AECOM Imagine it. Delivered.

Analysis of Brownfield Cleanup Alternatives

East 8th Avenue Block Property
Oshkosh, Wisconsin

City of Oshkosh Redevelopment Authority

AECOM Project number: 60XXXXXX
January 11, 2019

Quality information

Prepared by	Checked by	Approved by
Michelle Freimund, P.G. Senior Project Manager/ Program Manager	Andrew Mott, P.G., CPG Senior Project Manager	Andrew Mott, P.G., CPG Senior Project Manager

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0					

Distribution List

# Hard Copies	PDF Required	Association / Company Name

Prepared for:

City of Oshkosh Redevelopment Authority
215 Church Avenue
Oshkosh, Wisconsin 54901

Prepared by:

AECOM
558 North Main Street
Oshkosh, WI 54901
aecom.com

Table of Contents

1. Introduction 1
2. Site Description and History 1
2.1 Site Location and Description 1
2.2 Site History 1
2.3 Subsurface Assessment Findings 2
2.4 Subsurface Assessment Conclusions 3
3. Potential Exposure Pathways 3
3.1 Soil 3
3.2 Groundwater 4
3.3 Vapor Intrusion 4
4. Analysis of Soil Cleanup Alternatives 4
4.1 Site Redevelopment Plans 4
4.2 Potential Cleanup Alternatives 4
4.2.1 No Action 4
4.2.2 Off-Site Landfilling 5
4.2.3 On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling 5
4.3 Evaluation of Cleanup Alternatives 5
4.3.1 Evaluation Criteria 5
4.3.2 Comparative Results 6
4.4 Recommended Cleanup Alternative 7

Figures

Figure 1 Site Location Map
Figure 2 Site Layout with Phase II ESA Boring Locations
Figure 3 Phase II ESA Soil Impacts
Figure 4 Conceptual Site Redevelopment Plan
Figure 5 Cross-Sectional View of Conceptual Site Redevelopment Plan

Tables

Table 1 Phase II ESA Soil Analytical Results – 2009
Table 2 Phase II ESA Groundwater Analytical Results – 2009
Table 3 Evaluation of Potential Soil Remedial Alternatives
Table 4 Opinion of Probable Costs of Potential Remedial Alternatives

1. Introduction

On behalf of the City of Oshkosh, Wisconsin (City), AECOM Technical Services, Inc. (AECOM) has prepared this Analysis of Brownfield Cleanup Alternatives (ABCA) for the East 8th Avenue Block property, located within the Sawdust Redevelopment Area in Oshkosh, Wisconsin (Site). The 8th Avenue Block property is a former industrial and commercial corridor and the Brownfield properties within this 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.

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 fill material. The EPA Brownfield Cleanup Grant will specifically be applied to the planned redevelopment of the Site, which consists of a parking lot. Available parking is limited in this area and very much in demand, resulting from the historical (South Shore Riverfront walkway, Pioneer Drive Park, and Menominee Nation Arena) and planned future redevelopment projects in this Sawdust Redevelopment Area.

2. Site Description and History

2.1 Site Location and Description

The Site is located at 1 and 37 East 8th Avenue in Oshkosh, Wisconsin (Parcel Nos. 90301550000 and 90301540000, respectively). The City, as part the Sawdust Redevelopment Area initiative, has combined both parcels into the East 8th Avenue block. The Site encompasses approximately 2.6 acres and is located in the Southwest 1/4 of the Southwest 1/4 of Section 24, Township 18 North, Range 16 East, in the city of Oshkosh, Winnebago County, Wisconsin. The site is generally level and currently vacant. Buildings at the site have been razed; however, the concrete from the demolition of structures and topsoil from other City projects are stockpiled on the eastern portion of the Site. These will be removed prior to site development activities. Adjacent properties currently include a mixed industrial, commercial and residential use, and vacant parcels. The location of the Site is depicted on **Figure 1**.

2.2 Site History

A Phase I Environmental Site Assessment (Phase I ESA) was performed by AECOM on the East 8th Avenue Block Redevelopment Area, dated October 2009, under a grant from the EPA Brownfields Economic Redevelopment Initiative. According to the Phase I ESA, the parcel had been developed with industrial, manufacturing and commercial facilities since 1890. Specifically, the area of the proposed development was developed in the 1890s with the Seymour Hotel, a furniture store, residential buildings and associated sheds and stables. In the mid-1900s, the Site was developed with a filling station, painting facility and equipment warehouse, a paper and napkin factory, rolled paper and paper warehouses, and a junk yard. In the late 1900s, the Site was developed with a printer (Miles Kimball Company), and at the time of the Phase I ESA, the Site contained Advance Military Packaging (manufacturer of various packaging supplies - boxes, cartons, crates, and pallets, dismantling of truck axles and associated parts washing/cleaning, and storage/warehousing).

The Phase I ESA reported that a prior environmental assessment (*Phase I Environmental Site Assessment, 1 E 8th Avenue, Oshkosh, Wisconsin*, AECOM [STS Consultants, LTD], May 5, 2005) and investigation (*Soil and Groundwater Quality Assessment Report, Miles Kimball Main and Printing Facilities, Oshkosh, Wisconsin*, GZA GeoEnvironmental, Inc., June 2, 1992) performed at the Site indicated fill soils were known to be present on the subject property from historical property uses, which included cinders, glass, sawdust, and other wood products. In addition, site investigation and remedial activities were performed in the southeast portion of the Site resulting from volatile organic compounds (VOCs) impacts to the soil and groundwater in this area. The Wisconsin Department of Natural Resources (WDNR) granted the site regulatory closure with a groundwater use restriction in May of 2002.

As a result of the Phase I ESA, the following recognized environmental conditions (RECs) and historical RECs were identified on the Site:

1. A gasoline underground storage tank (UST) of unknown size was identified near the northern property boundary (at 37 E 8th Avenue) on a 1949 Sanborn Fire Insurance (Sanborn) map. The UST appeared to be associated with a former structure on the site labeled as “private garage.”
2. The western portion of the Site was formerly occupied by a filling station from approximately the 1930s through the 1950s. Documentation concerning the abandonment of the fuel system and condition of the adjoining subsurface was not available at the time the Phase I ESA was performed.
3. The Site was formerly used as painting, printing, and paper manufacturing facilities, and as a foundry. Additionally, the southeastern portion of the Site was formerly occupied by a junk yard. The methods of use, storage, and disposal of petroleum products and other potentially hazardous substances on the Site during the period of these operations were unknown. Additionally, fill materials from the former foundry operations and from unknown sources were reportedly present on the site, and may include wood products, sawdust, glass, cinders, and other potentially hazardous substances.
4. A groundwater use restriction related to chlorinated solvents is recorded on the deed of the Site (1 E 8th Avenue, Parcel 90301550000), which was listed on the WDNR GIS website as a property with residual groundwater contamination.

Following the Phase I, a Phase II Environmental Subsurface Assessment (Phase II ESA) was performed in October 2009.

2.3 Subsurface Assessment Findings

Six soil borings (B-1 through B-6) were advanced in the area of the proposed development in association with the October 2009 Phase II ESA. Three of the soil borings were converted into temporary monitoring wells for groundwater sampling, installed to depths of approximately 8.5 to 11 feet below grade. Locations of the soil borings and monitoring wells are depicted on **Figure 2**.

Results of the soil borings indicate that fill soils apparently extend beneath the entire site and range from about two (B-1) to nine (B-3) feet thick. The fill soils are comprised of sand and gravel, cinders, sawdust, wood chips and traces of silt and clay. Beneath the fill are natural deposits of mostly silty clay, with some clayey silt, and trace organic material. According to the 1992 site investigation conducted in the southeast portion of the Site, fill material was encountered to depths between 6.5 to 9 feet below grade. In addition, a silty sand layer was encountered beneath the silty clay at depths of approximately 19 feet below grade, underlain by dolomite encountered at approximate depths of 19.5 to 25 feet below grade.

Groundwater was observed at depths between approximately four and six feet below grade, and generally flows to the northeast toward the Fox River. The 1992 site investigation also determined that groundwater flow in the bedrock (dolomite) was also to the northeast.

Results of the Phase II ESA soil and groundwater sampling indicate the following:

- Metals, VOCs, and polynuclear aromatic hydrocarbons (PAHs) were detected in samples collected from the fill soils. Several PAHs, arsenic and lead concentrations exceeded the State of Wisconsin generic direct contact residual contaminant level (RCL) for a non-industrial setting (for the upper 4 feet). No VOCs were detected in the soil sample collected from boring B-4, performed in the area of the prior Miles Kimball investigation.
- Arsenic, barium, cadmium, lead, mercury selenium, benzo(a)pyrene, and benzo(b)fluoranthene concentrations in the soil also exceeded the generic groundwater pathway RCL in the fill soils.
- VOCs (chloroethane and p-isopropyltoluene) were detected in the groundwater sample collected from temporary groundwater monitoring well B-3. Chloroethane concentrations did not exceed the WAC Chapter NR 140 groundwater quality standards.

Soil and groundwater concentrations are summarized on attached **Tables 1** and **2**.

2.4 Subsurface Assessment Conclusions

Based on results of the subsurface assessments, the concentrations of several PAHs, arsenic and lead in the fill soils represent a potential direct contact risk to human health. Additionally, arsenic, barium, cadmium, lead, mercury selenium, benzo(a)pyrene, and benzo(b)fluoranthene were detected in several soil samples at concentrations that represent a potential risk to groundwater quality. Because of the elevated levels of metals 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. 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 an exceedance of 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 RCLs were used as soil cleanup objectives for this site.

Based on soil analytical results from the Phase II ESA, a potential exposure pathway for direct contact and groundwater exists at the Site. **Figure 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 102 to 106 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 in NR 140: 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 mutagenic 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 represent groundwater cleanup criteria for this site.

Based on results of groundwater samples collected from the temporary monitoring wells installed on the East 8th Avenue Block property, no VOCs, metals or PAHs were detected above the NR 140 groundwater quality standards.

3.3 Vapor Intrusion

Vapor intrusion or the migration of volatile chemicals from the subsurface into overlying buildings was not evaluated for the site based on the redevelopment plan for the Site as a parking lot. There are no buildings or other above ground structures planned for the Site development, therefore, vapor intrusion is not an issue.

4. Analysis of Soil Cleanup Alternatives

4.1 Site Redevelopment Plans

The City Redevelopment Authority (RDA) has executed a final conceptual development plan for the site that consists of a 422 stall parking lot with underlying storm water storage and treatment. Conceptual redevelopment plans for the site are indicated on **Figures 4 and 5**. The City anticipates initiating construction in 2020.

The City proposes to implement corrective action concurrent with site redevelopment. In this manner, the parking lot with underlying storm water storage can be integral components of the remedy.

Three potential alternatives were selected for the site. These alternatives are subsequently discussed in the sections below.

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, as a vacant lot. This alternative is not practical because it constrains and potentially eliminates any practical redevelopment of this property and does not support the Sawdust Redevelopment plans.

4.2.2 Off-Site Landfilling

The off-site landfilling alternative would involve the transfer of the excavated impacted (fill) 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 to facilitate construction.

Under this alternative, the proposed parking lot would be constructed to a preliminary design depth of four feet below grade to accommodate storm water storage and placement of supporting backfill. All fill material excavated during construction would be managed as a solid waste. A geomembrane will be placed across the site following the removal of the four feet of soil and fill material. The geomembrane will act as a barrier for water infiltration from precipitation events and protect groundwater quality. Samples of impacted fill would be collected and analyzed for waste characterization analyses, as necessary, to obtain landfill approval. Potential solid waste disposal facilities include the Waste Management Valley Trail Landfill located in Berlin, Wisconsin. The site would be closed with the WDNR as a No further Action site closure as impacted soils from zero to four feet would be completely excavated.

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 at the Site and utilizing the parking lot as a performance barrier over impacted soils to address direct contact concerns. Impacted fill soils that may be reused on Site will not contain cinders, sawdust or other non-soil type material (which would be in the areas around B-4 and B-5) and would require placement outside of the proposed storm water storage area. The barrier would substantially reduce the potential for the public or site occupants to come into contact with the underlying impacted soil. In addition, the geomembrane installed beneath the storm water storage will act as a barrier for the groundwater pathway, reducing potential impacts to groundwater quality. The remaining fill material excavated to facilitate construction will require off-site landfilling. The site would be closed with WDNR but the site would have a continual obligations placed on the property for inspection and maintenance of the performance barrier.

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
- Potential climate change impacts
- 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 3**. On the basis of technical simplicity, all alternatives rated equal with the exception of the on-site reuse with performance barriers alternative. In terms of effectiveness and protecting human health and the environment, the No Action Alternative rated lowest while the other two alternatives were equally effective. For the climate change risk evaluation, the off-site landfilling scored better than the no action and on-site reuse/performance barrier alternatives. The risks from exposed soils by direct contact and impacts to groundwater quality were greater for these alternatives in the following categories:

- Increased/decreased precipitation:

  - no action: topsoil layer could be removed, exposing the impacted soils beneath, increased precipitation infiltration
  - onsite reuse with performance barrier: could crack/loosen pavement, exposing impacted soil below
- Ground thaw/freeze date changes:
  - no action: could result in flooding and surface erosion
  - onsite reuse with performance barrier: increased maintenance on pavement to prevent cracking and potholes in pavement that would expose impacted soils beneath
- Extreme weather events:
  - no action: localized flooding events eroding surface soil, mobilizing impacted soil beneath
  - onsite reuse with performance barrier: localized flooding could cause storm water reservoir beneath pavement to overfill, coming in contact with impacted soils reused on Site and mobilizing as sediment in water being pushed out of storm drains in parking lot

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. 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. In addition, soils planned for reuse would require stockpiling on Site until placement, creating additional effort by the contractor to move the soil twice (or more).

A summary of probable costs related to each of the three alternatives is summarized on **Table 4**, which is intended to be used for comparative purposes only and does not represent a formal budget to implement a specific alternative. Actual costs will depend on details of site development plans including grading plans, pavement plans, and utilities. Economically, the No Action Alternative could be implemented for the least cost; however, from a broader perspective, without implementing corrective action, the former industrial/commercial property could not be redeveloped and the economic benefit from the future redevelopment in this area that this parking lot is supporting 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 a performance barrier 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. Cap maintenance plans, for the purposes of environmental remediation, should be consistent with grounds maintenance commonly practiced for a development such as this. However, both the off-site landfilling and on-site reuse with a performance barrier are relatively equal in overall costs.

4.3.2 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. In addition, a geomembrane would be placed beneath the storm water reservoir to reduce the risk to groundwater quality from groundwater pathway migration resulting from infiltration. There is no required cap maintenance plan and associated operation and maintenance activities with this alternative. Additionally, there is less risk to human health and the environment resulting from potential climate change impacts with this alternative. Disadvantages of off-site landfilling the entire mass of impacted soils excavated for the construction of the parking lot 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 a performance barrier 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. The performance barrier will be required to

address direct contact issues with the impacted soils reused on Site, which will require a cap maintenance plan with future operation and maintenance. Disadvantages include a greater risk to human health and environment from potential climate change impacts from the contaminated soils reused (performance barrier maintenance) on Site and increased schedule to complete.

4.4 Recommended Cleanup Alternative

The on-site reuse with a performance barrier and limited off-site landfilling is the preferred remedy for achieving environmental closure at the East 8th Avenue Block property due to the cost effectiveness, implementation feasibility, potential climate change risks rating, and cost. This alternative consists of removing impacted fill material that is necessary to facility the construction of the parking lot with the storm water storage beneath, and disposing of the material at a licensed solid waste landfill. A geomembrane will be placed beneath the storm water reservoir to prevent infiltration to impacted material that may be beneath (and not removed during construction) to reduce impacts to groundwater quality.

Additionally, there are several management best practices that could be employed under the selected remedy, which support green remediation core elements with little impact on cost and effectiveness. Management practices which will be considered when implementing corrective action include: Imposing idle restrictions on construction equipment, planning trucking routes to limit noise disturbance in residential neighborhoods, sequencing work to reduce material handling, covering stockpiles for dust control, and limiting construction dewatering. The City will perform an annual maintenance on the parking lot (performance barrier) as part of their annual parking lot maintenance reducing disturbance from climate change issues.

Tables

Table 1 - Phase II ESA Soil Analytical Results – 2009

Table 2 - Phase II ESA Groundwater Analytical Results – 2009

Table 3 - Evaluation of Potential Soil Remedial Alternatives

Table 4 - Opinion of Probable Costs of Potential Remedial Alternatives

Table 1
Soil Analytical Results - September 29, 2009
East 8th Avenue Block Site
Oshkosh, Wisconsin

	Sample ID and Depth						RCL	
Parameter	**EA-B1-SO2 (2.5-4)**	**EA-B2-SO1 (4-4.5)**	**EA-B3-SO3 (4-6)**	**EA-B4-SO3 (2-4)**	**EA-B5-SO2 (2-4)**	**EA-B6-SO2 (2-4)**	Groundwater Pathway	Direct Contact (Non-Industrial)
DRO (mg/kg)	4.5	NA	40.5	NA	NA	NA	NL	NL
Metals (mg/kg)								
Arsenic	**3.4**	**8.3J**	**2.7**	**22.2**	**7.2**	**4.9J**	0.584	0.677
Barium	104	50	23.0	**222**	107	75.9	164.8	15,300
Cadmium	0.059J	0.50J	0.076J	**2.9**	0.078J	0.28J	0.752	71.1
Chromium (trivalent)	24.2	13.8	5.8	22.2	35.1	8.3	360,000	100,000
Lead	**37.9**	**134**	**42.5**	**1,470**	12.5	**359**	27	400
Mercury	0.065	0.036	0.013	**0.53**	0.045	**0.59**	0.208	3.13
Selenium	<0.30	<1.3	<0.26	**2.3J**	<0.44	<1.4	0.52	391
Silver	0.28J	0.44J	0.13J	0.76J	0.34J	0.61J	0.8491	391
Total PCBs (µg/kg)	NA	NA	<25.8	<27.0	NA	NA	9.4	234
PAHs (µg/kg)								
Acenaphthene	<1.2	3.7J	25.6J	74.9J	<1.7	72.1	NL	3,590,000
Acenaphthylene	<2.2	37.8	10.5J	359J	7.6J	74.7	NL	NL
Anthracene	<5.8	29	102	1,230	<8.4	101	196,949.2	17,900,000
Benzo (a) anthracene	<10.6	47.2	78.3	2,520	<15.3	191	NL	1,140
Benzo (a) pyrene	<4.6	36.7	61.8	**2,330**	<6.6	143	470	115
Benzo (b) fluoranthene	<7.2	48	61.7	**2,050**	<10.4	215	478.1	1,150
Benzo (g,h,i) perylene	<5.3	30.2	37.4	1,660	<7.7	<5.0	NL	NL
Benzo (k) fluoranthene	<7.9	28.8	42.1	2,030	<11.4	103	NL	11,500
Chrysene	<4.4	61.4	82.4	2,520	<6.3	334	144.2	115,000
Dibenz(a,h)anthracene	<5.9	8.9J	14.4J	482	<8.5	53.4	NL	115
Fluoranthene	6.2J	90.1	145	5,660	4.2J	389	88,877.8	2,390,000
Fluorene	<1.2	9.9J	42.1	156J	3.6J	74.2	14,829.9	2,390,000
Indeno (1,2,3-cd) pyrene	<5.3	19.6	28.8	1,390	<7.7	86.7	NL	1,150
1-Methylnaphthalene	<2.3	215	158	179J	16.2J	153	NL	17,600
2-Methylnaphthalene	<2.4	284	235	267J	31.1	251	NL	239,000
Naphthalene	8.7J	241	110	332J	71.2	506	658.2	5,520
Phenanthrene	5.0J	199	434	2,770	13.1J	556	NL	NL
Pyrene	5.3J	91.2	146	4,580	5.0J	281	54,545.5	1,790,000
VOCs (µg/kg)								
Naphthalene	<25	91.5	<25	<25	<25	<26.9	658.2	1,790,000
1,2,4 Trimethylbenzene	<25	40.3J	<25	<25	<25	<26.9	1,378.7	219,000
1,3,5 Trimethylbenzene	<25	<29.1	<25	<25	<25	39.4J		182,000

Notes:

NA=not analyzed

NL =criterion not listed.

DRO= diesel range organics

PAHs = polynuclear aromatic hydrocarbons

PCBs= polychlorinated biphenyls

VOCs = Volatile organic compounds

mg/kg = milligrams per kilogram, equivalent to parts per million.

µg/kg = micrograms per kilogram, equivalent to parts per billion.

Only the compounds detected above laboratory detection limits are listed.

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

Generic Residual Contaminant Levels (RCLs) as listed in the Wisconsin Administrative Code (WAC) NR Ch. 720 (June 2018).

Outlined values exceed the direct contact pathway RCL (only applies to soils from zero to four feet below ground surface).

Bold values exceed the groundwater migration pathway RCL (DF=2).

Table 2
Groundwater Analytical Results - September/October 2009
East 8th Avenue Block Site
Oshkosh, Wisconsin

Parameter	Sample ID				ES	PAL
	EA-B1-W100209	EA-B3-W093009	EA-B3-D093009	EA-B5-W100609		
VOCs (µg/L)						
Chloroethane	NS	1.0	<0.97	<0.97	400	80
p-Isopropyltoluene	NS	27.2	31.0	<0.67	NL	NL

Notes:
VOCs = Volatile organic compounds
µg/L = Micrograms per liter (parts per billion).
Only the compounds detected above laboratory detection limits are listed.
ES = Enforcement Standard per Wisconsin Administrative Code (WAC) Chapter NR 140 (Feb. 2017).
PAL = Preventative Action Limit per Wisconsin Administrative Code Chapter NR 140 (Feb. 2017).
NL = Criterion not listed in the Wisconsin Administrative Code Chapter NR 140 (Feb. 2017).
NS = Not sampled due to insufficient groundwater.

Table 3
Evalution of Potential Soil Remedial Alternatives
East 8th Avenue Block Site
Oshkosh, Wisconsin

Feasibility Criteria		Weight	No Action	Off-Site Landfilling	On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling
Technical simplicity		5	3	3	2
Effectiveness in protecting human health and the environment		6	1	3	3
Affordability		6	3	1	2
Implementation time frame savings		7	3	3	3
Climate Change Risk Evaluation	Increased/Decreased Temperatures	1	1	1	1
	Increased/Decreased Precipitation	1	2	1	2
	Extreme Weather Events	1	3	2	2
	Increased Risk of Wildfires	1	0	0	0
	Ground thaw/freeze date changes	1	2	1	2
	Rising Sea Level	1	0	0	0
	Changing Flood Zones	1	2	2	2
	Changing Environmental/Ecological Zones	1	0	0	0
	Increased Salt Water Intrusion	1	0	0	0
	Higher/Lower Groundwater Tables	1	1	1	3
TOTAL UNWEIGHTED SCORE			21	15	22
TOTAL WEIGHTED SCORE			**71**	**68**	**73**

Scoring
1 = Low
2 = Medium
3 = High

Table 4
Opinion of Probable Costs of Potentail Remedial Alternatives
East 8th Avenue Block Site
Oshkosh, Wisconsin

	Estimated Costs		
	No Action	Off-Site Landfilling	On-Site Reuse with Performance Barriers and Limited Off-Site Landfilling
Community Involvement	$0	$3,000	$3,000
Cleanup Planning	$0	$90,000	$90,000
Cleanup Activites	$0	$940,000	$470,000
Monitoring and Documentation	$0	$30,000	$30,000
Contigency (5%)	$0	$53,150	$29,650
Total Estimated Cost	**$0**	**$1,116,150**	**$622,650**

Figures

Figure 1 – Site Location Map

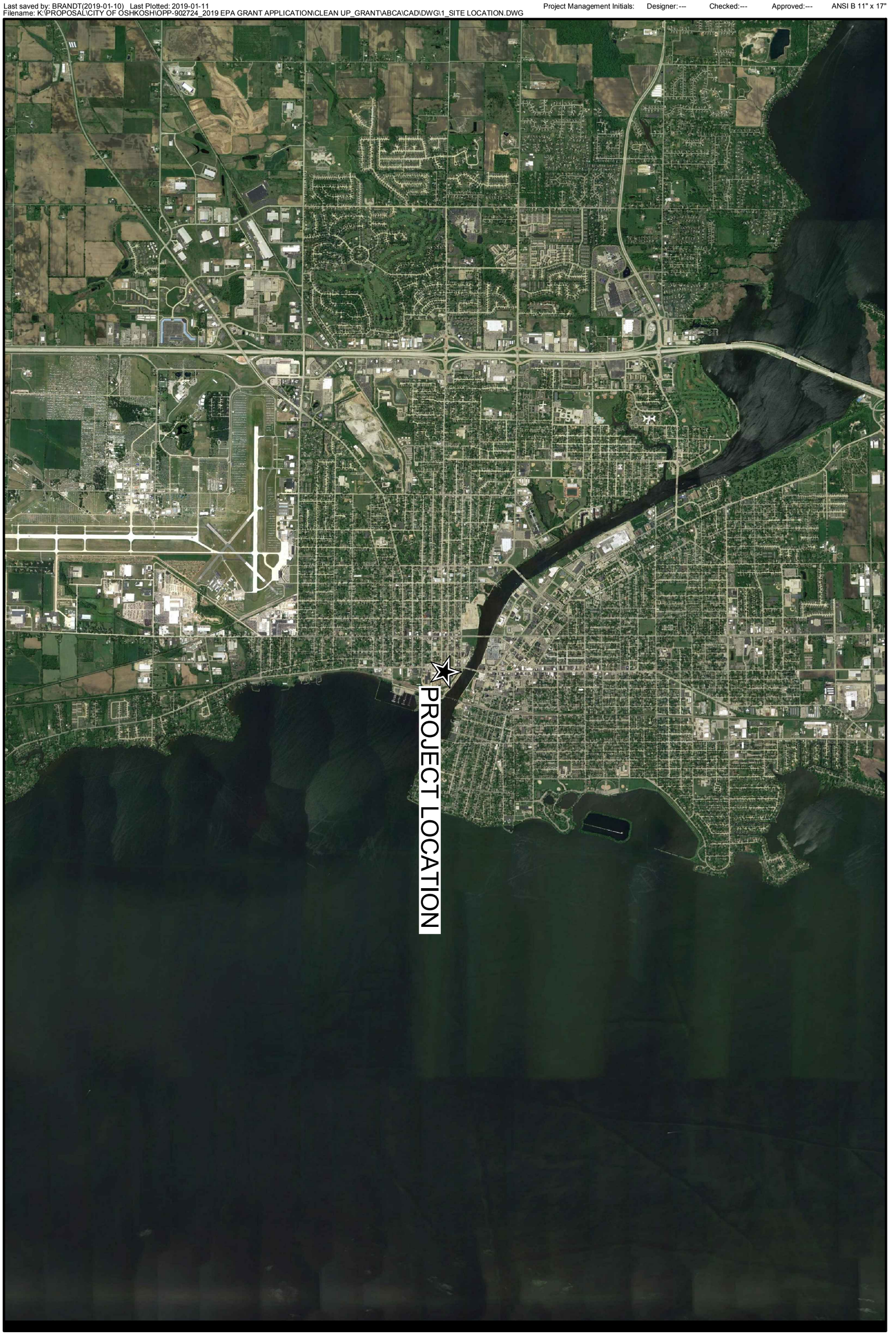
Figure 2 – Site Layout with Phase II ESA Boring Locations

Figure 3 – Phase II ESA Soil Impacts

Figure 4 – Conceptual Site Redevelopment Plan

Figure 5 – Cross-Sectional View of Conceptual Site Redevelopment Plan

Last saved by: BRANDT(2019-01-10) Last Plotted: 2019-01-11
Filename: K:\PROPOSAL\CITY OF OSHKOSH\OPP-902724_2019 EPA GRANT APPLICATION\CLEAN UP_GRANT\ABCA\CAD\DWG\1_SITE LOCATION.DWG
Project Management Initials: Designer:--- Checked:--- Approved:--- ANSI B 11" x 17"



ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
East 8th Avenue Block
City of Oshkosh, Oshkosh, Wisconsin
Proposal No.: OPP-902724 2019-01-04

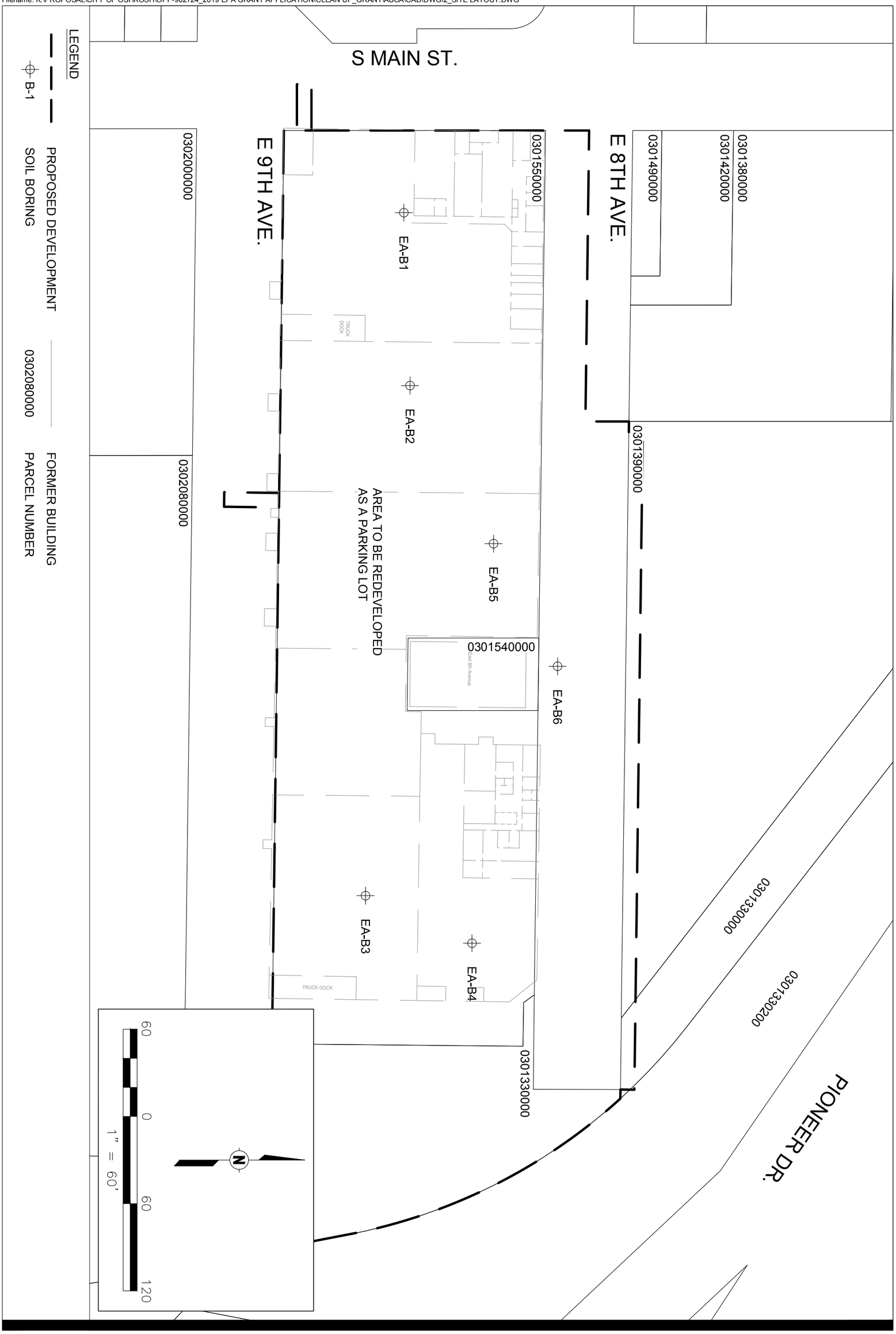
SITE LOCATION MAP

AECOM

FIGURE 1

Last saved by: BRANDT(2019-01-11) Last Plotted: 2019-01-11
Filename: K:\PROPOSAL\CITY OF OSHKOSH\OPP-902724_2019 EPA GRANT APPLICATION\CLEAN UP_GRANT\ABCA\CAD\DWG\2_SITE LAYOUT.DWG

Project Management Initials: Designer:--- Checked:--- Approved:--- ANSI B 11" x 17"



ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
East 8th Avenue Block
City of Oshkosh, Oshkosh, Wisconsin
Proposal No.: OPP-902724 2019-01-04

SITE LAYOUT WITH
PHASE II ESA BORING LOCATIONS

AECOM

FIGURE 2

E 8TH AVE.

S MAIN ST.

E 9TH AVE.

SAMPLE ID AND DEPTH	EA-B1-SO2 (2.5-4)
Metals (mg/kg)	
Arsenic	**3.4**
Lead	**37.9**

SAMPLE ID AND DEPTH	EA-B5-SO2 (2-4)
Metals (mg/kg)	
Arsenic	**7.2**

SAMPLE ID AND DEPTH	EA-B6-SO2 (2-4)
Metals (mg/kg)	
Arsenic	**4.9J**
Lead	**359**
Mercury	**0.59**
PAHs (µg/kg)	
Benzo (a) pyrene	143

SAMPLE ID AND DEPTH	EA-B4-SO3 (2-4)
Metals (mg/kg)	
Arsenic	**22.2**
Barium	**222**
Cadmium	**2.9**
Lead	**1,470**
Mercury	**0.53**
Selenium	**2.3J**
PAHs (µg/kg)	
Benzo (a) anthracene	2,520
Benzo (a) pyrene	**2,330**
Benzo (b) fluoranthene	**2,050**
Dibenz(a,h)anthracene	482
Indeno (1,2,3-cd) pyrene	1,390

SAMPLE ID AND DEPTH	EA-B2-SO1 (4-4.5)
Metals (mg/kg)	
Arsenic	**8.3J**
Lead	**134**

SAMPLE ID AND DEPTH	EA-B3-SO3 (4-6)
Metals (mg/kg)	
Arsenic	**2.7**
Lead	**42.5**

EA-B1 EA-B2 EA-B3 EA-B4 EA-B5 EA-B6

N

60 0 60 120

1" = 60'

NOTES:

PAHS	POLYNUCLEAR AROMATIC HYDROCARBONS
mg/kg	MILLIGRAMS PER KILOGRAM, EQUIVALENT TO PARTS PER MILLION
µg/kg	MICROGRAMS PER KILOGRAM, EQUIVALENT TO PARTS PER BILLION
J	ESTIMATED CONCENTRATION ABOVE THE ADJUSTED METHOD DETECTION LIMIT AND BELOW THE ADJUSTED REPORTING LIMIT

GENERIC RESIDUAL CONTAMINANT LEVELS (RCLS) AS LISTED IN THE WISCONSIN ADMINISTRATIVE CODE (WAC) NR CH. 720 (JUNE 2018).
OUTLINED VALUES EXCEEDED THE DIRECT CONTACT PATHWAY RCL (ONLY APPLIES TO SOILS FROM ZERO TO FOUR FEET BELOW GROUND SURFACE).
BOLD VALUES EXCEED THE GROUNDWATER PATHWAY RCL (DF=2).
SOIL BORINGS PERFORMED BY AECOM ON SEPTEMBER 29, 2009.

LEGEND

PROPOSED DEVELOPMENT

B-1 SOIL BORING

AECOM

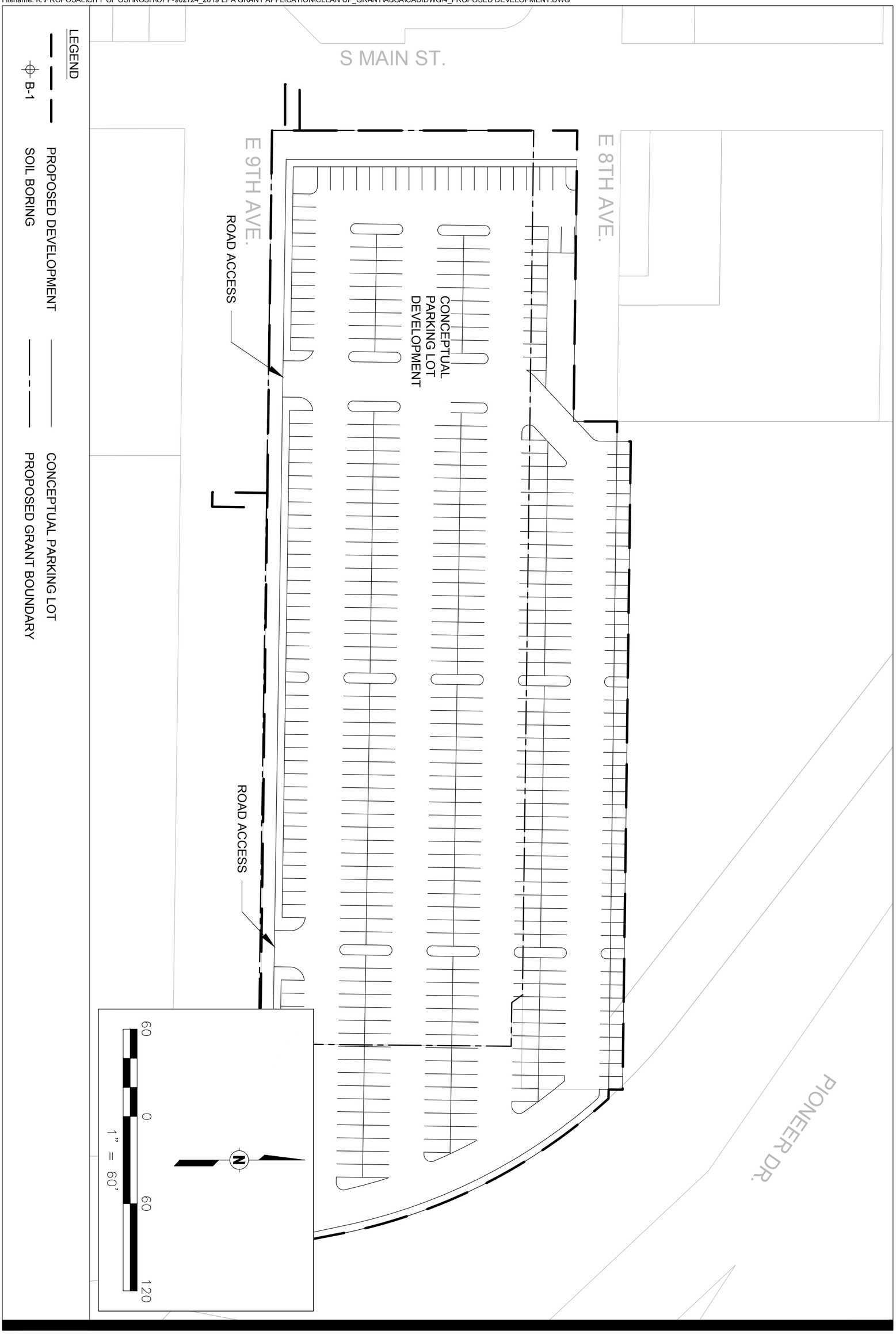
FIGURE 3

PHASE II ESA SOIL IMPACTS

ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
East 8th Avenue Block
City of Oshkosh, Oshkosh, Wisconsin
Poposal No.: OPP-902724 2019-01-04

ANSI B 11" x 17"
Approved:---
Checked:---
Designer:---
Project Management Initials:
Last saved by: BRANDT (2019-01-11) Last Plotted: 2019-01-11
Filename: K:\PROPOSAL\CITY OF OSHKOSH\OPP-902724_2019 EPA GRANT APPLICATION\CLEAN UP_GRANT\ABCA\CAD\DWG\3_SOIL TABLE AND MAP.DWG

Last saved by: BRANDT(2019-01-11) Last Plotted: 2019-01-11
Filename: K:\PROPOSAL\CITY OF OSHKOSH\OPP-902724_2019 EPA GRANT APPLICATION\CLEAN UP_GRANT\ABCA\CAD\DWG\4_PROPOSED DEVELOPMENT.DWG
Project Management Initials: Designer:--- Checked:--- Approved:--- ANSI B 11" x 17"



ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
East 8th Avenue Block
City of Oshkosh, Oshkosh, Wisconsin
Proposal No.: OPP-902724 2019-01-04

CONCEPTUAL SITE REDEVELOPMENT PLAN

AECOM

FIGURE 4

CONCRETE CURBWALK

PERMEABLE BLOCK PAVERS

ASPHALT

GEOTEXTILE
(NON-WOVEN)

5-INCH THICK MIN. AGGREGATE BASE
PER WISDOT STANDARD SPEC 305

30 MIL HDPE LINER

12-INCH THICK MIN. PERMEABLE RESERVOIR
(¾ INCH CLEAR ANGULAR STONE)

6-INCH PERFORATED
STORM SEWER

30 MIL HDPE LINER

INPLACE FILL

AECOM

FIGURE 5

CROSS-SECTIONAL VIEW OF CONCEPTUAL SITE REDEVELOPMENT PLAN

ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
East 8th Avenue Block
City of Oshkosh, Oshkosh, Wisconsin
Proposal No.: OPP902724 2019-01-04

Project Management Initials: Designer: --- Checked: --- Approved: --- ANSI B 11" x 17"

Last saved by: BRANDT (2019-01-11) Last Plotted: 2019-01-11
Filename: K:\PROPOSAL\CITY OF OSHKOSH\OPP-902724_2019 EPA GRANT APPLICATION\CLEAN UP_GRANT\ABCA\CAD\DWG\5_XS.DWG

AECOM
558 North Main Street
Oshkosh, WI 54901
aecom.com