Geochemical Analysis of Surface Materials Surrounding the Bautsch-Gray Mine Superfund Site near Galena, Illinois Plath, Ryan P., Geology Department, Augustana College Augustana College 639 38th Street, Rock Island, IL, 61201, ryanplath11@augustana.edu

ABSTRACT

The Bautsch-Gray zinc and lead mine, near Galena, IL, was in operation from the early 1900s until closing in 1975. The mine's tailings pile has documented elevated lead and zinc concentrations in the surface materials surrounding the site. Numerous floods have caused contaminated sediment to migrate off the mine tailings pile, across Blackjack Road and into an outwash basin, and towards Smallpox Creek. Since this site was designated an EPA Superfund site in 2010, the EPA has conducted numerous remediation efforts. This study attempts to develop a better understanding of the contamination within the soils of the outwash basin down-gradient of the mine as well as within the sediment bedload and vegetation of Smallpox Creek. Thirtyeight samples (mine tailings, soil, stream bedload sediment and algae) were collected, using a shovel or garden trowel, throughout this area and analyzed for lead and zinc contamination using X-ray fluorescence spectrometry. Samples from both the outwash basin and Smallpox Creek had concentrations of lead and zinc in excess of EPA limits for soils near a Superfund site. Excluding six samples from the mine tailings, that served as a baseline for contamination levels in mine tailing sediments, 17 samples exceeded the lead contamination limit of 400 ppm for soils near a Superfund site and 19 samples exceeded the zinc contamination limit of 7500 ppm for soils near a Superfunds site. The highest concentrations of lead and zinc were 4,539 ppm and 94,537 ppm respectively. Though there have been mitigation efforts to remove contamination from the outwash area, these results indicate that there is still more work to be done. High concentrations of lead and zinc in the outwash basin indicate that Smallpox Creek is susceptible to continued contamination from this site.

INTRODUCTION

Mining in the area surrounding Galena occurred as early as the 1800s. In 1927 the Mineral Point Zinc company began mining in the current Bautsch-Gray mine site. From 1946 until 1969 Tri-State Zinc and a few other companies mined this site. Mining and milling of the Galena dolomite and the Platteville limestone (middle Ordovician) at this site produced an approximately 55 acres mine tailings pile at the site when the mine was closed in 1975. Heavy metal (lead, zinc, arsenic, copper and cadmium) contamination is present to varying degrees in the tailings pile, in nearby residential properties, in a nearby marshland and in Smallpox Creek. In 2009 a heavy rain event caused roughly 1-2 feet of mine tailings to migrate across Blackjack Road and into a marshland that flowed towards Smallpox Creek. In 2010 the EPA designated the site a Superfund site and began mitigation efforts. In 2012 the site was placed on the NPL (National Priorities List), which is a list of the nation's most hazardous waste sites. This allowed for additional funding which prompted another round of testing and mitigation efforts. The aim of this study is to test surface materials at and around the site to see how effective mitigation efforts have been and if more mitigation efforts are necessary. A second goal of this study is to determine if Smallpox Creek is contaminated and how prone it is to contamination from site runoff.







In order to achieve a better understanding of the contamination occurring at and from the mine tailings pile, the marshland (outwash basin) to the west of the mine eter

Sample Name	•	Pb (In PPM) 🗾	Zn (In PPM)
Mt-1		1010	2008
Mt-2		1609	1794
Mt-3		446	1144
Mt-4		1282	350
Mt-5		1366	1377
Mt-6		1943	1435
Average		1276	13519
Maximum		1943	2008
Minimum		446	350
EPA TCR		1200	2300
EPA COL		400	750
EPA EMT		107	510
EPA Background	101	35.2	13
EPA Background1	L 02	44.5	25

Sample Name	🗾 Pb (In PPM) 🗾	Zn (in PPM)
Rs-1	207	3156
Rs-2 ALG	135	620
Rs-3	65	29
Rs-4	205	6311
Rs-5	173	821
Rs-6	142	213
Rs-7	460	486
Rs-8 ALG	305	703
Rs-10	122	141
Rs-11	858	9453
Rs-12	134	188
Rs-13	130	1216
Rs-14	210	369
Rs-15	172	331
Rs-16 ALG	1368	2055
Average	312	1740
Maximum	1368	9453
Minimum	65	29
EPA TCR	1200	2300
EPA COL	400	750
EPA EMT	107	510
EPA Background 1	.01 35.2	13
EPA Background1	02 44.5	25

Sample Name	Pb (INPPIVI)	Zh (ln ppm)
Ha-1	199	293
Ha-2	4539	2582
Ha-3	194	15
Ha-4	2401	662
Ha-5 ALG	609	2543
Ha-6	4219	256
Ha-7	1974	1012
Ha-8	815	108
Ha-9	1727	1203
Ha-10	929	141
Ha-11	915	1403
Ha-12	1427	166
Ha-13	3167	209 :
Ha-14	2034	65 3
Ha-15	810	92
Ha-16	166	112
Ha-17	932	898
Average	1592	131
Maximum	4539	2582
Minimum	166	15
EPA TCR	1200	230
EPA COL	400	75
EPA EMT	107	51
EPA Background 101	L 35.2	13
EPA Background102	44.5	2



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ence and 20 below and analyzed for trace elements (heavy metals). If contamination is occurring near the confluence, this study could also provide insight into the distance downstream that contamination is affecting sediment in Smallpox Creek (contamination would likely decrease downstream).