

Results of ICP-OES analyses of the TVA ash spill samples collected 12-27-08 from the Emory River

Samples collected by Donna Lisenby (Appalachian Voices/Watauga Riverkeeper) and analyzed by Shea Tuberty, PhD and Carol Babyak, PhD (Appalachian State University)

Element	N=3	Water Samples			Sediment	TN Water Quality Standards (mg/L or ppm)		Notes
		Power Line Crossing 1.94 miles downstream	Barge Boom 0.51 miles downstream	Ash-berg Near breach site	Ash-berg Near breach site	Domestic Water Supply	Fish & Aquatic Maximum (CMC)	
Arsenic	mean	0.356	3.062	1.083	135.205	0.010	0.340	35 to 300 times higher than drinking water criteria
	std dev	0.063	0.572	0.082	4.363			3-10 times the max TN aquatic life criteria
Barium	mean	0.818	5.265	7.904	583.603	2.000	n/a	2 to 4 times higher than drinking water criteria
	std dev	0.214	0.424	0.920	11.576			
Cadmium	mean	0.001	0.014	0.008	0.985	0.005	0.002	0.25 to 3 times higher than drinking water criteria
	std dev	0.000	0.001	0.000	0.002			4-7 times the max TN aquatic life criteria
Chromium	mean	0.049	0.376	0.345	49.857	0.100	*	3.5 times higher than max drinking water criteria
	std dev	0.014	0.033	0.023	1.730			
Cobalt	mean	0.031	0.195	0.141	11.143	n/a	n/a	
	std dev	0.009	0.042	0.059	1.152			
Copper	mean	0.095	0.622	1.025	86.624	n/a	0.013	7-70 times the max TN aquatic life criteria
	std dev	0.019	0.058	0.121	3.217			
Iron	mean	28.004	151.917	122.988	18849.288	n/a	n/a	
	std dev	10.497	22.554	13.471	1009.305			
Lead	mean	0.029	0.137	0.313	25.931	0.005	0.065	6 to 60 times higher than max drinking water limit
	std dev	0.006	0.018	0.044	0.842			0.5 to 5 the max TN aquatic life criteria
Manganese	mean	1.172	10.893	1.705	92.870	n/a	n/a	
	std dev	0.003	0.249	0.007	2.794			
Mercury	mean	0.010	not detected	0.017	0.173	0.002	0.001	5 to 8 times higher than max drinking water limit
	std dev	0.013		0.022	0.088			7-12 the max TN aquatic life criteria
Molybdenum	mean	0.027	0.182	0.061	4.034	n/a	n/a	
	std dev	0.012	0.075	0.004	0.099			
Nickel	mean	0.046	0.339	0.363	40.016	0.100	0.470	3 times higher than max drinking water limit
	std dev	0.012	0.026	0.043	1.430			
Selenium	mean	0.005	0.036	0.042	2.598	0.050	0.020	0.25 to 2 the max TN aquatic life criteria
	std dev	0.001	0.007	0.013	0.558			
Silver	mean	not detected	not detected	not detected	0.021	n/a	n/a	
	std dev				0.008			
Thallium	mean	not detected	0.006	0.008	0.808	0.002	n/a	3 to 4 times higher than max drinking water limit
	std dev		0.000	0.003	0.449			
Vanadium	mean	0.196	1.280	1.388	124.074	n/a	n/a	
	std dev	0.050	0.128	0.145	3.257			
Zinc	mean	0.164	0.977	0.619	71.149	n/a	0.120	1.5 to 8 the max TN aquatic life criteria
	std dev	0.045	0.055	0.022	5.584			

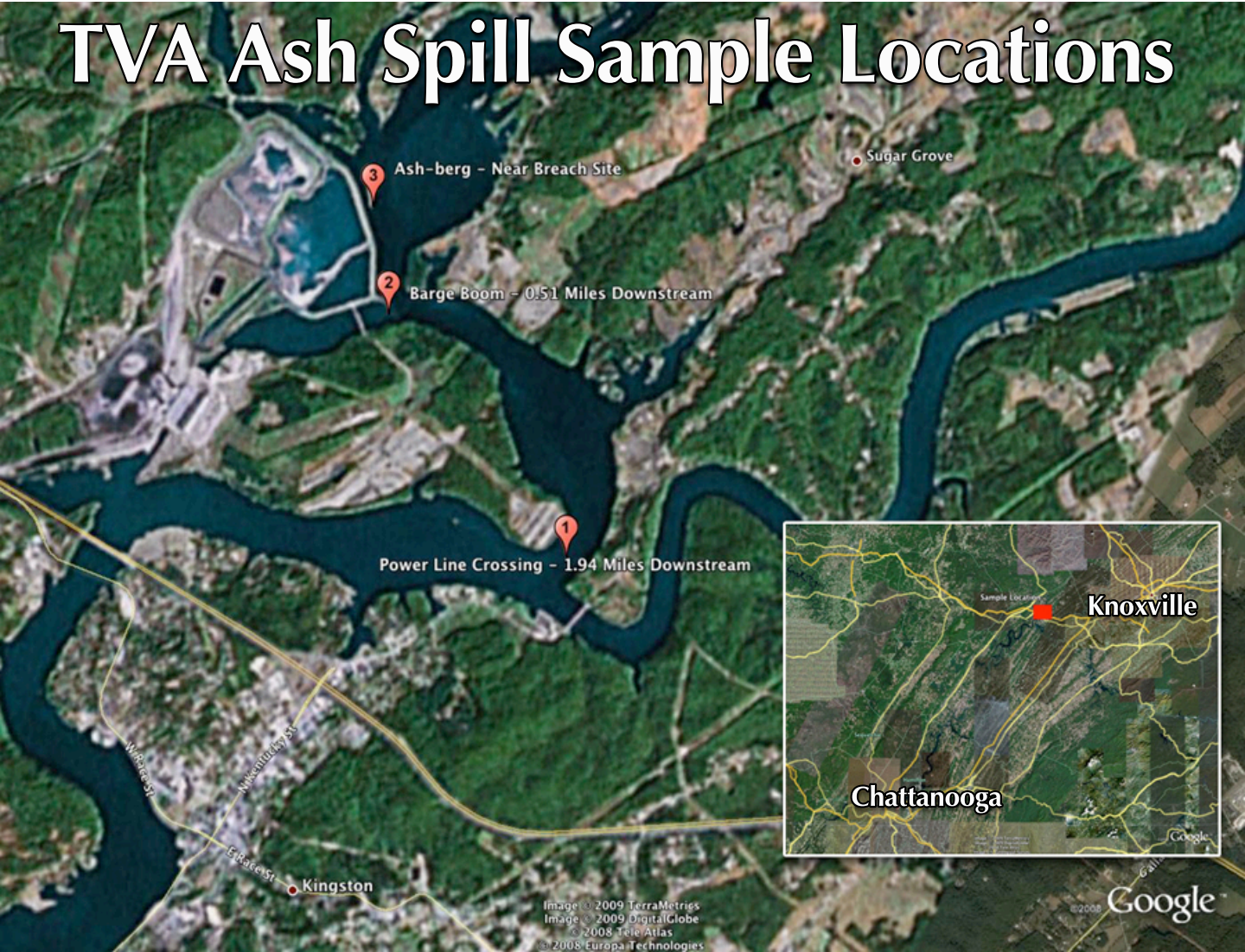
not detected = no levels were found at the limits of our analytical instrumentation

n/a = there are no regulated levels of these elements in drinking water

*Fish and Aquatic criteria are speciated into Co III and Co IV but samples are not speciated

	Sample exceeds one or more TN water quality criteria
	Description of domestic drinking water criteria exceedence
	Description of fish and aquatic criteria exceedence

TVA Ash Spill Sample Locations



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Samples analyzed by Professor Shea Tuberty, PhD and Professor Carol Babyak, PhD - Appalachian State University

Each field sample was used to prepare 3 replicate samples for analyses, means and standard deviations were calculated from these three replicates

Element	Water Samples from Emory River Sites			Ash Pile Sample	
	Power Line Crossing	Barge Boom	Ash-berg	Ash-berg	
	Water values are expressed in mg/L (or parts per million)			mg/kg dry ash wt	
Arsenic	0.380	3.711	0.989	135.691	
	0.285	2.635	1.116	139.304	
	0.403	2.839	1.142	130.619	
	mean	0.356	3.062	1.083	135.205
	std dev	0.063	0.572	0.082	4.363
Barium	0.916	5.750	8.649	570.244	
	0.572	4.965	8.188	589.901	
	0.965	5.079	6.876	590.665	
	mean	0.818	5.265	7.904	583.603
	std dev	0.214	0.424	0.920	11.576
Cadmium	0.001	0.015	0.009	0.987	
	0.001	0.013	0.009	0.985	
	0.001	0.013	0.008	0.983	
	mean	0.001	0.014	0.008	0.985
	std dev	0.000	0.001	0.000	0.002
Chromium	0.055	0.414	0.329	48.901	
	0.033	0.358	0.371	48.815	
	0.058	0.356	0.336	51.854	
	mean	0.049	0.376	0.345	49.857
	std dev	0.014	0.033	0.023	1.730
Cobalt	0.035	0.169	0.207	9.891	
	0.021	0.243	0.121	12.158	
	0.037	0.172	0.094	11.381	
	mean	0.031	0.195	0.141	11.143

	std dev	0.009	0.042	0.059	1.152
Copper		0.105	0.689	1.120	83.573
		0.073	0.581	1.066	89.985
		0.108	0.596	0.890	86.314
	mean	0.095	0.622	1.025	86.624
	std dev	0.019	0.058	0.121	3.217
Iron		32.638	177.875	117.263	18575.140
		15.988	137.125	138.375	18005.377
		35.388	140.750	113.325	19967.345
	mean	28.004	151.917	122.988	18849.288
	std dev	10.497	22.554	13.471	1009.305
Lead		0.031	0.157	0.347	25.070
		0.023	0.126	0.329	26.752
		0.035	0.128	0.264	25.970
	mean	0.029	0.137	0.313	25.931
	std dev	0.006	0.018	0.044	0.842
Manganese		1.179	11.075	1.758	89.838
		1.144	10.609	1.729	93.430
		1.193	10.994	1.630	95.342
	mean	1.172	10.893	1.705	92.870
	std dev	0.025	0.249	0.067	2.794
Mercury		0.020	not detected	0.042	0.273
		0.001	not detected	0.006	0.141
		not detected	not detected	0.004	0.105
	mean	0.010		0.017	0.173
	std dev	0.013		0.022	0.088
Molybdenum		0.032	0.267	0.060	4.082
		0.012	0.127	0.057	4.100
		0.035	0.153	0.065	3.920
	mean	0.027	0.182	0.061	4.034
	std dev	0.012	0.075	0.004	0.099

Nickel	0.052	0.369	0.395	38.479
	0.033	0.322	0.380	40.262
	0.055	0.328	0.313	41.308
	mean 0.046	0.339	0.363	40.016
	std dev 0.012	0.026	0.043	1.430
Selenium	0.006	0.044	0.026	2.275
	0.004	0.030	0.049	3.242
	0.006	0.035	0.050	2.277
	mean 0.005	0.036	0.042	2.598
	std dev 0.001	0.007	0.013	0.558
Silver	not detected	not detected	not detected	0.027
	not detected	not detected	not detected	0.012
	not detected	not detected	not detected	0.024
	mean 0.021			
	std dev 0.008			
Thallium	not detected	0.006	0.007	1.158
	not detected	0.006	0.007	0.965
	not detected	0.006	0.011	0.302
	mean 0.006	0.006	0.008	0.808
	std dev 0.000	0.000	0.003	0.449
Vanadium	0.219	1.426	1.221	120.404
	0.139	1.188	1.479	126.617
	0.230	1.225	1.464	125.202
	mean 0.196	1.280	1.388	124.074
	std dev 0.050	0.128	0.145	3.257
Zinc	0.182	1.037	0.644	65.887
	0.113	0.930	0.612	70.551
	0.198	0.964	0.602	77.007
	mean 0.164	0.977	0.619	71.149
	std dev 0.045	0.055	0.022	5.584