



November 16, 2015

Mr. Bob Rosen
Brownfields Project Manager
U. S. Environmental Protection Agency, Region 4
61 Forsyth Street, SW, 11th Floor
Atlanta, GA 30303-3104

**Subject: Revised Final Analysis of Brownfields Cleanup Alternatives
McClung Warehouses
Knoxville, Knox County, Tennessee
EPA Contract No. EP-S4-14-03
Technical Direction Document No. TT-06-006**

Dear Mr. Rosen:

The Tetra Tech, Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) is submitting the revised final Analysis of Brownfields Cleanup Alternatives (ABCA) for the McClung Warehouses site located in Knoxville, Knox County, Tennessee. This revised final ABCA was prepared in support of the Phase I and Phase II environmental site assessments (ESAs) conducted as part of a Targeted Brownfields Assessment (TBA) for the site. This ABCA addresses potential climate change conditions and supersedes the revised final ABCA dated September 23, 2015.

SITE BACKGROUND AND INITIAL SITE VISIT

Businesses that formerly operated at the McClung Warehouses site included an automobile garage, woodworking shop, freight shipping businesses, and railroad freight storage, shipment, and administrative operations. The site includes 10 parcels of land located at 401, 420, 501, 505, 509, 512, 517, 519, 523, and 525 W. Jackson Avenue in Knoxville, Knox County, Tennessee. The site covers between 4 and 5 acres of land in downtown Knoxville. The portion of the site located at 401, 501, 505, 509, 517, 519, 523, and 525 W. Jackson Avenue is bordered to the north-northwest by Norfolk Southern Railroad; to the east by a woodworking shop; to the south by W. Jackson Avenue followed by commercial businesses; and to the west by a mixed-use development. The portion of the site located at 420 and 512 W. Jackson Avenue is bordered to the north by W. Jackson Avenue followed by the portion of the site located at 401, 501, 505, and 509; to the east by a banquet hall; to the south by residential condominiums and a paved parking lot; and to the west by an architectural firm. The portion of the site known as the Option Tract that extends beneath the North Broadway and Oak Avenue overpasses is bordered to the north by Norfolk Southern Railroad and to the south by the Southeastern Glass building with underground parking garage and the Keener Lighting building.

Based on historical documents, the portion of the site located at 401 W. Jackson Avenue was previously occupied by railroad freight sheds and an administrative office building from approximately 1884 to 1997. In 1903, the C.M. McClung and Company operated on this portion of the site, but vacated the property by 1917. A blacksmith shed also operated on this portion of the site for approximately 70 years. Freight businesses, including Universal Southern Carthage Company and Cargo Re Manufactured Products, Inc., also operated on this portion of the site from the 1970s through the 1980s. By 2006, the property was a paved, self-service pay-to-park parking lot. The portion of the site located at 501 and 505 W. Jackson Avenue was previously occupied by drug and oil warehouses from approximately 1884 to 1890. By 1903, this portion of the site was vacant. In 1893, the McClung Warehouses were constructed on the portion of the site located at 505 and 509 W. Jackson Avenue, which sold items such as lanterns,

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glassware, clocks, automobiles tires, lawn mowers, and bicycles. By 1917, the McClung Warehouses had expanded to the portion of the site located at 501, 517, and 523 W. Jackson Avenue. By 1950, the portion of the site located at 525 W. Jackson Avenue was occupied by Crane Co. In addition, an automobile garage occupied the portion of the site located at 512 W. Jackson Avenue. By 1973, the 512 W. Jackson Avenue property was a paved, free parking lot. Businesses operated in the McClung Warehouses until 2007 (including a woodworking shop located at 509 W. Jackson Avenue). In 2007, a fire destroyed the warehouses located at 501, 505, and 509 W. Jackson Avenue. In 2014, a second fire destroyed the warehouses located at 517, 519, 523, and 525 W. Jackson Avenue. The portion of the site known as the Option Tract, which extends beneath the North Broadway and Oak Avenue overpasses, appears to have been used as a rear access alleyway for the Keener Lighting and Southern Glass buildings.

According to the City of Knoxville Tax Assessor's Office, the owner of 401 W. Jackson Avenue is listed as the City of Knoxville; the owner of 420, 501, 505, 512, 517, 519, 523, and 525 is listed as Knoxville's Community Development Corporation; and the owner of 509 W. Jackson Avenue is listed as Ernie and Pamela H. Gross. The City of Knoxville would like to develop the property into a mixed-use complex consisting of commercial and residential properties.

In 2015, Tetra Tech, on behalf of the U.S. Environmental Protection Agency (EPA), conducted a TBA at the property, consisting of Phase I and II ESAs. In January 2015, Tetra Tech personnel conducted an initial site visit at the property and identified recognized environmental conditions (RECs), visually inspected the on-site structures for possible asbestos-containing materials (ACMs), and identified other environmental hazards on the property. These activities fulfilled the site visit requirements of a Phase I ESA and provided the basis for a Phase II sampling strategy. For more details, see *Phase I Environmental Site Assessment Report: McClung Warehouses*, prepared for EPA by Tetra Tech in August 2015. The following RECs were identified during the Phase I ESA:

- The portion of the site located at 401 W. Jackson Avenue was used by the railroad from approximately 1884 to 1997. Additionally, a blacksmith shed operated on this portion of the site for approximately 70 years.
- The McClung Warehouses, Crane Co., and oil and drug warehouses operated on the portion of the site located at 401, 501, 505, 509, 517, 519, 523, and 525 W. Jackson Avenue.
- An automobile garage operated on the portion of the site located at 512 W. Jackson Avenue for approximately 19 years.
- Suspected ACM was observed in the remnants of the warehouses at the site.

PHASE II ACTIVITIES

Based on the results of the initial site visit, EPA concluded that a Phase II ESA was appropriate to assess the RECs identified during the Phase I ESA and to identify the presence and nature of contamination, if any, on the site. During the week of March 23, 2015, Tetra Tech conducted the Phase II ESA which included soil, groundwater, soil gas, and suspected ACM sampling. Tetra Tech collected 18 surface and subsurface soil samples, three composite soil samples (including one duplicate), six soil gas samples (including one split), three groundwater samples (including one duplicate), and 53 suspected ACM samples. The analytical results for these samples are summarized below. (For full details of the sampling event, see *Phase II Environmental Site Assessment Report: McClung Warehouses*, prepared for EPA by Tetra Tech in August 2015.)

- All surface soil samples contained one or more Target Analyte List (TAL) metals, such as arsenic, cobalt, manganese, and thallium at levels that exceed EPA Regional Screening Levels (RSLs) for residential or industrial soil.
- All subsurface soil samples contained one or more TAL metals, such as arsenic, cobalt, manganese, and thallium at levels that exceed EPA RSLs for residential or industrial soil.
- No volatile organic compounds (VOCs) or semivolatile organic compounds (SVOCs) were detected in the surface and subsurface soil samples above EPA RSLs for residential or industrial soils.
- Three composite surface soil samples collected from the Option Tract contained metals, such as arsenic, cobalt, lead, manganese, and thallium at levels that exceed EPA RSLs for residential or industrial soil.
- Two soil gas samples contained benzene at concentrations that exceeded the calculated vapor intrusion screening level (VISL) for carcinogenic residential soil gas screening levels.
- Groundwater samples contained metals, but none of the concentrations exceeded EPA Maximum Contaminant Levels (MCLs).
- Six suspected ACM samples contained asbestos at greater than 1 percent.

CLEANUP ALTERNATIVES

This section presents recommendations for addressing environmental concerns identified at the site.

SURFACE AND SUBSURFACE SOIL AT THE SITE

Option 1: No Action is a zero cost option; however, it is not effective in controlling or preventing residents from coming into contact with contamination at the site.

Option 2: Surface and subsurface soil contained TAL metals such as arsenic, cobalt, lead, manganese, and thallium were detected in surface and subsurface soil at concentrations above their respective EPA RSLs for residential or industrial soil. However, these concentrations detected in the surface and subsurface soils are below their respective EPA Removal Management Levels (RMLs) for residential and industrial soils, except for two samples MC-SB05-09, collected at 9 feet below land surface (bls) at 501 W. Jackson Avenue, and MC-COM-01-DUP collected at 4 inches bls in the unpaved area of the Option Tract behind the warehouses at 501, 505, and 509 W. Jackson Avenue. Arsenic was detected at 150 mg/kg in subsurface soil sample MC-SB05-09, which is above the EPA RML of 67 mg/kg for residential soil. Lead was detected at 420 mg/kg in surface soil sample MC-COM-01-DUP, which is above the EPA RML of 400 mg/kg for residential soil. RMLs are used to help identify areas, contaminants, and conditions where a removal action may be appropriate. Sites where contaminant concentrations fall below RMLs, are not necessarily “clean.” In some cases, further action or study may be warranted. Also, sites with contaminant concentrations above the RMLs may not necessarily warrant a removal action; factors including location and depths of construction, the use of site-specific exposure scenarios or other program considerations may need to be evaluated.

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As a result, a limited, localized soil removal is recommended in the areas of soil samples MC-COM-01-DUP and MC-SB05-09. Based on EPA's removal criteria for residential properties, the top 2 feet of contaminated soil are removed, because depths greater than 2 feet are not likely to be encountered by the residents. A localized removal would be minimal costs of about \$9,800 to \$16,200 for the areas that exceed their residential RMLs. The City of Knoxville plans to redevelop the site as a mixed use complex with residential and commercial properties.

Covering the excavated areas with clean backfill 2 feet thick would require approximately 790 cubic yards of clean backfill. Clean backfill ranges in price from \$17 to \$26 per cubic yard, delivered. Purchasing and transporting 790 cubic yards of clean backfill would cost an estimated \$13,500 to \$20,600.

The cost of the soil excavation does not include the removal of the concrete foundations or building remnants at 501 (area not immediately surrounding sample MC-SB05-09), 505, 509, 517, 519, 523, and 525 W. Jackson Avenue.

ASBESTOS-CONTAINING MATERIALS

Option 1: No Action is a zero cost option; however, it is not a viable option because the remnants of the building are in disrepair and the buildings have been partially demolished. Therefore, the asbestos identified in the buildings needs to be removed.

Option 2: The black wall adhesive and roof flashing identified as ACM are non-friable and; therefore, is not regulated asbestos-containing material (RACM) provided it is not subjected to grinding, cutting, sanding, or abrading. These homogenous areas may be disposed of along with the demolition debris as long as they remain in good condition. However, doing so can greatly increase disposal costs. Often, the most economical means of addressing waste classified as non-friable RACM is to remove and dispose of it separately, prior to demolition, thus preventing all demolition debris from being contaminated. Non-RACM removal and disposal should only be undertaken by a contractor familiar with state and federal asbestos regulations. Because the removal is not an abatement, no special permitting is required for removal and disposal. Removal and disposal of RACM typically costs around \$1.50 to \$2.00 per square foot, translating to about \$4,500 to \$6,000 to dispose of the RACM identified on site. As previously mentioned, the cost of the asbestos removal does not include the removal of the concrete foundations or building remnants at 501 (area not immediately surrounding sample MC-SB05-09), 505, 509, 517, 519, 523, and 525 W. Jackson Avenue.

VAPOR INTRUSION

Option 1: No Action is a zero cost option; however, it is not effective in controlling or preventing residents from exposure to contamination at the site.

Option 2: Soil gas samples MC-SG-01 (401 W. Jackson Avenue) and MC-SG-04 (519 W. Jackson Avenue) contained elevated levels of benzene at concentrations that exceeded the cancer calculated vapor intrusion screening level for residential air of 12 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Benzene was detected in sample MC-SG-01 at $18 \mu\text{g}/\text{m}^3$ and in sample MC-SG-04 at $30 \mu\text{g}/\text{m}^3$. If residential structures are planned for the properties located at 401 and 519 W. Jackson Avenue, additional vapor intrusion assessment may be warranted.

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The property located at 401 W. Jackson Avenue is currently an asphalt-covered parking lot. If future use is going to stay the same as its current use, Tetra Tech recommends collecting four ambient air samples, one at each corner, to assess the conditions of the ambient air in the area of 401 W. Jackson Avenue. Based on TestAmerica invoices for air samples, four ambient air samples will cost approximately \$1,228, translating to about \$2,000 for a senior scientist to conduct air sampling during an 8-hour work day. If the paved parking lot is removed, Tetra Tech recommends collecting four ambient and four soil gas samples after the pavement has been removed. Based on TestAmerica invoices for air and soil gas samples, four ambient air and four soil gas samples will cost approximately \$2,500, translating to about \$3,200 for a senior scientist to conduct air and soil gas sampling during an 8-hour work day. Driller costs are estimated to be approximately \$3,600. If the results of the air and soil gas samples still exceed the cancer calculated vapor intrusion screening level for residential air, then soil excavation may need to be conducted. Soil excavation, transportation and disposal, and replacement with clean backfill for the property located at 401 W. Jackson Avenue is estimated to cost between \$30 and \$47 per cubic yard.

The property located at 519 W. Jackson Avenue is currently occupied with the remnants of a partially demolished warehouse. After the concrete foundation has been removed, Tetra Tech recommends collecting two ambient air and two soil gas samples, co-located on the north and south side of the property, to assess the conditions of the ambient air and soil gas in the area of 519 W. Jackson Avenue. Based on TestAmerica invoices for air samples, four samples will cost approximately \$1,228, translating to about \$2,000 for a senior scientist to conduct air sampling during an 8-hour work day. Driller costs are estimated to be approximately \$2,900. If the results of the air and soil gas samples still exceed the cancer calculated vapor intrusion screening level for residential air, then soil excavation may need to be conducted. Soil excavation, transportation and disposal, and replacement with clean backfill for the property located at 519 W. Jackson Avenue is estimated to cost between \$30 and \$47 per cubic yard.

POTENTIAL CLIMATE CHANGE CONDITIONS

In light of reasonably foreseeable changing climate conditions, including rising sea levels, increased frequency and intensity of flooding, and extreme weather events, an evaluation of the remedial alternatives discussed above was conducted for the Site. Sources of information used to conduct this evaluation include:

- Scenarios for Climate Assessment and Adaptation, which was accessed on-line at: <http://scenarios.globalchange.gov/content/scenarios>
- Climate Explorer, which was accessed on-line at: http://toolkit.climate.gov/climate-explorer/?tp=g_a¢er=-9355279.1,4519567.9&zoom=4&p=L&layers=aag:1

Site is located in Knoxville, Tennessee, a highly urbanized area in eastern Tennessee. Therefore, rising sea levels along the coastal areas of the southeastern United States and salt water intrusion are not expected to adversely impact the remedial alternatives discussed in the sections above. Also, the Site is located outside the 100-year floodplain of the Tennessee River. Other factors associated with climate change, including increases and decreases in temperature, potential for wildfires, and extreme weather events like hurricanes, also are not expected to adversely impact the recommended remedial alternatives.

In addition, changes in ground thaw and freeze cycles and depths to groundwater in the surficial aquifer, could potentially impact soil vapor concentrations. Benzene, detected less than three times higher than the calculated vapor intrusion screening level (VISL) for residential air for carcinogenic constituents, was the only VOC detected in soil gas samples above a calculated VISL. Based on the timeframe of past facility operations, it is likely that natural attenuation is occurring at the Site. Therefore, it is anticipated

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that the remedial alternative recommended above to address vapor intrusion will be a conservative approach that is protective of human health based on the planned future redevelopment of the Site.

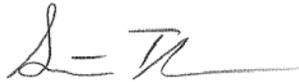
CONCLUSION

Prior to redevelopment activities, the contaminated soil identified in the Phase II ESA report should be removed and disposed of at an approved waste disposal facility. A qualified asbestos abatement company should also be retained to appropriately address the asbestos issues. Based on the Phase II ESA, the remedial alternatives presented, and climate change scenarios evaluated, Tetra Tech does not anticipate the need to modify the proposed cleanup alternatives to address changing climate conditions.

Disclaimer: This ABCA has been prepared in accordance with EPA and TDEC standards. The cleanup alternatives are based on our understanding of existing site conditions at the time field sampling was conducted. While every effort has been made to adequately characterize site conditions, the full extent of contamination may prove to be greater or less than what is represented herein. As a result, the actual cost of implementing cleanup options may vary. Cleanup costs are based on anticipated future use of the property; however, specific details on future use were not available at the completion of this ABCA.

If you have any questions regarding this ABCA, please call me at (678) 775-3115.

Sincerely,



Satara Thomas
Tetra Tech START IV Project Manager



Andrew F. Johnson
Tetra Tech START IV Program Manager

Enclosure 1:

Table 1: Costs and Assumptions Associated with Cleanup Alternatives

**TABLE 1
COSTS AND ASSUMPTIONS ASSOCIATED WITH CLEANUP ALTERNATIVES**

Remedial Alternative	Cost (USD)	Assumptions
Metals Contamination		
Option 1 – No Action	\$0	No Action is a zero cost option; however, it is not effective in controlling or preventing residents from coming into contact with contamination at the site.
Option 2 – Limited, Localized Soil Removal and Off-site Disposal of Contaminated Soil	\$9,800 to \$16,200	<p>Costs are based on the limited, localized soil removal at depths of 2 feet bls in the areas of soil samples MC-COM-01-DUP and MC-SB05-09 which exceed EPA RMLs for lead and arsenic. Costs are estimated to be \$12.30 per cubic yard to \$20.50 per cubic yard. Cost inputs were generated from experience on a similar site, RSMMeans Cost Data, and quotes from local landfills.</p> <p>Covering the excavated areas with clean backfill 2 feet thick would require approximately 790 cubic yards of clean backfill. Clean backfill ranges in price from \$17 to \$26 per cubic yard, delivered. Purchasing and transporting 790 cubic yards of clean backfill would cost an estimated \$13,500 to \$20,600.</p> <p>The cost of the soil excavation does not include the removal of the concrete foundations at 501 (area not immediately surrounding sample MC-SB05-09), 505, 509, 517, 519, 523, and 525 W. Jackson Avenue.</p>
Asbestos-Containing Materials		
Option 1 – No Action	\$0	No Action is a zero cost option; however, it is not a viable option because the remnants of the buildings are in disrepair have been partially demolished. Therefore, the asbestos identified in the buildings need to be removed.
Option 2 – Removal and Disposal	\$4,500 to \$6,000	Costs are based on typical \$1.50 to \$2.00 per square foot removal and disposal costs, applied to an estimated 3,000 square feet of RACM.
Vapor Intrusion		
Option 1 – No Action	\$0	No Action is a zero cost option; however, it is not effective in controlling or preventing residents from exposure to contamination at the site.
Option 2 – Additional Sampling at 401 W. Jackson Avenue	\$2,000 to 3,200	Four ambient air samples will cost approximately \$1,228, translating to about \$2,000 for a senior scientist to conduct air sampling during an 8-hour work day. To collect four ambient air and four soil gas samples after the pavement is removed will cost approximately \$2,500, translating to about \$3,200 for a senior scientist to conduct air and soil gas sampling during an 8-hour work day. Driller costs are estimated to be

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COSTS AND ASSUMPTIONS ASSOCIATED WITH CLEANUP ALTERNATIVES**

Remedial Alternative	Cost (USD)	Assumptions
		<p>approximately \$3,600.</p> <p>Soil excavation, transportation and disposal, and replacement with clean backfill for the property located at 401 W. Jackson Avenue is estimated to cost between \$30 and \$47 per cubic yard.</p>
Option 2 – Additional Sampling at 519 W. Jackson Avenue	\$2,000	<p>Four ambient air samples will cost approximately \$1,228, translating to about \$2,000 for a senior scientist to conduct air sampling during an 8-hour work day. Driller costs are estimated to be approximately \$2,900.</p> <p>Soil excavation, transportation and disposal, and replacement with clean backfill for the property located at 519 W. Jackson Avenue is estimated to cost between \$30 and \$47 per cubic yard.</p>

Notes:

bls Below land surface
RACM Regulated Asbestos-Containing Material
RML Removal Management Level
RSM Means Robert Snow Means
USD United States dollar