EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

NOTE: The data below represents sediment samples that were collected on May 5, 2014 by EPA START Team 1. Sediment sample measurements are in milligrams per kilogram (mg/kg). The data is being compared to ecological risk screening levels (ERSLs) to protect aquatic life in the sediments of the Dan River. Specific qualifiers and footnotes are listed below the summary table. These samples were collected at various locations along the river (refer to map for generalized locations). The detected concentrations in sediment are all below the ERSLs with the exception of aluminum, antimony, barium, iron, and manganese. There were no exceedances of human health screening criteria for sediment. When chemical concentrations exceed the screening values it doesn't mean there will be adverse health or ecological effects, but recommends further investigation may be needed.

Analyte	Ecological Screening Standards for Sediment[2]		Transect EPA 04 Left Descending		Transect EPA 04 Left Descending		Transect EPA 05 Left Descending	
Sample Information								
Sample ID	-		EDEN-EPA04-L-SD-20140505		EDEN-EPA04-L-SD-20140505-DUP		EDEN-EPA05-L-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1540		1545		1640	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	6,800J	mg/kg	5,000J	mg/kg	9,000J	mg/kg
Antimony	2[a]	mg/kg	1.6UJ	mg/kg	1.5UJ	mg/kg	2.3UJ	mg/kg
Arsenic	9.8	mg/kg	1.3J	mg/kg	0.91J	mg/kg	2.5J	mg/kg
Barium	60[b]	mg/kg	65J	mg/kg	48J	mg/kg	92J	mg/kg
Beryllium	-	-	0.4J	mg/kg	0.3J	mg/kg	0.59J	mg/kg
Boron	-	-	14UJ	mg/kg	14UJ	mg/kg	23UJ	mg/kg
Cadmium	0.99	mg/kg	0.057J	mg/kg	0.036J	mg/kg	0.076J	mg/kg
Calcium	-	-	1,500J	mg/kg	510J	mg/kg	1,000J	mg/kg
Chromium	43.4	mg/kg	16J	mg/kg	14J	mg/kg	20J	mg/kg
Cobalt	50	mg/kg	5.9J	mg/kg	4.5J	mg/kg	7.4J	mg/kg
Copper	31.6	mg/kg	8.2J	mg/kg	5.8J	mg/kg	10J	mg/kg
Iron	6,800 (bkg)	mg/kg	11,000J	mg/kg	8,700J	mg/kg	15,000J	mg/kg
Lead	35.8	mg/kg	8J	mg/kg	6.4J	mg/kg	8.1J	mg/kg
Magnesium	-	-	1,900J	mg/kg	1,500J	mg/kg	2,600J	mg/kg
Manganese	460[c]	mg/kg	200J	mg/kg	130J	mg/kg	320J	mg/kg
Mercury	0.18	mg/kg	0.028UJ	mg/kg	0.03UJ	mg/kg	0.022J	mg/kg
Molybdenum	-	-	1.4UJ	mg/kg	1.4UJ	mg/kg	2.3UJ	mg/kg
Nickel	22.7	mg/kg	7J	mg/kg	5.2J	mg/kg	8.7J	mg/kg
Potassium	-	-	1,500J	mg/kg	1,200J	mg/kg	1,900J	mg/kg
Selenium	2[d]	mg/kg	0.78UJ	mg/kg	0.75UJ	mg/kg	0.82J	mg/kg
Silver	0.733	mg/kg	0.16UJ	mg/kg	0.15UJ	mg/kg	0.23UJ	mg/kg
Sodium	-	-	290UJ	mg/kg	280UJ	mg/kg	450UJ	mg/kg
Thallium	-	mg/kg	0.12J	mg/kg	0.098J	mg/kg	0.22J	mg/kg
Vanadium	57[c]	mg/kg	22J	mg/kg	17J	mg/kg	28J	mg/kg
Zinc	121	mg/kg	34J	mg/kg	25J	mg/kg	37J	mg/kg

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Analyte	Ecological Screening Standards for Sediment[2]		Transect EPA 04 Left Descending		Transect EPA 04 Left Descending		Transect EPA 05 Left Descending	
Sample Information								
Sample ID	-		EDEN-EPA04-L-SD-20140505		EDEN-EPA04-L-SD-20140505-DUP		EDEN-EPA05-L-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1540		1545		1640	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Physical Properties								
Percent Ash	-	-	1	%	ND	%	4	%

Notes

[2] MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

[a] The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

[b] The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

[c] Sediment screening values for manganese and vanadium come from the NOAA SQuIRT.
http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

[d] The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

[e] Cadmium from diet

[f] Chromium (VI)

[g] Methyl Mercury

[h] Thallium Chloride

%	Percent
EPA	U.S. Environmental Protection Agency
J	Value is estimated
J+	Value is estimated with a possible high bias
J-	Value is estimated with a possible low bias
mg/kg	milligrams per kilogram
ND	No fly ash detected at a PLM reporting limit of 1 percent
PLM	Polarized light microscopy
U	Analyte was not detected at the listed reporting limit.
UJ	Analyte was not detected at the listed reporting limit, which is an estimated quantitation.

EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment[2]		Transect DUKE DRB Left Descending		Transect DUKE DRE Left Descending		Transect DUKE SBD Left Descending	
Sample Information								
Sample ID	-		EDEN-DUKEDRB-L-SD-20140505		EDEN-DUKEDRE-L-SD-20140505		EDEN-DUKESBD-L-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1015		1140		0920	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	3,800	mg/kg	4,100	mg/kg	11,000	mg/kg
Antimony	2[a]	mg/kg	1.5U	mg/kg	1.3U	mg/kg	1.5U	mg/kg
Arsenic	9.8	mg/kg	2.9U	mg/kg	2.4U	mg/kg	2.9U	mg/kg
Barium	60[b]	mg/kg	40	mg/kg	42	mg/kg	86	mg/kg
Beryllium	-	-	0.27J	mg/kg	0.26J	mg/kg	0.62	mg/kg
Boron	-	-	14U	mg/kg	12U	mg/kg	14U	mg/kg
Cadmium	0.99	mg/kg	0.035J	mg/kg	0.026J	mg/kg	0.048J	mg/kg
Calcium	-	-	540	mg/kg	640	mg/kg	1,100	mg/kg
Chromium	43.4	mg/kg	13	mg/kg	13	mg/kg	19	mg/kg
Cobalt	50	mg/kg	5.1	mg/kg	4	mg/kg	7.2	mg/kg
Copper	31.6	mg/kg	5	mg/kg	4.2	mg/kg	11	mg/kg
Iron	6,800 (bkg)	mg/kg	7,600	mg/kg	7,900	mg/kg	15,000	mg/kg
Lead	35.8	mg/kg	4	mg/kg	3.9	mg/kg	8.7	mg/kg
Magnesium	-	-	1,200	mg/kg	1,300	mg/kg	1,900	mg/kg
Manganese	460[c]	mg/kg	180	mg/kg	180	mg/kg	460	mg/kg
Mercury	0.18	mg/kg	0.081	mg/kg	0.028U	mg/kg	0.023J	mg/kg
Molybdenum	-	-	1.4U	mg/kg	1.2U	mg/kg	1.4U	mg/kg
Nickel	22.7	mg/kg	5.2J	mg/kg	4.7J	mg/kg	8.2	mg/kg
Potassium	-	-	920	mg/kg	970	mg/kg	1,400	mg/kg
Selenium	2[d]	mg/kg	0.75U	mg/kg	0.65U	mg/kg	0.47J	mg/kg
Silver	0.733	mg/kg	0.15U	mg/kg	0.13U	mg/kg	0.15U	mg/kg
Sodium	-	-	290U	mg/kg	240U	mg/kg	290U	mg/kg
Thallium	-	mg/kg	0.1J	mg/kg	0.084J	mg/kg	0.13J	mg/kg
Vanadium	57[c]	mg/kg	14	mg/kg	17	mg/kg	31	mg/kg
Zinc	121	mg/kg	18	mg/kg	19	mg/kg	33	mg/kg

EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment[2]		Transect DUKE DRB Left Descending		Transect DUKE DRE Left Descending		Transect DUKE SBD Left Descending	
Sample Information								
Sample ID	-		EDEN-DUKEDRB-L-SD-20140505		EDEN-DUKEDRE-L-SD-20140505		EDEN-DUKESBD-L-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1015		1140		0920	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Physical Properties								
Percent Ash	-	-	ND	%	1	%	1	%

Notes

[2] MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

[a] The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

[b] The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

[c] Sediment screening values for manganese and vanadium come from the NOAA SQuIRT.
http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

[d] The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

[e] Cadmium from diet

[f] Chromium (VI)

[g] Methyl Mercury

[h] Thallium Chloride

%	Percent
EPA	U.S. Environmental Protection Agency
J	Value is estimated
J+	Value is estimated with a possible high bias
J-	Value is estimated with a possible low bias
mg/kg	milligrams per kilogram
ND	No fly ash detected at a PLM reporting limit of 1 percent
PLM	Polarized light microscopy
U	Analyte was not detected at the listed reporting limit.
UJ	Analyte was not detected at the listed reporting limit, which is an estimated quantitation.

EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment[2]		Transect EPA 06 Mid-Channel		Transect EPA 07 Left Descending		Transect EPA 08 Right Descending	
Sample Information								
Sample ID	-		EDEN-EPA06-C-SD-20140505		EDEN-EPA07-L-SD-20140505		EDEN-EPA08-R-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1030		1130		1250	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	5,000J	mg/kg	8,100J	mg/kg	2,200J	mg/kg
Antimony	2[a]	mg/kg	1.4UJ	mg/kg	1.4UJ	mg/kg	1.2UJ	mg/kg
Arsenic	9.8	mg/kg	1.1J	mg/kg	2.1J	mg/kg	1.2J	mg/kg
Barium	60[b]	mg/kg	51J	mg/kg	70J	mg/kg	27J	mg/kg
Beryllium	-	-	0.28J	mg/kg	0.44J	mg/kg	0.21J	mg/kg
Boron	-	-	13UJ	mg/kg	13UJ	mg/kg	11UJ	mg/kg
Cadmium	0.99	mg/kg	0.026J	mg/kg	0.038J	mg/kg	0.024J	mg/kg
Calcium	-	-	790J	mg/kg	820J	mg/kg	420J	mg/kg
Chromium	43.4	mg/kg	15J	mg/kg	19J	mg/kg	12J	mg/kg
Cobalt	50	mg/kg	4.5J	mg/kg	5.8J	mg/kg	4.1J	mg/kg
Copper	31.6	mg/kg	4.9J	mg/kg	8.7J	mg/kg	2.3J	mg/kg
Iron	6,800 (bkg)	mg/kg	8,700J	mg/kg	13,000J	mg/kg	5,600J	mg/kg
Lead	35.8	mg/kg	4.4J	mg/kg	6.5J	mg/kg	2.9J	mg/kg
Magnesium	-	-	1,800J	mg/kg	2,200J	mg/kg	620J	mg/kg
Manganese	460[c]	mg/kg	210J	mg/kg	170J	mg/kg	280J	mg/kg
Mercury	0.18	mg/kg	0.027UJ	mg/kg	0.027UJ	mg/kg	0.024UJ	mg/kg
Molybdenum	-	-	1.3UJ	mg/kg	1.3UJ	mg/kg	1.1UJ	mg/kg
Nickel	22.7	mg/kg	6J	mg/kg	8J	mg/kg	2.7J	mg/kg
Potassium	-	-	1,300J	mg/kg	1,500J	mg/kg	420J	mg/kg
Selenium	2[d]	mg/kg	0.7UJ	mg/kg	0.7UJ	mg/kg	0.62UJ	mg/kg
Silver	0.733	mg/kg	0.14UJ	mg/kg	0.14UJ	mg/kg	0.12UJ	mg/kg
Sodium	-	-	260UJ	mg/kg	250UJ	mg/kg	220UJ	mg/kg
Thallium	-	mg/kg	0.085J	mg/kg	0.11J	mg/kg	0.043J	mg/kg
Vanadium	57[c]	mg/kg	19J	mg/kg	27J	mg/kg	11J	mg/kg
Zinc	121	mg/kg	21J	mg/kg	30J	mg/kg	13J	mg/kg

EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment[2]		Transect EPA 06 Mid-Channel		Transect EPA 07 Left Descending		Transect EPA 08 Right Descending	
Sample Information								
Sample ID	-		EDEN-EPA06-C-SD-20140505		EDEN-EPA07-L-SD-20140505		EDEN-EPA08-R-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1030		1130		1250	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Physical Properties								
Percent Ash	-	-	1	%	ND	%	ND	%

Notes

[2] MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

[a] The screening value for antimony is from Long, Edward R., and Lee G. Morgan. 1991. The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National Status and Trends Program. NOAA Technical Memorandum NOS OMA 52.

[b] The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

[c] Sediment screening values for manganese and vanadium come from the NOAA SQuIRT.
http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

[d] The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

[e] Cadmium from diet

[f] Chromium (VI)

[g] Methyl Mercury

[h] Thallium Chloride

%	Percent
EPA	U.S. Environmental Protection Agency
J	Value is estimated
J+	Value is estimated with a possible high bias
J-	Value is estimated with a possible low bias
mg/kg	milligrams per kilogram
ND	No fly ash detected at a PLM reporting limit of 1 percent
PLM	Polarized light microscopy
U	Analyte was not detected at the listed reporting limit.
UJ	Analyte was not detected at the listed reporting limit, which is an estimated quantitation.

EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment[2]		Transect EPA 09 Left Descending		Transect EPA 10 Left Descending		Transect EPA 11 Right Descending	
Sample Information								
Sample ID	-		EDEN-EPA09-L-SD-20140505		EDEN-EPA10-L-SD-20140505		EDEN-EPA11-R-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1015		1143		1240	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Total Metals								
Aluminum	3,200 (bkg)	mg/kg	10,000J	mg/kg	9,000J	mg/kg	13,000J	mg/kg
Antimony	2[a]	mg/kg	1.4UJ	mg/kg	1.4UJ	mg/kg	1.6UJ	mg/kg
Arsenic	9.8	mg/kg	2.5J	mg/kg	1.8J	mg/kg	2.8J	mg/kg
Barium	60[b]	mg/kg	82J	mg/kg	88J	mg/kg	110J	mg/kg
Beryllium	-	-	0.57J	mg/kg	0.51J	mg/kg	0.7J	mg/kg
Boron	-	-	15UJ	mg/kg	13UJ	mg/kg	17UJ	mg/kg
Cadmium	0.99	mg/kg	0.057J	mg/kg	0.025J	mg/kg	0.077J	mg/kg
Calcium	-	-	860J	mg/kg	740J	mg/kg	1,300J	mg/kg
Chromium	43.4	mg/kg	23J	mg/kg	18J	mg/kg	28J	mg/kg
Cobalt	50	mg/kg	7.3J	mg/kg	6J	mg/kg	9.6J	mg/kg
Copper	31.6	mg/kg	11J	mg/kg	8.6J	mg/kg	15J	mg/kg
Iron	6,800 (bkg)	mg/kg	14,000J	mg/kg	13,000J	mg/kg	19,000J	mg/kg
Lead	35.8	mg/kg	8.8J	mg/kg	7.2J	mg/kg	10J	mg/kg
Magnesium	-	-	2,400J	mg/kg	2,200J	mg/kg	3,200J	mg/kg
Manganese	460[c]	mg/kg	230J	mg/kg	540J	mg/kg	460J	mg/kg
Mercury	0.18	mg/kg	0.014J	mg/kg	0.02J	mg/kg	0.025J	mg/kg
Molybdenum	-	-	1.5UJ	mg/kg	1.3UJ	mg/kg	1.7UJ	mg/kg
Nickel	22.7	mg/kg	9.3J	mg/kg	7.2J	mg/kg	12J	mg/kg
Potassium	-	-	1,700J	mg/kg	1,500J	mg/kg	2,300J	mg/kg
Selenium	2[d]	mg/kg	0.4J	mg/kg	0.35J	mg/kg	0.51J	mg/kg
Silver	0.733	mg/kg	0.14UJ	mg/kg	0.14UJ	mg/kg	0.16UJ	mg/kg
Sodium	-	-	290UJ	mg/kg	270UJ	mg/kg	340UJ	mg/kg
Thallium	-	mg/kg	0.14J	mg/kg	0.14J	mg/kg	0.2J	mg/kg
Vanadium	57[c]	mg/kg	32J	mg/kg	27J	mg/kg	38J	mg/kg
Zinc	121	mg/kg	37J	mg/kg	24J	mg/kg	46J	mg/kg

EDEN NORTH CAROLINA COAL ASH SPILL
SEDIMENT RESULTS

Analyte	Ecological Screening Standards for Sediment[2]		Transect EPA 09 Left Descending		Transect EPA 10 Left Descending		Transect EPA 11 Right Descending	
Sample Information								
Sample ID	-		EDEN-EPA09-L-SD-20140505		EDEN-EPA10-L-SD-20140505		EDEN-EPA11-R-SD-20140505	
Date	-		05/05/2014		05/05/2014		05/05/2014	
Time	-		1015		1143		1240	
Status	-		Validation Complete		Validation Complete		Validation Complete	
Type	-		Sediment		Sediment		Sediment	
Physical Properties								
Percent Ash	-	-	ND	%	ND	%	ND	%

Notes

[2] MacDonald, D.D.; Ingersoll, C.G.; Smorong, D.E.; Lindskoog, R.A.; Sloane, G; and T. Biernacki. 2003. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters. Florida Department of Environmental Protection, Tallahassee, FL. Development and Evaluation of Numerical Sediment Quality Assessment Guidelines for Florida Inland Waters.

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[b] The screening value for barium was the probable effect level (PEL) instead of the threshold effect level (TEL) because the TEL was below background

[c] Sediment screening values for manganese and vanadium come from the NOAA SQuIRT.
http://response.restoration.noaa.gov/sites/default/files/SQuiRTs.pdf

[d] The screening value for selenium is from Region 3 after Lemley, A.D. 2002. Selenium assessment in aquatic ecosystems. US Forest Service, Blacksburg, VA.

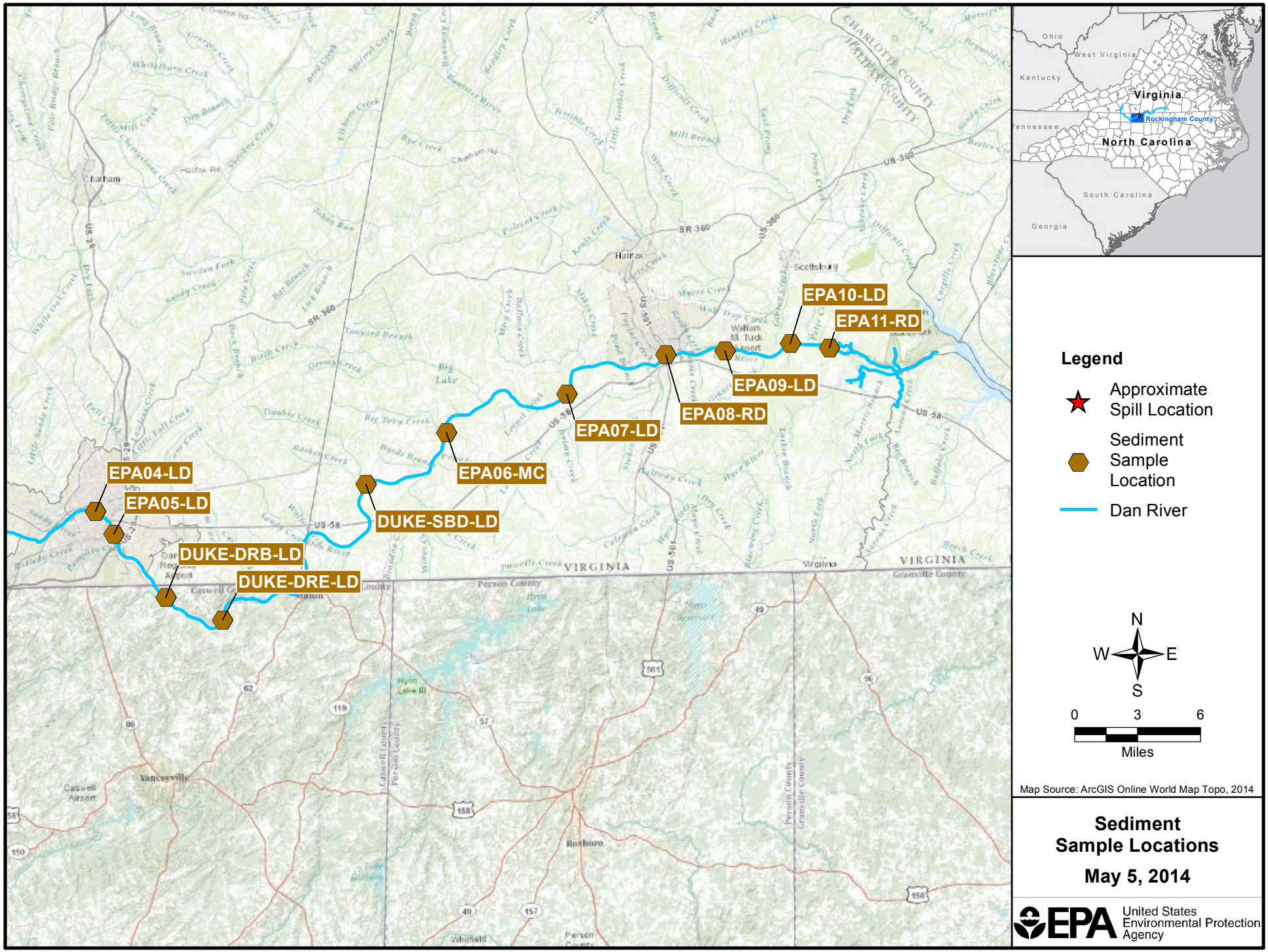
[e] Cadmium from diet

[f] Chromium (VI)

[g] Methyl Mercury

[h] Thallium Chloride

%	Percent
EPA	U.S. Environmental Protection Agency
J	Value is estimated
J+	Value is estimated with a possible high bias
J-	Value is estimated with a possible low bias
mg/kg	milligrams per kilogram
ND	No fly ash detected at a PLM reporting limit of 1 percent
PLM	Polarized light microscopy
U	Analyte was not detected at the listed reporting limit.
UJ	Analyte was not detected at the listed reporting limit, which is an estimated quantitation.


EPA10-LD
EPA11-RD
EPA09-LD
EPA08-RD
EPA07-LD
EPA06-MC
DUKE-SBD-LD
EPA04-LD
EPA05-LD
DUKE-DRB-LD
DUKE-DRE-LD
Chatham
Halifax
Scottsburg
VIRGINIA
Virginia
Person County
Caswell County
Granville County
Vanceyville
Roxboro
Caswell Airport
Dan River Region Airport
William M. Tuck Airport
Big Lake
Hyco Lake III
Mayo Reservoir
Ohio
West Virginia
Kentucky
Virginia
Rockingham County
North Carolina
South Carolina
Georgia
Legend
Approximate Spill Location
Sediment Sample Location
Dan River
N
W
E
S
0
3
6
Miles
Map Source: ArcGIS Online World Map Topo, 2014
Sediment Sample Locations
May 5, 2014
EPA
United States Environmental Protection Agency
File: C:\GIS_Workspace\Eden_Coal_Ash\Projects\mxd\Reporting\EPA_START\050514\SedimentSampleLocations_050514.mxd