Basin Environmental Improvement Project Commission (BEIPC)

Bunker Hill Superfund Site – Lower Basin of the Coeur d'Alene River

5/18/2022





Lead Sources in Lower CDA



ES062006003PDX 360606.01.04 CDA_LeadBudget_20.al 01-8-10 cts/h

Sources of Sediment Transported Past Harrison

1. Source - Bookstrom et al., 2004 2. Graphed percentages represent the midpoint of the ranges estimated by Bookstrom et al., 2004. The Bookstrom et al., 2004, dataset was developed from observations and data from other studies conducted from 1993 to 2002.

Riverbed Pilot Project Selection

Consider Multiple Lines of Environmental Evidence
1) 2017 flood sampling
2) Borehole data
3) Bathymetric survey differencing



2017 Flood Sampling

Large -scale increase in suspended sediment and bulk lead just downstream of RM 160





Analyte Concentration Versus River Mile - 3/16/17

Surface Lead Concentrations



Metal Concentration Vertical Variation

High lead at both surface (LC -DR-006 and LC-DR-007) and at depth (LC -DR-005 and *LC-DR-008*)

	Carl Carl						0 K90A	No.	IN SALE						
		-				Sector Sector		LC-D	R-005						
		1	- Carrie	the state			Date	Depth	Lead	Zinc					
							9/12/19	0.5	1,300	1,030					
C. LESIL					Sea . Se	-	9/12/19	0.75	1,490	969					
		-	1000	9/12/19	1.25	1,890	1,420								
				9/12/19	1.75	1,810	1,310								
1			Date	Depth	Lead	Zinc	9/12/19	2.25	3,670	3,990					
			9/12/19	0.5	2,090	1,540	9/12/19	2.75	13,400	17,400					
	9/12/19 0.75 1,880 1,260														
- Although			9/12/19	1.25	2,030	1,460	LC-DR-006								
126 N. T. C.			9/12/19	1.75	2,330	2,070	Date	Depth	Lead	Zinc					
			9/12/19	2.25	10,400	16,100	9/12/19	0.5	53,700	37,600					
	/		1				9/12/19	0.75	40,200	28,700					
244							9/12/19	1.25	39,300	27,900					
				The second			9/12/19	1.75	48,100	27,600					
-	Set	on 008		12 State			9/12/19	2.13	53,200	31,400					
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and the second			Sec.		The line	S				200					
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		1000	~		Marine .					White and					
and server					No.5	STELLER .		and the second	Mill March						
		LC-	DR-007	/		-	SIE	tion UU/							
发展的 常	Date	Depth	Lea	d Zir				Contraction of the	and the state of the						
	9/12/19	0.5	16,2	00 20,3	00	X		Current .	-	-					
Co. Walt	9/12/19	0.75	16,6	00 18,0	00	TRUCK			Town of grant						
	9/12/19	1.25	28,8	00 19,7	00		1-20-2								
	9/12/19	1.75	28,4	00 18,4	00		A State Inc	A REAL							
and the second	9/12/19	2.13	26,1	00 15,5	00		1	the way	Strew of the P						
1000	and showing			Contraction of the											

Station 005

Station 00

Longitudinal comparison of flood samples and borehole data

Dudley Reach Environmental Data 1993-2020 RM 157-160



Flood samples and borehole data (summarized)

Dudley Reach Environmental Data 1993-2020 RM 157-160



Borehole Lead Data

Table 1.	Vertically	y aggregate	d borehole	statistics in l	Dudley Rea	ch from RM	4 157-160	1	Table 2.	Surface (<1 ft depth) borehole	statistics in D	udley Reac	h fron
	Count	Mean	Median	Standard Dev	Maximum	Minimum	LOWESS			Count	Mean	Median	Standard Dev	LOWESS	
RM	(<i>n</i> =)	(mgPb/kg)	(mgPb/kg)	(mgPb/kg)	(mgPb/kg)	(mgPb/kg)	(mgPb/kg)		RM	(n=)	(maPb/ka)	(maPb/ka)	(maPb/ka)	(maPb/ka)	
157.0	6	16898	2150	27780	70100	707	3948		157.0	2	894	894	264	6426	
157.1	8	9050	7290	5845	15900	2500	5794		157.1	4	15150	15150	1061	7162	
157.2	16	8156	4680	8759	25700	21	7391		157.2	9	8127	5000	8779	7786	
157.3	11	14814	15900	11983	36800	15	8737		157.3	9	17280	16550	11009	8303	
157.4	19	9608	11150	7670	27000	21	9822		157.4	5	9868	6225	12668	8704	
157.5	29	8817	6800	8237	24000	16	10645		157.5	14	5411	3115	4766	8977	
157.6	28	12848	9950	13764	54500	15	11215		157.6	6	15367	6875	19337	9122	
157.7	15	5472	2030	9691	37500	7	11544		157.7	2	867	867	1037	9141	
157.8	26	21748	16050	17554	60100	49	11585		157.8	3	17840	13300	15304	9099	
157.9	25	22792	20300	12480	56700	5470	11341		157.9	3	15433	16100	3943	9025	
158.0	12	16658	16400	9332	28800	4890	10894		158.0	10	17394	17000	9996	8860	
158.1	18	2190	242	3314	9040	13	10329		158.1	2	2186	2186	2764	8547	
158.2	27	13984	10000	13478	45200	322	9394	Pilot	158.2	7	10214	4740	12145	7848	Pilot
158.3	46	13045	10400	13113	59300	593	8131	Pilot	158.3	19	13475	6885	17529	6849	Pilot
158.4	55	15542	6260	18048	63300	13	7064	Pilot	158.4	42	16656	6310	18976	5971	Pilot
158.5	12	5493	2195	7028	23400	462	6149	Pilot	158.5	9	5558	1590	7760	5154	Pilot
158.6	46	9810	5445	12650	64100	42	5127	Pilot	158.6	23	8318	3350	9990	4196	Pilot
158.7	25	10183	6180	14432	53400	59	4196		158.7	5	6430	8330	4587	3307	
158.8	3	4120	1710	4472	9280	1370	3555		158.8	1	1710	1710	NaN	2697	
158.9	31	4198	3765	3052	8560	19	3315		158.9	9	2657	1090	3048	2442	
159.0	12	7405	2660	10304	31000	1150	3272		159.0	9	2961	1730	2702	2352	
159.1	37	7795	3330	10935	46100	32	3153		159.1	18	2767	1620	2573	2236	
159.2	78	3784	2555	3342	18100	25	2934		159.2	41	2725	2435	1207	2073	
159.3	0	NaN	NaN	NaN	NaN	NaN	NaN		159.3	0	NaN	NaN	NaN	NaN	
159.4	47	7631	4720	8427	40100	64	2626		159.4	14	5863	2395	6056	1896	
159.5	3	10070	4360	12403	24300	1550	2500		159.5	2	2955	2955	1987	1868	
159.6	5	2562	2350	356	2950	2250	2369		159.6	5	2562	2350	356	1870	
159.7	18	1517	1750	949	2560	12	2226		159.7	5	1844	1570	453	1901	
159.8	17	2743	2720	1279	4640	16	2084		159.8	10	3426	3265	819	1965	
159.9	6	521	438	397	1270	123	1951		159.9	6	521	438	397	2066	
160.0	0	NaN	NaN	NaN	NaN	NaN	NaN		160.0	0	NaN	NaN	NaN	NaN	

m RM 157-160

River Monitoring activities in 2021 and 2022



➢ RM 158.8 to RM 157.5



2,500 to 4,999

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LOWER BASIN OF THE

COEUR D'ALENE RIVER

2016 - 2019

Exposed native silt beds

Exposed native silt beds - thin soil mantie Bank side slope with no bathymetry

Bank side slope with bathymetric data

Lower Basin of the Coeur d'Alene River (OU3) Page 103 of 108

➢ RM 158.5 to RM 157.3



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COEUR D'ALENE RIVER

Bank side slope with no bathymetry

Bank side slope with bathymetric data

Lower Basin of the Coeur d'Alene River (OU3) Page 102 of 108

> RM 158.2 to RM 158.1



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➢ RM 158.0 to RM 157.8



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Summarized Bathymetric Differencing

> Dudley Reach RM 158.5 to 157.5 is the largest contributor of Lead



Conclusions

- Evidence suggests Upper Dudley Reach is good area for Pilot Project:
 - > March 2017 flood sampling shows large increase in suspended Pb from RM 158.6 to 158 (58% increase)
 - Borehole data indicate significant surficial and subsurface stored Pb in riverbed
 - Riverbed erosion and Pb losses from repeat bathymetric surveys is greatest from the upper Dudley Reach
 - > A high density of samples have already been collected in the Dudley area
 - > A pilot project in the Upper Dudley Reach best fits upstream to downstream remediation approach and reduces recontamination to the extent practicable

Riverbed Pilot Project

- Current status of Pilot Project Planning and Schedule \triangleright
 - > Ongoing
 - ➢ HEC-RAS design model setup (RM 162.2 to 156.9)
 - > Develop hydraulic design criteria (design flood, margin of safety, approaches) towards capping, etc.)
 - WCA planning \succ
 - > To be completed
 - > All civil design work, grading plans, etc.

Riverbed Pilot Project Schedule

- \blacktriangleright Preliminary (~30%) Design \rightarrow April through August 2022
- Intermediate (~60%) Design \rightarrow August 2022 through February 2023
- ➢ Pre-Final (~90%) Design → February 2023 through August 2023
- \blacktriangleright Final (100%) Design \rightarrow August 2023 through December 2023
- Contractor Prequalification Process \rightarrow November 2023 through February 2024
- Contractor Project Bidding Period → February 2024 through May 2024
- Construction Planning Period \rightarrow May 2024 though August 2024
- \blacktriangleright In-River Construction \rightarrow September 2024

Potential WCA Locations







Overview of Potential WCA Sites Kootenai County, Idaho





S. River Road Parcels

Miles



Sources: USGS aerial photography and National Geographic base map and via Esri Web Mapping Service.

Hydraulic Modeling

> HEC-RAS 2D design models are being developed in conjunction with the MIKE 21C basin -scale model to support the design.

MIKE 21C



HEC-RAS 2D



Riverbed and Banks

- > 2019 installed 10 riverbed erosion pin arrays in Dudley Reach. Monitored in 2020 and 2021
- > 2020 classified riverbank types from confluence of South and North Forks of Coeur d'Alene Rivers to Harrison.
- > 2020 installed 25 riverbank erosion pin locations from confluence to Lake Coeur d'Alene
 - Monitored 25 new pins and 11 existing pins by KSSWCD in 2021

2019 Riverbed Erosion Pins



Figure 3 Riverbed Erosion Pin and Sampling Locations

Coeur d'Alene Trust Lower Coeur d'Alene Basin, Idaho



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Y. ALA

Coeur D'Alene River

> NOTES: % = percent. Coeur d'Alene KSSWCD = Kou MFA = Maul Fa ^(a)Riverbank ty ^(b)See Table 3 ^(c)Riverbank ty



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Table 5Cumulative Lengths of Riverbank Classification TypesLower Basin—Riverbed and Riverbank MonitoringCoeur d'Alene Trust

Project Extent		Cataldo Reach		Dudley Reach		Killarney F	Reach	Springston Reach		
Feet	%	Feet	%	Feet	%	Feet	%	Feet	%	
20,416	5.1	11,552	12.3	5,432	6.3	2,040	2.3	1,401	1.2	
43,882	10.9	6,530	7.0	8,259	9.6	13,910	15.6	15,183	13.4	
26,643	6.6	5,913	6.3	8,745	10.2	11,320	12.7	675	0.6	
3,535	0.9	0	0.0	655	0.8	2,120	2.4	750	0.7	
8,336	2.1	8,336	8.9	0	0.0	0	0.0	0	0.0	
109,835	27.3	5,383	5.7	17,674	20.6	30,045	33.6	56,734	50.0	
41,380	10.3	25,214	26.9	5,825	6.8	3,990	4.5	6,351	5.6	
148,358	36.9	30,938	33.0	39,020	45.6	26,010	29.1	52,400	46.2	

Coeur d'Alene Trust = Successor Coeur d'Alene Custodial and Work Trust.

- KSSWCD = Kootenai-Shoshone Soil and Water Conservation District.
- MFA = Maul Foster & Alongi, Inc.
- ^(a)Riverbank type is sourced from the 2008-2009 KSSWCD riverbank classification and erosion pin installation study (KSSWCD, 2010). ^(b)See Table 3 for a summary of riverbank type descriptions.
- ^(c)Riverbank type was defined by MFA during the 2019 riverbank inventory.

2019 Bank Classification Inventory



Bank Type 3



Bank Type 5

2020 Erosion Pin Installation and 2021 Monitoring





First Bank Stabilization Projects – Cataldo Reach



Cataldo Reach Investigation

Lower Coeur d'Alene Basin, Idaho





Riverbank Stabilization Project Schedule

➢ Predesign Investigation → Summer/Fall 2022

➢ Remedial Design Investigation → Summer/Fall 2023

 \blacktriangleright Remedial Action Design \rightarrow 2024 through 2025

 \blacktriangleright Remedial Action Construction \rightarrow 2026 through 2027

2022 High Flow Coeur d'Alene River Monitoring







Thank you!

➤ Questions ?



