ABCA EXECUTIVE SUMMARY
CITY OF SHERWOOD PUBLIC MEETING
AUGUST 22, 2017

Amec Foster Wheeler prepared an Analysis of Brownfield Cleanup Alternatives (ABCA) for two vacant tax lots (Tax Lots 600 and 602) at the Former Frontier Leather Property (Site) located at 1210 SW Oregon Street in Sherwood, Oregon (Figure 1). The Site consists of approximately 24 acres with 17.36 acres identified as wetland areas. The Site is surrounded by industrially zoned land on the west, north, and east with a residential neighborhood located south of the Site. Washington County currently owns the property as a result of property tax foreclosure.

BACKGROUND

Historically, the Site was part of a large tannery operation that existed from the late 1940s through the early 1990s and was used for landfilling of hide-splits (the non-valued part of the hide) and for processing various tannery wastes. Site soil and sediment are contaminated with metals, primarily chromium, associated with the tanning process and waste treatment. The hide-split landfill remains on-Site, as do remnants of two aeration ponds and two sedimentation lagoons used for waste treatment.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) are written statements that guide how cleanup alternatives are developed because they define what requires remediation using the outcome of the remedial investigations. The RAOs below were developed for the Site to address the issues of contamination identified by remedial investigations conducted in 2003-2004 and 2015. The Oregon Department of Environmental Quality (DEQ) was provided a preview of these RAOs to obtain early input prior to preparing the ABCA:

1. RAO #1 – Prevent ecological receptors from exposure to soil or sediments containing chromium, or other metals, at concentrations in excess of appropriate cleanup levels determined to be protective of sensitive Site receptors.
2. RAO #2 – Prevent migration of soil or sediments in stormwater or surface water runoff that could result in an adverse effect to the beneficial water uses of Rock Creek for aquatic life.
3. RAO #3 – Source control of materials in historical features that are not being addressed by RAO #1 or RAO #2 (i.e. the two aeration ponds, hides on the ground surface outside the footprint of the hide-split landfill).
4. RAO #4 - Remediate soil or sediment hot spots of contamination to the extent feasible.

Amec Foster Wheeler Environment & Infrastructure, Inc.
7376 SW Durham Road
Portland, Oregon
USA 97224
Tel+1 (503) 639-3400
www.amecfw.com

These RAOs were used to develop a series of remedial action alternatives to address contaminated soil, contaminated sediment, and the hide-split landfill.

Proposed Cleanup Levels

DEQ was also provided a preview of proposed cleanup levels and their application in identifying areas for remediation. Chromium was previously found to be the chemical of greatest concern for ecological receptors and therefore the selection of cleanup levels focused on addressing chromium in soil and sediment. In consultation with DEQ, the following cleanup levels for chromium were identified as relevant and appropriate for this Site:

- Site-specific risk-based concentration (RBC) of 280 mg/kg for soil – This value was developed based on bioaccumulation to the America Robin from consumption of worms (as previously established in the 2003-2004 remedial investigation).
- Probable Effect Concentration (PEC) of 111 mg/kg for sediment – The PEC is a consensus-based sediment guideline that approximates a level above which harmful effects are likely to be observed. The PEC also considers the effects of multiple chemicals.
- Soil Hot Spot Cleanup Level of 2,800 mg/kg – DEQ rules provide a preference for treatment of hot spots for areas contributing the greatest amount of unacceptable risk. A 10-fold multiplier is applied to the site-specific RBC to calculate the soil hot spot cleanup level.
- Sediment Hot Spot Cleanup Level of 1,110 mg/kg – As for soil, DEQ rules provide a preference for treatment of hot spots with a 10-fold multiplier applied to calculate the sediment hot spot cleanup level.

Hot spot cleanup levels were used to identify remediation areas that contribute the greatest level of unacceptable risk to ecological receptors. Additionally, hot spot cleanup levels were used to define soil and sediment remediation areas so that a smaller volume of soil could be considered in the development of remedial alternatives, reducing the cost of remediation.

No areas of soil contamination outside the footprint of the hide-split landfill exceeded the hot spot level of 2,800 mg/kg in the upland portion of the Site. Therefore, no soil remediation areas were identified in the upland portion of the Site, except for the hide-split landfill. Multiple areas of sediment contamination in the wetland portion of the Site did exceed the hot spot level of 1,110 mg/kg (Figure 2).

Remedial Alternatives

Seven cleanup alternatives were developed for evaluation in the ABCA. Each was developed within the context of Site redevelopment as the future city public works facility and possibly with park space to provide access to the Tualatin River National Wildlife Refuge. Re-locating the public works facilities to the Site puts out-of-use industrial land back into productive service for the community while moving the facility away from the downtown core where public works activities are in conflict with desired downtown development. The seven cleanup alternatives are:

1. Alternative 1 – No Action
2. Alternative 2 – Removal and Disposal of Contaminated Sediments and Hide Splits

3. Alternative 3 – Placement of Contaminated Sediments and Hide Splits Within High-Density Polyethylene (HDPE)-Lined On-Site Containment Cell
4. Alternative 4 – Placement of Contaminated Sediments and Hide Splits Within Chemically Stabilized On-Site Containment Cell
5. Alternative 5 – Placement of Contaminated Sediments Within Chemically Stabilized On-Site Containment Cell; Removal and Disposal of Hide Splits
6. Alternative 6 – Placement of Contaminated Sediments Within Chemically Stabilized On-Site Containment Cell; Hide-Split Landfill Managed In Place
7. Alternative 7 – Removal and Disposal of Contaminated Sediments; Hide-Split Landfill Managed In-Place

Each alternative was evaluated using the balancing factors required by DEQ, as well as evaluating sustainability and climate change concerns as required by the United States Environmental Protection Agency (US EPA) Brownfield program. The balancing factors include:

- protectiveness
- effectiveness
- long-term reliability
- implementability
- implementation risk
- sustainability
- climate change concerns
- cost

Table 1 presents a summary of the cleanup alternatives compared to the evaluation criteria. Table 2 provides a summary of the major redevelopment costs for each alternative.

MAJOR ASSUMPTIONS

The ABCA evaluates six remedial alternatives (excluding Alternative 1 which is "no action") within the context of five major assumptions:

1. Remediation Areas Defined using Hot Spot Cleanup Levels – All six remedial alternatives have remediation areas for soil and sediment defined based on the hot spot cleanup levels of 2,800 mg/kg and 1,110 mg/kg, respectively. Remediation to a lower and more stringent standard would increase the cost of all six alternatives.
2. Wastes are Classified as Non-Hazardous – Three alternatives include off-site disposal as part of the remedy, and assume contaminated materials are non-hazardous, based on assessment data. The costs for remediation for these three alternatives would increase if some or all of the contaminated materials must be handled as hazardous waste.
3. An On-Site Containment Cell Can be Constructed in a Wetland – Four of the six remedial alternatives rely on construction of an on-site containment cell in a wetland area (in the south sedimentation lagoon), where the water table is above the ground surface during the wet season. These four alternatives assume that major reconstruction of the sedimentation

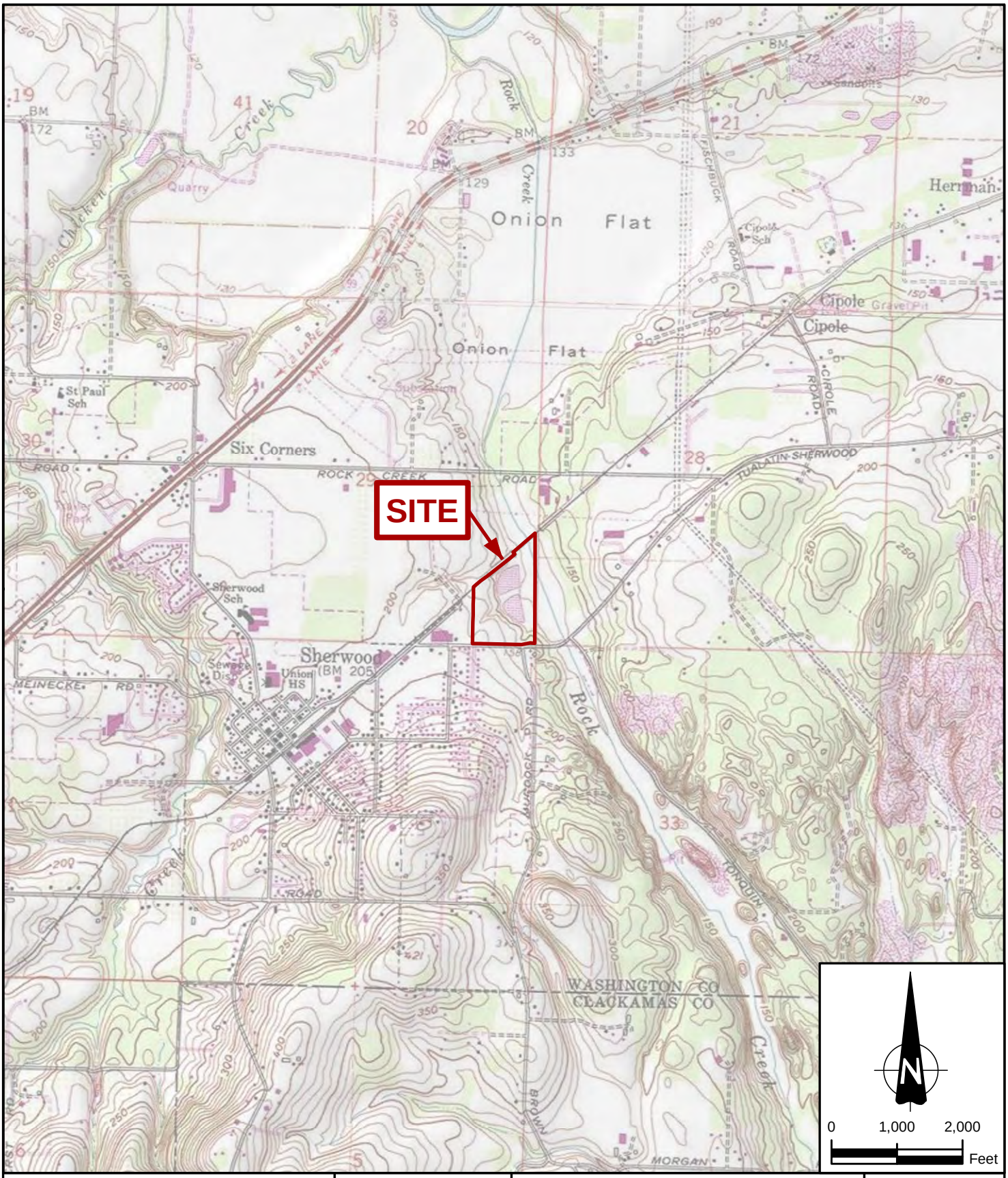
lagoon would not be required (other than addition of an engineered floor and cap) and that the regulatory agencies governing environmental cleanup and wetland areas will approve this approach. Additional planning and engineering design beyond that presented in this ABCA will be required if the selected alternative includes construction of an on-site containment cell.

4. Preservation of Upland Area for Redevelopment – Construction of an engineered on-Site containment cell in the upland portion of the Site was not evaluated to preserve the upland portion of the Site for future redevelopment. Managing the hides in place where they currently exist, however, is evaluated in two alternatives to provide a simplified evaluation of an upland management strategy.

5. Wetland Mitigation – All of the remedial alternatives will impact wetland areas, including a maximum elimination of 1.2 total acres of wetland from the Site. Loss of wetlands will require mitigation, so the ABCA incorporates a simplified assessment of the requirements for mitigation to capture estimated costs for this element of a cleanup. The simplified assessment assumes that the City will pay into a wetland bank for two alternatives (increasing remedy cost) and assumes the City would be willing to open and manage a wetland mitigation bank to sell wetland mitigation credits for three alternatives (decreasing remedy cost). However, there could be a variety of other solutions that will meet mitigation requirements, so additional planning and negotiations with key regulatory agencies will be required to design a final wetland mitigation plan that integrates with the selected remedy.

SELECTED ALTERNATIVE

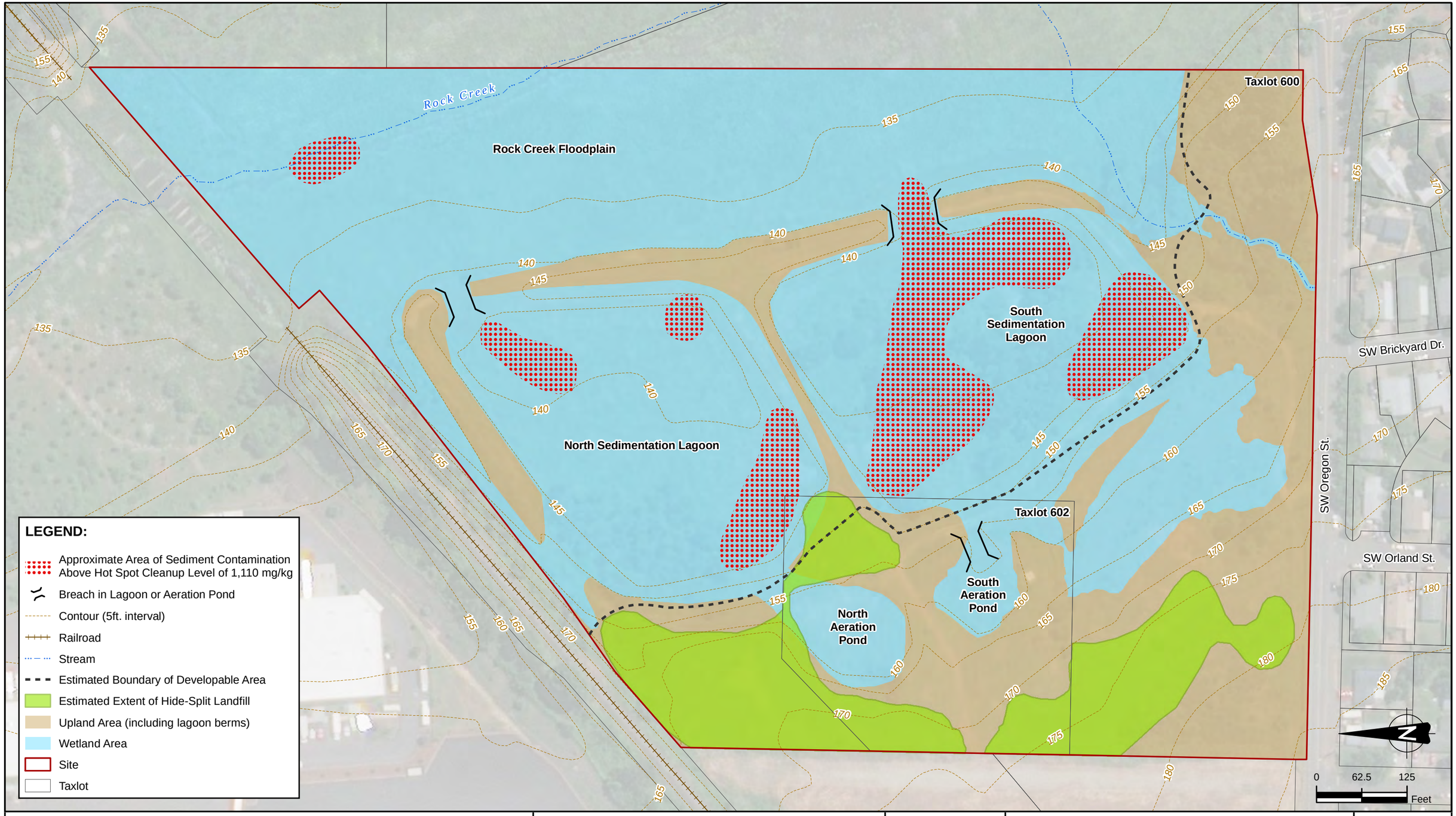
Alternatives 2 and 7 ranked the highest, followed by Alternatives 4 and 5 which were closely ranked. When cost is considered, Alternatives 4 and 7 are the lowest, at $1.37M and $1.6M, respectively. However, the lowest cost alternative (Alternative 7) leaves hides in place in the upland portion of the Site, which is not a desired attribute for putting the property back in productive use. Therefore, Alternative 4 – *Placement of Contaminated Soils and Hides in a Chemically Stabilized On-Site Containment Cell* - is selected as the most appropriate cleanup action for the Site based on the balancing factors, including cost, and assuming preservation of the upland portion of the Site for redevelopment. The primary components of Alternative 4 are depicted on Figure 3 including the proposed excavation areas and the proposed location of the chemically-stabilized containment cell.



CITY OF SHERWOOD		FORMER FRONTIER LEATHER PROPERTY SHERWOOD, OREGON	DATE: JULY 2017
			SCALE: 1 " = 2,000 '
Amec Foster Wheeler Environment & Infrastructure, Inc. 7376 S.W. Durham Road Portland, OR 97224	amec foster wheeler	SITE LOCATION MAP	PROJECT NO.: 5-61M-130820-03
			FIGURE: 1

DRAWN BY: SD CHECKED BY: EH

K:\13000\13000\13082\DWG_ABCA\Figure 1 - Site Location Map.mxd - stephane.descombes - 7/25/2017 - 10:33:31 AM



DRAFT

CITY OF SHERWOOD

Amec Foster Wheeler
Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224

FORMER FRONTIER LEATHER PROPERTY
SHERWOOD, OREGON

CLEANUP PLANNING MAP

DATE: AUGUST 2017
SCALE: 1 " = 125 '
PROJECT NO.: 5-61M-130820-03
FIGURE: 2

DRAWN BY: SD CHECKED BY: EH

K:\13000\13000\13082\DWG_ABCA\Figure 2 - Cleanup Planning Map.mxd - stephane.descombes - 8/8/2017 - 11:24:14 AM

Rock Creek

Rock Creek Floodplain

Floodplain Excavation
(Approx. Volume: 200 cu. yds.)

North Sedimentation Lagoon Excavation
(Approx. Volume: 2,600 cu. yds.)

North Sedimentation Lagoon

South Sedimentation Lagoon

Phosphate-Amended Containment Cell
(Approx. Volume: 35,000 cu. yds.)

Taxlot 600

Taxlot 602

South Aeration Pond

North Aeration Pond

Hide-Split Landfill Excavation
(Volume: 25,300 cu. yds.)

SW Brickyard Dr.

SW Oregon St.

SW Orland St.

LEGEND:

- Approximate Area of Sediment Contamination Above Hot Spot Cleanup Level of 1,110 mg/kg
- Chemically Stabilized Containment Cell (Approximate Volume: 35,000 cu. yds.)
- Excavated Area
- Breach in Lagoon or Aeration Pond
- Contour (5ft. interval)
- Railroad
- Stream
- Estimated Boundary of Developable Area
- Estimated Extent of Hide-Split Landfill
- Upland Area (including lagoon berms)
- Wetland Area
- Site
- Taxlot

N

0 62.5 125
Feet

NOTE: Containment cell would be capped with 3 feet of suitable fill.

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Environment & Infrastructure, Inc.
7376 S.W. Durham Road
Portland, OR 97224

FORMER FRONTIER LEATHER PROPERTY
SHERWOOD, OREGON

SELECTED REMEDIAL ALTERNATIVE MAP

DATE: AUGUST 2017
SCALE: 1 " = 125 '
PROJECT NO.: 5-61M-130820-03
FIGURE: 3

DRAWN BY: SD CHECKED BY: EH

K:\13000\13000\13082\DWG_ABCA\Figure 3 - Selected Cleanup Alternative Map.mxd - stephane.descombes - 8/8/2017 - 11:26:18 AM

TABLE 1
Summary of Cleanup Alternatives Compared to Evaluation Criteria
Former Frontier Leather Tannery Property
Sherwood, Oregon

Alternative No. and Title	Protectiveness		Effectiveness		Long-term Reliability		Implementability		Implementation Risk			Sustainability		Climate Change Concerns		Rank (higher score = more desirable)	Cost
	Scoring		Scoring		Scoring		Scoring		Scoring			Scoring		Scoring			
	None 0 Low 1 Moderate 2 High 3		None 0 Low 1 Moderate 2 High 3		None 0 Low 1 Moderate 2 High 3		NA Difficult 1 Moderate 2 Easy 3		None 0 High 1 Moderate 2 Low 3		No. of Weeks	NA Low 1 Moderate 2 High 3		None 4 Low 3 Moderate 2 High 1			
Alternative 1 No Action	None	0	None	0	None	0	Easy	3	None	0	0	Moderate	2	None	4	9	$0
Alternative 2 Removal and Disposal of Contaminated Soils and Hide	High	3	High	3	High	3	Easy	3	High	1	13	Moderate	2	None	4	19	$2,490,000
Alternative 3 Placement of Contaminated Soils and Hides in (HDPE)-Lined On-Site Containment Cell	High	3	High	3	Low	1	Difficult	1	Moderate	2	12	Moderate	2	Moderate	2	14	$1,780,000
Alternative 4 Placement of Contaminated Soils and Hides in Chemically Stabilized On-Site Containment Cell	Moderate	2	High	3	Moderate	2	Easy	3	Moderate	2	10	High	3	Moderate	2	17	$1,600,000
Alternative 5 Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Removal and Disposal of Hides	Moderate	2	High	3	Moderate	2	Easy	3	Moderate	2	9	Moderate	2	Moderate	2	16	$2,540,000
Alternative 6 Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Hides Managed In Place	Moderate	2	High	3	Low to Moderate	2	Easy	3	Low	3	8	Low	1	Moderate	2	16	$1,590,000
Alterative 7 Removal and Disposal of Contaminated Soils; Hides Managed In-Place	Moderate	2	High	3	Moderate	2	Easy	3	Moderate	2	9	High	3	None	4	19	$1,370,000

Notes:
No. of weeks - total weeks estimated for construction
Green highlight identifies the remedial alternatives with the highest rank
Yellow highlight identifies the alternatives of similar score below the highest ranked alternatives

TABLE 2
Summary of Key Costs for Each Remedial Alternative
Former Frontier Leather Tannery Property
Sherwood, Oregon

Major Redevelopment Elements	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6	Alternative 7
	No Action	Removal and Disposal of Contaminated Soils and Hide	Placement of Contaminated Soils and Hides in (HDPE)-Lined On-Site Containment Cell	Placement of Contaminated Soils and Hides in Chemically-Stabilized On-Site Containment Cell	Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Removal and Disposal of Hides	Placement of Contaminated Soils in Chemically-Stabilized On-Site Containment Cell; Hides Managed In Place	Removal and Disposal of Contaminated Soils; Hides Managed In-Place
Consultant Fees (Labor and Expenses)	$ -	$ 304,000	$ 296,000	$ 272,000	$ 264,000	$ 248,000	$ 259,000
Contractor Fees	$ -	$ 2,180,000	$ 1,482,000	$ 1,327,000	$ 2,269,000	$ 1,333,000	$ 1,110,000
Excavation/Grading	$ -	$ 501,000	$ 501,000	$ 501,000	$ 501,000	$ 341,000	$ 341,000
Transport/Disposal	$ -	$ 1,767,000	$ -	$ -	$ 1,218,000	$ -	$ 550,000
Site Prep	$ -	$ 87,000	$ 83,000	$ 75,000	$ 71,000	$ 67,000	$ 71,000
Liner/Phosphate Installation	$ -	$ -	$ 319,000	$ 193,000	$ 193,000	$ 193,000	$ -
Wetland Mitigation	$ -	$ (600,000)	$ 189,000	$ 189,000	$ (206,000)	$ -	$ (600,000)
Cap Cover/Backfill/Restoration	$ -	$ 142,000	$ 198,000	$ 198,000	$ 198,000	$ 765,000	$ 605,000
Contractor Markup	$ -	$ 285,000	$ 194,000	$ 174,000	$ 296,000	$ 174,000	$ 145,000
Total	$ -	$ 2,490,000	$ 1,780,000	$ 1,600,000	$ 2,540,000	$ 1,590,000	$ 1,370,000

Notes:
Negative wetland mitigation costs indicate a credit for wetland mitigation banking. Require restoration and sale of wetland credits.