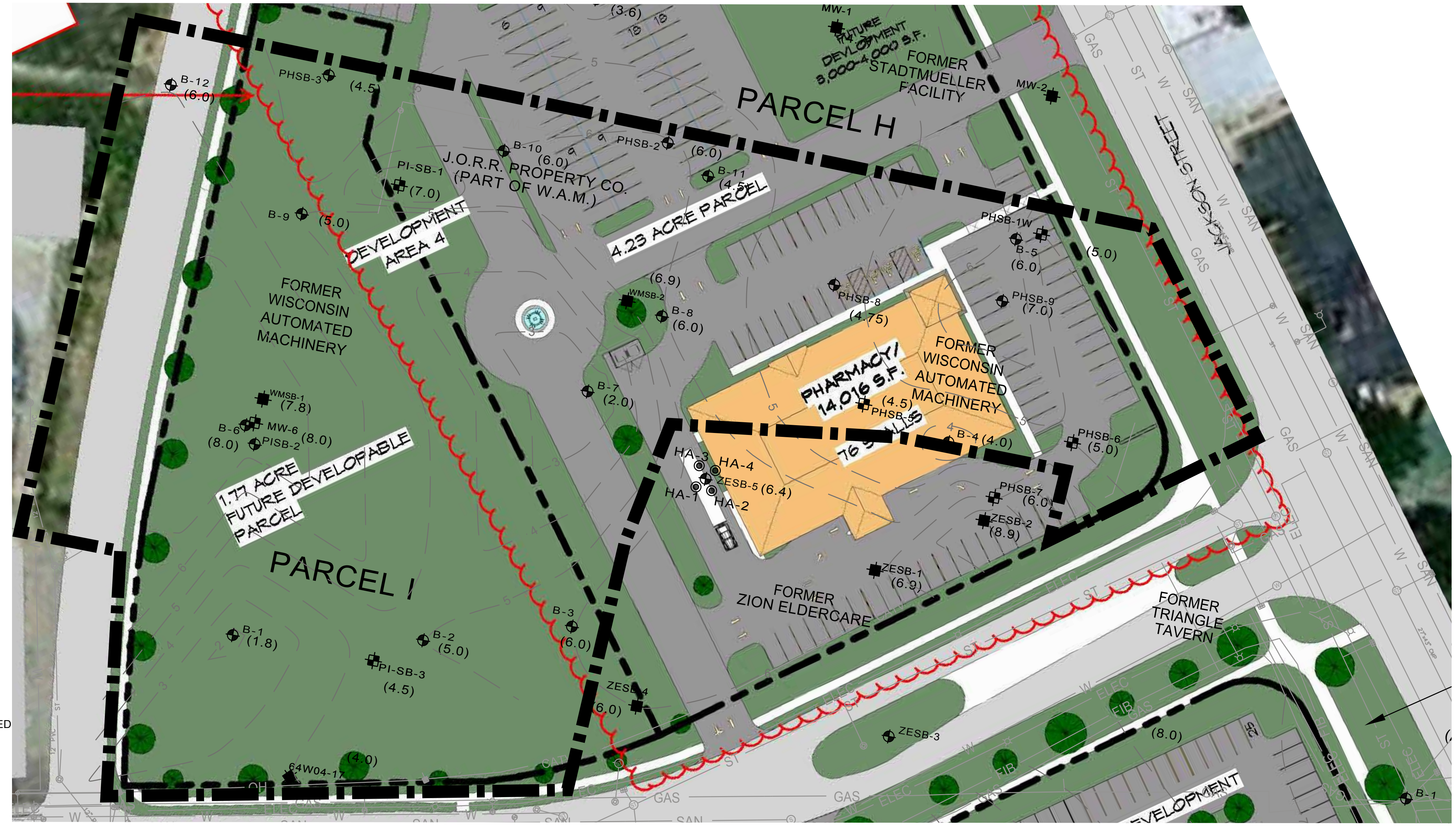

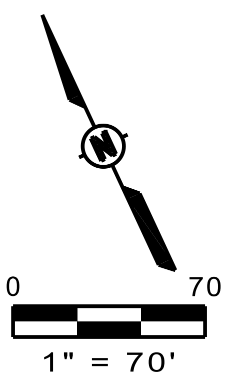

LEGEND

▬ ▬ ▪ ▬	FORMER WISCONSIN AUTOMATED MACHINERY BOUNDARY
———	FORMER PARCEL LINES
— — —	FORMER RIGHT OF WAY LINE
———	FORMER ROAD CENTERLINE
☐	EXISTING BUILDING
B-3	STS SOIL BORING LOCATION
MMSB-4	STS MONITORING WELL LOCATION
MW-3	STS ABANDONED MONITORING WELL
HA-4	STS HAND AUGER LOCATION
MW-4	SIGMA MONITORING WELL LOCATION
64W97-18	SIGMA ABANDONED MONITORING WELL
— — — —	EVEN FILL THICKNESS CONTOUR
— — — —	ODD FILL THICKNESS CONTOUR
(10.0)	FILL THICKNESS AT BORING LOCATION

FILL ISPACH
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Drawn :	ALB	06/11/2009
Checked:	ECS	06/11/2009
Approved:		
PROJECT NUMBER	13090002	
FIGURE NUMBER	2	

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Parameters	Generic RCLs: Direct Contact Pathway – Non-Industrial	Generic RCLs: Direct Contact Pathway – Industrial	Generic RCLs: Groundwater Pathway	NR 746 Soil Screening Depth Levels	ZE-SB-1 SO1 0 - 2' 4/29/2002	ZE-SB-2 SO2 2 - 4' 4/29/2002	ZE-SB-5 SO1 0 - 2' 4/29/2002	ZE-SB-5 SO5 8 - 10' 4/29/2002	WM-SB-2 SO1 0 - 2' 7/3/2002	ZE-HA-1 SO1 1' 9/25/2002	ZE-HA-2 SO1 1' 9/25/2002	ZE-HA-3 SO1 1' 9/25/2002	ZE-HA-4 SO1 1' 9/25/2002
Metals (mg/kg)													
Arsenic	0.039 [E]	1.6 [E]	0.58	–	**1.62** [B]	**6.67** [B]	**3.95** [B]	**1.37** [C]	**4.7** [B]	NA	NA	NA	NA
Cadmium	8.0 [E]	510 [E]	1.5	–	0.61	0.576	**4.0** [C]	<0.0434	0.851	NA	NA	NA	NA
Chromium	16,000 [E]	1.53×10^6	0.36	–	**8.0** [C]	**17** [C]	**13** [C]	**22** [C]	**14.1** [C]	NA	NA	NA	NA
Lead	50 [E]	500 [E]	–	–	**95** [A]	**397** [A]	**17000** [B]	5.0	**113** [A]	**80** [A]	26	**96** [A]	**180** [A]
Mercury	–	–	0.42	–	0.083	0.612	**0.454** [C]	0.095	0.285	NA	NA	NA	NA
Detected VOCs (µg/kg)													
Benzene	1,100 [E]	52,000	5.5 [E]	8,500	<25	**89.6** [C]	<100	NA	<25	NA	NA	NA	NA
Bromomethane	21,900	1,430,000	4.0	–	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	160	7,150	3.7	–	**79.3** [C]	**49.9** [C]	<100	NA	<25	NA	NA	NA	NA
PAHs (µg/kg) [F]													
Benzo(a)anthracene	88	3,900	17,000	–	**327** [A]	**1470** [A]	**313** [A]	NA	<1.0	NA	NA	NA	NA
Benzo(a)pyrene	8.8	390	48,000	–	**290** [A]	**1660** [B]	**486** [B]	NA	<73	NA	NA	NA	NA
Benzo(b)fluoranthene	88	3,900	360,000	–	**506** [A]	**1790** [A]	**530** [A]	NA	<1.2	NA	NA	NA	NA
Benzo(ghi)perylene	1,800	39,000	6,800,000	–	252	**9510** [A]	341	NA	<2.9	NA	NA	NA	NA
Benzo(k)fluoranthene	880	39,000	870,000	–	227	**7090** [A]	212	NA	<2.2	NA	NA	NA	NA
Dibenzo(a,h,)anthracene	8.8	390	38,000	–	**432** [B]	**1330** [B]	**99** [A]	NA	<1.2	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	88	3,900	680,000	–	**255** [A]	**1000** [A]	**302** [A]	NA	<1.0	NA	NA	NA	NA
Phenanthrene	18,000	390,000	1,800	–	648	**4620** [C]	594	NA	300	NA	NA	NA	NA

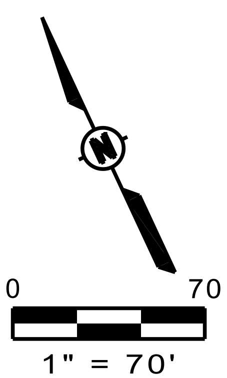
Parameters	B-1 – 2-4' 2003	B-1 – 8-10' 2003	B-2 – 2-4' 2003	B-3 -- 2-4' 2003	B-3 -- 8-10' 2003	B-4 -- 2-4' 2003	B-4 – 8-10' 2003	B-5 – 0-2' 2003	B-6 – 0-2' 2003	B-6 – 6-8' 2003	B-7 – 0-2' 2003	B-7 – 8-9.5' 2003
Metals (mg/kg)												
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	**110** [A]	7.7	**110** [A]	**65** [A]	10	**97** [A]	32	**120** [A]	**93** [A]	**120** [A]	**230** [A]	7.2
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Detected VOCs (µg/kg)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
PAHs (µg/kg) [F]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(ghi)perylene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h,)anthracene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

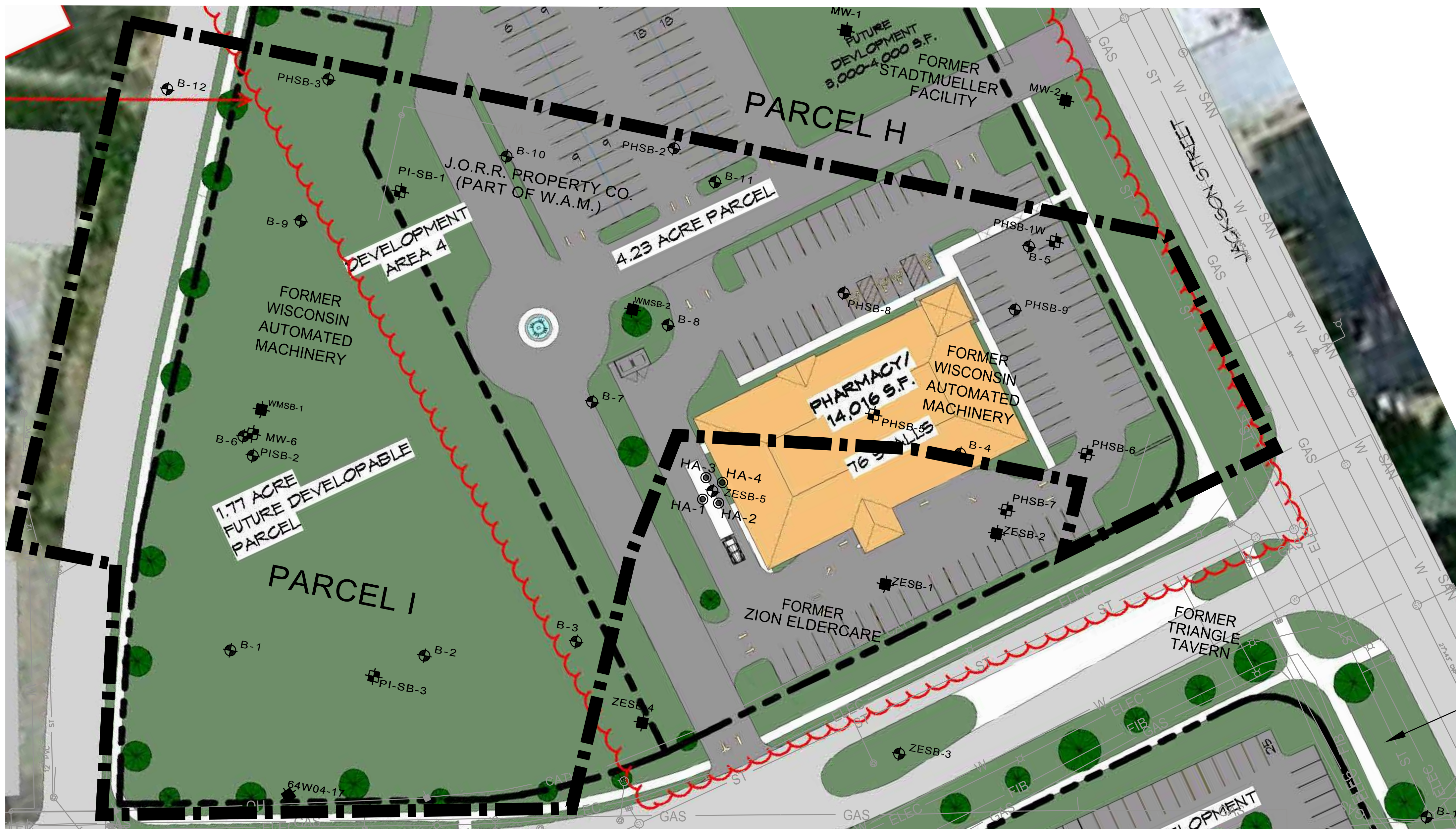
Parameters	B-8 -- 2-4' 2003	B-9 -- 2-4' 2003	B-10 -- 2-4' 2003	B-11 – 2-4' 2003	B-11 – 8-9.5' 2003	B-12 – 2-4' 2003	PH-SB-5 SO5 – 7/16/2007	PH-SB-6 SO4 – 7/17/2007	PH-SB-7 SO4 – 7/16/2007	PH-SB-8 SO4 -- 7/18/2007	PH-SB-9 SO4 -- 7/18/2007
Metals (mg/kg)											
Arsenic	NA	NA	NA	NA	NA	NA	**0.842** [C]	<0.439	**2.02** [B]	**4.07** [B]	**1.62** [B]
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	**84** [A]	**83** [A]	**84** [A]	42	9.9	14	9.89	9.5	8.68	7.3	8.43
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Detected VOCs (µg/kg)	NA	NA	NA	NA	NA	NA					
Benzene	NA	NA	NA	NA	NA	NA	<10	<10	<10	<10	<10
Bromomethane	NA	NA	NA	NA	NA	NA	**41.7** [C]	<17	<17	**29.9** [C]	<17
Trichloroethene	NA	NA	NA	NA	NA	NA	<8.0	<8.0	<8.0	<8.0	<8.0
PAHs (µg/kg) [F]	NA	NA	NA	NA	NA	NA					
Benzo(a)anthracene	NA	NA	NA	NA	NA	NA	<6.1	<5.4	<5.3	5.1	<5.8
Benzo(a)pyrene	NA	NA	NA	NA	NA	NA	<3.4	<3.0	<3.0	<2.7	<3.3
Benzo(b)fluoranthene	NA	NA	NA	NA	NA	NA	<3.1	7.1	<2.7	4.8	5.2
Benzo(ghi)perylene	NA	NA	NA	NA	NA	NA	<5.9	<5.3	<5.1	6.8	11.2
Benzo(k)fluoranthene	NA	NA	NA	NA	NA	NA	<4.3	<3.8	<3.7	<3.4	<4.1
Dibenzo(a,h,)anthracene	NA	NA	NA	NA	NA	NA	<4.0	<3.6	<3.5	<3.2	<3.8
Indeno(1,2,3-cd)pyrene	NA	NA	NA	NA	NA	NA	<3.3	<2.9	<2.8	5.4	5.6
Phenanthrene	NA	NA	NA	NA	NA	NA	<6.1	<5.4	<5.3	12.4	<5.8

Notes:

[A] Parameter exceeds NR 720 Generic RCL for Non-Industrial Direct Contact.
[B] Parameter exceeds NR 720 Generic RCL for Industrial Direct Contact.
[C] Parameter exceeds NR 720 Generic RCL for Groundwater Pathway.
[D] Parameter exceeds NR 746 Table 1 Soil Screening Levels
[E] Generic RCL is established under NR 720 or NR 746
[F] Generic RCLs provided in *Soil Cleanup Levels for PAHs Interim Guidance*, WDNR RR-5 1997

-- No Generic RCL established.
Generic RCLs not included in Wisconsin Administrative Code or Guidance are calculated from the US EPA Soil Screening Level Web Page and the default values contained in *Determining Residual Contaminant Levels using the EPA Soil Screening Level Web Site* WDNR PUB-RR-682 on May 12, 2006
VOCs = Volatile Organic Compounds
PAHs = Polynuclear Aromatic Hydrocarbons
NA = Not Analyzed





LEGEND

- FORMER WISCONSIN AUTOMATED MACHINERY BOUNDARY
- FORMER PARCEL LINES
- FORMER RIGHT OF WAY LINE
- B-3 — STS SOIL BORING LOCATION
- MMSB-4 — STS MONITORING WELL LOCATION
- MW-3 — STS ABANDONED MONITORING WELL
- HA-4 — STS HAND AUGER LOCATION
- MW-4 — SIGMA MONITORING WELL LOCATION
- 64W97-18 — SIGMA ABANDONED MONITORING WELL
- PROPOSED SOIL EXCAVATION AREA

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SOIL ANALYTICAL RESULTS
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Drawn : ALB 06/11/2009
Checked: ECS 06/11/2009
Approved:
PROJECT NUMBER 13090002
FIGURE NUMBER 3

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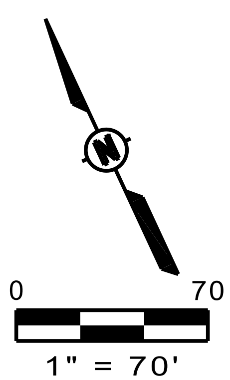
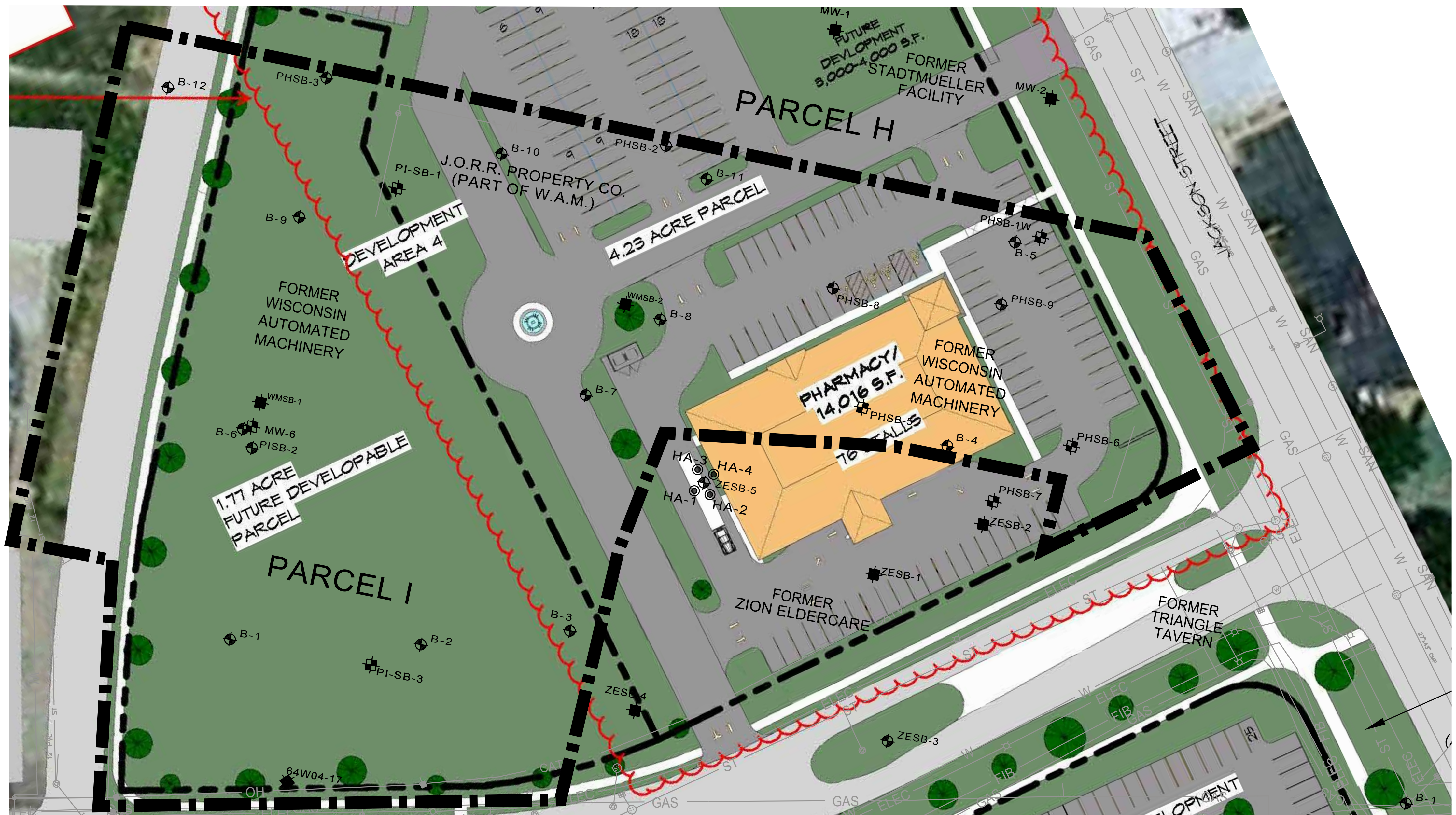
Parameters	NR 140 Standards ES	PAL	Well Name / Sample ID / Date	ZE-SB-1 ZE-SB-1W 5/9/2002	ZESB-2 ZE-SB-2W 5/9/2002	ZESB-2 ZE-SB-2W 5/9/02 (Dup)	WMSB-2 WM-SB-2 7/4/2002	WMSB-2 WM-SB-2 7/8/2002	PHSB-1W WP-H-SB-1W 8/10/07	PHSB-1W WP-H-SB-1W 6/10/08	PHSB-5 WP-H-SB-5 8/13/07	PHSB-5 WP-H-SB-5 6/10/08	PHSB-6 WP-H-SB-6 8/10/07	PHSB-6 WP-H-SB-6 6/10/08	PHSB-7 WP-H-SB-7 8/13/07	PHSB-7 WP-H-SB-7 6/10/08	WMSB-1 WM-SB-1 7/4/2002	WMSB-1 WM-SB-1 7/8/2002	PI-SB-1 WP-I-SB-1 8/10/07	PI-SB-1 WP-I-SB-1 6/10/08	PI-SB-3 WP-I-SB-3 8/13/07	PI-SB-3 WP-I-SB-3 6/10/08	MW-6 WMW-6 8/13/07	MW-6 WMW-6 6/10/08
Metals (µg/L)																								
Arsenic	**10**	1.0		9.6	<1.3	<1.3	4.39	4.39	<0.60	NA	0.72	NA	2.98	<0.60	6.29	1.53	2.02	2.02	5.14	<0.60	4.53	2.20	3.15	<0.60
Lead	**15**	1.5		3.37	1.39	1.89	<1.00	<1.00	<0.30	NA	0.45	NA	<0.30	NA	0.38	NA	<1.00	<1.00	<0.30	NA	<0.30	NA	<0.30	NA
VOCs (µg/L)																								
Benzene	**5.0**	0.5		<0.31	0.499	0.514	<0.31	<0.31	<0.20	<0.20	<0.20	<0.20	<0.20	NA	<0.20	<0.20	<0.31	<0.31	<0.20	NA	<0.20	NA	<0.20	NA
Bromomethane	**10**	1.0		NA	NA	NA	NA	NA	2.32	<1.0	<1.0	1.10	<1.0	NA	<1.0	1.64	NA	NA	<1.0	NA	<1.0	NA	<1.0	NA
Vinyl chloride	**0.2**	0.02		<0.2	**0.661**	**0.632**	<0.2	<0.2	<0.20	<0.20	<0.20	<0.20	<0.20	NA	<0.20	<0.20	<0.2	<0.2	<0.20	NA	<0.20	NA	<0.20	NA
PAHs (µg/L)																								
Benzo(a)pyrene	**0.2**	0.02		<0.017	<0.017	<0.017	<0.022	<0.022	<0.020	NA	<0.020	NA	<0.020	NA	<0.020	NA	<0.022	**0.76**	<0.020	NA	<0.020	NA	<0.020	NA
Benzo(b)fluoranthene	**0.2**	0.02		<0.4	<0.4	<0.4	<0.036	<0.036	<0.020	NA	<0.020	NA	<0.020	NA	<0.020	NA	**0.22**	0.16	<0.020	NA	<0.020	NA	<0.020	NA

Notes:
- VOCs = Volatile Organic Compounds
- ES = NR 140 Enforcement Standard
- PAL = NR 140 Preventive Action Limit
- **Bold value** = NR 140 Enforcement Standard Exceedance
- Underline value = NR 140 Preventive Action Limit Exceedance
- -- No NR 140 ES or PAL established.
- NA = Not analyzed
- ND = Not detected



LEGEND
- FORMER WISCONSIN AUTOMATED MACHINERY BOUNDARY
- FORMER PARCEL LINES
- FORMER RIGHT OF WAY LINE
- B-3 STS SOIL BORING LOCATION
- MMSB-4 STS MONITORING WELL LOCATION
- MW-3 STS ABANDONED MONITORING WELL
- HA-4 STS HAND AUGER LOCATION
- MW-4 SIGMA MONITORING WELL LOCATION
- 64W97-18 SIGMA ABANDONED MONITORING WELL



AECOM
3909 Concord Avenue
Weston, WI 54476
715.355.4304
www.aecom.com

GROUNDWATER ANALYTICAL RESULTS
PROPOSED PHARMACY
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Drawn :	ALB	06/11/2009
Checked:	ECS	06/11/2009
Approved:		
PROJECT NUMBER	13090002	
FIGURE NUMBER	4	

Appendix A

EPA Citizen's Guides

United States
Environmental Protection
Agency

Office of Solid Waste and
Emergency Response
(5102G)

EPA 542-F-01-024
December 2001
www.epa.gov/superfund/sites
www.cluin.org

EPA

A Citizen's Guide to Solidification/Stabilization

The Citizen's Guide Series

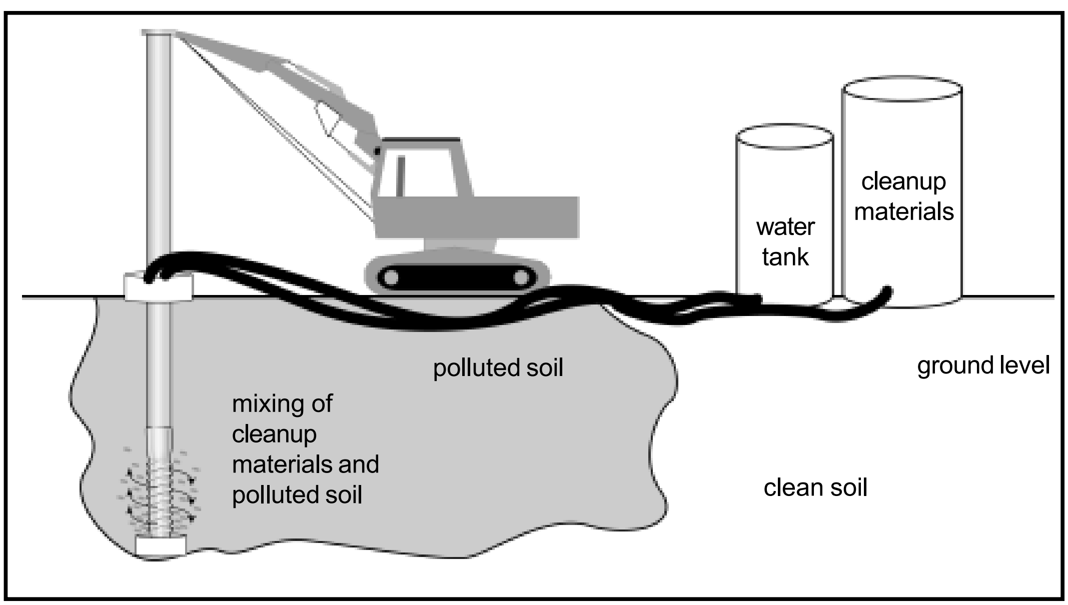
EPA uses many methods to clean up pollution at Superfund sites. If you live, work, or go to school near a Superfund site, you may want to learn more about these methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

What is solidification/stabilization?

Solidification/stabilization refers to a group of cleanup methods that prevent or slow the release of harmful chemicals from polluted soil or sludge. These methods usually do not destroy the chemicals—they just keep them from moving into the surrounding environment. Solidification refers to a process that binds the polluted soil or sludge and cements it into a solid block. Stabilization refers to changing the chemicals so they become less harmful or less mobile. These two methods are often used together to prevent exposure to harmful chemicals.

How do they work?

Solidification involves mixing polluted soil with a substance, like cement, that causes the soil to harden. The mixture dries to form a solid block that can be left in place or removed to another location. The solidification process prevents chemicals from spreading into the surrounding environment. Rain or other water cannot pickup or dissolve the chemicals as it



moves through the ground. Solidification does not get rid of the harmful chemicals, it simply traps them in place.

Stabilization changes harmful chemicals into substances that are less harmful or less mobile. For example, soil polluted with metals can be mixed with lime. The lime reacts with metals to form metal hydroxides. The metal hydroxides do not move through and out of the soil as easily.

Solidification/stabilization methods may or may not require the soil to be removed. Sometimes it is better to dig up the soil and place it in large mixers above ground to be sure that all of the polluted soil mixes with the cleanup materials, such as cement and lime. The mixture may then be returned to the ground at the site or placed in a landfill. At other sites, instead of digging up the soil, it is mixed in place with the cleanup materials. Then it is covered with clean soil or pavement. After solidification/stabilization is completed, EPA tests the surrounding soil to make sure no pollution was missed.

Is solidification/stabilization safe?

In order to make sure of the safety of the remedy, EPA tests the final mixture to confirm proper sealing of the harmful chemicals and for strength and durability of the solidified or stabilized materials. Sometimes EPA will place use restrictions on areas that have received solidification or stabilization. These land use restrictions can prevent future damage to the treated area.

How long will it take?

Solidification/stabilization may take weeks or months to complete, depending on several factors that vary from site to site:

- types and amounts of chemicals present
- size and depth of the polluted area
- types of soil and geologic conditions
- whether the mixing occurs in place or in mixing tanks

Why use solidification/stabilization?

Solidification/stabilization provides a relatively quick and low cost way to protect from the threat posed by harmful chemicals, especially metals. Solidification/stabilization has been chosen as part of the remedy at 183 Superfund sites across the country.

For more information write the Technology Innovation Office at:

U.S. EPA (5102G)
1200 Pennsylvania Ave., NW
Washington, DC 20460

or call them at
(703) 603-9910.

Further information also can be obtained at **www.cluin.org** or **www.epa.gov/superfund/sites**.

NOTE: This fact sheet is intended solely as general guidance and information to the public. It is not intended, nor can it be relied upon, to create any rights enforceable by any party in litigation with the United States, or to endorse the use of products or services provided by specific vendors. The Agency also reserves the right to change this fact sheet at any time without public notice.

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response (5102G)
EPA 542-F-01-018
February 2002
www.epa.gov/superfund/sites
www.cluin.org

A Citizen's Guide to Incineration

The Citizen's Guide Series

EPA uses many methods to clean up pollution at Superfund and other sites. If you live, work, or go to school near a Superfund site, you may want to learn more about these methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

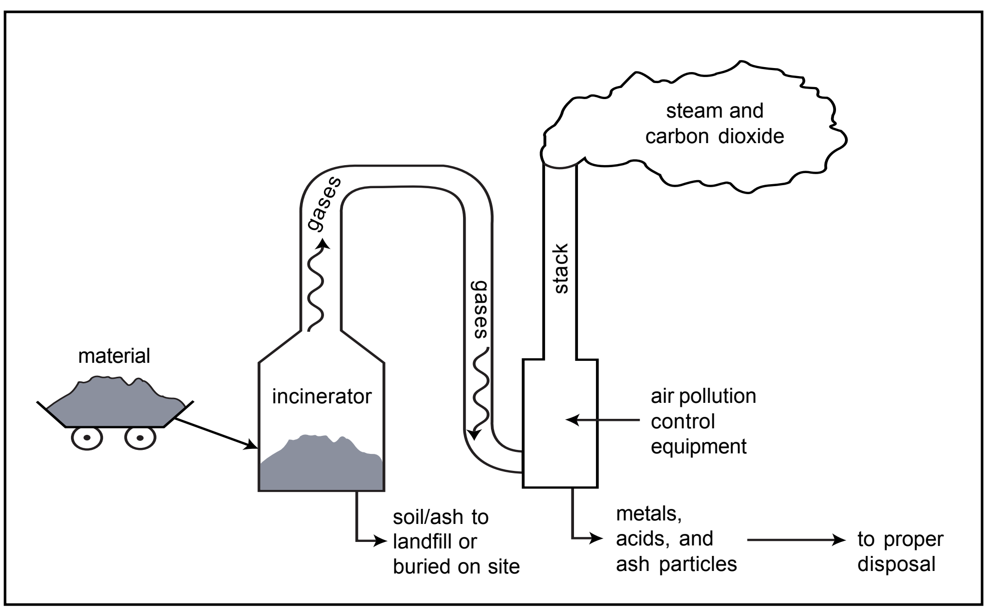
What is incineration?

Incineration is the process of burning hazardous materials to destroy harmful chemicals. Incineration also reduces the amount of material that must be disposed of in a landfill. Although it destroys a range of chemicals, such as PCBs, solvents, and pesticides, incineration does not destroy metals.

How does it work?

An *incinerator* is a type of furnace. It burns material, such as polluted soil, at a controlled temperature, which is high enough to destroy the harmful chemicals. An incinerator can be brought to the site for cleanup or the material can be trucked from the site to an incinerator.

The material is placed in the incinerator where it is heated. To increase the amount of harmful chemicals destroyed, workers control the amount of heat and air in the incinerator. As the chemicals heat up, they change into gases, which pass through a flame to be heated



further. The gases become so hot they break down into smaller components that combine with oxygen to form less harmful gases and steam.

The gases produced in the incinerator pass through air pollution control equipment to remove any remaining metals, acids, and particles of ash. These wastes are harmful and must be properly disposed of in a licensed landfill. The other cleaner gases, like steam and carbon dioxide, are released outside through a stack.

The soil or ash remaining in the incinerator after the burning may be disposed of in a landfill or buried on site. The amount of material that requires disposal is much less than the initial amount of waste that was burned.

Is incineration safe?

An incinerator that is properly designed and operated can safely destroy harmful chemicals. It can also run without producing odors or smoke. EPA tests the incinerator before and during operation to make sure that gases are not released in harmful amounts.

How long will it take?

The time it takes for incineration to clean up a site depends on several factors:

- size and depth of the polluted area
- types and amounts of chemicals present
- whether or not the waste must be trucked to the incinerator

Larger incinerators can clean up several hundred tons of waste each day.

Why use incineration?

Incineration can destroy some types of chemicals that other methods can’t. It is also quicker than many other methods. This is important when a site must be cleaned up quickly to prevent harm to people or the environment. On-site incineration can reduce the amount of material that must be moved to a landfill. Incinerators have been used to clean up 136 Superfund sites across the country.

For more information
write the Technology Innovation Office at:

U.S. EPA (5102G)
1200 Pennsylvania Ave., NW
Washington, DC 20460

or call them at
(703) 603-9910.

Further information also can be obtained at **www.cluin.org** or **www.epa.gov/superfund/sites**.

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United States
Environmental Protection
Agency

Office of Solid Waste and
Emergency Response
(5102G)

EPA 542-F-01-023
December 2001
www.epa.gov/superfund/sites
www.cluin.org

A Citizen's Guide to Soil Excavation

The Citizen's Guide Series

EPA uses many methods to clean up pollution at Superfund and other sites. If you live, work, or go to school near a Superfund site, you may want to learn more about cleanup methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

What is excavation?

Excavation is digging up polluted soil so it can be cleaned or disposed of properly in a landfill. The soil is excavated using construction equipment, like backhoes or bulldozers.

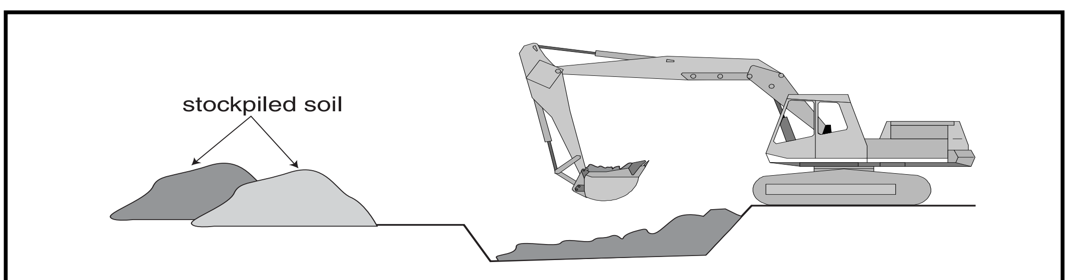
How does it work?

Before soil can be excavated, EPA must figure out how much of it there is. EPA also determines the types of harmful chemicals in the soil. This requires research on past activities at the site as well as testing of the soil.

Once the polluted areas are found, digging can begin. Backhoes, bulldozers and front-end loaders remove the soil and put it on tarps or in containers. The soil is covered to prevent wind and rain from blowing or washing it away. The covers also keep workers and other people near the site from coming into contact with polluted soil. The digging is complete when test results show that the remaining soil does not pose a risk to people or the environment.

The polluted soil may be cleaned up onsite or taken elsewhere for this purpose (See *A Citizen's Guide to Thermal Desorption* [EPA 542-F-01-003], and *A Citizen's Guide to Soil Washing* [EPA 542-F-01-008]). The soil may also may be disposed of in a regulated landfill. If the soil is cleaned, it may be returned to the holes it came from. This is called *backfilling.* The area may also be backfilled with clean soil from another location.

After an excavation is backfilled, it may be landscaped to prevent erosion or it may be paved or prepared for some other use.



Is excavation safe?

Excavation can safely remove most types of polluted soil from a site. However, certain types of harmful chemicals require special safety precautions. For example, some chemicals may *evaporate*, or change into gases. To prevent the release of gases to the air, site workers may coat the ground with foam or draw the vapor into gas wells. Other chemicals, like acids and explosives, also require special handling and protective clothing to reduce the danger to site workers.

How long will it take?

Excavating polluted soil may take as little as one day or as long as several months. Cleaning the soil may take much longer. The total time it takes to excavate and clean up soil depends on several factors:

- types and amounts of harmful chemicals present
- size and depth of the polluted area
- type of soil
- amount of moisture in the polluted soil (wet soil slows the process)

Why use excavation?

EPA has had lots of experience using excavation to clean up sites. Excavation is used most often where other underground cleanup technologies will not work or will be too expensive. Excavation of soil for disposal or treatment above ground is often the fastest way to deal with chemicals that pose an immediate risk. Polluted soils deeper than 10 feet generally cannot be excavated. This method is most cost-effective for small amounts of soil.

For more information

write the Technology Innovation Office at:

U.S. EPA (5102G)
1200 Pennsylvania Ave., NW
Washington, DC 20460

or call them at
(703) 603-9910.

Further information also can be obtained at **www.cluin.org** or **www.epa.gov/superfund/sites**.

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response (5102G)
EPA 542-F-01-022
December 2001
www.epa.gov/superfund/sites
www.cluin.org

A Citizen's Guide to Capping

The Citizen's Guide Series

EPA uses many methods to clean up pollution at Superfund and other sites. If you live, work, or go to school near a Superfund site, you may want to learn more about these methods. Perhaps they are being used or are proposed for use at your site. How do they work? Are they safe? This Citizen's Guide is one in a series to help answer your questions.

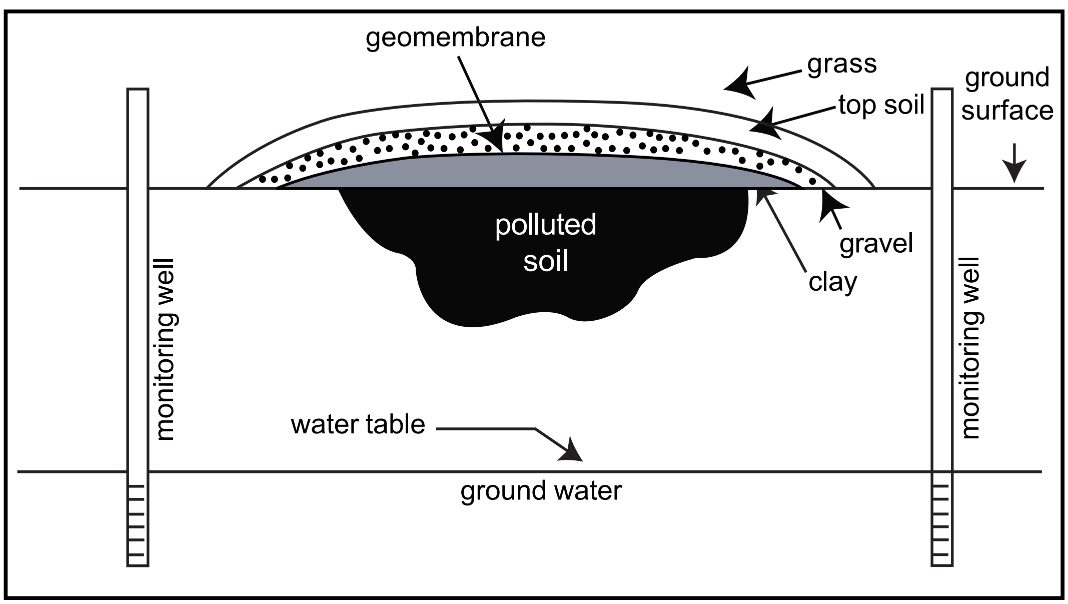
What is capping?

Capping involves placing a cover over contaminated material such as the waste buried at a landfill. Such covers are called "caps." Caps do not clean up the contaminated material. They just keep it in place so it will not come into contact with people or the environment.

How does it work?

Sometimes digging up and removing contaminated material can be difficult or expensive. Instead, a cap will be placed over it to keep it in place. A cap works in three main ways:

1) It stops rainwater from seeping through the hazardous material and carrying the pollution into the groundwater, lakes or rivers.
2) It stops wind from blowing away the hazardous material.
3) It keeps people and animals from coming into contact with the contaminated material and tracking it off the site.



Constructing a cap can be as simple as placing a single layer of asphalt on top of the contaminated material. More often, however, caps are made of several layers. The top layer at the ground surface is usually soil with grass or other plants. Plants take up rainwater with their roots and help prevent it from soaking down into the next layer. They also keep the topsoil from eroding. The second layer down drains any water that comes through the first layer. It is usually constructed of gravel and pipes. A third layer may be added to control gasses that come from the hazardous material. The bottom layer lies directly on the contaminated material. It is usually made of clay. The clay is covered by a sheet of strong synthetic material called a *geomembrane*. Together the clay and the geomembrane help stop further flow of water downward.

Is capping safe?

When properly built and maintained, a cap is a safe method for keeping contaminated material in place. A cap will continue to work safely as long as it is not broken or eroded. Regular inspections are made to make sure that the weather, plant roots or some human activity have not damaged the cap. Also, groundwater monitoring wells are placed around the edges of the cap so that any leakage from the site can be found and fixed.

How long will it take?

Building a cap can take a few days up to several months.

The length of time depends on several factors that vary from site to site:

- size of the area
- thickness and design of the cap
- availability of clean topsoil and clay

Caps can be effective for many years as long as they are properly maintained.

Why use capping?

Caps have been used at hundreds of sites because they are an effective method for keeping wastes contained. Caps are usually only part of a cleanup remedy. Often they are used with pump and treat systems (See *A Citizen's Guide to Pump and Treat* [EPA 542-01-025]). The pumping and treating cleans up polluted groundwater, while the cap prevents contaminated materials from reaching the groundwater.

For more information

write the Technology Innovation Office at:

U.S. EPA (5102G)
1200 Pennsylvania Ave., NW
Washington, DC 20460

or call them at
(703) 603-9910.

Further information also can be obtained at **www.cluin.org** or **www.epa.gov/superfund/sites**.

Appendix B

Sustainability Evaluation Calculations

SUSTAINABLE REMEDIATION TOOL CALCULATION

OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SUSTAINABLE REMEDIATION TOOL

1. Enter Project Information.

Site Name FORMER WISCONSIN AUTOMATED MA
Location OSHKOSH, WISCONSIN
Site/Project Phase for Calculation Capital and O&M

Tier 1 **Tier 2**

SRT

Instructions:

=Enter your data here. Click button to the right of the cell for help.
=Use this default value or override with your own.
=Calculated value. You cannot change this.
For help, click on the square gray buttons located throughout the SRT.

***New users**: Fill in the boxes as indicated above. Choose Soil or Groundwater. Click buttons on Recommended Flow to proceed through the screens.*
***Advanced users**: Follow Recommended Flow, or click on tabs to navigate.*

Fit Window

Fuel Costs

Gasoline	$2.50	*$/gallon*
Diesel	$2.50	*$/gallon*
Electricity	$0.10	*$/kWh*
Natural gas	$11.00	*$/mcf*

2. Choose Environmental Media

Soil...

Recommended flow:

Main → Soil Input → Excavation / SVE → Output

...or Groundwater.

Recommended flow:

Main → GW Input → Pump & Treat / Enhanced Bioremediation → Output

SUSTAINABLE REMEDIATION TOOL CALCULATION

OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SOIL/SOURCE INPUT

FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Instructions:
- =Enter your data here. Click button to the right of the cell for help.
- =Use this default value or override with your own.
- =Calculated value. You cannot change this.

Paste Tier 2 Example

Clear Soil Inputs

Area of Affected Soil	172097	ft^2
Depth to Top of Affected Soil	0	ft
Depth to Bottom of Affected Soil	5	ft
Depth to Groundwater	3	ft
Soil Type	Sandy gravel	
Contaminant Class		
Max Concentration		mg/kg
Typical Concentration		mg/kg
Contaminant mass	0.	lbs

Calculate natural resource service? Yes No

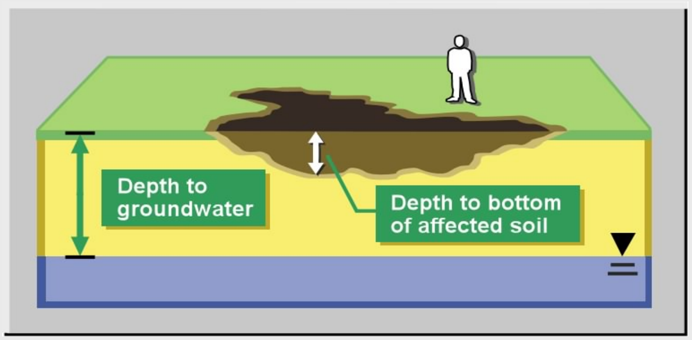
Recommended flow:

You are here

Main → Input → Next: Choose Technologies → Results

- [x] Excavation
- [x] Soil Vapor Extraction

Next>>



OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

EXCAVATION - TIER 1

FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN
CAPITAL and O&M

Instructions:
- =Enter your data here. Click button to the right of the cell for help.
- =Use this default value or override with your own.
- =Calculated value. You cannot change this.

Restore Defaults

Recommended flow: Main → Input → Technology Design (You are here; Excavation; Soil Vapor Extraction; Next>>) → Results

Design for Managing Soil

Airline miles flown by project team (total miles for all travelers)	0	miles over proj lifetime
Average Distance Traveled by Site Workers per one-way trip	10	miles one-way
Trips by Site Workers during construction	100	# over project lifetime
Trips by Site Workers after construction	10	# over project lifetime
Distance to Disposal (one-way)	5	miles
Type of Disposal	Non-hazardous	
Volume of affected soil	860,485.	cu ft
Volume of affected soil	31,870.	cu yd
Total hours to excavate	830.	person-hours
Number of loads for disposal	3,100.	#
Total miles driven for disposal	31,000.	miles
Total hours for fill dirt placement	350.	hours
Number of loads of fill dirt	3,500.	#
Total miles driven for fill	70,000.	miles

Materials and Consumable Amounts used for Metrics

Diesel	16,000.	gal
Gasoline	150.	gal

Technology Cost

Capital	3,300,000.	$
O&M	n/a	$

Project-specific Metrics (Add & Subtract/Offsets)

Yes No

Additional Technology Cost		$
Total Energy Consumed		Megajoules
CO_2 Emissions to Atmosphere		tons CO_2
Safety / Accident Risk		lost hours

SUSTAINABLE REMEDIATION TOOL CALCULATION

OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SOIL/SOURCE RESULTS

Instructions:

- =Enter your data here.
- =Use this default value or override with your own.
- =Calculated value. You cannot change this.

Recommended flow:

Main → Input → Technology Design → Results (You are here*)

* Normalize metrics to see more, go back to Inputs to adjust & compare, go back to Main (Tier 1/2 or GW), or Exit.

Non-normalized

Calculations in natural units

	Excavation	SVE	
Carbon Dioxide Emissions to Atmosphere	210.	-	*tons CO_2*
CO_2 per pound of contaminant	#N/A	-	*lbs CO_2 per lb contam*
Total Energy Consumed	2,700,000.	-	*Megajoules*
	750,000.	-	*kWh*
Technology Cost	3,300,000.	-	*dollars*
Cost per pound of contaminant	#N/A	-	*dollars per lb contam*
Safety/Accident Risk	4.5	-	*lost hours*
	9.4E-02	-	*injury risk*
Change in Resource Service for Land - Economic	-	-	
Change in Resource Service for Land - Ecologic	-	-	

Normalize? Yes No

SRT

ON-SITE REUSE WITH PERFORMANCE BARRIERS AND LIMITED OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SUSTAINABLE REMEDIATION TOOL

1. Enter Project Information.

Site Name FORMER WISCONSIN AUTOMATED MA
Location OSHKOSH, WISCONSIN
Site/Project Phase for Calculation Capital and O&M

Tier 1 Tier 2

Instructions:

=Enter your data here. Click button to the right of the cell for help.
=Use this default value or override with your own.
=Calculated value. You cannot change this.
For help, click on the square gray buttons located throughout the SRT.

***New users**: Fill in the boxes as indicated above. Choose Soil or Groundwater.*
Click buttons on Recommended Flow to proceed through the screens.
***Advanced users**: Follow Recommended Flow, or click on tabs to navigate.*

Fit Window

Fuel Costs

Gasoline	$2.50	*$/gallon*
Diesel	$2.50	*$/gallon*
Electricity	$0.10	*$/kWh*
Natural gas	$11.00	*$/mcf*

2. Choose Environmental Media

Soil…

Recommended flow:

Main → Soil Input → Excavation / SVE → Output

…or Groundwater.

Recommended flow:

Main → GW Input → Pump & Treat / Enhanced Bioremediation → Output

SUSTAINABLE REMEDIATION TOOL CALCULATION

ON-SITE REUSE WITH PERFORMANCE BARRIERS AND LIMITED OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SOIL/SOURCE INPUT

FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Area of Affected Soil	15000	ft^2
Depth to Top of Affected Soil	0	ft
Depth to Bottom of Affected Soil	5	ft
Depth to Groundwater	3	ft
Soil Type	Sandy gravel	
Contaminant Class		
Max Concentration		mg/kg
Typical Concentration		mg/kg
Contaminant mass	0.	lbs

Calculate natural resource service? Yes No

Instructions:
=Enter your data here. Click button to the right of the cell for help.
=Use this default value or override with your own.
=Calculated value. You cannot change this.

Paste Tier 2 Example

Clear Soil Inputs

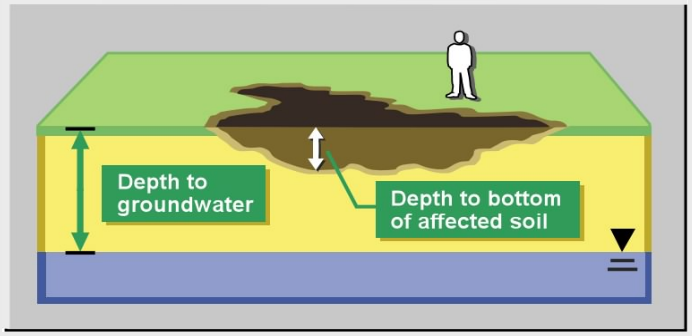
Recommended flow:

You are here

Main → Input → Next: Choose Technologies → Results

- [x] Excavation
- [x] Soil Vapor Extraction

Next>>



SUSTAINABLE REMEDIATION TOOL CALCULATION

ON-SITE REUSE WITH PERFORMANCE BARRIERS AND LIMITED OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

EXCAVATION - TIER 1

FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN
CAPITAL and O&M

Instructions:
- =Enter your data here. Click button to the right of the cell for help.
- =Use this default value or override with your own.
- =Calculated value. You cannot change this.

Restore Defaults

Recommended flow: Main → Input → Technology Design (Excavation; Soil Vapor Extraction) → Results

You are here

Next>>

Design for Managing Soil

Airline miles flown by project team (total miles for all travelers)	0	*miles over proj lifetime*
Average Distance Traveled by Site Workers per one-way trip	10	*miles one-way*
Trips by Site Workers during construction	100	*# over project lifetime*
Trips by Site Workers after construction	10	*# over project lifetime*
Distance to Disposal (one-way)	5	*miles*
Type of Disposal	Non-hazardous	
Volume of affected soil	75,000.	*cu ft*
Volume of affected soil	2,778.	*cu yd*
Total hours to excavate	72.	*person-hours*
Number of loads for disposal	270.	*#*
Total miles driven for disposal	2,700.	*miles*
Total hours for fill dirt placement	30.	*hours*
Number of loads of fill dirt	300.	*#*
Total miles driven for fill	6,000.	*miles*

Materials and Consumable Amounts used for Metrics

Diesel	1,400.	*gal*
Gasoline	150.	*gal*

Technology Cost

Capital	290,000.	*$*
O&M	n/a	*$*

Project-specific Metrics (Add & Subtract/Offsets)

Yes No

Additional Technology Cost		*$*
Total Energy Consumed		*Megajoules*
CO_2 Emissions to Atmosphere		*tons CO_2*
Safety / Accident Risk		*lost hours*

ON-SITE REUSE WITH PERFORMANCE BARRIERS AND LIMITED OFF-SITE LANDFILLING REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SOIL/SOURCE RESULTS

Instructions:
- =Enter your data here.
- =Use this default value or override with your own.
- =Calculated value. You cannot change this.

Recommended flow: Main → Input → Technology Design → Results (You are here*)

* Normalize metrics to see more, go back to Inputs to adjust & compare, go back to Main (Tier 1/2 or GW), or Exit.

Non-normalized

Calculations in natural units

	Excavation	SVE	
Carbon Dioxide Emissions to Atmosphere	20.	-	*tons CO_2*
CO_2 per pound of contaminant	#N/A	-	*lbs CO_2 per lb contam*
Total Energy Consumed	260,000.	-	*Megajoules*
	72,000.	-	*kWh*
Technology Cost	290,000.	-	*dollars*
Cost per pound of contaminant	#N/A	-	*dollars per lb contam*
Safety/Accident Risk	0.48	-	*lost hours*
	1.0E-02	-	*injury risk*
Change in Resource Service for Land - Economic	-	-	
Change in Resource Service for Land - Ecologic	-	-	

Normalize? Yes No

SUSTAINABLE REMEDIATION TOOL CALCULATION

THERMAL TREATMENT REMEDIAL OPTION (EXCAVATION PORTION ONLY)
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SUSTAINABLE REMEDIATION TOOL

1. Enter Project Information.

Site Name	FORMER WISCONSIN AUTOMATED MA
Location	OSHKOSH, WISCONSIN
Site/Project Phase for Calculation	Capital and O&M
	Tier 1 / Tier 2

Instructions:

=Enter your data here. Click button to the right of the cell for help.
=Use this default value or override with your own.
=Calculated value. You cannot change this.
For help, click on the square gray buttons located throughout the SRT.

***New users**: Fill in the boxes as indicated above. Choose Soil or Groundwater.*
Click buttons on Recommended Flow to proceed through the screens.
***Advanced users**: Follow Recommended Flow, or click on tabs to navigate.*

Fit Window

Fuel Costs

Gasoline	$2.50	*$/gallon*
Diesel	$2.50	*$/gallon*
Electricity	$0.10	*$/kWh*
Natural gas	$11.00	*$/mcf*

2. Choose Environmental Media

Soil...

Recommended flow:

Main → Soil Input → Excavation / SVE → Output

...or Groundwater.

Recommended flow:

Main → GW Input → Pump & Treat / Enhanced Bioremediation → Output

SUSTAINABLE REMEDIATION TOOL CALCULATION

THERMAL TREATMENT REMEDIAL OPTION (EXCAVATION PORTION ONLY)
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SOIL/SOURCE INPUT

FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

Area of Affected Soil	172097	ft^2
Depth to Top of Affected Soil	0	ft
Depth to Bottom of Affected Soil	5	ft
Depth to Groundwater	3	ft
Soil Type	Sandy gravel	
Contaminant Class		
Max Concentration		mg/kg
Typical Concentration		mg/kg
Contaminant mass	0.	lbs

Calculate natural resource service? Yes No

Instructions:

=Enter your data here. Click button to the right of the cell for help.

=Use this default value or override with your own.

=Calculated value. You cannot change this.

Paste Tier 2 Example

Clear Soil Inputs

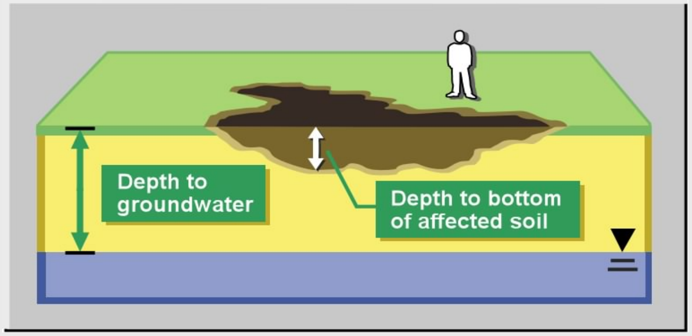
Recommended flow:

You are here

Main → Input → Next: Choose Technologies
- [x] Excavation
- [x] Soil Vapor Extraction

Next>>

→ Results



SUSTAINABLE REMEDIATION TOOL CALCULATION

THERMAL TREATMENT REMEDIAL OPTION (EXCAVATION PORTION ONLY)
FORMER AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

EXCAVATION - TIER 1

FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN
CAPITAL and O&M

Instructions:
=Enter your data here. Click button to the right of the cell for help.
=Use this default value or override with your own.
=Calculated value. You cannot change this.

Restore Defaults

Recommended flow:
Main → Input → Technology Design (You are here): Excavation; Soil Vapor Extraction → Results

Next>>

Design for Managing Soil

Airline miles flown by project team (total miles for all travelers)	0	*miles over proj lifetime*
Average Distance Traveled by Site Workers per one-way trip	10	*miles one-way*
Trips by Site Workers during construction	100	*# over project lifetime*
Trips by Site Workers after construction	10	*# over project lifetime*
Distance to Disposal (one-way)	1	*miles*
Type of Disposal	Non-hazardous	
Volume of affected soil	860,485.	*cu ft*
Volume of affected soil	31,870.	*cu yd*
Total hours to excavate	830.	*person-hours*
Number of loads for disposal	3,100.	*#*
Total miles driven for disposal	6,200.	*miles*
Total hours for fill dirt placement	350.	*hours*
Number of loads of fill dirt	3,500.	*#*
Total miles driven for fill	70,000.	*miles*

Materials and Consumable Amounts used for Metrics

Diesel	13,000.	*gal*
Gasoline	150.	*gal*

Technology Cost

Capital	3,300,000.	*$*
O&M	n/a	*$*

Project-specific Metrics (Add & Subtract/Offsets)

Yes No

Additional Technology Cost		*$*
Total Energy Consumed		*Megajoules*
CO_2 Emissions to Atmosphere		*tons CO_2*
Safety / Accident Risk		*lost hours*

SUSTAINABLE REMEDIATION TOOL CALCULATION

THERMAL TREATMENT REMEDIAL OPTION (EXCAVATION PORTION ONLY)
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

SOIL/SOURCE RESULTS

Instructions:
- =Enter your data here.
- =Use this default value or override with your own.
- =Calculated value. You cannot change this.

Recommended flow:

Main → Input → Technology Design → Results

You are here*

* Normalize metrics to see more, go back to Inputs to adjust & compare, go back to Main (Tier 1/2 or GW), or Exit.

Non-normalized

Calculations in natural units

	Excavation	SVE	
Carbon Dioxide Emissions to Atmosphere	170.	-	*tons CO_2*
CO_2 per pound of contaminant	#N/A	-	*lbs CO_2 per lb contam*
Total Energy Consumed	2,200,000.	-	*Megajoules*
	610,000.	-	*kWh*
Technology Cost	3,300,000.	-	*dollars*
Cost per pound of contaminant	#N/A	-	*dollars per lb contam*
Safety/Accident Risk	3.4	-	*lost hours*
	7.1E-02	-	*injury risk*
Change in Resource Service for Land - Economic	-	-	
Change in Resource Service for Land - Ecologic	-	-	

Normalize? Yes No

SRT

THERMAL TREATMENT REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

8 THERMAL TREATMENT			
Description	**Equipment**	**Units**	**Alt 1**
volume	desorber	cubic yard	860,485
construction area	-	acres	4
soil density	-	pounds/cubic yard	2,601
soil temperature increase	-	°C	300
specific heat of soil	-	megajules/pund °C	0.0004
plant throughput	desorber	long tons/day	336
number of construction equipment operators	-	worker	3
OTHER CATEGORIES	-	worker	0

LDW SUSTAINABILITY TOOL CALCULATION

THERMAL TREATMENT REMEDIAL OPTION
FORMER WISCONSIN AUTOMATED MACHINERY
OSHKOSH, WISCONSIN

8 THERMAL TREATMENT			Thermal	
GAS EMISSION	CO_2 emissions	lb	E_{CO2}	53,796,211
	CO emissions	lb	E_{CO}	10,099
	NOx emissions	lb	E_{NOx}	64,632
	SOx emissions	lb	E_{SOx}	317,102
WORK ACCIDENTS	expected number of accidents during miscellaneus activities	-	N_I	0.510
	expected number of deadly accidents during miscellaneus activities	-	N_F	0.001
ENERGY	energy consumption	MJ	E	3.23E+06