TABLES

Table 2.1: General North Cave Hills Stratigraphy (after Curtis, 1955).

Age	Group	Formation	Thickness (ft.)	Lithology
Early Tertiary (Paleocene	Fort Union	Tongue River	30-60	Yellow to brown, locally reddish to purple, soft, cavernous sandstone; silt, clay, and coal
		Ludlow	~200	Buff to yellow sand, sandstone, silt, clay, coal
Late Cretaceous		Hell Creek	~400	"Somber beds" of drab, gray gumbo sand, silt, clay, coal, dinosaur bones
		Fox Hills	20-75	Light gray to yellow, fine-grained quartzose sand
		Pierre	~50	Dark grey bentonitic gumbo-like clay with concretions

Table 3.1: Bluff identification, location, and landowner for mined Bluffs in the North Cave Hills.

BLUFF #	MAP LOCATION (Black Hills Meridian)	LAND OWNERSHIP OF MINES AND SPOILS
A	T22N, R5E, Sec.'s 22, 23	USFS
B	T22N, R5E, Sec.'s 22, 23, 26, 27	USFS, small part Private
C	T22N, R5F, Sec. 26	USFS
D	T22N, R5F, Sec. 26	USFS
E	T22N, R5F, Sec.'s 26, 35	USFS
F	T22N, R5E, Sec. 35	USFS
G	T22N, R5E, Sec. 36	USFS
H	T22N, R5F, Sec.'s 25, 36	USFS, small part Private
I (1)	T22N, R5E, Sec. 35	USFS
I (2)	T22N, R5E, Sec. 36	USFS
J	T22N, R5E, Sec. 20	USFS
K (1)	T22N, R5E, Sec. 21	USFS
K (2)	T22N, R5E, Sec. 21	USFS
L	T22N, R5E, Sec. 29	USFS
Flat Top	T22N, R5E, Sec. 27	Private

Table 5.1: Summary of target metal and radionuclide analytes and analytical methods employed.

Analyte Name	Chemical Symbol	Soil/ Sediment	Air Filter	Surface Water	Ground Water
Arsenic	As	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Copper	Cu	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Molybdenum	Mo	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Selenium	Se	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Lead	Pb	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Thorium	Th	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Radium	Ra	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Uranium	U	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Vanadium	V	SW6020[1]	SW6020[1]	E200.8[2]	E200.8[2]
Radium-226	Ra-226	E903.0[3]	E903.0[3]	E903.0[3]	E903.0[3]
Uranium-235	U-235	E907.0[4]	E907.0[4]	E907.0[4]	E907.0[4]

[1] Standard EPA method for ICP/MS analysis of Total Recoverable Metals in solids;
[2] Standard EPA Method for ICP/MS analysis of Total Recoverable Metals in water;
[3] Standard EPA Method for Analysis Radionuclides in Water Using Radiochemical Methods (also adapted to solids);
[4] Standard EPA Method measuring Total Radioactive Uranium in water (also adapted to solids).

Table 5.2: Summary of water quality and radiochemical analytical methods employed.

Analysis	Standard EPA Surface Water Method
Alkalinity (CO_3^{2-}, HCO_3^-, H_2CO_3)	A2320 B
Solids, Suspended Volatile	A2540
Solids, Total Suspended	E160.2
Anions by Ion Chromatography (NO_3/NO_2, SO_4^{2-})	E300.0
Phosphorus, Total	E365.1
Gross Alpha	E900.0
Radium 226, Total	E903.0
Radium 228, Total	E904.0
Thorium 230, Total	E907.0
Thorium, Isotopic	E907.0
Uranium, Isotopic	E907.0

Table 5.3: South Dakota DENR surface water quality standards (SD DENR 2002).

Analyte Name	Human Health [µg L^{-1}]	Aquatic Life Value Concentrations	
		Acute @ 100 mg/L hardness [µg L^{-1}]	Chronic @ 100 mg/L hardness [µg L^{-1}]
Arsenic	0.018	360	190
Cadmium		3.7	1.0
Chromium III		550	180
Chromium VI		15	10
Copper	1,300	17	11
Lead		65	2.5
Mercury	0.14	2.1	0.012
Molybdenum			
Nickel	610	1,400	160
Radium-226, 228			
Selenium		20	5
Silver		3.4	
Thorium			
Uranium		20	
Vanadium			
Zinc		110	100

Table 6.1: Surface water background sampling sites and results[1] for the establishment of overall project background concentrations.

Sample ID	Total As (mg/L)	Total U (mg/L)	Total Mo (mg/L)	Total Cu (mg/L)	Total V (mg/L)	Total Se (mg/L)	Total Pb (mg/L)	Total Th (mg/L)
NCH-SW-21-1	0.0050	0.0170	0.0225	0.0191	0.0053	<0.005	<0.005	<0.005
NCH-SW-24-1	0.0060	<0.005	<0.005	0.0102	0.0058	<0.005	<0.005	<0.005
NCH-SW-26-1	0.0115	0.0120	0.0131	0.0226	<0.005	<0.005	<0.005	<0.005
NCH-SW-31-1	0.0126	<0.005	0.0210	<0.005	<0.005	<0.005	<0.005	<0.005
Mean	0.0088	0.0097	0.0154	0.0142	0.0053			
Stnd Dev	0.0038	0.0058	0.0081	0.0081	0.0004			
3x Stnd Dev	0.0115	0.0175	0.0242	0.0242	0.0012			
BACKGROUND	**0.0202**	**0.0273**	**0.0396**	**0.0385**	**0.0065**			
(Mean + 3x Stnd Dev)								

[1.] Only total metals concentrations were determined for NCH-SW-21-1, 24-1, and 26-1 background samples. Dissolved metal concentrations for NCH-SW-31-1 were reported as <0.005 mg/L for all metals except dissolved Mo (0.0213 mg/L).

Table 6.2: Phase I surface water results.

Sample ID	Total As (mg/L)	Total As (x bkgd)	Diss As (mg/L)	Diss As (x bkgd)	Total U (mg/L)	Total U (x bkgd)	Diss U (mg/L)	Diss U (x bkgd)	Total Mo (mg/L)	Total Mo (x bkgd)	Diss Mo (mg/L)	Diss Mo (x bkgd)	Total Cu (mg/L)	Total Cu (x bkgd)	Diss Cu (mg/L)
NCH-SW-1-1	0.5855	28.9			0.1210	4.4			0.2292	5.8			0.1413	3.7	
NCH-SW-1-5	0.7657	37.9	ND	0.0	0.1499	5.5	0.0597	2.2	0.1587	4.0	0.5388	13.6	0.1845	4.8	0.0326
NCH-SW-2-1	0.4908	24.3			0.0649	2.4			0.1134	2.9			0.0751	2.0	
NCH-SW-2-3	0.5622	27.8			0.0811	3.0			0.1087	2.7			0.0947	2.5	
NCH-SW-2-5	0.6545	32.4	ND	0.0	0.0940	3.4	0.0602	2.2	0.1036	2.6	0.1146	2.9	0.0996	2.6	0.0409
NCH-SW-16-1	0.1139	5.6			0.0285	1.0			0.0918	2.3			0.0205	0.5	
NCH-SW-18-1	0.5638	27.9			0.1155	4.2			0.1844	4.7			0.1359	3.5	
NCH-SW-22-1	0.0109	0.5			ND	0.0			0.0051	0.1			0.0227	0.6	
NCH-SW-22-2	0.0092	0.5			ND	0.0			0.0052	0.1			0.0251	0.7	
NCH-SW-22-3	0.0102	0.5			ND	0.0			ND	0.0			0.0263	0.7	
NCH-SW-23-1	ND	0.0			0.0259	0.9			0.0363	0.9			0.0579	1.5	
NCH-SW-23-2	0.0038	0.2	ND	0.0	0.0134	0.5	0.0158	0.6	0.0175	0.4	0.0114	0.3	0.0387	1.0	0.0475
NCH-SW-25-1	0.0283	1.4			0.0074	0.3			ND	0.0			0.0222	0.6	
NCH-SW-27-1	0.0005	0.0			0.0876	3.2			0.0406	1.0			0.0626	1.6	
NCH-SW-27-2	ND	0.0	ND	0.0	0.1068	3.9	0.1012	3.7	0.0359	0.9	0.0529	1.3	0.0642	1.7	0.0703
NCH-SW-28-1	ND	0.0			0.0422	1.5			0.0413	1.0			0.0565	1.5	
NCH-SW-28-2	0.0117	0.6	ND	0.0	0.0463	1.7	0.0434	1.6	0.0565	1.4	0.0569	1.4	0.0782	2.0	0.0823

Sample ID	Total V (mg/L)	Total V (x bkgd)	Diss V (mg/L)	Diss V (x bkgd)	Total Se (mg/L)	Total Pb (mg/L)	Total Th (mg/L)
NCH-SW-1-1	0.2325	36.0			0.0347	0.1591	0.0568
NCH-SW-1-5	0.2734	42.3	0.0557	8.6	0.0363	0.2160	0.0690
NCH-SW-2-1	0.1206	18.7			0.0084	0.0758	0.0344
NCH-SW-2-3	0.1392	21.6			0.0089	0.1016	0.0330
NCH-SW-2-5	0.1492	23.1	0.0737	11.4	0.0109	0.1229	0.0377
NCH-SW-16-1	ND	0.0			ND	ND	0.0068
NCH-SW-18-1	0.2482	38.4			0.0314	0.1971	0.0605
NCH-SW-22-1	ND	0.0			ND	ND	ND
NCH-SW-22-2	ND	0.0			ND	ND	ND
NCH-SW-22-3	ND	0.0			ND	ND	ND
NCH-SW-23-1	ND	0.0			ND	ND	ND
NCH-SW-23-2	0.0102	1.6	0.0103	1.6	ND	ND	ND
NCH-SW-25-1	0.0253	3.9			ND	0.0105	ND
NCH-SW-27-1	0.0085	1.3			ND	ND	ND
NCH-SW-27-2	0.0073	1.1	0.0073	1.1	ND	ND	ND
NCH-SW-28-1	ND	0.0			ND	ND	ND
NCH-SW-28-2	0.0089	1.4	0.0085	1.3	ND	ND	0.0080

Table 6.3: Phase II surface water results

Sample ID	Total As (mg/L)	Total As (x bkgd)	Diss As (mg/L)	Diss As (x bkgd)	Total U (mg/L)	Total U (x bkgd)	Diss U (mg/L)	Diss U (x bkgd)	Total Mo (mg/L)	Total Mo (x bkgd)	Diss Mo (mg/L)	Diss Mo (x bkgd)	Total Cu (mg/L)	Total Cu (x bkgd)	Diss Cu (mg/L)
NCH-SW-29-1	0.0062	0.3			0.0252	0.9			0.0529	1.3			0.0407	1.1	
NCH-SW-32-1	0.0057	0.3	ND	0.0	0.0430	1.6	0.0384	1.4	0.0500	1.3	0.0537	1.4	0.0850	2.2	0.0908
NCH-SW-33-1	0.0295	1.5	ND	0.0	0.0232	0.9	0.0203	0.7	0.0226	0.6	0.0275	0.7	0.0565	1.5	0.0708
NCH-SW-34-1	0.0446	2.2	ND	0.0	0.0783	2.9	0.0589	2.2	0.1076	2.7	0.1114	2.8	0.0881	2.3	0.1005
NCH-SW-35-1	0.0180	0.9	ND	0.0	0.0296	1.1	0.0280	1.0	0.0386	1.0	0.0451	1.1	0.0403	1.0	0.0464
NCH-SW-36-1	ND	0.0	ND	0.0	0.0347	1.3	0.0299	1.1	0.0343	0.9	0.0335	0.8	0.1748	4.5	0.1557
NCH-SW-37-1	0.4067	20.1	ND	0.0	0.1313	4.8	0.1247	4.6	0.0649	1.6	0.4314	10.9	0.1076	2.8	0.0742
NCH-SW-38-1	0.2717	13.4	0.1539	7.6	0.1034	3.8	0.0796	2.9	0.1635	4.1	0.2599	6.6	0.1024	2.7	0.0803
NCH-SW-39-1	ND	0.0	ND	0.0	0.0139	0.5	0.0151	0.6	0.0052	0.1	0.0063	0.2	0.2300	6.0	0.1950
NCH-SW-40-1	0.0475	2.3	ND	0.0	0.0628	2.3	0.0628	2.3	0.1943	4.9	0.1986	5.0	0.0943	2.5	0.1039
NCH-SW-40-2	0.0488	2.4	ND	0.0	0.0614	2.2	0.0661	2.4	0.2059	5.2	0.2057	5.2	0.1022	2.7	0.1061
NCH-SW-41-1	1.0516	52.0	0.4238	21.0	0.3285	12.0	0.2534	9.3	0.2852	7.2	0.7302	18.5	0.1846	4.8	0.0654
NCH-SW-42-1	1.3526	66.9	0.4702	23.3	0.3158	11.6	0.2170	8.0	0.2533	6.4	0.7065	17.9	0.1854	4.8	0.0758
NCH-SW-43-1	1.8066	89.3	0.1873	9.3	0.6381	23.4	0.1475	5.4	0.1214	3.1	0.9952	25.2	0.5244	13.6	0.0874
NCH-SW-44-1	0.1358	6.7	ND	0.0	0.0748	2.7	0.0652	2.4	0.0949	2.4	0.1270	3.2	0.0816	2.1	0.0526
NCH-SW-45-1	0.1001	4.9	ND	0.0	0.1879	6.9	0.1903	7.0	0.3421	8.6	0.3482	8.8	0.0784	2.0	0.0760
NCH-SW-46-1	0.1983	9.8	ND	0.0	0.3069	11.2	0.2548	9.3	0.0676	1.7	0.1617	4.1	0.2281	5.9	0.0943
NCH-SW-47-1	0.0127	0.6	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND
NCH-SW-48-1	0.0319	1.6	0.0320	1.6	0.0162	0.6	0.0145	0.5	0.0171	0.4	0.0260	0.7	0.0230	0.6	0.0284
NCH-SW-49-1	0.0776	3.8	ND	0.0	0.0385	1.4	0.0439	1.6	0.0616	1.6	0.0653	1.7	0.1002	2.6	0.0959
NCH-SW-49-2	0.0737	3.6	ND	0.0	0.0343	1.3	0.0425	1.6	0.0585	1.5	0.0707	1.8	0.0994	2.6	0.1033
NCH-SW-49-3	0.0084	0.4	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND	0.0	ND
NCH-SW-50-1	0.2942	14.5	0.1924	9.5	0.1107	4.1	0.0966	3.5	0.3373	8.5	0.3410	8.6	0.0519	1.4	0.0547
NCH-SW-51-1	0.0062	0.3	0.0094	0.5	0.0175	0.6	0.0239	0.9	0.0154	0.4	0.0188	0.5	0.1390	3.6	0.1454
NCH-SW-52-1	0.3140	15.5	ND	0.0	0.1061	3.9	0.1575	5.8	0.3368	8.5	0.5352	13.5	0.0511	1.3	0.0558
NCH-SW-53-1	0.0126	0.6	ND	0.0	0.0069	0.3	0.0116	0.4	0.0179	0.5	0.0218	0.6	0.0401	1.0	0.0398
NCH-SW-54-1	0.3290	16.3	0.2071	10.2	0.1094	4.0	0.1023	3.7	0.3050	7.7	0.3046	7.7	0.0579	1.5	0.0465
NCH-SW-55-1	0.0101	0.5	ND	0.0	0.0105	0.4	0.0133	0.5	0.0087	0.2	0.0126	0.3	0.1195	3.1	0.1239
NCH-SW-56-1	0.0110	0.5	0.0402	2.0	0.0104	0.4	0.0366	1.3	0.0092	0.2	0.1190	3.0	0.1261	3.3	0.0905
NCH-SW-57-1	0.2742	13.6	0.2064	10.2	0.0924	3.4	0.1071	3.9	0.2950	7.5	0.4099	10.4	0.0548	1.4	0.0614
NCH-SW-57-2	0.2916	14.4	0.1374	6.8	0.1011	3.7	0.0900	3.3	0.3254	8.2	0.3184	8.0	0.0587	1.5	0.0426

Sample ID	Total V (mg/L)	Total V (x bkgd)	Diss V (mg/L)	Diss V (x bkgd)	Total Se (mg/L)	Total Pb (mg/L)	Total Th (mg/L)
NCH-SW-29-1	0.0109	1.7			ND	0.0053	0.0087
NCH-SW-32-1	0.0143	2.2	0.0083	1.3	ND	ND	0.0080
NCH-SW-33-1	0.0134	2.1	0.0137	2.1	ND	ND	ND
NCH-SW-34-1	0.0108	1.7	0.0072	1.1	ND	ND	ND
NCH-SW-35-1	0.0097	1.5	0.0073	1.1	ND	ND	ND
NCH-SW-36-1	0.0190	2.9	0.0139	2.2	ND	ND	0.0073
NCH-SW-37-1	0.1515	23.5	0.0091	1.4	0.0066	0.0401	ND
NCH-SW-38-1	0.0657	10.2	0.0155	2.4	0.0063	0.0174	ND
NCH-SW-39-1	ND	0.0	ND	0.0	ND	ND	ND
NCH-SW-40-1	0.0086	1.3	0.0075	1.2	ND	ND	ND
NCH-SW-40-2	0.0093	1.4	0.0076	1.2	ND	ND	ND
NCH-SW-41-1	0.2476	38.4	0.0324	5.0	0.0173	0.1678	0.0577
NCH-SW-42-1	0.2250	34.9	0.0434	6.7	0.0115	0.1732	0.0601
NCH-SW-43-1	0.4730	73.3	0.0337	5.2	0.0303	0.5421	0.0703
NCH-SW-44-1	0.0834	12.9	0.0267	4.1	ND	0.0329	0.0071
NCH-SW-45-1	0.0608	9.4	0.0428	6.6	ND	0.0086	ND
NCH-SW-46-1	0.2272	35.2	0.0235	3.6	0.0141	0.1294	0.0426
NCH-SW-47-1	0.0071	1.1	ND	0.0	ND	ND	ND
NCH-SW-48-1	0.0117	1.8	0.0140	2.2	ND	ND	ND
NCH-SW-49-1	0.0202	3.1	0.0120	1.9	ND	ND	ND
NCH-SW-49-2	0.0207	3.2	0.0132	2.0	ND	ND	ND
NCH-SW-49-3	ND	0.0	ND	0.0	ND	ND	ND
NCH-SW-50-1	0.0381	5.9	0.0183	2.8	ND	0.0132	0.0067
NCH-SW-51-1	0.0363	5.6	0.0219	3.4	ND	ND	ND
NCH-SW-52-1	0.0360	5.6	0.0175	2.7	ND	0.0121	0.0062
NCH-SW-53-1	0.0188	2.9	ND	0.0	ND	ND	ND
NCH-SW-54-1	0.0442	6.8	0.0143	2.2	ND	0.0162	0.0081
NCH-SW-55-1	0.0419	6.5	0.0255	4.0	ND	0.0067	ND
NCH-SW-56-1	0.0390	6.0	0.0107	1.7	ND	0.0091	ND
NCH-SW-57-1	0.0432	6.7	0.0193	3.0	ND	0.0154	0.0074
NCH-SW-57-2	0.0479	7.4	0.0095	1.5	ND	0.0170	0.0081

Table 7.1: Groundwater analysis parameters listed by major classification. Analytical reference method is shown for each parameter.

Measurement Class	Parameter	Method
Physical Parameters	Alkalinity, Total as CaCO3	A2320 B 1
	Bicarbonate as HCO3	A2320 B 1
	Carbonate as CO3	A2320 B 1
	Conductivity @ 25 C	A2510 B 1
	pH	A4500-H B 1
	Solids, Total Dissolved TDS @ 180 C	A2540 C 1
	Solids, Total Suspended TSS @ 105 C	E160.2 1
	Turbidity	A2130 B 1
Inorganic Parameters	Calcium	E200.7 1
	Chloride	E300.0 10
	Hardness as CaCO3	A2340 B 1
	Magnesium	E200.7 1
	Potassium	E200.7 1
	Sodium	E200.7 5
	Sulfate	E300.0 10
	Hardness as CaCO3 - Grains	A2340 B 1
Nutrient Parameters	Nitrogen, Ammonia as N	A4500-NH3 G 1
	Nitrogen, Nitrate+Nitrite as N	E353.2 1
	Phosphorus, Total as P	E365.1 10
Radionuclides - Total	Gross Alpha	E900.0 15 1
	Uranium 235	E907.0 1
	Radium 226	E903.0 5 1
Total Metals Analysis	Arsenic	E200.8 1
	Copper	E200.8 1
	Iron	E200.7 1
	Lead	E200.8 1
	Molybdenum	E200.8 1
	Selenium	E200.8 1
	Thorium 232	E200.8 1
	Uranium	E200.8 1
	Vanadium	E200.8 1
	Zinc	E200.8 1
	Silicon	E200.7 1

Table 7.2: Target analytes for water samples collected during the North Cave Hills groundwater study.

Analyte Name	Chemical Symbol	Maximum Contaminant Level (MCL; mg/L)
Arsenic	As	0.01
Copper	Cu	1.3
Molybdenum	Mo	-
Selenium	Se	0.05
Lead	Pb	0.015
Thorium	Th	-
Uranium	U	0.03
Vanadium	V	-
Radium	Ra	-
Radium-226	Ra-226	5 pCi/L
Uranium-235	U-235	-
Gross Alpha		15 pCi/L

Table 7.3: List of analytes and concentrations for each groundwater well sampled in this study. Blanks spaces in the table represent a non-detect. Values highlighted in *RED italics* indicate MCL exceedences.

Longitude	Latitude	LandOwner	Well Type	Gross Alpha pCi/L	Ra 226 pCi/L	U 235 pCi/L	U mg/L	Zn mg/L	Mo mg/L	Se mg/L	Th 232 mg/L	Cu mg/L	Pb mg/L	As mg/L
			MCL	15	5	-	0.03	-	-	0.05	-	1.3	0.015	0.01
-103.4337211	45.86589467	T. Kalisiak	domestic							0.5				
-103.4459372	45.90563219	M. Downing	domestic	7.6		0.3	0.3							
-103.3929165	45.92617350	G. Miller	domestic	4.4					0.5					
-103.386632	45.89216672	M. Johnson	domestic	*19.6*	0.7		0.1	0.2	0.8					
-103.4074278	45.89109373	M. Johnson	domestic	12.4					0.6					
-103.3776275	45.83607400	Ludlow Fire Dept	domestic					0.15						
-103.3835354	45.81952556	M. Welch	domestic	*29.6*		0.4	0.27	0.2						
-103.4843971	45.93906769	Gilbert Cattle Co.	domestic											
-103.3681774	45.82610155	W. Welch	domestic	7.2		0.3		0.15						
-103.4080802	45.81201514	L. Burghduff	domestic	7.2										
-103.4383491	45.82034506	W. Rotenberger	domestic	3.5					0.7					
-103.4377439	45.81301336	W. Rotenberger	domestic	44.4	0.7	1	0.64	0.5	0.1	0.21		0.6		
-103.3764174	45.79165508	R. Jacobi	domestic	5.4				0.2	0.14					
-103.3851911	45.76009019	T. Hafner	domestic											
-103.4476685	45.76005120	J.D. Brown	domestic	7.5			0.1		0.7					
-103.504392	45.74200674	J.D. Brown	domestic	3.6				0.1						
-103.5524253	45.77222600	W. Johnson	domestic					0.2						
-103.6038344	45.80366331	J. Janvrin	domestic	1.8			0.5	0.2						
103.5317802-	45.91083202	C. Janvrin	domestic	4.3										
-103.6087511	45.92079215	G. Buckley	domestic	8.7				0.2						
-103.5218066	45.86730891	M. Clarkson	domestic					0.1	0.11					
-103.4732726	45.88724891	R. Feist	range						0.5					
-103.4628235	45.87495786	R. Feist	range	8.4	0.5			0.68	0.15			0.7	*0.2*	
-103.4140334	45.93487782	M. Downing	range	6.1				0.2						
-103.4030517	45.90819759	G. Miller	range	5.5										
-103.4030517	45.90819759	G. Miller	range											
-103.3773003	45.83494839	Crooked Creek Bar	range	6.2					0.1					
-103.4377439	45.81301336	W. Rotenberger	range	*44.4*	0.7	1	*0.64*	0.5	0.1	0.21		0.6		

-103.4126356	45.86271500	W. Rotenberger	range	6.2								
-103.4045256	45.76707593	T. Hafner	range					0.9				
-103.4990279	45.79060401	J.D. Brown	range	5.7			0.6	1.62			0.1	*0.2*
-103.4866236	45.76203716	J.D. Brown	range									
-103.4561225	45.72037709	J.D. Brown	range									
-103.5303986	45.78092927	J. Janvrin	range	4.3								
-103.5303986	45.78092927	J. Janvrin	range									
-103.5217318	45.92934251	C. Janvrin	range									
-103.6568696	45.88046120	T. Stearns	range	13.3								
-103.6030208	45.87265857	T. Stearns	range	7	0.4			0.1	0.7			
-103.5491601	45.87840559	M. Clarkson	range	5.6								
-103.5491601	45.87840559	M. Clarkson	range	4.6								

Table 7.4: Groundwater chemistry for this study (NCHUIS) and the NWIS (USGS) data for 6 location-correlated wells from each study. Well locations are shown in Figure 7.1.

Land Owner	Well Depth	Source	Gross Alpha	Ra 226	U 235	U	Zn	Mo	Se	Th 232	Cu	Pb	As
M. Johnson	400	NCHUIS	19.6	0.7		0.001	0.02	0.008					
M. Johnson	384	NCHUIS	12.4					0.006					
M. Welch	55	NCHUIS	29.6		0.4	0.027	0.02						
W. Rotenberger	60	NCHUIS	44.4	0.7	1	0.064	0.05	0.01	0.021		0.06		
W. Rotenberger	300	NCHUIS	3.5					0.007					
M. Johnson	64	USGS	N/A	N/A	N/A								
M. Welch	49.2	USGS	N/A	N/A	N/A								
M. Welch	50	USGS	N/A	N/A	N/A	0.022	0.08	0.032		0.012			
W. Rotenberger	190	USGS	N/A	N/A	N/A	0.033	0.12	0.02		0.01	0.12		0.001
W. Rotenberger	100	USGS	N/A	N/A	N/A								
W. Rotenberger	164	USGS	N/A	N/A	N/A	0.144	0.16	0.03		0.006			0.002

Table 7.5: MCL exceedences in the groundwater sampled in the North Cave Hills.

		MCL Exceedences	
Analyte	MCL	Sample ID	Value
Gross Alpha	15 pCi/L	NCH-GW-16-1	44.4
		NCH-GW-12-1	29.6
		NCH-GW-8-1	19.6
Uranium	0.03 pCi/L	NCH-GW-16-1	0.064
Lead	0.015 mg/L	NCH-GW-2-1	0.02
		NCH-GW-24-1	0.02

Table 8.1: Laser particle sizing data for each site showing the particle size in each percentile based on mass. Approximate PM10 dust content of the soils is also calculated based on the percentiles.

		Percentiles											
	Mass	16	20	30	40	50	60	70	84	90	95	PM_{10}	~PM_{10}
Sample ID	gm	Size (μm)										%	gm/kg
NCH-WTS-1-1	5.5	52.2	49.0	43.3	39.2	35.8	32.6	29.4	23.8	20.0	13.9	0.27	1.75
NCH-WTS-2-1	8.2	97.1	58.4	37.7	33.8	31.2	28.8	26.5	22.1	18.8	14.0	0.41	2.37
NCH-WTS-3-1	11.3	1186.0	1071.0	94.2	51.4	41.5	35.9	31.7	26.0	22.7	17.9	0.56	3.49
NCH-WTS-4-1	5.3	44.0	40.8	35.3	31.2	27.7	24.4	20.6	12.7	8.7	5.9	0.27	5.98
NCH-WTS-5-1	10.6	786.9	771.2	737.7	707.3	678.2	649.1	616.8	32.3	22.5	16.3	0.53	4.38
NCH-WTS-6-1	13.6	53.0	48.4	41.0	36.1	32.4	29.1	25.8	19.4	13.5	8.3	0.68	6.57
NCH-WTS-7-1	16.2	38.6	36.8	33.5	30.9	28.6	26.3	23.7	18.8	15.5	11.8	0.81	6.25
NCH-WTS-8-1	18.8	35.2	33.5	30.1	27.5	24.9	22.0	17.3	6.9	4.8	2.4	0.94	28.96
NCH-WTS-9-1	4.5	50.6	47.4	41.8	37.9	34.8	31.9	29.1	24.6	21.6	17.1	0.23	2.06
NCH-WTS-10-1	3.9	1320.0	1303.0	1262.0	1218.0	1050.0	61.2	45.9	35.6	31.7	27.7	0.20	2.32
NCH-WTS-11-1	11.1	49.3	45.5	39.0	34.4	30.7	27.3	23.7	16.7	11.6	7.6	0.56	4.64
NCH-WTS-12-1	17.6	43.0	40.8	37.0	34.3	31.9	29.5	26.8	19.6	10.8	7.0	0.88	11.37
NCH-WTS-13-1	4.8	35.3	33.7	30.7	28.2	25.8	23.0	19.4	11.9	8.5	5.1	0.24	10.02
NCH-WTS-14-1	12.0	41.0	38.2	33.4	30.0	27.1	24.4	21.7	16.8	13.7	10.2	0.60	4.39
NCH-WTS-15-1	8.9	50.4	47.2	42.5	39.5	37.1	35.0	33.0	29.8	27.9	25.4	0.44	4.04
NCH-WTS-16-1	4.1	41.7	39.6	36.3	34.1	32.2	30.3	28.3	24.0	14.1	6.9	0.20	1.50
NCH-WTS-17-1	13.0	39.5	37.9	35.3	33.4	31.7	30.0	28.1	23.3	9.9	5.7	0.65	14.69
NCH-WTS-18-1	12.9	91.7	62.2	44.4	39.0	35.5	32.7	29.9	25.4	22.1	15.7	0.64	4.19
NCH-WTS-19-1	2.2	61.1	57.9	52.1	47.7	44.1	40.9	37.7	32.6	29.8	26.4	0.11	1.22
NCH-WTS-20-1	12.6	41.6	39.2	34.8	31.4	28.4	25.5	22.6	17.7	14.8	11.3	0.63	4.47
NCH-WTS-21-1	22.0	50.0	46.8	41.1	37.1	33.7	30.7	27.6	22.2	18.3	11.9	1.10	6.49
NCH-WTS-22-1	15.3	35.1	33.7	31.0	28.9	26.9	24.6	21.6	14.6	10.9	7.3	0.76	5.86
NCH-WTS-23-1	16.7	43.0	40.6	36.4	33.5	30.9	28.4	25.7	19.1	11.1	7.0	0.84	12.23

Table 8.2: Surface dust analytical results with background sites shown in **bold red** type.

Longitude	Latitude	Sample ID	Elevation	Landowner	V mg/kg	Cu mg/kg	As mg/kg	Se mg/kg	Mo mg/kg	Pb mg/kg	Th mg/kg	U mg/kg
-103.42346917	45.760332772	NCH-WT-1-2	3002.9	J.D. Brown	22.891	13.480	7.000	0.707	1.059	12.861	3.225	0.882
-103.44445007	45.737065403	NCH-WT-2-2	2897.49	J.D. Brown	22.352	11.357	7.880	0.569	0.550	7.489	2.452	0.728
-103.49618561	45.758320170	NCH-WT-3-2	2988.9	J.D. Brown	17.007	11.417	13.136	0.647	0.652	9.302	1.807	0.735
-103.38777054	45.800566735	NCH-WT-4-4	3080.37	R. Jacobi	19.117	9.170	15.133	0.593	0.880	12.696	3.303	0.887
-103.36592178	45.820361943	NCH-WT-5-4	3061.78	W. Welch	20.718	11.652	10.098	0.705	1.034	13.422	3.463	1.603
-103.39846973	45.820903209	NCH-WT-6-3	3092.89	L. Burghduff	19.007	8.182	11.570	0.651	1.340	10.946	1.137	1.204
-103.45869505	45.926311328	**NCH-WT-7-2**	2985.39	R. Fiest	19.301	8.852	10.002	0.579	0.651	11.646	1.828	0.560
-103.46068348	45.875608703	NCH-WT-8-3	3010.03	R. Fiest	13.407	6.217	8.695		0.997	9.779	1.746	0.980
-103.45835685	45.849725183	NCH-WT-9-3	3041.55	R. Fiest	11.593	4.569	10.873		1.515	8.753	1.826	1.197
-103.41531479	45.858998675	NCH-WT-10-2	3020.48	B. Rottenberger	14.705	5.707	16.730		1.381	10.136	2.139	1.147
-103.39863934	45.887435338	NCH-WT-11-2	2918.1	M. Johnson	13.667	4.708	6.669		0.612	8.226	1.616	0.697
-103.41762710	45.935292395	**NCH-WT-12-2**	2952.96	M Downing	16.388	6.198	9.211		0.757	9.793	2.946	0.684
-103.48900238	45.918182587	NCH-WT-13-2	2974.15	L. Foust	13.908	8.158	7.359			11.146	5.788	0.976
-103.48900238	45.918182587	NCH-WT-26-1	2974.15	L. Foust	16.550	9.190	10.507	0.556	0.695	12.407	5.661	1.508
-103.48359439	45.938328830	NCH-WT-14-2	2980.51	Gilbert Cattle Co	21.133	7.332	11.004	0.550	0.917	13.002	3.091	1.055
-103.53198858	45.908254777	NCH-WT-15-2	2986.6	C. Janvrin	11.287	4.218	7.563			6.371	1.772	
-103.60757141	45.919821726	**NCH-WT-16-2**	3177.52	G. Buckley	6.515	4.199	6.501			6.359	0.536	
-103.58394105	45.938645335	**NCH-WT-17-2**	3048.11	G. Buckley	15.482	6.503	8.294		0.543	8.051	2.620	0.662
-103.54536433	45.849311895	NCH-WT-18-3	3223.55	M Clarkson	13.286	5.651	9.868		0.866	7.796	1.049	0.590
-103.52685643	45.865240737	NCH-WT-19-4	3113.91	M Clarkson	10.356	7.706	10.543	0.586	0.893	5.710	0.681	1.958
-103.60902062	45.872045565	NCH-WT-20-2	3229.87	T. Stearns	13.469	5.388	9.658		0.675	8.022	2.089	1.538
-103.60902062	45.872045565	NCH-WT-25-1	3229.87	T. Stearns	13.438	5.502	10.358		0.825	9.610	2.739	1.774
-103.52166100	45.777131407	NCH-WT-21-2	2980.95	J. Janvrin	18.961	9.723	8.879	0.575	0.778	10.899	3.651	0.913
-103.58396957	45.803888818	**NCH-WT-22-2**	2968.11	J. Janvrin	15.365	8.692	7.584			11.796	3.269	0.527
-103.60584828	45.816513544	**NCH-WT-23-3**	3127.76	J. Janvrin	11.953	8.144	7.339			11.022	2.573	0.579
-103.60755750	45.837155292	**NCH-WT-24-2**	3082.42	J. Janvrin	10.690	8.187	5.302		0.745	11.828	1.709	0.682
-103.3681874	45.75149014	**NCH-WT-27-1**	3009.9	T. Hafner	19.154	13.190	10.125	0.519	0.651	13.053	2.590	0.650
-103.3681874	45.75149014	NCH-WT-28-1	3009.9	T. Hafner	26.853	16.114	12.160	0.794	0.763	12.060	2.494	0.697
-103.4045256	45.76707593	NCH-WT-29-1	3008.08	T. Hafner	23.471	13.034	12.034	0.640	0.946	14.279	3.374	0.690
-103.3603325	45.79371586	**NCH-WT-30-1**	3116.15	R. Jacobi	14.348	7.298	10.344		0.694	11.884	2.561	0.642

-103.3386196	45.79271452	NCH-WT-31-1	3205.63	R. Jacobi	12.085	3.660	12.765	0.574	1.305	6.052	2.126	0.969
-103.4026301	45.74805511	NCH-WT-34-1	2998.53	JD Brown	13.041	12.112	8.464	0.623		10.443	2.736	0.665
-103.3837379	45.71927314	**NCH-WT-35-1**	3002.25	M Stensland	13.232	6.763	9.880		1.105	10.304	1.708	0.584
-103.41531479	45.858998675	NCH-ELIWT-10-2	3020.48	B. Rottenberger	43.4	10.6	22.6	1.5	3.9	13.2	5.2	1.7
-103.60902062	45.872045565	NCH-ELIWT-20-2	3229.87	T. Stearns	26.3	8.5	6.3	0.5	0.9	9.2	5.2	1.6
-103.3603325	45.79371586	NCH-ELIWT-30-1	3116.15	R. Jacobi	28.2	11.4	6.2	0.5	1.0		5.4	0.9
		Values computed for Background Sites										
		Mean			14.24	7.80	8.46	0.51	0.66	10.57	2.23	0.61
		St Dev			3.88	2.35	1.74	0.02	0.18	2.03	0.79	0.07
		2x StDev + Mean			22.01	12.51	11.93	0.56	1.03	14.64	3.82	0.74

Table 8.3: Independent lab results compared to the SDSM&T analysis for three duplicate samples.

	V (mg/kg)	Cu (mg/kg)	As (mg/kg)	Se (mg/kg)	Mo (mg/kg)	Pb (mg/kg)	Th (mg/kg)	U (mg/kg)
NCH-WT-10-2	14.7	5.7	16.7	0.0	1.4	10.1	2.1	1.1
NCH-WT-20-2	13.5	5.4	9.7	0.0	0.7	8.0	2.1	1.5
NCH-WT-30-1	14.3	7.3	10.3	0.0	0.7	11.9	2.6	0.6
NCH-WT-10-2-EL	43.4	10.6	22.6	1.5	3.9	13.2	5.2	1.7
NCH-WT-20-2-EL	26.3	8.5	6.3	0.5	0.9	9.2	5.2	1.6
NCH-WT-30-1-EL	28.2	11.4	6.2	0.5	1.0	0.0	5.4	0.9

Table 8.4: Analytical results from the ambient dust samplers. Values given as <0.5 are below the minimum detection limit of the analytical instrument.

Sample ID	Date	V mg/kg	Cu	As	Se	Mo	Pb	Th	U
NCH-AD-1-1	8/2	2.09	26.59	2.31	2.58	1.01	19.22	0.61	<0.5
NCH-AD-2-1	8/2	0.97	46.27	5.15	8.81	7.83	3.87	<0.5	0.54
NCH-AD-2-1 ELI	8/3	1.30	62.00	4.60	13.00	15.00	5.20	0.35	0.42
NCH-AD-3-1	8/2	1.53	24.45	2.01	3.35	1.45	3.99	<0.5	<0.5
NCH-AD-2-2	9/1	0.77	33.24	2.09	5.38	3.70	3.26	<0.5	<0.5

Table 8.5: Comparison of methods used to collect fine dusts from four locations within the North Cave Hills.

Landowner	Location & sample	Date	Method	V	Cu	As	Se	Mo	Pb	Th	U
L. Burghduff	NCH-WT-6-1	8/24/06	WT	11.62	5.92	6.44		1.03	10.30	0.67	1.21
L. Burghduff	NCH-WT-6-2	8/25/06	bulk soil	13.81	8.73	6.85	0.52	1.08	11.69	1.12	1.38
L. Burghduff	NCH-WT-6-3	11/4/06	scoop	19.01	8.18	11.57	0.65	1.34	10.95	1.14	1.20
R. Fiest	NCH-WT-8-1	8/24/06	WT	12.08	6.11	6.46	0.65	1.34	8.75	1.47	1.64
R. Fiest	NCH-WT-8-2	8/25/06	bulk soil	14.15	13.89	6.23	0.61	1.20	16.82	4.13	1.82
R. Fiest	NCH-WT-8-3	11/4/06	scoop	13.41	6.22	8.69		1.00	9.78	1.75	0.98
M. Clarkson	NCH-WT-19-1	8/23/06	WT	10.50	12.61	5.54	0.90	1.27	7.69	0.71	1.12
M. Clarkson	NCH-WT-19-2	8/23/06	WT	9.74	12.35	5.17	0.88	1.19	7.16	0.61	1.08
M. Clarkson	NCH-WT-19-3	8/25/06	bulk soil	7.74	19.03	4.38	0.67	0.86	21.08	1.15	1.74
M. Clarkson	NCH-WT-19-4	11/4/06	scoop	10.36	7.71	10.54	0.59	0.89	5.71	0.68	1.96
J. Janvrin	NCH-WT-23-1	8/23/06	WT	21.16	15.02	9.15		1.93	9.66	3.38	1.48
J. Janvrin	NCH-WT-23-2	8/26/06	bulk soil	12.15	9.82	4.22			7.89	2.80	0.63
J. Janvrin	NCH-WT-23-3	11/4/06	scoop	11.95	8.14	7.34			11.02	2.57	0.58

Table 8.6: Metals concentrations from site NCH-WT-4 in mg/kg.

Final Sample ID	Method	Landowner	V	Cu	As	Se	Mo	Pb	Th	U
NCH-WT-4-1	WT	R. Jacobi	17.09	12.82	8.10	0.76	1.14	13.24	3.43	1.60
NCH-WT-4-2	tracway	R. Jacobi	26.27	11.93	10.83	0.93	1.44	16.02	4.46	2.22
NCH-WT-4-3	bulk soil	R. Jacobi	13.63	11.09	6.02	0.56	0.68	15.20	3.77	1.43

Table 9.1: Sample ID's and target analyte concentrations of samples used for establishing background values. Statistical values and concentration intervals for each of the eight target analytes and the copper/molybdenum ratio are listed at the bottom of the table. NCH-SE-5-2.9/5 indicates a composite sample taken from a sediment/soil core at site #5 from 2.9 to 5 feet depth.

Sample ID	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
NCH-SE-5-2.9/5	2.1	21.3	5.4	5.9	6.7	1.0	21.7	2.3	1.1
NCH-SE-6-3.2/10	17.5	12.1	7.5	7.2	9.4	0.8	17.2	5.1	1.0
NCH-SE-7-1.0/5	6.0	13.6	12.2	4.9	5.1	1.8	18.3	2.3	0.4
NCH-SE-8-3.0/5	6.6	23.9	5.3	11.9	14.1	0.8	24.4	4.9	2.3
NCH-SE-13-1.7/5	4.1	19.3	5.5	7.7	8.6	0.9	21.5	2.8	1.4
NCH-SE-14-2.6/5	6.3	19.9	4.2	8.2	9.2	0.8	22.6	4.0	1.9
NCH-SE-15-3.5/5	2.3	20.7	4.3	6.0	7.4	0.1	17.8	3.3	1.4
Mean	6.4	18.7	6.3	7.4	8.6	0.9	20.5	3.5	1.4
Standard Deviation	5.2	4.3	2.8	2.3	2.9	0.5	2.7	1.1	0.6
Confidence Level(95.0%)	4.8	4.0	2.6	2.1	2.6	0.5	2.5	1.1	0.6
Background	<22	<32	<15	<14	<17	<2	<29	<7	0.75 - 2
2xBackgrnd	22 - 44	32 - 63	15 - 29	14 - 29	17 - 34	2 - 5	29 - 57	7 - 14	
3xBackgrnd	44 - 66	63 - 95	29 - 44	29 - 43	34 - 52	5 - 7	57 - 86	14 - 21	
>3xBackgrnd	>66	>95	>44	>43	>52	>7	>86	>21	
>Background									>2
1/2xBackgrnd									0.5 - 0.75
1/3xBackgrnd									0.25 - 0.5

Table 9.2: Sample ID's, analytical data, and mean values of background samples listed in the Pioneer (2005) study; all sampling locations located on USFS-administered land.

Sample ID	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
Pioneer 1999									
RP-SS-X	228.0	332.0	135.0	93.0	68.4	90.0	99.5	4.7	0.7
RP-SS-X2	4.5	35.8	8.0	11.8	17.5	8.5	32.7	6.5	1.5
RP-SS-X3	1.0	9.0	1.5	6.8	13.8	7.7	14.8	5.9	4.5
RP-SS-X4	7.0	42.7	11.7	8.2	16.9	8.1	21.2	6.2	0.7
Mean	**60.1**	**105.0**	**39.1**	**29.9**	**29.2**	**28.6**	**42.1**	**5.8**	**0.8**
Portage 2004									
RPSS01		46.9	1.3			1.2			
RPSS02		44.7	1.3			1.1			
RPSS03		13.6	0.7			0.3			
RPSS04		19.7	1.1			1.1			
RPSS05		11.1	0.9			1.2			
Mean		**27.2**	**1.0**			**1.0**			

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Table 9.3: Sample ID's and target analyte concentrations of soil survey below Bluff B. NCH-SE-5-0/2.9 indicates a composite sample taken from a sediment/soil core at site #5 from surface to 2.9 feet depth; NCH-SE-73-0 indicates a scooped-up soil sample taken at site #73 at the surface.

Sample ID	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
NCH-SE-5-0/2.9	7.0	29.7	7.7	6.7	6.6	1.0	19.0	2.2	0.9
NCH-SE-6-0/3.2	17.9	25.7	15.6	7.2	8.0	1.5	23.4	2.6	0.5
NCH-SE-7-0/1.0	22.8	56.8	13.4	12.3	10.4	1.3	23.5	3.5	0.9
NCH-SE-8-0/3.0	11.4	65.9	21.1	10.0	9.0	0.8	29.4	4.4	0.5
NCH-SE-63-0	11.2	54.3	11.0	7.9	8.2	0.6	16.6	3.9	0.7
NCH-SE-64-0	17.4	48.8	10.1	9.1	8.9	0.7	17.7	3.5	0.9
NCH-SE-65-0	11.6	68.3	18.1	5.5	6.5	0.1	10.3	3.4	0.3
NCH-SE-66-0	32.9	97.1	29.6	13.3	15.2	0.8	19.9	6.8	0.4
NCH-SE-67-0	18.9	30.9	12.9	10.0	13.1	0.8	14.8	3.7	0.8
NCH-SE-68-0	6.7	39.8	15.3	8.2	7.5	0.1	19.4	4.2	0.5
NCH-SE-69-0	3.9	18.2	7.3	6.9	12.1	0.1	13.2	2.1	1.0
NCH-SE-70-0	11.2	38.3	9.6	8.8	8.9	0.8	18.5	3.1	0.9
NCH-SE-71-0	5.5	28.6	7.9	6.5	6.9	0.1	15.6	2.9	0.8
NCH-SE-72-0	11.1	41.3	6.8	10.4	12.3	0.6	22.1	5.1	1.5
NCH-SE-73-0	4.3	37.3	6.5	6.8	7.1	0.1	17.0	4.0	1.0
NCH-SE-74-0	3.7	14.8	6.0	7.0	12.8	0.5	18.0	2.4	1.2
NCH-SE-75-0	3.3	9.1	4.3	4.5	7.9	0.1	6.7	1.7	1.0
NCH-SE-76-0	3.5	8.7	3.6	4.0	8.4	0.1	10.5	1.7	1.1
NCH-SE-77-0	4.3	11.1	4.0	4.3	8.5	0.1	12.6	1.8	1.1
NCH-SE-78-0	2.4	12.6	2.5	3.1	6.6	0.1	14.3	2.1	1.2
NCH-SE-79-0	6.8	39.6	6.6	6.2	7.6	0.1	14.6	3.4	0.9
NCH-SE-80-0	2.2	9.2	3.0	3.3	5.1	0.1	9.0	1.4	1.1
NCH-SE-81-0	3.8	21.1	4.0	3.9	5.3	0.1	10.8	2.7	1.0
Minimum	2.2	8.7	2.5	3.1	5.1	0.1	6.7	1.4	0.3
Maximum	32.9	97.1	29.6	13.3	15.2	1.5	29.4	6.8	1.5
Average	9.7	35.1	9.9	7.2	8.8	0.5	16.4	3.1	0.9

Table 9.4: Sample ID's and target analyte concentrations below Bluff H. NCH-SE-13-0/1.7 indicates a composite sample taken from a sediment/soil core at site #13 from surface to 1.7 feet depth.

Sample ID	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
NCH-SE-13-0/1.7	3.5	58.7	12.4	9.5	9.8	0.9	21.4	4.3	0.8
NCH-SE-14-0/2.6	4.8	19.9	5.0	7.9	8.4	0.9	18.6	2.6	1.6
NCH-SE-15-0/3.5	4.4	14.9	3.2	6.6	7.3	0.7	16.9	2.5	2.1
Min	3.5	14.9	3.2	6.6	7.3	0.7	16.9	2.5	0.8
Max	4.8	58.7	12.4	9.5	9.8	0.9	21.4	4.3	2.1
Average	4.3	31.2	6.8	8.0	8.5	0.8	19.0	3.1	1.5

Table 10.1: Core logs of background sampling sites; classification according to the Unified Soil Classification System. Red line represents boundary between drainage sediments and in-situ Formation. Site #29 was sampled with a 1' hand auger.

Site #	Depth	Soil Classification	Remarks
20	0.0-1.2	organic soil	top 1' not recovered, top soil and roots
	1.2-2.2	sandy lean clay	charcoal layers in sand
	2.2-4.5	poorly graded sand	charcoal layers in sand some roots
	4.5-5	clayey sand	some sand stone pieces;charcoal? layers
	5-5.5	clayey sand	sand; coal pieceat 5.1
	5.5-5.8	coal with clay	coal layer at 5.5, turning to clay
	5.8-7.2	fat clay	brown clay with coal at 6.3' 2cm by 3mm piece
	7.2-10	fat clay	green and brown mottled clay with coal at 7.9'
	10-15	fat clay	sandstone pieces, coal layers
21	0-0.2	sandy organic soil	12" not revovered
	0.2-0.5	clayey sand	2cm gravel pieces
	0.5-1.1	poorly graded sand with clay	charcoal upper 2"
	1.1-3.5	clayey sand	17"-20" charcoal, 13"-14" fine sand
	3.5-5.0	clayey sand	sand 1cm-3cm grains matrix supported
	5.0-7.0	fat clay	
	7.0-7.1	well graded gravel with silt	
	7.1-7.5	fat clay	
	9.5-13	lean clay with sand	top 2' not recovered, sand
	13-13.5	fat clay with sand	charcoal and weatherd sandstone
	13.5-14	lean clay with sand	sand / weathered
	14-16	well graded sand with clay	top 1' not recovered, 2" clay, bottom 4" clay
	16-18.5	well graded sand	3" oxidized soil @16.5'
24	0-3.7	fat clay	top 2.5' not recovered, charcoal; plant material
	3.7-5	fat clay	soft clay with charcoal from 4.8' to 5.0' some scoria
	5-6.1	fat clay	Top .8' not recovered; scoria, sand and gravel
	6.1-7.2	well gradedgravel with silt and sand	normal grading (fine to coarse); road wash?
	7.2-9.5	well graded sand	fine sand poorly graded
	9.5-12.5	well graded sand	1' not recovered, uniform sand coal pieces
	12.5-13	coal	
26	0-0.7	silt with sand roots and plant parts	top 0.4' not recoverd, 2" round gravel piece, top soil
	0.7-1.4	silty sand with layers of lean clay	coaly streaks; brown oxidized mottled
	1.4-3.1	well graded sand with silt	large piece of coal; most likely charcoal 2cm
	3.1-3.5	lean clay with sand	
	3.5-5	well graded sand with silt	some rust colored mottling and network of up to 1cm
	5-6.3	well graded sand with silt	top 1.0' not recovered
	6.3-6.9	clayey sand	2% rusty brown mottling
	6.9-7.2	clayey gravel with sand	angular sandstone gravel at channel base
	7.2-7.5	fat clay with gravel and sand	in situ Ludlow Formation? 2% rusty brown mottling
	7.5-8.2	well graded sand with coal	in situ Ludlow Formation?? Organic soil with sand
	8.2-8.9	well graded sand	in situ Ludlow or lower Formation?
	8.9-10	well graded sand	in situ Ludlow or lower Formation?
29	0-0.2	organic soil	top soil, 1mm of peat on top
	0.2-0.7	silt with sand	slope talus and rubble from exploration cuts

Table 10.2: Sample ID and target analyte concentrations of samples used for establishing background values. Statistical values and concentration intervals for each of the eight target analytes and the copper/molybdenum ratio are listed at the bottom of the table. NCH-SE-20-0/5.4 indicates a composite sample taken from a sediment core at site #20 from 0 to 5.4 feet depth. Site #29 was sampled with a hand auger. Intervals representing in-situ formation are highlighted in yellow.

Sample ID	**U (mg/kg)**	**As (mg/kg)**	**Mo (mg/kg)**	**Cu (mg/kg)**	**Pb (mg/kg)**	**Se (mg/kg)**	**V (mg/kg)**	**Th (mg/kg)**	**Cu/Mo Ratio**
NCH-SE-20-0/5.4	2.3	10.0	3.1	10.5	10.2	0.9	19.1	3.8	3.4
NCH-SE-21-0/9.5	1.7	17.6	3.8	15.1	14.8	0.9	28.2	4.7	4.0
NCH-SE-21-9.5/18.5	1.1	16.3	2.9	7.8	8.3	0.6	19.5	3.9	2.7
NCH-SE-24-0/12.5	1.6	12.3	2.3	11.2	11.5	1.0	26.0	4.3	4.9
NCH-SE-24-12.5/13	20.6	9.4	7.6	19.6	11.0	2.4	52.5	4.4	2.6
NCH-SE-26-0/1.4	1.3	9.0	1.1	9.6	9.6	0.6	20.2	2.8	8.6
NCH-SE-26-1.4/7.2	1.2	17.6	2.4	8.9	9.0	0.5	25.0	3.6	3.8
NCH-SE-26-7.2/8.9	6.8	10.9	4.7	8.3	11.2	1.0	32.2	4.3	1.8
NCH-SE-29-0/0.7	0.6	7.2	0.7	5.2	8.6	0.6	13.5	4.0	7.4
Mean	1.4	12.9	2.3	9.7	10.3	0.7	21.7	3.9	5.0
Standard Deviation	0.5	4.3	1.1	3.1	2.3	0.2	5.1	0.6	2.2
Confidence Level(95%)	0.5	4.0	1.0	2.8	2.1	0.2	4.7	0.5	2.0
Background Range determined by +/- three Standard Deviations from Mean									
Background	<4	<26	<6	<19	<17	<1.3	<37	<6	
2xBackground	4-8	26-52	6-12	19-38	17-34	1.3-2.6	37-74	6-12	
3xBackground	8-12	52-78	12-18	38-57	34-51	2.6-3.9	74-111	12-18	
>3xBackground	>12	>78	>18	>57	>51	>3.9	>111	>18	
High Background									>4
Low Background									2.5-4
1/2 Background									1.25-2.5
1/3 Background									0.8-1.25
<1/3 Background									<0.8

Table 10.3: Sample ID, analytical data, and mean values of background samples listed in the Pioneer (2005) study; all sampling locations are located on USFS-administered land.

Sample ID	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
RP-SE-X1	17.0	18.9	1.3	6.6	8.6	8.2	22.9	4.3	5.1
RP-SE-X2	4.2	16.3	2.4	9.3	10.5	12.6	17.8	9.6	3.9
RP-SE-X3	4.1	14.1	1.6	8.0	8.2	8.4	24.5	6.4	5.0
RP-SE-X4	5.9	64.1	12.0	6.3	14.2	7.8	24.6	5.9	0.5
Mean	7.8	28.4	4.3	7.5	10.4	9.3	22.5	6.6	3.6

Table 10.4: Sample ID and target analyte concentrations. NCH-SE-33-1.9/2.1 indicates a composite sample taken from a sediment core at site #33 from 1.9 to 2.1 feet depth. NCH-SE-58-0/1 indicates a hand auger sample from 0 to 1 foot depth. Intervals representing in-situ formation are highlighted in yellow.

Sample ID	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
NCH-SE-1-0.9/1.2	29.8	52.4	18.4	12.7	15.9	1.8	24.8	7.3	0.7
NCH-SE-1-1.2/2.7	13.3	36.6	16.9	7.9	9.3	1.1	19.4	3.2	0.5
NCH-SE-1-3.3/3.6	17.2	114.7	99.5	7.8	9.2	5.3	45.9	3.2	0.1
NCH-SE-1-3.8/5.0	6.2	134.4	36.1	10.2	15.7	10.2	42.1	4.5	0.3
NCH-SE-1-5.0/6.6	3.5	10.3	6.7	9.3	10.2	3.4	17.4	5.4	1.4
NCH-SE-1-6.7/9.9	4.8	9.3	6.5	8.8	10.2	1.6	14.9	5.8	1.3
NCH-SE-2-0/3.6	6.4	29.8	10.4	8.3	9.9	0.9	20.3	3.4	0.8
NCH-SE-2-3.6/8	13.1	22.6	18.6	11.6	12.2	1.4	17.6	4.1	0.6
NCH-SE-3-0/1	15.5	43.2	14.4	11.9	12.1	1.7	31.7	5.1	0.8
NCH-SE-4-0/1	23.2	50.8	21.1	13.0	11.5	1.6	29.0	4.5	0.6
NCH-SE-8-0/3.0	11.4	65.9	21.1	10.0	9.0	0.8	29.4	4.4	0.5
NCH-SE-8-3.0/5	6.6	23.9	5.3	11.9	14.1	0.8	24.4	4.9	2.3
NCH-SE-9-0/1	9.2	46.2	7.5	15.3	15.7	1.5	24.8	7.2	2.0
NCH-SE-10-0/2.7	3.8	37.5	5.7	7.8	7.5	0.8	15.7	3.5	1.4
NCH-SE-10-2.7/11.4	4.2	26.7	6.6	9.3	7.4	0.7	22.6	3.1	1.4
NCH-SE-10-11.4/15	1.7	3.8	3.1	5.3	6.3	0.9	15.2	4.4	1.7
NCH-SE-11-0/0.8	3.6	30.4	5.6	9.9	10.1	1.6	21.2	1.4	1.8
NCH-SE-11-0.8/6.5	1.7	17.9	6.8	4.7	5.4	ND	15.8	2.3	0.7
NCH-SE-12-0.1/1.2	15.4	69.8	13.1	14.2	12.9	1.8	23.8	4.8	1.1
NCH-SE-16-0/8.5	4.8	27.3	7.7	6.3	7.1	0.7	21.9	2.8	0.8
NCH-SE-16-8.5/10	3.4	36.3	10.9	11.8	15.5	1.1	19.3	5.1	1.1
NCH-SE-17-0/7.4	2.9	19.2	4.0	6.3	7.7	0.6	21.0	2.6	1.6
NCH-SE-17-7.4/8.5	3.6	17.7	3.5	9.5	12.0	1.3	28.2	5.4	2.7
NCH-SE-17-8.5/15	13.0	27.3	2.6	19.7	14.5	1.1	27.7	6.6	7.6
NCH-SE-18-0/4.6	5.9	34.7	7.6	10.1	11.2	1.3	30.7	4.9	1.3
NCH-SE-18-4.6/10.2	7.1	26.3	6.0	5.9	6.6	0.5	19.4	3.7	1.0
NCH-SE-18-10.2/15	11.2	40.8	9.8	11.3	10.3	0.8	25.4	4.9	1.2
NCH-SE-19-0/6.7	4.1	28.0	6.7	6.6	7.4	0.8	21.6	2.7	1.0
NCH-SE-19-6.7/9.5	6.3	44.3	8.9	13.7	12.4	0.7	28.6	5.5	1.5
NCH-SE-22-0/7.8	4.4	19.8	4.1	7.3	7.7	0.8	27.5	3.6	1.8
NCH-SE-22-7.9/8.3	7.7	47.1	12.0	7.7	7.8	0.8	25.9	4.2	0.6
NCH-SE-23-0/4.5	2.1	46.2	10.4	7.1	10.8	1.0	50.1	3.6	0.7
NCH-SE-25-0/9.5	1.6	13.0	2.1	7.1	7.9	0.7	19.7	2.6	3.3
NCH-SE-25-9.5/10.6	13.3	21.6	4.3	11.5	9.4	5.0	32.0	3.4	2.7
NCH-SE-25-10.6/13.5	2.2	24.4	3.7	7.3	8.8	1.6	33.0	3.4	2.0
NCH-SE-27-0/0.7	4.1	6.5	1.8	5.2	6.2	1.2	12.3	1.1	2.8
NCH-SE-27-0.7/5	1.9	12.1	2.9	7.4	8.1	1.0	19.6	3.4	2.5
NCH-SE-28-0/3.0	6.1	17.9	3.9	6.8	8.5	1.2	22.7	3.0	1.8
NCH-SE-28-3.0/10	4.0	13.9	1.9	6.2	7.5	0.8	21.3	3.6	3.2
NCH-SE-29-0/0.7	0.6	7.2	0.7	5.2	8.6	0.6	13.5	4.0	7.4
NCH-SE-30-0/1	1.5	23.8	3.3	6.8	7.2	0.6	26.3	2.7	2.0

NCH-SE-31-0/5	1.8	11.5	3.3	11.3	10.3	0.8	23.3	3.9	3.5
NCH-SE-31-5/8.1	2.0	9.2	2.6	7.9	6.6	0.7	18.3	2.8	3.0
NCH-SE-31-8.1/9.6	3.3	33.5	8.8	8.9	7.9	0.9	34.7	2.9	1.0
NCH-SE-31-9.6/10	1.5	4.0	2.4	19.7	15.3	0.7	19.5	7.1	8.1
NCH-SE-32-0/1.9	3.5	28.1	5.3	12.3	10.7	1.0	22.0	3.4	2.3
NCH-SE-32-1.9/5	1.7	11.0	2.8	9.0	8.2	0.9	19.3	3.4	3.2
NCH-SE-33-0/1.9	16.9	52.5	19.1	12.5	10.2	1.3	23.3	4.2	0.7
NCH-SE-33-1.9/2.1	11.3	49.7	17.1	9.8	7.5	1.0	20.6	3.3	0.6
NCH-SE-33-2.1/3.0	11.5	49.3	12.1	13.5	11.2	1.2	22.8	4.2	1.1
NCH-SE-33-3/7	3.2	20.0	10.4	6.1	6.8	0.7	17.6	3.1	0.6
NCH-SE-33-7/10	3.1	5.7	2.6	14.2	12.1	0.9	25.6	5.4	5.6
NCH-SE-34-0/1.3	5.1	35.5	7.2	14.5	12.8	1.4	24.5	5.0	2.0
NCH-SE-34-1.3/7.8	6.7	71.0	26.4	8.0	9.3	0.9	45.1	3.2	0.3
NCH-SE-35-0/2.8	6.5	37.4	11.1	7.3	7.0	0.6	17.8	3.3	0.7
NCH-SE-35-2.8/3.8	6.2	55.5	8.9	10.8	19.5	0.9	21.3	4.5	1.2
NCH-SE-35-3.8/4.1	21.5	38.5	13.3	15.2	10.6	1.4	22.9	4.4	1.1
NCH-SE-35-4.1/5.3	6.4	22.9	51.9	8.9	9.5	0.7	17.6	3.9	0.2
NCH-SE-35-5.3/8.5	1.9	6.5	9.8	13.8	13.6	0.7	23.3	6.9	1.4
NCH-SE-36-0/2.8	2.8	19.6	4.6	6.3	6.8	ND	17.9	2.8	1.4
NCH-SE-36-2.8/5	3.8	26.0	8.5	8.4	9.3	0.7	24.0	3.4	1.0
NCH-SE-37-0/4.4	1.8	12.2	3.9	5.1	6.3	ND	14.2	2.5	1.3
NCH-SE-37-4.4/10	3.8	20.2	5.9	5.9	7.0	ND	22.6	2.8	1.0
NCH-SE-38-0/1	7.8	50.0	6.4	13.1	13.2	1.1	20.2	5.9	2.0
NCH-SE-39-0/1	3.4	36.9	8.3	6.5	6.6	ND	17.5	3.4	0.8
NCH-SE-40-0	10.1	39.1	7.4	7.4	10.8	0.6	15.3	4.8	1.0
NCH-SE-41-0/1	8.8	59.5	28.5	9.2	12.4	0.8	26.4	5.1	0.3
NCH-SE-42-0/1	2.2	10.3	4.7	4.2	6.1	ND	11.9	2.9	0.9
NCH-SE-43-0/1	3.7	50.0	4.6	8.4	9.9	0.7	17.6	3.9	1.8
NCH-SE-44-0/1	3.1	21.1	3.3	5.8	9.7	ND	13.9	3.4	1.8
NCH-SE-45-0/0	5.0	15.7	4.8	5.1	7.1	ND	12.5	1.9	1.1
NCH-SE-46-0/1	ND	ND	ND	ND	ND	0.5	ND	ND	NA
NCH-SE-47-0/1	14.2	82.4	16.1	18.9	19.8	1.5	32.7	9.0	1.2
NCH-SE-48-0/1	29.5	18.5	52.2	8.0	10.9	1.1	17.0	3.5	0.2
NCH-SE-49-0/0.3	3.6	65.7	16.4	8.3	9.4	0.7	56.3	2.7	0.5
NCH-SE-49-0.3/1	6.1	36.3	9.5	6.7	7.1	0.7	33.5	2.7	0.7
NCH-SE-50-0/1	6.9	20.0	6.9	6.7	7.5	0.6	20.0	3.0	1.0
NCH-SE-51-0/1	2.2	10.2	2.4	8.4	9.5	0.6	15.9	3.6	3.5
NCH-SE-52-0/1	2.7	27.3	3.2	6.7	8.2	0.6	15.7	3.2	2.1
NCH-SE-53-0/1	3.2	15.8	3.1	5.2	7.0	ND	14.5	3.0	1.7
NCH-SE-54-0/1	4.4	23.0	4.6	9.3	11.7	0.6	18.1	5.1	2.0
NCH-SE-55-0/1	1.2	13.6	1.6	8.8	9.9	0.7	16.5	3.3	5.6
NCH-SE-56-0/1	6.2	34.9	6.8	12.0	14.6	0.8	21.5	5.7	1.8
NCH-SE-57-0/1	4.3	9.5	1.3	9.4	11.2	ND	16.4	2.5	7.3
NCH-SE-58-0/1	1.7	10.9	2.2	13.6	12.3	0.5	15.7	5.9	6.2
NCH-SE-59-0/1	3.6	29.7	6.5	10.0	11.0	0.9	29.2	3.8	1.5
NCH-SE-60-0/1	2.9	33.2	8.9	7.5	10.6	0.6	34.0	3.6	0.8
NCH-SE-61-0/1	5.0	26.0	5.0	12.1	14.0	0.8	24.9	3.1	2.4
NCH-SE-62-0/0.3	3.5	40.9	6.7	9.6	11.0	0.7	24.8	4.3	1.4

Table 10.5: Statistical results for drainage sediments and samples with in-situ formation. Calculations include all background samples shown in Table 10.2.

	U (mg/kg)	As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)	Pb (mg/kg)	Se (mg/kg)	V (mg/kg)	Th (mg/kg)	Cu/Mo Ratio
Drainage Sediment Samples									
Min	0.6	6.5	0.7	4.2	5.4	0.5	11.9	1.1	0.1
Max	29.5	134.4	99.5	18.9	19.8	10.2	56.3	9.0	7.4
Avg	6.7	34.1	11.0	9.0	9.9	1.1	23.3	3.8	1.6
In-Situ Formation Samples									
Min	1.5	3.8	1.9	5.3	6.3	0.7	14.9	3.4	0.6
Max	20.6	47.1	18.6	19.7	15.5	5.0	52.5	7.1	8.1
Avg	6.7	17.3	6.4	11.7	11.2	1.5	25.1	4.9	2.7

Table 11.1: Summary of analytical support data

MEASUREMENT	LOCATION	ANALYTICAL METHOD	LEVEL	MEDIA	DATA USE
Target Analyte List (As, Cu, Mo, Se, Pb, Ra, Total U, Th, V)	SDSMT	SW6020[1]	III	SE, AF, AD, WT	WE, SC, AQ
	Energy Lab		IV		
Target Analyte List (As, Cu, Mo, Se, Pb, Ra, Total U, Th, V)	SDSMT	E200.8[1]	III	SW, GW	WE, GC
	Energy Lab		IV		
Ra-226	Energy Lab	E903.0[1]	IV	SE, SW, GW, AF, AD	WE, SC, AQ
U-235	Energy Lab	E907.0[1]	IV	SE, SW, GW, AF, AD	WE, SC, AQ
Solids, Suspended Volatile	Energy Lab	A2540 E[1]	IV	SW, GW	WE, GC
Solids, Total Suspended	Energy Lab	E160.2[1]	IV	SW, GW	WE, GC
Alkalinity, Includes Carbonate and Bicarbonate	Energy Lab	A2320 B[1]	IV	SW, GW	WE, GC
Anions (NO2/NO3 and SO4)	Energy Lab	E300.0[1]	IV	SW, GW	WE, GC
Phosphorus Preparation	Energy Lab	E365.1[1]	IV	SW, GW	WE, GC
pH/Temperature, ORP, Conductivity	Field	Manufacturer's Instructions	II	SW, GW	WE, GC
Radioactivity	Field	Manufacturer's Instructions	I	SE	SC, SS
Target Analyte List (As, Cu, Mo, Se, Pb, Ra, Total U, V)	Field	Hand-held XRF Manufacturer's Instructions	I	SE	SC, SS

[1]http://www.epa.gov/safewater/methods/inch_tbl.html, EPA, 2006. Approved Methods for Inorganic Chemicals and Other Water Quality Parameters. AD – Ambient Dust; AQ – Air Quality; GC – Groundwater Characterization; GW – Groundwater; SC – Site Characterization; SE – Sediment/Soil; SS – Sample Screening; SW – Surface Water; WE – Watershed Evaluation; WT – Wind Tunnel Eroded Dust Sample

Table 11.2: Comparison between detected target analytes found within sediment and soil rinsate samples and concentrations of preceding and following samples collected with field equipment.

Sample ID		As (mg/kg)	Mo (mg/kg)	Cu (mg/kg)
NCH-SE-20-0/5.4		10.0	3.1	10.5
NCH-RI-20-1	Coring Assembly with Sleeve	0.01484	0.005324	ND
NCH-SE-18-10.2/15		40.8	9.8	11.3
NCH-RI-18-1	Coring Assembly with Sleeve	0.01516	ND	ND
NCH-SE-21-0/9.5		17.6	3.8	15.1
NCH-SE-30-0/1		23.8	3.3	6.8
NCH-RI-30-1	Hand Auger	0.00775	ND	ND
NCH-SE-32-0/1.9		28.1	5.3	12.3
NCH-SE-37-4.4/10		20.2	5.9	5.9
NCH-RI-37-1	Coring Assembly w/o sleeve	ND	0.0873	0.05265
NCH-SE-52-0/1		27.3	3.2	6.7
NCH-RI-52-1	Hand Auger	0.01153	ND	ND
NCH-SE-53-0/1		15.8	3.1	5.2
NCH-SE-61-0/1		26.0	5.0	12.1
NCH-RI-61-1	Hand Auger	0.00865	ND	ND
NCH-SE-62-0/0.3		40.9	6.7	9.6
Concentrations in yellow fields are in mg/L Note - NCH-SE-37 core was the last core collected using the Geoprobe, therefore no sample follows NCH-RI-37-1				

Table 11.3: List of data qualifiers used for data validation.

Internal QC	**Qualifiers**
J-	Low Bias; sample was not acidified for 4-5 months and concentration values can only be used as estimates (see Field Duplicate NCH-SW-57-2)
CF	Questionable Correction Factor
SSR(-5%)	Quality Control Failure of Sample Spike Recovery by an additional -5% of acceptable limits (±30%)
BSR(-4%)	Quality Control Failure of Blank Spike Recovery by an additional -4% of acceptable limits (±15%)
LD(-4%)	Quality Control Failure of Lab Duplicate by an additional -4% of acceptable limits (±30%)
LBJ+	Quality Control Failure of Lab Blank indicates High Bias at low analyte concentrations
FBJ+	Quality Control Failure of Field Blank indicates High Bias at low analyte concentrations
QCM-	Quality Control samples missing
Qualifiers	LD = Lab Duplicate
	SB = Spike Blank
	LB = Lab Blank
	FB = Field Blank
Concentration in Red Font	Concentration is below the stated Detection Limit
External QC	
J	The result is an estimated quantity; external QC assessment not possible due to QC sample concentrations near or below the reporting (detection) limit
J+	The result is an estimated quantity, but the result may be biased high
J-	The result is an estimated quantity, but the result may be biased low
R	Rejected data due to severe quality control failure

Table 11.4: SDSM&T EMES and ELI detection limits for the 8 target analytes.

Analyte Detection Limits				
Metal	**SDSM&T EMES Water (mg/L)**	**ELI Water (mg/L)**	**SDSM&T EMES Soil (mg/kg)**	**ELI Soil (mg/kg)**
U	0.005	0.001	0.5	0.05
As	0.005	0.005	0.5	0.06
Mo	0.005	0.005	0.5	0.26
Cu	0.005	0.01	0.5	0.05
Pb	0.005	0.01	0.5	0.05
Se	0.005	0.005	0.5	0.2
V	0.01	0.1	1	0.05
Th	0.01	0.01	1	0.05

Table 11.5: Failure criteria for external QC samples.

Failure Criteria for External QC Samples		
	Water	**Soil**
Error	<-30% or >+30%	<-30% or >+30%
R^2	<0.9000	<0.9000
y-intercept	<0.02 or >0.02 (mg/L)	<2 or >2 (mg/kg)
Slope	<0.8 or >1.2	<0.8 or >1.2

Table 11.6: Error and the regression analysis for the dissolved metals external QC sample pairs (SDSM&T EMES and ELI). Data highlighted in Red indicate QC qualifiers.

Surface Water Dissolved Metals								
	U	As	Mo	Cu	Pb	Se	Th	V
R^2	0.9991	0.9654	0.969	NA	NA	NA	NA	NA
y-intercept	-0.0011	0.0146	-0.0331	NA	NA	NA	NA	NA
slope	0.9047	1.1249	1.4466	NA	NA	NA	NA	NA
Average Error (%)	-11.2%	-0.2%	21.5%	NA	NA	NA	NA	NA
Maximum	-9.5%	23.0%	39.9%	NA	NA	NA	NA	NA
Minimum	-13.2%	-20.6%	8.8%	NA	NA	NA	NA	NA
QC Limits >+/- 30%	0%	0%	33%	NA	NA	NA	NA	NA
Negative Values	100%	67%	0%	NA	NA	NA	NA	NA
Positive Values	0%	33%	100%	NA	NA	NA	NA	NA

Table 11.7: Error and the regression analysis for the total metals external QC sample pairs (SDSM&T EMES and ELI). Data highlighted in Red indicate QC qualifiers.

Surface Water Total Metals								
	U	As	Mo	Cu	Pb	Se	V	Th
R^2	0.9789	0.9683	0.799	0.9824	0.9437	0.9041	0.1395	0.1955
y-intercept	0.0019	0.0235	0.0274	0.0281	0.0306	0.0054	0.4102	0.0272
slope	0.9138	1.1176	0.8005	1.2707	0.9756	0.9916	-0.621	0.604
Average Error	-3.9%	6.3%	7.7%	94.5%	17.0%	28.4%	70.9%	41.8%
Maximum	54.0	82.0	55.6	193.6	79.2	51.7	173.4	129.9
Minimum	-32.5	-37.9	-56.1	10.7	-23.3	10.0	-50.3	-37.2
QC Limits of >+/- 30%	36%	46%	45%	83%	33%	50%	75%	80%
Negative Values	64%	54%	45%	0%	50%	0%	25%	50%
Positive Values	36%	46%	55%	100%	50%	100%	75%	50%

Table 11.8: Error and the regression analysis for wind tunnel external QC sample pairs (SDSM&T EMES and ELI). Data highlighted in Red indicate QC qualifiers.

Wind Tunnel								
	U	As	Mo	Cu	Pb	Se	V	Th
R^2	0.7161	0.9991	1	0.6624	0.9287	NA	0.6287	0.9906
y-intercept	-0.0742	2.6207	0.4692	2.8639	1.1344	NA	12.419	-9.505
slope	0.8492	0.4288	0.2337	1.1911	0.7359	NA	0.0543	2.2344
Average Error (%)	-21.1	-25.4	-38.5	-39.5	-16.7	NA	-54.3	-57.1
Maximum	-3.9	-13.5	-22.5	-33.7	-12.8	NA	-48.2	-52.6
Minimum	-32.5	-45.7	-64.6	-48.1	-22.0	NA	-65.8	-59.8
QC Limits >+/- 30%	33%	33%	33%	100%	0%	NA	100%	100%
Negative Values	100%	100%	100%	100%	100%	NA	100%	100%
Positive Values	0%	0%	0%	0%	0%	NA	0%	0%

Table 11.9: Error and the regression analysis for sediment and soil external QC sample pairs (SDSM&T EMES and ELI). Data highlighted in Red indicate QC qualifiers.

Sediment and Soil								
	U	As	Mo	Cu	Pb	Se	V	Th
R^2	0.9801	0.8929	0.9683	0.8969	0.8486	0.9714	0.5068	0.6389
y-intercept	-0.5145	-1.1597	2.3286	0.2729	-1.2669	-0.0497	0.8222	0.5576
slope	0.931	0.8731	0.8256	0.7711	0.9082	1.0525	0.6474	0.5948
Average Error	-11.6%	-15.8%	0.093%	-19.9%	-18.5%	4.5%	-38.0%	-33.8%
Maximum	11.1	30.5	33.9	-3.9	4.3	83.6	-6.2	-3.9
Minimum	-26.1	-34.2	-31.2	-36.3	-33.3	-55.2	-58.6	-78.4
QC Limits of >+/- 30%	0%	10%	13%	17%	13%	23%	77%	53%
Negative Values	97%	93%	60%	100%	97%	43%	100%	100%
Positive Values	3%	7%	40%	0%	3%	53%	0%	0%