

BNSF Railway Black Tank Site Draft Cleanup Action Plan

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Toxics Cleanup Program
Eastern Region



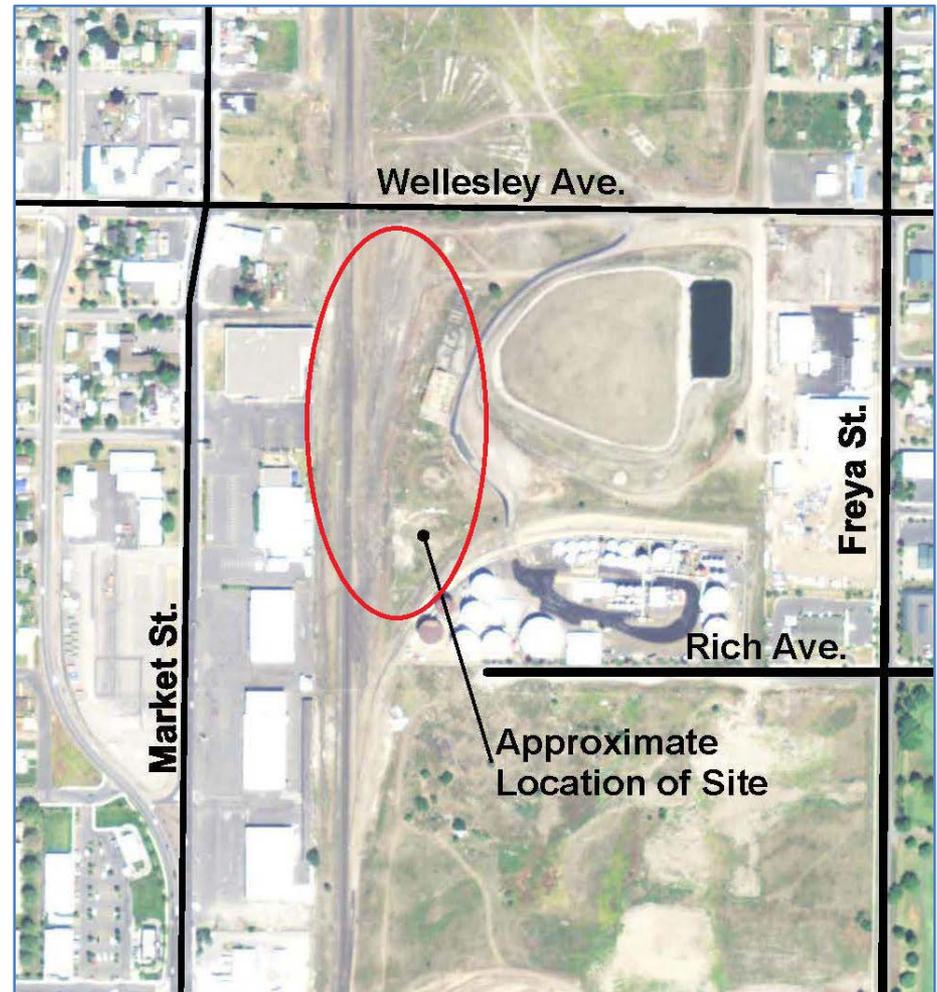
BNSF Railway Black Tank Site, Hillyard



Great Northern Shops at Hillyard, Washington in March, 1931. Looking north the entire erecting shop complex, freight yards, materials department, car shops and locomotive servicing area are clearly visible. The roundhouse, almost a full circle, has new long stalls for the huge "malleys," 530 ton, simple articulateds, 120 feet long, the GN was famous for and is crowding hard against Wellesley Avenue.

Location and Geology

- South of Wellesley
- East of Market
- Over the SVRP Aquifer
- 170 feet to groundwater
- Mostly sand and gravel from surface to water



SVRP = Spokane-Valley Rathdrum-Prairie

Black Tank Site History

- Late 1800s, Great Northern's Hill's Yard constructed
- By 1928, the black tank and infrastructure is on-site
- By 1955, the red tank is constructed
- Later, train refueling moved elsewhere
- Black tank was used to store Bunker C, asphaltic oil, and other petroleum products







Spokane Portland & Seattle 700 at Hillyard (Spokane) in September, 1950. These 4-8-4's were copies of Northern Pacific A-3 Class Northerns and got their class A shoppings at NP's Livingston, Montana Shops. The SP&S Northerns were oil burners.

W. R. McGee, Photo

Early Cleanup History

- **1999:** Site discovery (BNSF notified Ecology of ground surface contamination)
- **2000-2001:** Ecology completes II and SHA
 - Site ranked 3 out of 5
- **2006:** BNSF independently decommissioned most above-ground structures
 - Removed more than 10,000 tons of contaminated soil
- **2008:** BNSF discovers groundwater contamination
- **2011:** Ecology initiates the formal cleanup process as staff become available
 - Ecology determines BNSF and Marathon are PLPs



II = initial investigation, SHA = site hazard assessment, PLPs = potentially liable persons

Recent Cleanup History

- **2012:** Ecology and PLPs enter into Agreed Order that requires PLPs to complete RI/FS
 - Public review July 20 to August 20, 2012
- **2012–2016:** PLPs complete RI/FS work
- **January 2015–March 2017:** PLPs prepare draft RI/FS Report
 - Ecology accepts 3rd draft RI/FS Report
 - Public review May 22 to June 22, 2017
- **July 2017 through 2018:** Ecology wrote draft Cleanup Action Plan, Scope of Work and Schedule, and negotiated Consent Decree with PLPs
- **2018:** Shallow soil interim action negotiation, Agreed Order amendment, and cleanup implementation
 - Public review June 4 to July 3, 2018



Black Tank Site Status

- Site discovery
- Initial investigation
- Ranking the Site
- Remedial investigation/feasibility study
- Ecology selects cleanup action
- Conduct the cleanup



Black Tank ~1999



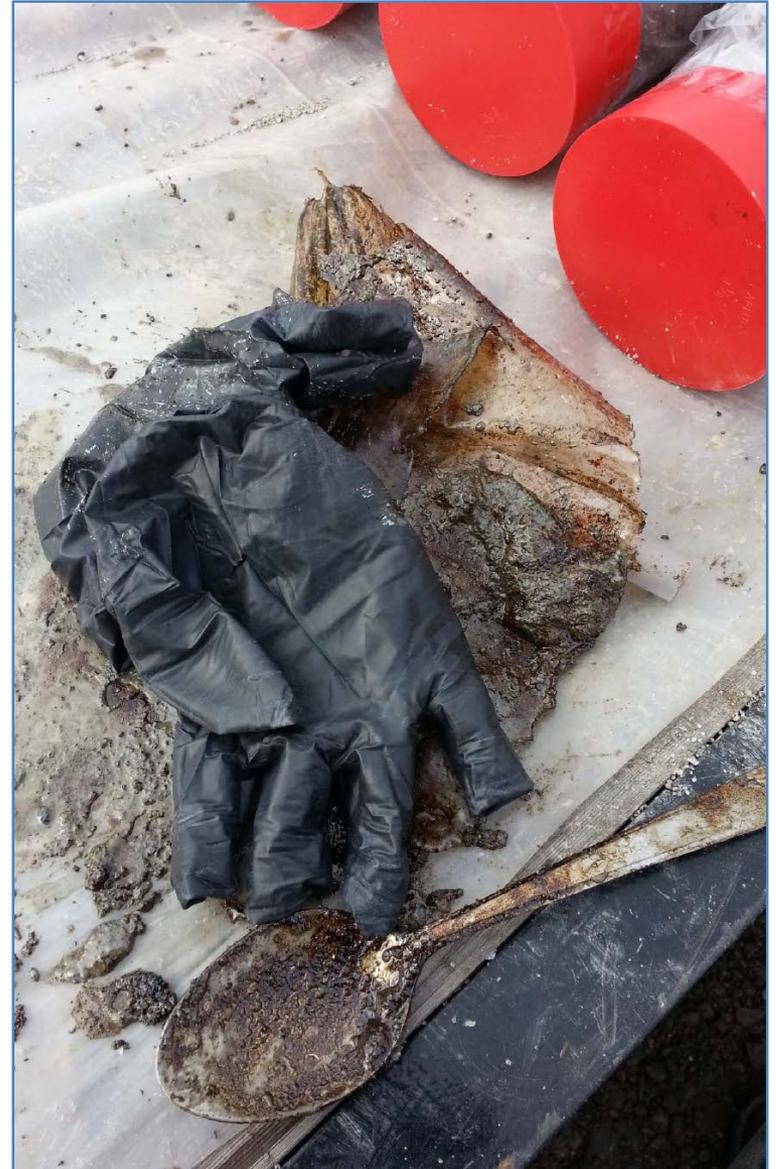
Black Tank Demo ~2006



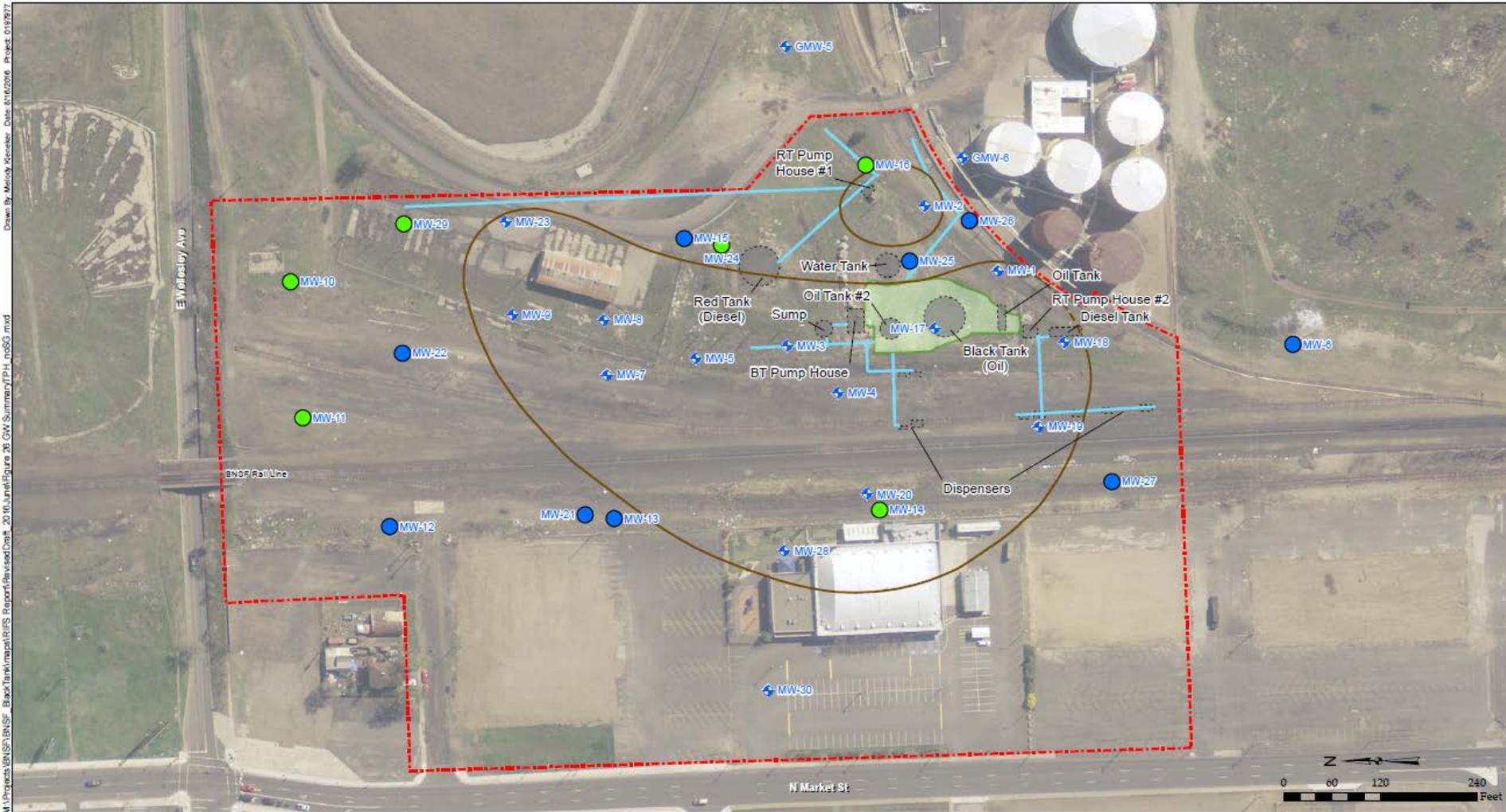
Investigational Drilling



Investigation Photos



Groundwater Monitoring



Legend

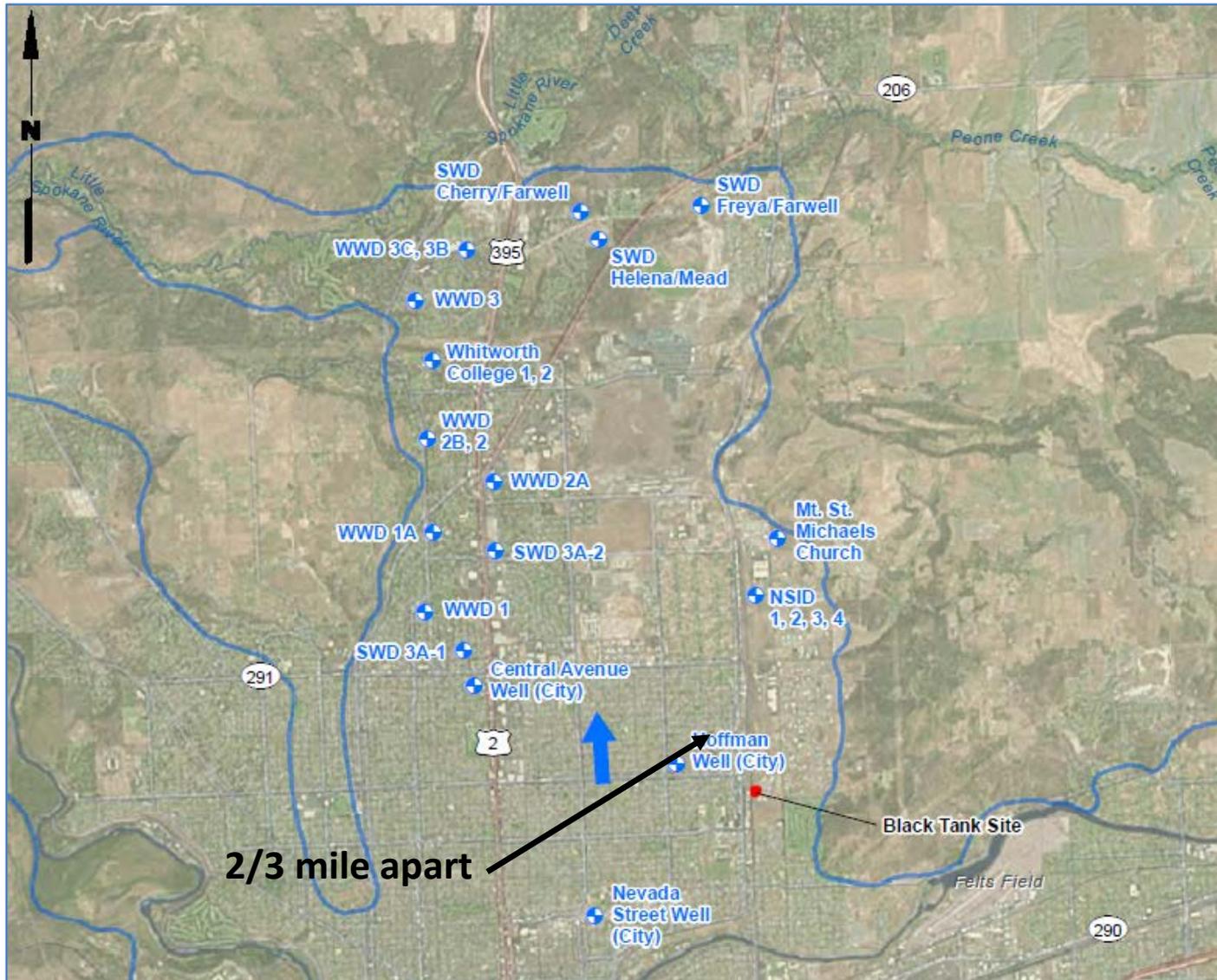
- + Monitoring Well
- Existing Piping (Petroleum and Chemical Solution)
- Most Recent Approximate Extent of LNAPL, June 2016
- Proposed BNSF Black Tank Site Boundary
- Historical Aboveground Storage Tank
- No Contaminants Detected
- Contaminant Detected Below CULs
- Former Black Tank Excavation

Notes:
 Groundwater TPH D/HO data presented was analyzed using NWTPH-Dx without Silica Gel Cleanup.
 CUL = Cleanup Level
 LNAPL = Light Non-Aqueous Phase Liquid.
 MTCAL = Model Toxics Control Act
 TPH-D/HO CUL = MTCAL Method A Groundwater CUL 500 ug/L
 Aerial Photo: USGS, April 2012.

Figure 26
 Groundwater Analytical Summary - TPH-D/HO
 Without Silica Gel Cleanup - March 2016
 BNSF Black Tank
 Spokane, Washington

M:\Projects\BNSF\BNSF - Black Tank\map\PIES Report\Revised\Dat\ 2016 June\Figure 26 GW Summary\TPH_n060.mxd
 Drawn By: Melissa Klecker, Date: 8/16/2016, Project: 019707

Drinking Water Wells



Drinking water is not impacted by site-related contamination.

Conceptual Site Model

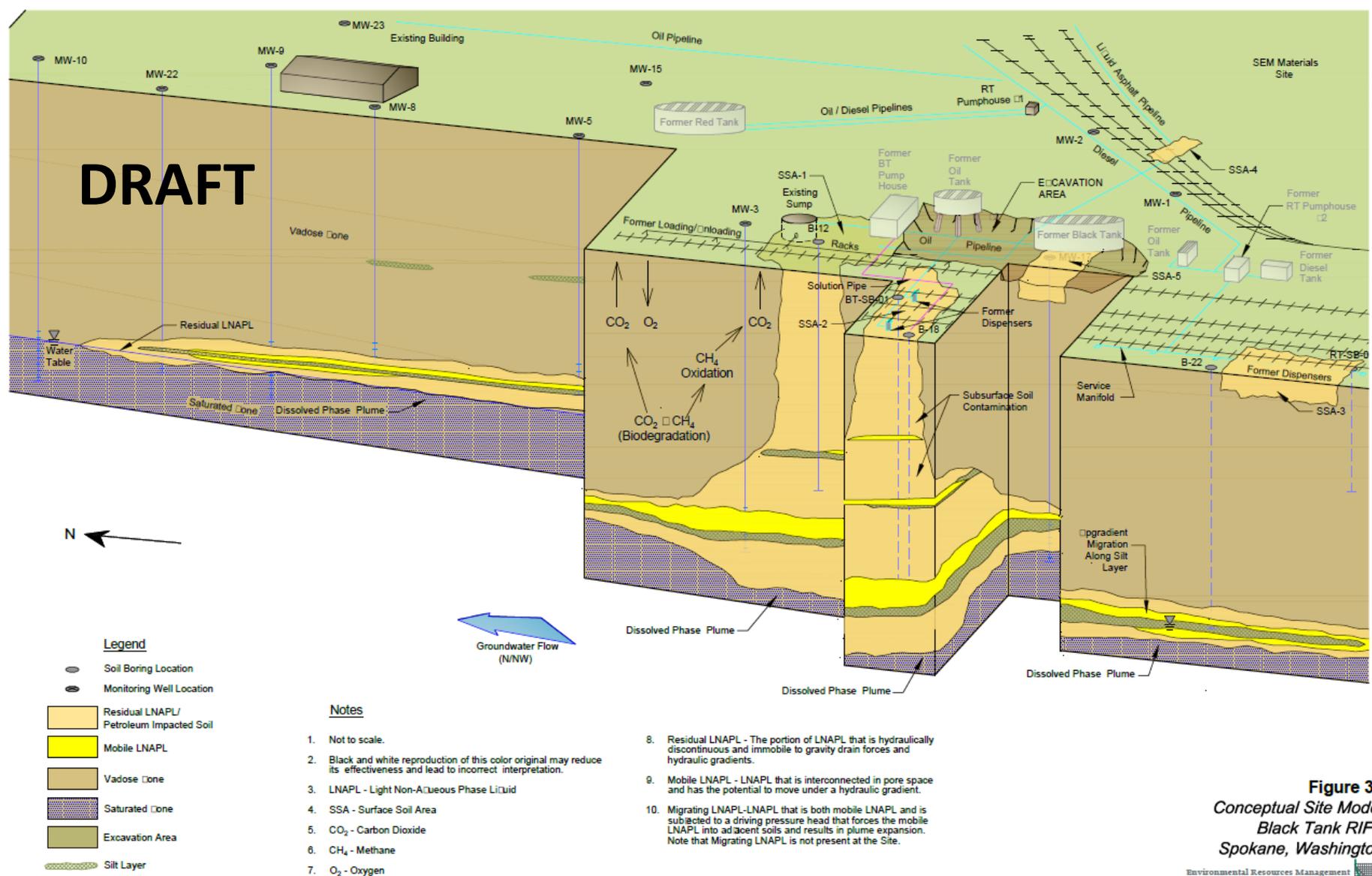


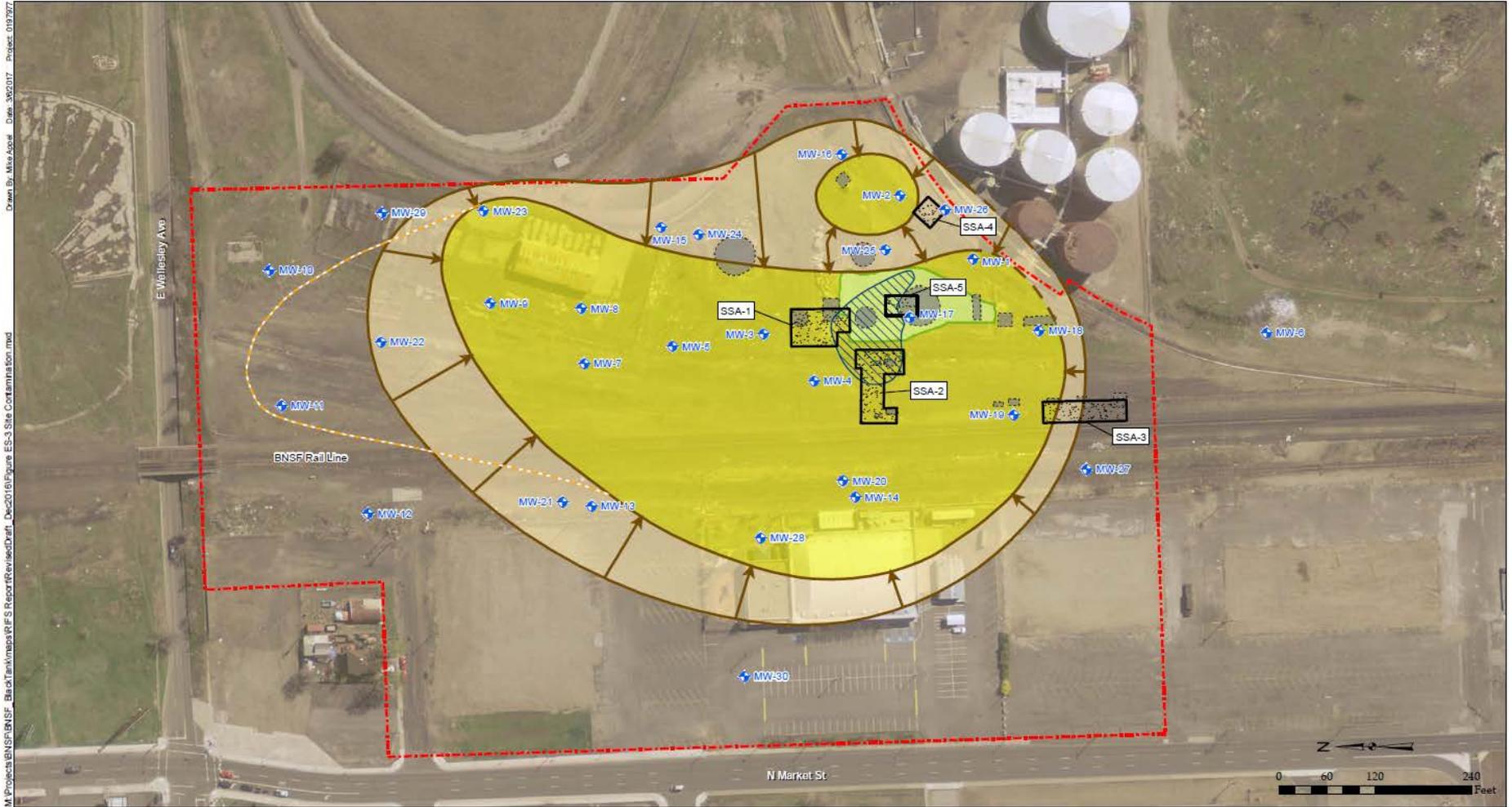
Figure 33
Conceptual Site Model
Black Tank RIFs
Spokane, Washington

Environmental Media Requiring Cleanup

- Shallow soil
 - 5 areas of contaminated soil, within 15 feet of the surface
- Deep contamination
 - Separated into different areas: high, medium, and low restoration time frame (RTF) areas
 - Intermediate soil
 - Two columns of contaminated soil where petroleum migrated from the surface to groundwater
 - Smear zone soil
 - Contaminated soil at/near groundwater
 - LNAPL (light non-aqueous phase liquid)
 - Approximately 6 acres
 - Groundwater
 - Small, seasonal dissolved-phase plume



Areas Requiring Cleanup



M:\Projects\BNSF\BNSF - Black Tank\Map\BFS Report\Revised\Draft_Dec2016\Figure ES-3 Site Contamination.mxd
 Drawn By: Mike Aspell Date: 10/20/17 Project: 1017977

Legend

- + Monitoring Well
- Receding Mobile LNAPL Due to Natural Source Zone Depletion
- Most Recent Approximate Extent of LNAPL, June 2016
- Most Recent Inferred Extent of LNAPL, June 2016
- Approximate Seasonal Maximum Extent of Dissolved Phase TPH-D/HO Plume
- Proposed BNSF Black Tank Site Boundary
- Intermediate Soil Exceeding the Preliminary CUL
- Surface Soil Exceeding Preliminary CULs
- Former Black Tank Excavation
- Historical Aboveground Storage Tank
- Mobile and Residual LNAPL
- Residual LNAPL

Notes:
 CUL = Cleanup Level
 LNAPL = Light Non-Aqueous Phase Liquid
 Mobile LNAPL = LNAPL that is interconnected in pore space and has the potential to move under a hydraulic gradient.
 Residual LNAPL = The portion of LNAPL that is hydraulically discontinuous and immobile to gravity drain forces and hydraulic gradients. Residual LNAPL is present throughout the mobile and residual LNAPL areas shown.
 Aerial Photo: USGS, April 2012.

Figure ES-3
 Site Contamination
 BNSF Black Tank
 Spokane, Washington

Areas Requiring Cleanup



- Legend**
- Monitoring Well - Black Tank Site
 - BNSF Black Tank Site Boundary
 - TPH-DiHO in Intermediate Soil Exceeding the CUL
 - Existing Piping, Dec. 2018
 - Piping Abandoned in Place
 - Former Black Tank Excavation
 - Approximate Lateral Limits of Surface Soil Cleanup Areas

- WSDOT Proposed Highway Alignment (2018 Version)
- Existing Railroad Alignment
- Proposed Railroad Alignment
- Centerline
- Bridge
- Fence
- Pedestrian Pathway
- Ditch
- Curb/Sidewalk

- High RTF Area
- Medium RTF Area
- Low RTF Area

Notes:
 CUL = Cleanup Level
 LNAPL = Light Non-Aqueous Phase Liquid
 RTF: Restoration Timeframe
 TPH-DiHO = Combined Diesel and Heavy Oil-Range Petroleum Hydrocarbons
 CUL = 5,360 milligrams per kilogram
 Aerial Photo: Spokane Image Consortium, 2018.

Figure 2
 Cleanup Action Areas
 BNSF Black Tank
 Spokane, Washington

Public Input on RI/FS

- 21 people or organizations commented on the RI/FS
- Ecology wrote the response to comments, which is available on our website
- We used input received from the public when developing the draft Cleanup Action Plan



DEPARTMENT OF
ECOLOGY
State of Washington

Response to Comments

Draft Remedial Investigation and Feasibility Study for BNSF Railway Black Tank Property

Facility Site ID: 98615712

Cleanup Site ID: 3243

Public comment period held:

May 22 – June 22, 2017

Summary of a public comment period and responses to comments

July 2017



RI/FS = remedial investigation and feasibility study

Shallow Soil Options and Proposed Remedy

- Options for managing top 15 feet of contaminated soil:
 - Capping and institutional controls (\$0.5M)
 - Excavation and disposal (\$1.5M)
- Proposed remedy:
 - Excavation and disposal
 - Substantially completed in 2018 after public comment
 - Last two areas will be excavated after railroad relocated (estimated for 2020)



Shallow Soil Cleanup - 2018



Shallow Soil Cleanup - 2018



Deep Contamination Cleanup Options

- Natural source zone depletion
 - Naturally occurring processes of dissolution, volatilization, and biodegradation that result in contaminant mass reduction
- PLPs predict a 7-year RTF and a cost of \$344,000 in the low RTF area
- 100+ year RTF in medium and high RTF areas
- Cannot be considered as a stand-alone remedy



RTF = restoration time frame

Deep Contamination Cleanup Options

- Bioventing/biosparging
 - Forced circulation of air into the subsurface via a network of wells screened above and below the groundwater table to encourage aerobic biodegradation
- Considered for use in the high and medium RTF areas
- PLPs estimate an RTF of 8 and 14 years in the medium and high RTF areas, respectively
- Cost of \$3.2M



RTF = restoration time frame, PLPs = potentially liable persons

Deep Contamination Cleanup Options

- Manual LNAPL removal
 - Manual removal of LNAPL that accumulates in a network of wells
- Considered for use in the high RTF area
- PLPs estimate this would reduce the RTF in the high RTF area from 14 to 13 years
- Cost of manual LNAPL removal combined with bioventing/biosparging remedy: \$6.6M
 - \$3.3M more than bioventing/biosparging alone



Deep Contamination Cleanup Options

- Steam-enhanced extraction (SEE)
 - Injection of steam near groundwater to heat the LNAPL, increasing its recoverability
 - LNAPL and groundwater are pumped from extraction wells and processed at the surface
- Considered for use in the high RTF area
- PLPs estimate this would reduce the RTF in the high RTF area from 14 to 10 years
- Cost of SEE combined with bioventing/biosparging: \$16.3M
 - \$13.2M more than bioventing/biosparging alone



LNAPL = light, non-aqueous phase liquid; RTF = restoration time frame;
PLPs = potentially liable persons

Deep Contamination Cleanup Options

- Smoldering combustion
 - Using ignition and air injection wells to propagate a combustion front in high-concentration petroleum contamination zones
- Considered for use in the high and medium RTF areas
- PLPs estimate this would reduce the RTF in the high and medium RTF areas to 3 years
- Cost of smoldering combustion: \$22.6M
 - \$19.4M more than bioventing/biosparging alone



PLP-estimated RTFs and costs

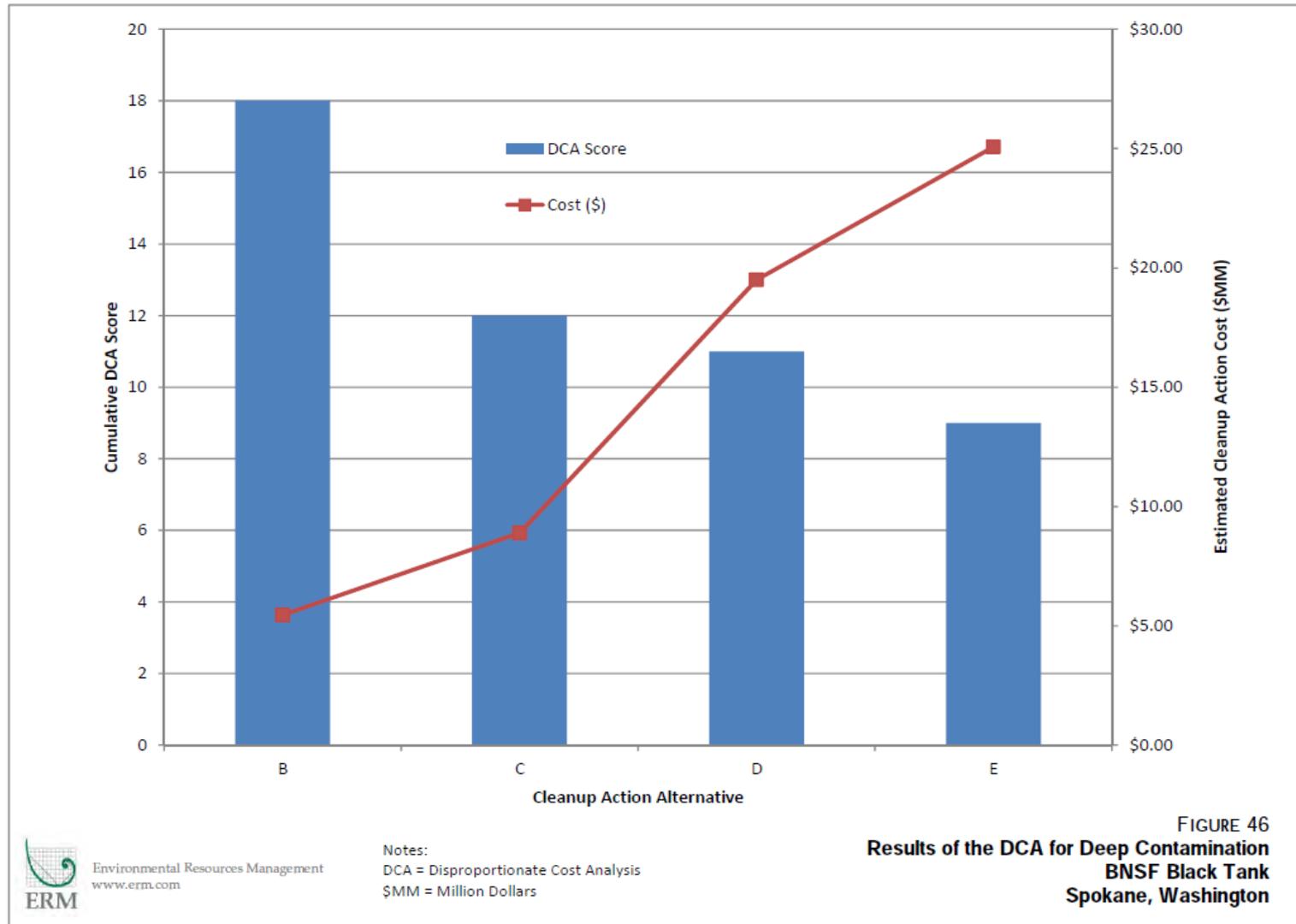
LNAPL Area	Estimated Restoration Timeframes for Cleanup Actions			
	B	C	D	E
	Bioventing/ Biosparging	Bioventing/ Biosparging and Manual LNAPL Recovery	Bioventing/ Biosparging and Steam Enhanced Extraction	Smoldering Combustion
Low RTF	7 years	7 years	7 years	7 years
Medium RTF	8 years	8 years	8 years	3 years
High RTF	14 years	13 years	10 years ¹	3 years
Site-wide RTF	~14 years	~13 years	~ 10 years	~ 7 years

Deep Contamination Cleanup Actions				Estimated Site-Wide Cleanup Action Costs				
Cleanup Action	Low RTF LNAPL Area	Medium RTF LNAPL Area	High RTF LNAPL Area and Intermediate Soil	Surface Soil ¹	Low RTF LNAPL Area	Medium and High RTF LNAPL Areas	Groundwater	Grand Total
B	NSZD	Bioventing/ Biosparging	Bioventing/Biosparging	\$1,455,000	\$344,000	\$3,156,000	\$496,000	\$5,451,000
C	NSZD	Bioventing/ Biosparging	Bioventing/Biosparging and Manual LNAPL Recovery	\$1,455,000	\$344,000	\$6,593,000	\$496,000	\$8,888,000
D	NSZD	Bioventing/ Biosparging	Bioventing/Biosparging and Steam Enhanced Extraction	\$1,455,000	\$344,000	\$16,319,000	\$686,000	\$19,500,000
E	NSZD	Smoldering Combustion	Smoldering Combustion	\$1,455,000	\$344,000	\$22,588,000	\$686,000	\$25,073,000



PLP = potentially liable person; RTF = restoration time frame; LNAPL = light, non-aqueous phase liquid; NSZD = natural source zone depletion

Disproportionate Cost Analysis

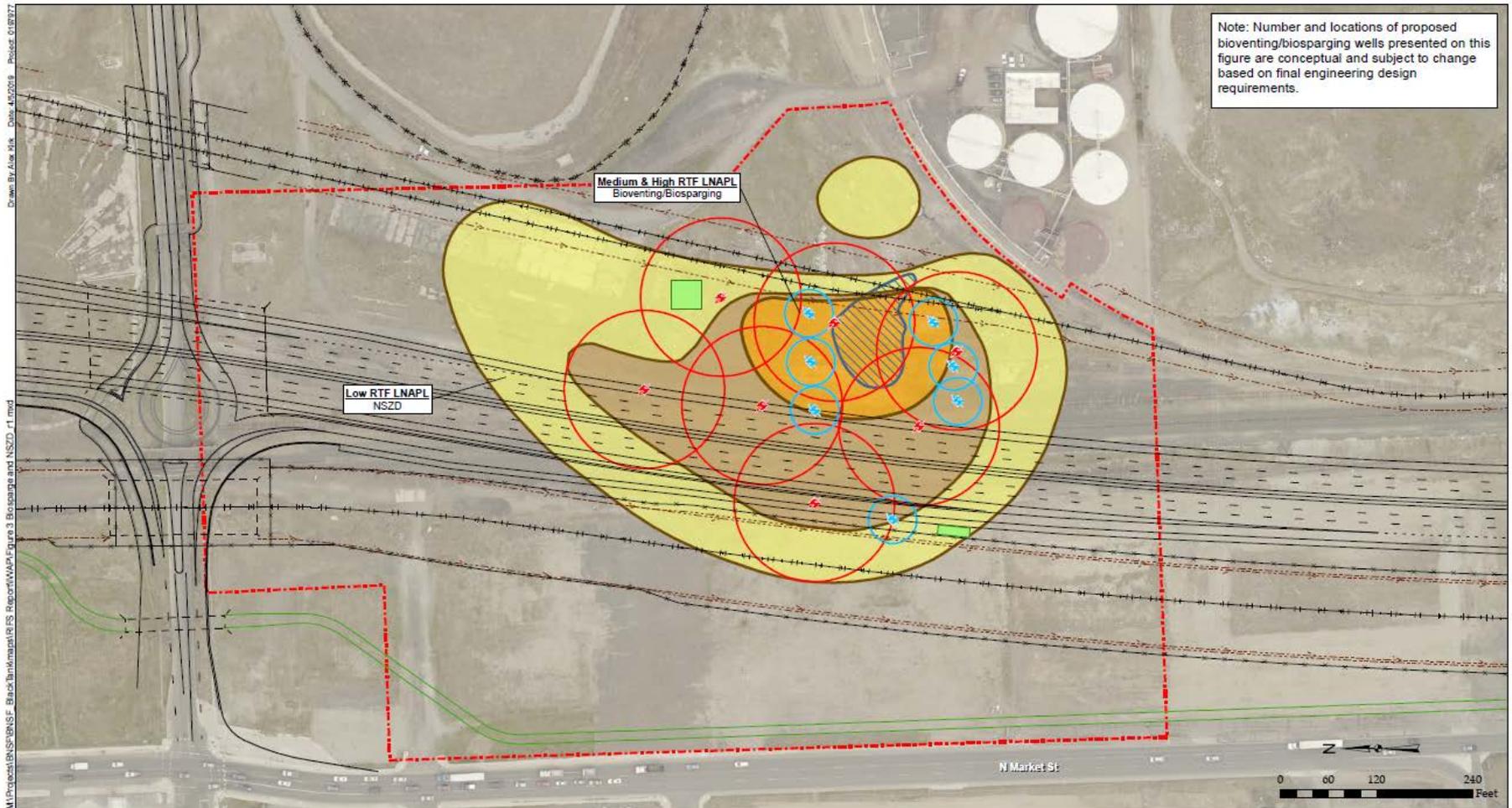


Deep Contamination Proposed Remedy

- Low RTF area
 - Natural source zone depletion
 - PLPs predict a 7-year RTF and a cost of \$344,000
- Medium and high RTF areas
 - Bioventing/biosparging
 - PLPs estimate an RTF of 8 and 14 years in the high and medium RTF areas, respectively, and a cost of \$3.2M
- High RTF area contingent remedy
 - Steam-enhanced extraction
 - Implemented if determined to be feasible and monitoring predicts a longer than 20-year RTF



Bioventing and Biosparging



M:\Projects\BNSF\BNSF - Black Tank\map\BNSF Report\WAP\Figure 3 Biosparging and NSZD_1.mxd

Legend

- Proposed Biosparge Well
- Proposed Bioventing Injection Well
- Proposed Biosparge Well 30 ft ROI
- Proposed Bioventing Injection Well 100 ft ROI
- Proposed Mechanical Equipment Facility
- TPH-DiHO in Soil Deeper than 15 feet bgs Exceeding the Preliminary CUL
- High RTF Area
- Medium RTF Area
- Low RTF Area
- Proposed BNSF Black Tank Site Boundary
- WSDOT Proposed Highway Alignment (2018 Version)
- Proposed Railroad Alignment
- Centerline
- Bridge
- Fence
- Pedestrian Pathway
- Ditch
- Curb/Sidewalk

Notes:

- ¹ Alignment subject to change
- bgs = Below ground surface
- CUL = Cleanup Level
- DOT = Washington State Department of Transportation
- LNAPL = Light Non-Aqueous Phase Liquid
- NSZD = Natural Source Zone Depletion
- ROI = Radius of Influence
- RTF = Restoration Timeframe
- TPH-DiHO = Combined Diesel and Heavy Oil-Range Petroleum Hydrocarbons
- Preliminary CUL = 13,500 milligrams per kilogram
- Aerial Photo: Spokane Image Consortium 2018.

Figure 3
Conceptual Representation of Base Remedy
(NSZD and Biosparging/Bioventing)
BNSF Black Tank
Spokane, Washington

Environmental Resources Management
www.erm.com

Deep Contamination Proposed Remedy

- Groundwater monitoring will continue
 - Ongoing verification that drinking water is safe
- Institutional controls will be required
 - Environmental covenant will restrict excavation and groundwater extraction
 - Signage and fencing where necessary
- Financial assurance is required
 - Must cover all costs associated with the operation and maintenance of the cleanup action, including institutional controls, compliance monitoring, and corrective measures



North Spokane Corridor (NSC)

- Shallow soil interim action implemented in 2018 to ensure environmental cleanup does not hinder construction
- Deep contamination remedy can be implemented adjacent to/under the NSC
- More information:
 - <https://www.wsdot.wa.gov/Projects/US395/NorthSpokaneCorridor/default.htm>



Questions?

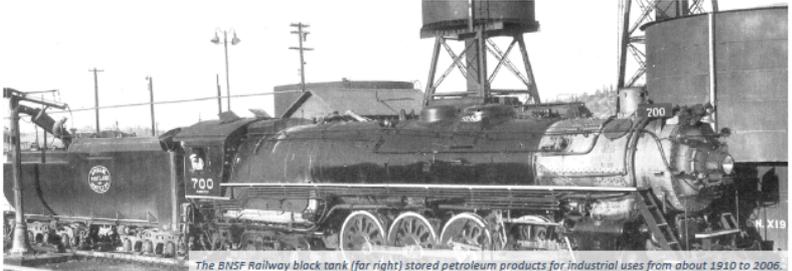
More information

- Web page
- Fact sheet
- Contact us!

Toxics Cleanup Program

DEPARTMENT OF
ECOLOGY
State of Washington

BNSF Railway Black Tank Property



The BNSF Railway black tank (far right) stored petroleum products for industrial uses from about 1910 to 2006.

Comments accepted:
May 13 – June 11, 2019

Submit comments:
Online at:
<http://ecy.ecology.wa.gov/commentinput.aspx?id=EQYNM>
Or by mail or email to:
Jeremy Schmidt, Site Manager
4601 North Monroe Street
Spokane, WA 99205
jeremy.schmidt@ecy.wa.gov

Document review locations:
<https://fortress.wa.gov/ecy/gsp/Sitepage.aspx?csid=3243>
Hillyard Public Library
4005 North Cook Street
Spokane, WA 99207
Phone: 509-444-5380
Hours: Tues. 12–8 p.m., Wed. – Sat. 10 a.m.–6 p.m.

Washington Dept. of Ecology
4601 North Monroe Street
Spokane, WA 99205
Phone: 509-329-3415
Hours: Monday – Friday, 8 a.m. – 5 p.m. (by appointment)

Facility Site ID: 98615712
Site Cleanup ID: 3243

Public invited to comment on draft Cleanup Action Plan and supporting documents

The Washington State Department of Ecology (Ecology) seeks your input on the following draft documents for the BNSF Railway Black Tank Property (site) May 13 through June 11, 2019:

- Cleanup Action Plan — explains the cleanup methods we are proposing for this site
- Consent decree — legal agreement requiring the parties responsible for cleanup to enact the cleanup plan
- State Environmental Policy Act (SEPA) documents — we have reviewed the cleanup actions using the SEPA checklist, and decided they won't adversely affect people or the environment

We are holding a public meeting May 22 at 6:30 p.m. at the Northeast Community Center in Hillyard to discuss the proposed cleanup and answer your questions.

The site covers roughly 18 acres in Spokane's Hillyard neighborhood at 3202 East Wellesley Avenue in Spokane, Washington. The property is owned by BNSF Railway Company and was once leased and operated by Marathon Oil Company. The companies are collectively called the potentially liable persons (PLPs) and are responsible for funding and completing cleanup.

The site is in the proposed path of the North Spokane Corridor (NSC) freeway (dark gray outline, Figure 1). The Washington State Department of Transportation (WSDOT) is building the NSC to connect U.S. Highway 395 to Interstate 90.

Ecology, the PLPs, and WSDOT are committed to working together to protect people and the environment, and incorporate public input about site cleanup and NSC freeway construction in Hillyard.

Publication 19-09-023

May 2019

Page 1