Analysis of Brownfield Cleanup Alternatives
Riverfront Parcels
Shipyard Redevelopment Area
239 Arndt and 119 Bridge Street
Green Bay, Wisconsin

(BRRTS: 03-05-213757)

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Analysis of Brownfield Cleanup Alternatives

Stantec Consulting Services Inc. (Stantec) prepared this Analysis of Brownfield Cleanup Alternatives to detail three alternatives evaluated as part of cleanup and redevelopment planning for the Riverfront Parcels situated at 239 Arndt and 119 Bridge Streets, Green Bay, Wisconsin (the Property). This Property is part of the City of Green Bay's (the City) Shipyard Redevelopment planning area. Alternative cleanup and environmental management activities with respect to changing climate and green remediation considerations, effectiveness, implementability and cost consist of the following:

- Alternative One – No Action
- Alternative Two – Site wide excavation and offsite disposal of Resource Conservation Recovery Act (RCRA) metal, Polynuclear Aromatic Hydrocarbon (PAH), and/or Petroleum Volatile Organic Compound (PVOC)-impacted soil within two feet of the ground surface followed by capping the entire Property with at least two feet of clean fill and/or impermeable surfaces (i.e. asphalt, concrete, etc.). Engine idle reduction practices would be utilized to minimize total emissions and fuel costs. Established engineering and institutional controls would be maintained.
- Alternative Three – Onsite management and capping of RCRA metal, PAH, and PVOC-impacted soil generated during construction of the proposed commercial development, parking lots, walkways, river shoreline stabilization enhancements; and maintenance of engineering and institutional controls. Engineered caps will consist of at least two feet of soil or impermeable surfaces (i.e. turf, asphalt, concrete and/or buildings). Excess excavated soil that is unsuitable for reuse on-site will be landfilled. Engine idle reduction practices would be utilized to minimize total emissions and fuel costs. Established engineering and institutional controls would be maintained.

Further details are provided in the following sections.

SITE HISTORY/COMPREHENSIVE PLAN

The City and the City of Green Bay Redevelopment Authority ("RDA") seek to complete a major redevelopment project known as The Shipyard, which involves remediating brownfields, repurposing vacant and underused structures, and enhancing a residential neighborhood on the near west side of the City. The catalyst for development involves the construction of a new commercial office headquarters for Breakthrough Fuel, LLC on the Property in conjunction with the adjacent development of a public recreation and entertainment facility at 100 W. Mason Street (Tax Parcel 2-78). The City acquired the 5.37-acre Property from the Fort Howard Corporation in 1994. This portion of the City containing the Shipyard Redevelopment Area is currently economically distressed with significant blight and underutilized brownfield sites with known contamination. This area of the City is also the focus of ongoing area-wide planning, assessment, remediation and redevelopment efforts.

The Property has a general history of industrial and commercial use. From at least 1883 to 1907, the Property was primarily used as a lumber yard and coal storage and distribution facility, with the assumed transfer of materials between cargo ships and railcars. The National Coal & Supply Co. occupied the Property from at least 1936 to the early 1980s, with most of the Property used to store coal. During the 1960s, a building likely used by a furniture manufacturing business was constructed on northern end of the Property.

Previous environmental investigations of the Property identified multiple petroleum releases occurred on the Property along with contamination migrating from the adjacent parcel to the west. Site investigation activities between 1999 and 2002 identified petroleum-contaminated soil and groundwater in the southwest corner of the site. Elevated arsenic and lead concentrations were also detected in historic fill material at the site. Cyanide concentrations in groundwater exceeded

regulatory limits across a large portion of the Property and thallium concentrations in groundwater exceeded regulatory limits beneath its northeast corner. The source of the elevated cyanide and thallium concentrations in groundwater reportedly was an adjacent site ("Ultra Plating Corp" site) to the northwest (Bureau of Remediation and Redevelopment Tracking System [BRRTS] 02-05-120570).

During 2008, the Wisconsin Department of Natural Resources (WDNR) agreed to the close the Riverfront Property case but required maintenance of a soil cap over residual petroleum, lead, and arsenic soil contamination. The WDNR also indicated in the closure letter that construction over contaminated materials may result in vapor mitigation into enclosed structures or mitigation along newly placed underground utility lines.

Additional Phase I and II environmental site assessments (ESAs) conducted by the City in 2016 and 2017 revealed select RCRA metals, PAHs, and PVOCs present in soil at concentrations above applicable Chapter NR 720 Wisconsin Administrative Code Residual Contaminant Levels (RCLs) for groundwater protection and/or direct contact. The contaminants are believed to be related to historic fill and are consistent with similar investigations conducted in downtown Green Bay. The Phase II ESA also identified selenium, barium, and cyanide in groundwater exceeding their respective NR140 preventative action limits (PAL). The previous WDNR closure was modified to include site wide impacts across the two parcels requiring a cap.

The Property is associated with two closed WDNR BRRTS cases (No. **03-05213757 and 04-05-521255)** and is managed under Case Manager Keld Lauridsen, (920) 662-5420, keld.lauridsen@wisconsin.gov. Specific concerns include direct contact with contaminated soils.

As part of the proposed redevelopment plans, the existing cap will be modified and the WDNR will require a post closure modification request in addition to a Soil Management Plan to handle soil disturbed during the redevelopment efforts.

BROWNFIELD CLEANUP ALTERNATIVES

As described above, alternative cleanup and environmental management activities considered for the Property in conjunction the proposed redevelopment plans consist of the following:

- Alternative One – No Action
- Alternative Two – Site wide excavation and offsite disposal of RCRA metals, PAHs, and/or PVOC-impacted soil within two feet of the ground surface followed by capping the entire Property with at least two feet of clean fill and/or impermeable surfaces (i.e. asphalt, concrete, etc.). Engine idle reduction practices would be utilized to minimize total emissions and fuel costs. Established engineering and institutional controls would be maintained.
- Alternative Three – Onsite management and capping of RCRA metal, PAH, and PVOC-impacted soil generated during construction of the proposed commercial development, parking lots, walkways, river shoreline stabilization enhancements; and maintenance of engineering and institutional controls. Engineered caps will consist of at least two feet of soil or impermeable surfaces (i.e. turf, asphalt, concrete and/or buildings). Excess excavated soil that is unsuitable for reuse on-site will be landfilled. Engine idle reduction practices would be utilized to minimize total emissions and fuel costs. Established engineering and institutional controls would be maintained.

No Action (i.e. natural attenuation) was evaluated as a remedial alternative to address the health and environmental impacts at the Property. Alternative 1 would leave the Property in its current condition and no action would be taken since a fence is already present surrounding the entire Property and limiting access.

- Effectiveness – Very limited to no effectiveness. Identified RCRA metals and PAH impacts are unlikely to be effectively removed by natural attenuation. Residual VOC in soil through natural attenuation is likely to occur over an extended timeline depending upon geologic, atmospheric, and biological conditions. Planned redevelopment requires the onsite management of soils which must be appropriately managed and does not provide protection from direct contact with contaminants at the Property and provides little to no protection of public health, safety and welfare and the environment if the current cap is disturbed.
- Implementability – This alternative is easy to implement in the short term; however, the expected time frame needed to achieve appropriate remedial objectives through natural attenuation of identified constituents is unlikely to be considered acceptable by WDNR. Alternative 1 would hinder future development at the Property.
- Cost – Costs are thought to be minimal. At a minimum, the Property will need to be secured as part of continuing obligations under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Probable costs for securing the Property (i.e. video surveillance/fence maintenance) are $10,000. The estimated cost for Alternative 1 is $10,000. Additional detail is provided on Table 1.

Alternative 2 involves excavation and offsite disposal of 17,500 cubic yards (CY) of RCRA metal, PAH, and PVOC-impacted soil from the Property. Excavation would remove soil from the surface to two feet below grade (direct contact interval). Following soil excavation, the site would be backfilled with clean materials to obtain desired subgrades. Engine idle reduction practices would be utilized to minimize total emissions and fuel costs. Established engineering and institutional controls would be maintained.

- Effectiveness – Highly effective in the short term and considered effective in the long term. Permanent removal of residual impacts that pose a direct contact concern and capping is consistent with WDNR guidance. In addition, excavation and offsite disposal of impacted soil is the most effective way to reduce the threat to public health, safety, welfare and the environment from soil and/or fill material impacted by low-level concentrations of RCRA metals, PAHs, and PVOCs.
- Implementability – Alternative 2 is technically easy to implement and materials, equipment, technologies, and services are easy to procure. Site accessibility will coincide with development. The permits and approval processes required for excavation and offsite disposal of impacted soil and construction of the soil capping could begin immediately depending on the development schedule.
- Cost – Alternative 2 includes site preparation tasks such as mobilization/demobilization, soil erosion and sediment control measures, construction entrance preparation, and site security ($10,000). Contaminated soil excavation, transportation and disposal (17,500 CY; $462,500) and placement of clean excavation backfill and soil cover of 17,500 CY ($210,000). Engineering fees are expected to be $30,000. The estimated cost for Alternative 2 is $712,500. This amount does not include $500,000 in additional remediation costs for excavation and transportation that is anticipated to be covered under a state funded brownfield cleanup grant. Additional detail is provided in Table 1.

Alternative 3 involves onsite management and capping of the entire Property. Approximately two-feet of clean soil materials will be utilized to provide a cap across the Property in all areas where hard surface covers will not be utilized. Soil caps will consist of 18-inches of clean soil followed by six-inches of topsoil. A limited volume of soil is expected to be encountered that is unsuitable for on-site reuse and will be disposed of off-site at a landfill. Engine idle reduction practices would be utilized to minimize total emissions and fuel costs. Established engineering and institutional controls would be maintained.

- Effectiveness – Soil consolidation and capping would be effective for the RCRA metal, PAH, and PVOC impacted soils.
- Implementability - Alternative 3 is technically easy to implement and materials, equipment, technologies and services are easy to procure. Currently the Property is a large vacant parcel and easily accessible. The permits and approval processes required for excavation of impacted soil could begin immediately depending on the development schedule.
- Cost – Alternative 3 includes site preparation tasks such as mobilization/demobilization, soil erosion and sediment control measures; construction entrance preparation; and site security ($10,000). The bulk of costs associated with Alternative 3 will be capping the site with an impervious surface or a two-foot thick clean soil cap over the entire Property with minimal soil excavation and reuse on-site ($26,350). Costs for landfill disposal of unsuitable soil is expected to be $10,000. Engineering fees are expected to be $30,000. The estimated cost range for Alternative 3 is $76,350. This amount does not include $500,000 in additional remediation costs for excavation, transportation, and capping that is anticipated to be covered under a state funded brownfield cleanup grant. Further detail is provided in Table 1.

CLIMATE CHANGE CONSIDERATIONS

The Property and Shipyard Redevelopment Area is located in Brown County which is in the northeastern portion of the State of Wisconsin. The Property is in a mixed commercial industrial/residential area and is bounded on the east by the Fox River. The water table in the area of the site is at depths ranging from four to eight feet below grade. The site is located within the Fox River floodplain.

Authoritative Resources:

The National Flood Insurance Rate Maps from the National Flood Insurance Program (FIRM) were consulted for the Green Bay area. The FIRM map number 55009 panel 0169F lists the Property as within the zone AE (Base Flood Elevations Determined). This is the 100-year flood plain. However, as part of the redevelopment efforts, the City plans to take the Property out of the flood zone.

The United States Environmental Protection Agency (USEPA) website for Climate Impacts for the Midwest was consulted (**USEPA Website:** http://www.epa.gov/climatechange/**.** Information available through the website noted that the summers in the Midwest are hot and humid, and winters are cold, since the region is far from the temperature-moderating effect of the oceans. Therefore, variations in climate will tend to be expressed without significant moderation in the area.

Site Specific Risk Factors:

Based on the physiographic location of the Property, some major climatic risk factors do not apply. For instance, Green Bay is not adjacent to an ocean or large saltwater body and therefore not likely to be affected by saltwater intrusion. In addition, local rainfall in the Midwest is expected to become more sporadic yet intense leading to higher rates of surface runoff, increasing the risk of contaminant transport. The primary climatic risk factors are the following:

- Changing flood zones – The Property is in the Fox River floodplain and therefore is at greater risk from the variations of the flood zone that could result from increased future annual and daily precipitation totals.
- Changing dates for ground thaw/freezing – Decreases in long-term average temperatures will shorten the already narrow window of the Wisconsin growing season. Increases in average temperature will increase the length of the Wisconsin growing season. These factors could affect infiltration and runoff at the Property.

- Changing the environmental/ecological zones – Possible changes will depend on the decrease or increase in average temperatures and future variations in precipitation. These factors are interrelated with the changing dates for ground thaw/freezing. Variations in the growing season will result in changes in bird nesting and migration ranges and dates and be expressed in changes in the ecological diversity of Northeastern Wisconsin, the Green Bay shoreline, and the Fox River.
- Changing the air quality Index - Decreases in average temperature long term will result in less heat index days, while increases in average temperature long term will result in more heat index days, causing increased ozone formation in urban areas. This will make it more challenging to meet air quality standards and will increase the risks of health effects in these areas.

Accommodation of Identified Climate Risk Factors:

The increase risk factor that could most effect the remediation on the site is the possibility of variation of the flood zone. Within the scope of the brownfield cleanup alternatives being considered is the use of engineered capping of the entire Property which will serve as an engineering control over areas that have been affected by the historical use of the Property.

The selected remediation alternatives will have no effect on potential variations in the growing season, as the Property is in a municipal area and will be used for green space and/or commercial space. Because of the relatively low concentrations of chemical constituents at the site, residual contaminants will be controlled by engineered cap and primarily utilized as an outdoor green space. However, it is not recommended that the Property be used for community gardens. The green space will be only indirectly affected by any changes in environmental and ecological zone, in that the type of wildlife that may use the site may vary with those changes, but the brownfield cleanup alternatives will not affect those variations. Also, the increase in green space will only serve to mitigate any air quality changes due to variations in climate, as trees and landscape planting help reduce ozone formation. The increase in green space will also aid in infiltration of rain water into the unconsolidated zone, eventually recharging the bedrock and the Fox River.

Based on the above climate change is not anticipated to significantly affect the effectiveness of the alternatives evaluated.

GREEN REMEDIATION CONSIDERATIONS

Potential remedial alternatives were evaluated with respect to USEPA's Green Remediation Strategy key actions. Alternative 1 requires the least carbon footprint. Alternative 3 appears to represent a lower carbon footprint than that required to excavate and transport all impacted soil and replace with clean soil (Alternative 2). Engine idle reduction practices will help to minimize total emissions. Alternatives two and three include restoring the Property to green space with public access to the Fox River.

RECOMMENDATION

All three remedial alternatives are considered technically feasible, though the effectiveness of each in achieving a remedial goal and providing long-term protection of human health and the environment varies greatly. Based on the conceptual site model, identified environmental liabilities, and proposed remedial alternatives, Remedial Alternative 3 was selected as the most technically and economically feasible approach to achieve the remedial objectives and provide for long-term protection of human health and the environment while providing for the greatest potential for future redevelopment. Remedial Alternative 3 is compatible with all phases of potential future uses of the Property.