ANALYSIS OF BROWNFIELD CLEANUP ALTERNATIVES
Former Ruby Headstart Building
Ruby, Alaska
May 9, 2016

1.0 Introduction

This analysis of Brownfield Cleanup Alternatives (ABCA) is intended as a screening tool to ensure and document that the appropriate type of cleanup is selected to address environmental contamination at the Ruby Former Headstart Building property in Ruby, Alaska. The preferred remedial action considers site characteristics, the surrounding environment, potential future uses, and cleanup goals.

2.0 Site Description

The Ruby Former Headstart Building property is located in the Alaska Native Village of Ruby on the Yukon River in interior Alaska. The property is a State owned parcel between Good Time Road and Airport Road, about 700 feet south of the south bank of the Yukon River. The legal description is Lot 3, Block 4, Tract A, US Survey 5088, Section 4, Township 9 South, and Range 17 East. The size of the lot, according to US Survey 5088 is 31,932 square feet.

The existing former headstart building was constructed in 1963. This property was abandoned when a new school was constructed elsewhere prior to 1979. DNR acquired the land and appurtenances (including buildings) in 1976 through a trustee deed. DNR issued a letter of entry to the City of Ruby in 1980, and a lease for the property in 1981. The City allowed the Tanana Chiefs Conference to use the site in 1981 for its Headstart preschool program. The lease expired in 2006 and the City re-applied for a lease in 2011, which was never issued due to contamination found on-site by DNR staff in a 2013 inspection. The building has been vacant since 2013 but the community continues to use the lot for summertime ceremonial events, as a checkpoint in the Iditarod, and other communal functions. Children play in the lot year-round. Both the City and Tribe are interested in reusing existing infrastructure, including a well (location unknown), for safe community gatherings. DNR cannot issue a lease to the City until extent of contamination has been identified and address and the site is deemed safe for use.

3.0 Previous Investigations

DNR conducted a site investigation in 2013 before the renewal of the City's lease on this property. DNR completed an ADEC spill report following their site visit, based on a fuel odor near the underground storage tank (UST) fill pipe and a "chemical" odor in the crawlspace. No samples were collected at this time.

In 2015, DNR and the Ruby Tribal Council requested and were awarded assistance from DEC through its Brownfield Assessment and Cleanup (DBAC) services. DNR requested assistance in evaluating the extent of contamination in the building and surrounding property so that DNR could move forward with plans to issue a lease and/or convey the property for community reuse. The DEC submitted a Draft Ruby Former Headstart Property Assessment and Cleanup Plan (PACP) to the City, Ruby Tribal Council, and DNR for their review. The PACP presents the findings of the work described below.

The issues that were addressed and/or completed as part of the 2015 DBAC are as follows:

1. A Historical Property Assessment was prepared by Ahtna Engineering Services, LLC (Ahtna) to collect historical information about the building, property use, and potential sources of contamination through a combination of records reviews, site reconnaissance, and interviews.

2. A Hazardous Building Materials Survey was completed on August 11, 2015, by Ahtna subcontractor NORTECH Sustainable Environment, Energy, Health & Safety, Inc. This included collecting numerous building material samples for analysis of asbestos. Paint was field-screened using an x-ray fluorescence (XRF) detector, and two paint samples were collected for analysis of lead. Other potential building hazardous, such as light ballasts and mercury-containing fluorescent bulbs were documented. Limited field screening for petroleum hydrocarbons in the floor of the furnace room was also conducted using a photoionization detector (PID). The asbestos identified in the building was found to be non-friable, and currently does not pose an exposure risk. Precautions must be taken to avoid any activities that would disturb any asbestos containing materials (ACM), rendering them friable. If the building requires any renovation or demolition the decision will have to be made to either encapsulate the ACM during renovation for continued management in place, or to abate (remove) the ACM.

3. Soil Field Screening and Sampling was conducted during a second visit on September 28-30, 2015. Soil samples were collected to characterize the degree and extent of contaminated soil associated with the heating oil UST and former ASTs (suppling the former school generator shed). The former AST locations were identified based on a scale pre-demolition sketch of the site in the DNR lease file.

Two areas of soil contamination were identified, with DRO, BTEX, and PAH concentrations exceeding soil cleanup levels. The contamination appeared relatively localized, extending from approximately 1 foot to 10 feet below ground surface, with an estimated soil volume of 160 cubic yards and 270 cubic yards for the UST area and the former AST area, respectively. There are multiple complete exposure pathways to contamination at the site. Incidental soil ingestion, dermal absorption of contaminants from soil, and inhalation of outdoor air are likely the dominate pathways for current exposure.

4. Crawlspace Vapor Mitigation was conducted during the September visit, when crawlspace vents were installed on the skirting around the southwest half of the building. This mitigation effort was

conducted with the approval of the ADEC project manager and ADNR property manager, with the intent of mitigating potential vapors arising from the UST-associated soil contamination. Shallow soil samples from the crawlspace were also sampled and analyzed. DRO and GRO were detected at low levels in crawlspace soil samples, but were at least an order of magnitude below cleanup levels. No BTEX or other VOCs were detected in crawlspace soil samples.

5. Air Sampling was conducted in March 2016 by Ahtna. This work was an authorized revision to the original scope of services. The goal was to evaluate both the potential for vapor intrusion, as well as the impacts to indoor-air quality from old fuel-impacted flooring in the furnace room, or other indoor background sources.

Air samples were collected from five locations: the furnace room, the main hall, the southwest portion of the crawlspace, the northeast portion of the crawlspace, and outdoor air (on the front steps of the building). Several VOC analytes were detected in indoor air, crawlspace air, and outdoor air. Concentrations were generally higher in indoor air than in crawlspace or outdoor air, suggesting a potential indoor source. However, all concentrations were below ADEC target levels for commercial indoor air.

4.0 Remedial Alternatives Considered

This section identifies the remediation alternatives that may be used to address the environmental contamination at the site. The "No Action Alternative" is used as the baseline against which the other alternatives are analyzed. All of the alternatives will be evaluated with respect to Chapter 75 of Title 18 of the Alaska Administrative Code (18 AAC 75).

The following broad categories of evaluation criteria were considered in assembling remediation at the site:

- Overall protectiveness to public health and welfare of the environment
- Feasibility in achieving site redevelopment

Summaries of general cost estimates for each alternative (with the exception of no action) are presented below. Each alternative includes the same basic assumptions for level of effort in preparing a work plan, excavating the contaminated soil, conducting twice annual air sampling in the building following soil removal, and reporting. However, each alternative includes different approaches to contaminated soil treatment, as described below.

4.1 No Action Alternative

The "No Action Alternative" is included for comparison purposes as stipulated in the ABCA process. This alternative does not address the contamination issues at the site. Contamination is present in the surface and sub-surface soil surrounding the building and could potentially migrate to groundwater having a possible negative effect on human health with prolonged exposure. Given the

use of this property for community functions and as a children's play area, this property would remain both a physical and environmental hazard. The no action alternative has no associated cost.

4.2 Removal and Thermal Desorption - Alternative #1

The "Removal and Thermal Desorption Alternative #1" includes excavation of the bulk of contaminated soil, transport to Fairbanks via barge, and treatment via thermal desorption. Thermal desorption involves heating the soil in a specialized "incinerator" to remove contaminants from bulk soil. The advantage of this alternative is that it eliminates the risk to human health and the environment almost immediately. The disadvantage is the high cost. The following table presents a summary of general estimated costs for Alternative #1:

Item	Task 1 - Work Plan	Task 2 - Cleanup	Task 3 - Thermal Desorption	Task 4 - Air sampling	Task 5 - Reporting
Labor	$8,000	$7,000	$3,000	$4,000	$7,000
Subcontract	$0	$33,000	$392,000	$3,000	$0
Equipment and supplies	$0	$1,000	$0	$1,000	$0
Materials	$0	$5,000	$11,000	$0	$0
ODC	$1,000	$2,000	$1,000	$2,000	$100
Task Totals	$9,000	$48,000	$407,000	$10,000	$7,100
Contingency (15%)	$1,200	$6,900	$60,900	$1,200	$1,000
Totals w/contingency	$10,200	$54,900	$467,900	$11,200	$8,100
PROJECT TOTAL - SOIL TREATMENT BY THERMAL DESORPTION					**$552,300**

This cost estimate assumes soil would be loaded in supersacks, transported to the barge landing in Ruby, barged to Nenana, trucked to Fairbanks, and disposed via thermal desorption. The freight costs used in this estimate are approximate.

4.3 Removal and Landfarming - Alternative #2

The "Removal and Landfarming - Alternative #2" includes excavation of the bulk of contaminated soil and treatment via landfarming at a suitable local site. Landfarming is a means of treating contaminated soil through a combination of physical and biological processes by spreading it in a thin layer, tilling it regularly, and augmenting it with fertilizer as needed. The advantages of this alternative are that it can achieve cleanup levels fairly rapidly (1 to 2 years) if the landfarm is well managed and tilled frequently, it is a proven solution readily achievable with local equipment, and the costs are relatively low. The disadvantages are that it requires active management and depends on the routine use of heavy equipment. Also, exposure to contamination remains a relatively high risk throughout the treatment process, particularly for the landfarm operator. The following table presents a summary of general estimated costs for Alternative #2:

Item	Task 1 - Work Plan	Task 2 - Cleanup	Task 3 - Landfarming	Task 4 - Air sampling	Task 5 - Reporting
Labor	$8,000	$7,000	$8,000	$4,000	$7,000
Subcontract	$0	$33,000	$23,000	$3,000	$0
Equipment and supplies	$0	$1,000	$1,000	$1,000	$0
Materials	$0	$5,000	$1,000	$0	$0
ODC	$1,000	$2,000	$1,000	$2,000	$100
Task Totals	$9,000	$48,000	$34,000	$10,000	$7,100
Contingency (15%)	$1,200	$6,900	$4,800	$1,200	$1,000
Totals w/contingency	$10,200	$54,900	$38,800	$11,200	$8,100
PROJECT TOTAL - SOIL TREATMENT BY LANDFARMING					**$123,200**

This cost estimate assumes relocation of the soil to a suitable local treatment site (within 5 miles), no bottom liner, one-time nutrient testing and fertilizer augmentation, twice-monthly tilling for two six-month seasons, and two progress sampling events.

4.4 Removal and Rhizoremediation – Alternative #3

The "Removal and Rhizoremediation Alternative #3" includes excavation of the bulk of contaminated soil and treatment via rhizoremediation at a suitable local site. Rhizoremediation is a passive means of treating contaminated soil through biological action by planting vegetation, creating a favorable and sustainable environment in the root zone for microbes that break down the contamination over time. It is a form of phytoremediation, or "remediation by plant." One advantage of this alternative is that it achieves quick reduction of exposure risk and contaminant migration once the vegetative cover is established, by stabilizing the soil surface (preventing dust) and reducing surface runoff and subsurface leaching of contaminants. Also, it requires minimal management, and costs are low. The primary disadvantage is the length of time required to achieve cleanup goals (estimated at 3 to 6 years). The following table presents a summary of general estimated costs for Alternative #3:

Item	Task 1 – Work Plan	Task 2 – Cleanup	Task 3 - Rhizoremediation	Task 4 - Air sampling	Task 5 - Reporting
Labor	$8,000	$7,000	$6,000	$4,000	$7,000
Subcontract	$0	$33,000	$7,000	$3,000	$0
Equipment and supplies	$0	$1,000	$1,000	$1,000	$0
Materials	$0	$5,000	$1,000	$0	$0
ODC	$1,000	$2,000	$2,000	$2,000	$100
Task Totals	$9,000	$48,000	$17,000	$10,000	$7,100
Contingency (15%)	$1,200	$6,900	$2,200	$1,200	$1,000
Totals w/contingency	$10,200	$54,900	$19,200	$11,200	$8,100
PROJECT TOTAL - SOIL TREATMENT BY RHIZOREMEDIATION					**$103,600**

This cost estimate assumes relocation of the soil to a suitable local treatment site (within 5 miles), no bottom liner, planting with locally-harvested willows and native grasses, one-time nutrient testing

and fertilizer augmentation, and one baseline sampling event. An estimated treatment time of 3 to 6 years is estimated for rhizoremediation of the contaminated soil. Since the final (closure) treatment sampling event would be outside the timeframe of the cleanup contract, that cost is not included (total cost of such a sampling event is estimated at roughly $5,000).

5.0 Preferred Remedial Alternative

The remedial alternatives were evaluated based on overall protectiveness to public health and welfare of the environment, and feasibility in achieving site reuse.

The "No Action Alternative" would leave the contaminated soil in place possibly endangering the community by exposure to contamination via multiple complete pathways, and hampering re-use of the site.

The Removal and Disposal Alternatives #1, #2, and #3 are considered technically feasible and capable of protecting human health and the environment. However, alternative #1 is not economically feasible due to the cost prohibitive nature of transporting and treating a large volume of soil with thermal desorption. Alternatives #2 and #3 are similar in cost and general approach, and share some of the same advantages and disadvantages. Both would serve to treat contaminated soil to below cleanup levels for a reasonable cost. Anticipated treatment times are longer with rhizoremediation, though success is less dependent on ongoing management. There is also the added advantage that risk of exposure and contaminant migration are reduced significantly within the first year by establishing a vegetative cover over the contaminated soils. Further, given limitations in the anticipated project budget, rhizoremediation is most likely to be economically feasible, having the lowest cost of the three alternatives.

DEC has determined that the "Removal and Rhizoremediation - Alternative #3" is the preferred remedial strategy for the site. The removal of contaminated soil will provide an important step in reuse of this property by providing a safe location for a community gathering space.

7.0 References

Ahtna Engineering Services, LLC. April 2016. Draft Property Assessment and Cleanup Plan, Former Headstart Building, Ruby, Alaska. ADEC File ID: 870.38.004

Notice of the public comment period for this ABCA document was posted on May 24, 2016. DEC held a public meeting in Ruby on June 22, 2016. Community members were generally supportive of the plan and provided useful feedback. One comment was received during the comment period; this comment and its response are summarized below.

Comment:

I am concerned about contamination running from the proposed treatment site into Little BigCreek. I recommend using the trail off Ruby Slough Road, because it is higher up and away from any creeks.
-Billy McCarty (Tribal Elder)

Response:

The DEC project manager, DNR representative, and DEC's consultant visited the location suggested by Mr. McCarty and we believe it is an ideal location for the treatment plot. Additional research into land ownership and access will be undertaken before finalizing the selection of a treatment plot, however due to community's concerns over nearby water bodies the previously proposed location at 3-mile pit will not be considered further.