ADMINISTRATIVE RECORD

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FINAL

MINE WASTE CHARACTERIZATION DATA TECHNICAL MEMORANDUM

CARPENTER-SNOW CREEK MINING DISTRICT NPL SITE SUPPLEMENTAL STUDIES FOR THE REMEDIAL INVESTIGATION CASCADE COUNTY, MONTANA

March 2013

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ACRONYMS AND ABBREVIATIONS

ABA	Acid-base accounting
ASTM	American Society for Testing and Materials
bgs	Below ground surface
CSCMD	Carpenter-Snow Creek Mining District
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
GPS	Global positioning system
MCL	Maximum contaminant level
NPL	National Priorities List
OU2	Operable Unit 2
RI	Remedial investigation
SPLP	Synthetic precipitation leaching procedure
Tetra Tech	Tetra Tech EM Inc.
USFS	U. S. Forest Service

1.0 INTRODUCTION

The Montana Department of Environmental Quality (DEQ), in cooperation with the U.S. Environmental Protection Agency (EPA) and the U.S. Forest Service (USFS), tasked Tetra Tech EM Inc. (Tetra Tech) to complete investigations to fill data gaps for the remedial investigation (RI) at Operable Unit 2 (OU2) of the Carpenter-Snow Creek Mining District (CSCMD) National Priorities List (NPL) site. This technical memorandum was prepared for DEQ under Contract Number 407026, Task Order 100.

The CSCMD site is in Cascade County, and occupies an area starting from approximately 4 miles northeast of Neihart, Montana, southwest through town and ending just southwest of Neihart (Figure 1-1). Mine tailings, waste rock, and acid mine drainage are present throughout the site. Previous investigations showed that the waste rock and tailings contain elevated concentrations of arsenic, cadmium, copper, lead, and zinc, and they may pose a risk to ecological and to human recreation and residential user receptors from surface water, groundwater, soil, and sediment. Remediation of the site will be necessary if concentrations of contaminants in tailings, soil, and groundwater pose unacceptable risks to human health or ecological receptors.

Supplemental RI tasks completed include evaluating the suitability of potential repository locations; delineating the extent and volume of tailings impoundments and waste rock piles throughout OU2; measuring metals concentrations in roadbed materials and residential soils; installing and sampling groundwater wells; surveying OU2 for potential hazards associated with mining activity; and conducting a screening assessment of metals in streamside sediments along Carpenter, Snow, and Belt Creeks and the drainages east of Neihart.

Tetra Tech was tasked with characterizing mine waste rock and tailings deposits at the site. Tetra Tech prepared this technical memorandum for the DEQ to begin summarizing the physical and chemical characteristics of waste rock and tailings present at the Carpenter and Snow Creek watersheds and on the Neihart Slope. This memorandum details the investigation activities and waste characteristics for those areas.

The remainder of this technical memorandum contains:

- The site history for the areas inspected in this investigation;
- The methods used to determine mine waste characterization data;
- The analytical results of geotechnical, synthetic precipitation leaching procedure (SPLP), and acid-base accounting (ABA) testing; and
- Interpretation of the data as they pertain to theoretical repository settings.

2.0 SITE HISTORY

The Neihart Mining District was a major silver producer in the state and the primary producer in Cascade County, producing about $16 million in silver between 1882 and 1929 (Sahinen 1935; GCM 1991). The first claim in the District was made in July 1881. Development slowed during the mid- to late-1880s, then began to increase again after construction of the Great Falls smelter and the Belt Mountain branch of the Great Northern Railroad in 1891, connecting Neihart with Great Falls.

The town of Neihart is southwest of the Carpenter – Snow Creek drainage. The estimated population of Neihart is 85 (City-Data.com 2011). Many more people who own property in and around Neihart use the residential structures for seasonal recreation. For this investigation and access, OU2 of the Carpenter-Snow Creek NPL Site has been divided into three geographical areas: the Carpenter Creek watershed, the Snow Creek watershed, and the Neihart Slope (Figure 1-1).

The Carpenter Creek watershed is approximately 2 miles northeast of the town of Neihart and includes the Haystack Creek, Squaw Creek, and Lucy Creek watersheds. The DEQ Abandoned and Inactive Mines Database lists 24 abandoned or inactive mines in the watershed. The main mine in the watershed and the largest ore production mine is the Silver Dyke Mine.

The Snow Creek watershed is approximately 1 mile northeast of Neihart. The DEQ Abandoned and Inactive Mines Database lists 14 abandoned or inactive mines in the watershed. The Big Seven Mine was the largest mine that operated in the upper Snow Creek area. There were several mills along Snow Creek and its tributaries but the absence of large tailings piles suggests that there was little production.

The Neihart Slope encompasses the eastern hillside directly above the town of Neihart. The DEQ Abandoned and Inactive Mines Database lists 33 abandoned or inactive mines on the slope, the largest of which were the Queen of the Hills, Broadwater, and Moulton mines.

3.0 METHODS

The following section describes the methods used to collect waste rock and tailings samples at the site. The sampling and analytical methods used for mine waste characterization are described in detail in the Sampling and Analysis Plan for the Carpenter-Snow Creek Mining District (CSCMD) National Priorities List (NPL) site (Tetra Tech 2012).

3.1 SAMPLE COLLECTION

Tetra Tech collected 20 waste rock samples from the Carpenter Creek watershed, the Snow Creek watershed, and the Neihart Slope. Collection of waste rock samples occurred concurrently with surveying waste rock piles to estimate their volume. Large waste rock piles were identified and composite samples were collected of waste rock material. Sample locations were chosen to be representative of material that could be placed in a repository for the area or treated in place. Sample aliquots were collected in multiple areas of each pile and composited in a 5-gallon container. Sample locations were recorded using global positional system (GPS) methods and are provided in Table 3-1 and Figure 3-1.

Additionally, 10 tailings samples were collected from the Carpenter Creek watershed. Two samples were collected from the Upper Tailings Pile, two were collected from the Lower Tailings Pile, and six were collected from streamside tailings deposits along Carpenter Creek. Tetra Tech used a backhoe to collect samples and composited material from multiple depths at each sample location. The depth of sample aliquots ranged from 1 to 8 feet below ground surface (bgs). Samples were collected in a 5-gallon container. Locations of samples are in Table 3-1 and Figure 3-1.

4.0 RESULTS

4.1 GEOTECHNICAL TESTING

The 30 waste rock and tailings samples were analyzed for geotechnical properties using American Society for Testing and Materials (ASTM) procedures: Moisture Content (D-2216), Sieve Analysis (C-136), Atterberg Limits (D-4318), One Dimensional Consolidation (D-2435), Swell Test (D-4546), Direct Shear (D-3080), Moisture Density Determination (D-698) and Organic Content (D-2974).

Results are summarized in Table 4-1. Full analytical data packages are in Appendix A. Geotechnical testing results were incorporated in slope stability models for potential repository alternatives in the Mackay Gulch area. It was determined that with native fill conditions and grades similar to what is found in Mackay Gulch, any repository design that maintained slopes of no greater than 2.5:1 would be considered stable. Stability could be increased if tailings and waste rock were incorporated together before they were placed into a potential repository.

4.2 SPLP AND ABA TESTING

After geotechnical testing was completed, soil samples were analyzed using SPLP and ABA. Results are summarized in Table 4-2 and full analytical data are provided in Appendix B. The SPLP metals analyzed were arsenic, cadmium, copper, iron, lead, manganese, mercury, silver, and zinc.

ABA results indicated several of the samples would require a lime additive to neutralize their inherent acid-generating potential if reclaimed in place. To limit waste rock and tailings exposure to runoff, it's recommended that potential repository designs incorporate either a synthetic liner or soil cap to limit leaching potential of the mine waste.

5.0 REFERENCES

City Data.com. 2011. Neihart population data. http://www.city-data.com/city/Neihart-Montana.html

Department of Environmental Quality. 2012. Final Circular DEQ-7, Montana Numeric Water Quality Standards. October.

GCM Services, Inc. 1991. Cultural Resource Inventory and Assessment of the Neihart Mining District. Prepared for L.C. Hanson Company. Butte.

Sahinen, Uuno M. 1935. "Mining Districts in Montana." Thesis, Montana School of Mines, Butte.

Tetra Tech 2011. "Final Sampling and Analysis Plan for the Carpenter-Snow Creek Mining District NPL Site." August 2011.

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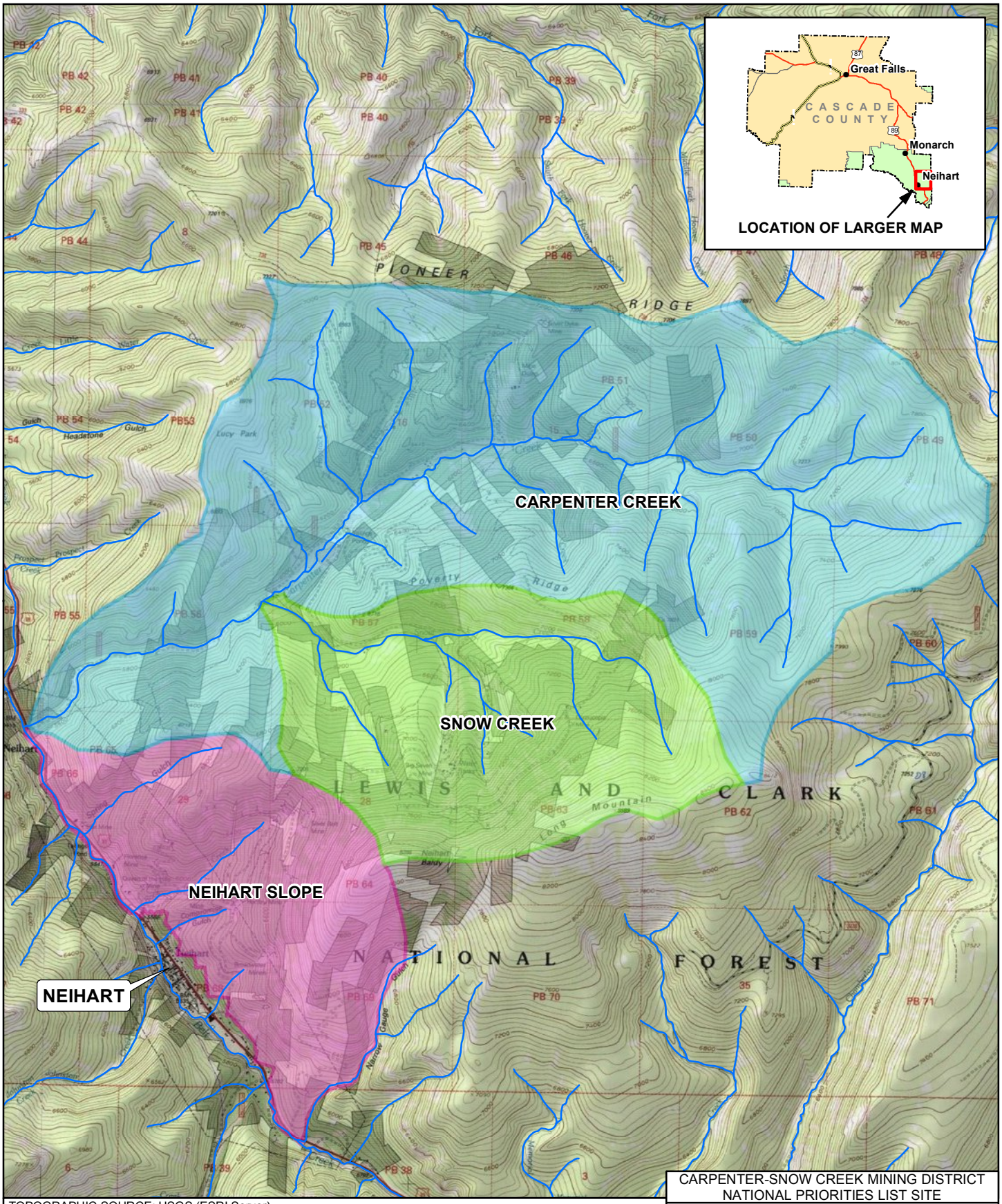
FIGURES



TOPOGRAPHIC SOURCE: USGS (ESRI Server)

LEGEND

DRAINAGE

0 0.2 0.4 0.6 0.8 1 Miles

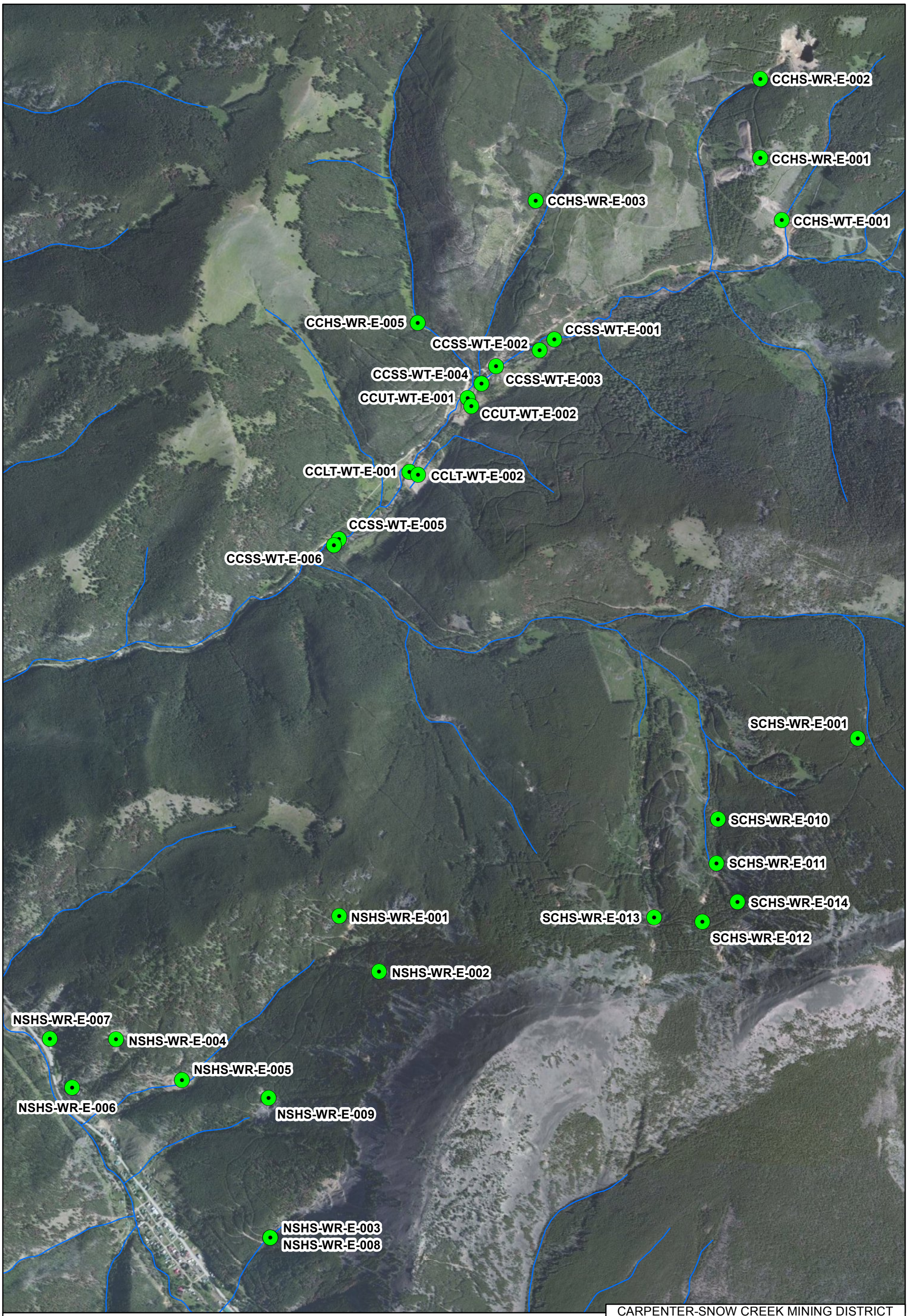
CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 1-1

INVESTIGATION LOCATION MAP
CARPENTER CREEK, SNOW CREEK,
AND NEIHART SLOPE DRAINAGES

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - FIGURE_1-1_Investigation_Location_Map_121312.mxd



AERIAL IMAGERY SOURCE: BING SATELLITE IMAGE

LEGEND

STREAM

SAMPLE LOCATION

N

0 1,000 2,000 3,000 4,000 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 3-1

WASTE ROCK SAMPLE POINTS

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - FIGURE_3-1_Waste_Rock_Sample_Points_010613.mxd

TABLES

TABLE 3-1
WASTE ROCK AND TAILINGS SAMPLE LOCATIONS

Sample Name	Northing	Easting	Elevation	Area	Parcel Name	Owner Name
	UTM m	UTM m	m			
CCHS-WT-E-001	5202560	523076	1901.952	CARPENTER CREEK	CC022	ALEXANDRA RESOURCES CO
CCHS-WR-E-001	5202858	522974	2064.7152	CARPENTER CREEK	CC021	ALEXANDRA RESOURCES CO
CCHS-WR-E-002	5203234	522974	2085.4416	CARPENTER CREEK	CC020	ALEXANDRA RESOURCES CO
CCHS-WR-E-003	5202653	521898	1912.0104	CARPENTER CREEK	CC037	MATHES DANIEL C
CCHS-WR-E-005	5202068	521334	1877.8728	CARPENTER CREEK	CC045	AMAX EXPLORATION INC
CCLT-WT-E-001	5201355	521294	1716.9384	CARPENTER CREEK	CC075	AMAX EXPLORATION INC
CCLT-WT-E-002	5201342	521336	1819.0464	CARPENTER CREEK	CC075	AMAX EXPLORATION INC
CCSS-WT-E-001	5201988	521987	1846.7832	CARPENTER CREEK	CC053	CAMP COURTNEY T & DEBORAH A
CCSS-WT-E-002	5201937	521917	1844.6496	CARPENTER CREEK	CC053	CAMP COURTNEY T & DEBORAH A
CCSS-WT-E-003	5201860	521709	1851.66	CARPENTER CREEK	CC053	CAMP COURTNEY T & DEBORAH A
CCSS-WT-E-004	5201776	521639	1850.136	CARPENTER CREEK	CC053	CAMP COURTNEY T & DEBORAH A
CCSS-WT-E-005	5201033	520957	1732.788	CARPENTER CREEK	CC075	AMAX EXPLORATION INC
CCSS-WT-E-006	5201004	520933	1805.6352	CARPENTER CREEK	CC075	AMAX EXPLORATION INC
CCUT-WT-E-001	5201708	521573	1848.0024	CARPENTER CREEK	CC029	UNITED STATES OF AMERICA
CCUT-WT-E-002	5201668	521590	1849.5264	CARPENTER CREEK	CC029	UNITED STATES OF AMERICA
NSHS-WR-E-001	5199229.534	520958.037	2073.328	NEIHART SLOPE	NS016	MONARCH COMPANY INC
NSHS-WR-E-002	5198963.851	521147.986	2091.617	NEIHART SLOPE	NS021	RALL ZELDA S
NSHS-WR-E-003	5197691	520629	1731.5688	NEIHART SLOPE	NS086	HAUG DAVID A & MARY E
NSHS-WR-E-004	5198638.427	519890.149	1832.256	NEIHART SLOPE	NS048	ROCK CREEK PROPERTIES LLP
NSHS-WR-E-005	5198445	520206	1800.4536	NEIHART SLOPE	NS056	ALEXANDRA RESOURCES CO
NSHS-WR-E-006	5198409	519680	1731.8736	NEIHART SLOPE	NS090	ROCK CREEK PROPERTIES LLP
NSHS-WR-E-007	5198642	519574	1699.8696	NEIHART SLOPE	NS046	MONARCH CO INC
NSHS-WR-E-008	5197691	520629	1731.5688	NEIHART SLOPE	NS086	HAUG DAVID A & MARY E
NSHS-WR-E-009	5198360	520620	1891.284	NEIHART SLOPE	NS059	TRAMMEL GARY L
SCHS-WR-E-001	5200079.391	523439.904	2265.39	SNOW CREEK	SC023	ALLEN S J
SCHS-WR-E-010	5199691.995	522771.206	2128.335	SNOW CREEK	SC035	BENTON GROUP MINING CO
SCHS-WR-E-011	5199480.58	522762.879	2177.095	SNOW CREEK	SC034	BENTON GROUP MINING COMPANY
SCHS-WR-E-012	5199201.401	522695.538	2298.228	SNOW CREEK	SC045	BENTON GROUP MINING CO
SCHS-WR-E-013	5199223.766	522465.681	2265.943	SNOW CREEK	SC062	LEXINGTON SILVER LEAD MINES IN
SCHS-WR-E-014	5199297.251	522864.772	2280.072	SNOW CREEK	SC034	BENTON GROUP MINING COMPANY

Notes:

CCHS = Carpenter Creek Hazard Survey
CCLT = Carpenter Creek Lower Tailings
CCSS = Carpenter Creek Streamside Sample
CCUT = Carpenter Creek Upper Tailings
WT = Waste Tailings
WR = Waste Rock
E = Ex situ

NS = Neihart Slope
SC = Snow Creek
CC = Carpenter Creek
NSHS = Neihart Slope Hazard Sample
SCHS = Snow Creek Hazard Sample
UTM = Universal Transverse Mercator
m = meter

TABLE 4-1
Mine Waste Characterization Geotechnical Results

ASTM Procedure	C-136		D-4318		D-2216	D-2974	D-3080		D-4546	D-698				D-2435	
										Proctor				Consolidation	
	Soil Classification		Atterberg Limits							Rock Corrected		Uncorrected			
	USCS	AASHTO	Liquid Limit	Plastic Limit	Moisture Content	Organic Content	C	ϕ	Dry Density Remolded	Density	Moisture	Density	Moisture	P_c	c_c
Sample Name					%	%	ksf	deg	pcf	pcf	%	pcf	%	ksf	
CCHS-WT-E-001	SM	A-2-4(0)	NV	NP	4.6	96.7%	0.089	34.5	115.6	128	11.3	121.6	11.3	2.1	0.06
CCHS-WR-E-001	GC	A-2-4(0)	31	22	8.9	93.9%	1.243	37.8	115.5	140.3	12	121.5	12	2.02	0.02
CCHS-WR-E-002	SC-SM	A-1-a	27	22	4.1	93.4%	0.084	35.2	112.6	129.6	13.1	118.5	13.1	2.02	0.51
CCHS-WR-E-003	SW-SM	A-1-a	NV	NP	6.0	95.6%	0.126	37.3	106.6	119.9	13.3	112.1	13.3	2.02	0.04
CCHS-WR-E-005	SM	A-1-b	NV	NP	9.1	96.2%	1.867	45.1	110.4	NA	NA	116.2	11.3	0.61	0.08
CCLT-WT-E-001	CL	A-4(2)	27	18	24.4	94.6%	1.197	21.5	105.8	NA	NA	111.3	14.9	1.93	0.12
CCLT-WT-E-002	CL	A-7-6(22)	45	22	33.2	91.6%	0.285	29	97.1	NA	NA	102.2	19.3	0.74	0.07
CCSS-WT-E-001	SM	A-2-4(0)	NV	NP	18.9	95.4%	0.095	33.2	99.7	108.9	18.4	104.9	18.4	0.52	0.05
CCSS-WT-E-002	SM	A-2-4(0)	NV	NP	9.0	95.9%	0.57	34.6	102	113.4	13.8	107.3	13.8	1.05	0.06
CCSS-WT-E-003	SM	A-4(0)	NV	NP	19.5	95.6%	0.361	37.5	100.6	111.7	16.2	105.8	16.2	0.97	0.07
CCSS-WT-E-004	CL	A-6(9)	37	24	41.5	92.0%	0.942	25.6	94.8	NA	NA	99.6	17.1	2.02	0.17
CCSS-WT-E-005	SM	A-1-b	NV	NP	5.0	97.4%	0.145	33.6	108.6	NA	NA	114.3	9.3	0.79	0.03
CCSS-WT-E-006	SM	A-2-4(0)	NV	NP	11.7	96.3%	0.981	36.6	100	105.8	19.1	105.2	19.1	0.76	0.05
CCUT-WT-E-001	CL	A-6(9)	34	18	33.8	92.7%	1.66	28.2	106.7	112.3	15.3	111.9	15.3	1.91	0.08
CCUT-WT-E-002	CL	A-7-6(16)	41	17	36.4	93.6%	1.744	26.1	104.3	NA	NA	109.8	16.1	3.15	0.09
NSHS-WR-E-001	SC	A-2-4(0)	32	23	6.5	93.9%	0.877	36.9	108	NA	NA	113.6	15.6	1.93	0.08
NSHS-WR-E-002	SM	A-2-6(0)	39	28	17.4	93.8%	0.113	28.9	100.5	110.2	19	105.7	19	1.97	0.06
NSHS-WR-E-003	SM	A-1-b	NV	NP	9.7	95.6%	0.948	44.5	115.7	131.9	12.3	121.7	12.3	1.96	0.03
NSHS-WR-E-004	SW	A-1-a	NV	NP	4.9	94.0%	0.042	38.2	123.9	NA	NA	130.4	11.1	0.79	0.25
NSHS-WR-E-005	SC	A-2-6(0)	37	24	8.3	93.8%	0.028	29.9	106.6	121	15.4	111.7	15.4	0.77	0.12
NSHS-WR-E-006	GM	A-2-4(0)	32	25	9.4	95.8%	0.201	33.5	112.3	130.2	14.6	118.2	14.6	2.09	0.05
NSHS-WR-E-007	GP-GC	A-2-4(0)	33	23	9.2	96.3%	0.397	30.8	115.6	134.7	13.1	121.6	13.1	0.92	906.94
NSHS-WR-E-008	GC	A-2-4(0)	27	18	8.1	94.4%	0.814	51.3	117	140	14	123.1	14	1.1	0.03
NSHS-WR-E-009	SM	A-1-b	NV	NP	7.2	95.0%	0.048	37.5	118.9	NA	NA	125.1	11.3	2	0.05
SCHS-WR-E-001	SM	A-1-b	36	30	11.9	96.2%	0.019	37.1	107.8	NA	NA	113.4	13.4	1.03	0.06
SCHS-WR-E-010	GP-GM	A-2-4(0)	39	29	9.9	96.5%	0.505	42.4	109.4	128.3	15.3	115.1	15.3	2.11	56.68
SCHS-WR-E-011	SW-SM	A-1-a	NV	NP	6.1	95.8%	0.294	34.6	116.9	133.2	12.4	123	12.4	0.33	0.04
SCHS-WR-E-012	SP	A-1-a	NV	NP	9.7	96.0%	0.014	38.1	113.9	NA	NA	119.8	13.1	1.15	0.05
SCHS-WR-E-013	SC	A-2-4(0)	31	23	9.2	95.4%	0.023	33.1	109	120.7	13.8	114.7	13.8	1.91	0.06
SCHS-WR-E-014	SC	A-2-4(0)	29	21	4.4	96.2%	0.033	37.2	117.3	131.4	10.8	123.4	10.8	1.03	0.04

Notes:

AASHTO = American Association of State Highway and Transportation Officials
ksf = kips per square foot
pcf = pounds per cubic foot
NV = non viscous
NP = non plastic
WR = Waste Rock
WT = Waste Tailings
E = Ex situ
NA = Not applicable
C = Cohesion

USCS = United Soil Classification System
AASHTO = American Association of State Highway and Transportation Officials
CCHS = Carpenter Creek Hazard Sample
CCLT = Carpenter Creek Lower Tailings
CCSS = Carpenter Creek Soil Sample
CCUT = Carpenter Creek Upper Tailings
NSHS = Neihart Slope Hazard Sample
SCHS = Snow Creek Hazard Sample
ϕ = Friction angle

TABLE 4-2
Tailings and Waste Rock Synthetic Precipitation Leaching Procedure (SPLP) and Acid Base Accounting (ABA) Results

Sample Name		Synthetic Precipitation Leaching Procedure Results									Acid Base Accounting Results				
	Leaching Element	Arsenic	Cadmium	Copper	Iron	Lead	Manganese	Silver	Zinc	Mercury	Neutralization Potential	Acid/Base Potential	Acid Potential	Lime Requirement	SMP Lime Requirement
	Surface Water Standard*	10	5	1300	NA	15	NA	100	2000	0.05					
	Groundwater Standard*	10	5	1300	NA	15	NA	100	2000	2					
	Secondary MCL				300		50								
	Units	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	tons/1000	tons/1000	tons/1000	tons/1000	tons/1000
CCHS-WR-E-001		ND	0.025	6680	100	1.5	3370	ND	3820	ND	<0.5	-23	23	46	13.2
CCHS-WR-E-002		0.01	0.0062	0.58	0.27	13.5	1.6	ND	0.93	ND	0.6	-16	17	28	8.1
CCHS-WR-E-003		ND	ND	0.053	2.5	0.18	0.37	ND	0.13	ND	<0.5	-5.5	5.5	26	15.5
CCHS-WR-E-005		ND	0.0046	0.06	1.4	0.46	0.089	ND	1.2	ND	0.9	0.9	<4.3	19	11.7
CCHS-WT-E-001		ND	ND	0.043	0.35	0.069	0.024	ND	ND	ND	7.6	-0.8	8.4	10	0
CCLT-WT-E-001		ND	ND	ND	ND	ND	ND	ND	ND	ND	15	1.3	13	17	0
CCLT-WT-E-002		ND	ND	ND	91	0.014	21.5	ND	ND	ND	3.4	-11	14	18	0
CCSS-WT-E-001		ND	0.0093	1.6	0.1	3.2	1.6	ND	0.85	ND	<0.5	0	<4.3	9.1	4.6
CCSS-WT-E-002		ND	0.03	1700	108	4.2	5390	ND	2740	ND	0.67	-7	7.7	23	10.4
CCSS-WT-E-003		ND	0.024	3.2	ND	3.3	5.1	ND	2.2	ND	1.5	1.5	<4.3	14	8.1
CCSS-WT-E-004		ND	0.16	0.64	ND	0.72	13.2	ND	9.2	ND	11	5.1	5.9	13	4.6
CCSS-WT-E-005		ND	0.0083	0.47	0.052	0.72	1.8	ND	0.54	ND	4.2	4.2	<4.3	8	3.9
CCSS-WT-E-006		ND	0.0024	0.24	0.08	0.96	0.73	ND	0.26	ND	<0.5	0	<5.4	8.6	4.6
CCUT-WT-E-001		ND	0.015	ND	ND	ND	0.93	ND	0.025	ND	29	20	8.7	11	0
CCUT-WT-E-002		ND	0.0074	ND	ND	0.0051	0.81	ND	ND	ND	34	22	11	14	0
NSHS-WR-E-001		ND	0.0071	ND	205	0.045	1050	ND	1510	ND	1.1	-22	23	43	11.1
NSHS-WR-E-002		ND	0.0049	ND	69	0.0031	1280	ND	870	ND	8.2	-4.9	13	24	6.1
NSHS-WR-E-003		ND	0.035	ND	ND	1.3	2.6	ND	4	ND	10	-2	12	15	0.3
NSHS-WR-E-004		ND	0.015	ND	ND	0.031	0.028	ND	0.68	ND	11	-10	21	26	0
NSHS-WR-E-005		ND	0.011	0.18	ND	4.7	6.6	ND	2.4	ND	1.7	-13	15	26	7.4
NSHS-WR-E-006		ND	0.025	ND	0.058	0.0072	4.5	ND	6.1	ND	4.7	-20	25	37	5.3
NSHS-WR-E-007		0.014	0.0038	ND	1.4	0.25	0.91	ND	0.59	ND	1.6	-4.2	5.8	13	4.6
NSHS-WR-E-008		ND	ND	ND	0.49	0.06	0.14	ND	0.085	ND	36	-22	58	72	0
NSHS-WR-E-009		0.03	0.0063	34.8	19400	1.5	3460	0.052	1790	ND	1.1	-8.2	9.3	12	0
SCHS-WR-E-001		ND	ND	ND	0.32	0.023	0.098	ND	0.21	ND	1.7	-3.6	5.3	20	11.1
SCHS-WR-E-010		ND	ND	ND	0.39	0.015	0.13	ND	0.56	ND	0.7	0.7	<4.3	15	9.6
SCHS-WR-E-011		0.021	0.0053	0.076	3.6	0.012	0.44	ND	0.93	ND	<0.5	-8.7	8.7	25	11.1
SCHS-WR-E-012		ND	0.004	0.038	ND	0.2	1.3	ND	0.73	ND	1.9	-6.3	8.2	24	11.1
SCHS-WR-E-013		ND	0.0041	0.017	0.075	0.15	0.14	ND	0.99	ND	<0.5	-4.7	4.7	18	9.6
SCHS-WR-E-014		ND	0.0023	ND	ND	0.065	0.31	ND	0.52	ND	1.3	-3.2	4.5	16	8.1

Notes: µg/L= micrograms per liter
tons/1000 = tons per 1000 tons
ND = Not Detected
SMP = Shoemaker-McLean-Pratt
* Groundwater and Surface Water standards from DEQ-7 Numeric Water Quality Standards
MCL = Maximum contaminant level

APPENDIX A

GEOTECHNICAL LABORATORY RESULTS

(available on CD only)

APPENDIX B

SPLP AND ABA LABORATORY RESULTS

(available on CD only)