

Table 1: Parameter Concentration per Well

2L 250 mg/l			
Well	Parameter	Value	Date
MW-21C	Sulfate	814.00	10/3/2012

2L 10 ug/l			
Well	Parameter	Value	Date
MW-21C	Arsenic	5.8	10/3/2012
MW-21C	Arsenic	15.90	3/9/2013
MW-21C	Arsenic	1.25	6/12/2013
MW-21C	Arsenic	22.80	10/2/2013
MW-21C	Arsenic	27.60	3/4/2014
MW-21C	Arsenic	28.50	6/3/2014
MW-21C	Arsenic	45.00	10/2/2014

2L 0.2 ug/l			
Well	Parameter	Value	Date
MW19	Thallium	0.50	3/9/2010
MW19	Thallium	0.31	11/10/2010
MW19	Thallium	0.30	3/2/2011
MW19	Thallium	0.28	10/4/2011
MW19	Thallium	0.23	3/6/2012
MW19	Thallium	0.38	6/5/2012
MW19	Thallium	0.23	3/6/2012
MW19	Thallium	0.62	3/12/2013
MW19	Thallium	0.31	6/12/2013
MW19	Thallium	0.43	10/2/2013
MW19	Thallium	0.32	3/4/2014
MW19	Thallium	0.30	6/3/2014
MW19	Thallium	0.46	10/2/2014
MW-22C	Thallium	0.35	10/3/2012
MW-22C	Thallium	0.30	3/12/2013
MW-22C	Thallium	0.25	6/12/2013
MW-22C	Thallium	0.25	10/2/2013
MW-22C	Thallium	0.23	3/6/2012
MW-22C	Thallium	0.23	6/2/2014
MW-22C	Thallium	0.42	10/2/2014
MW-23C	Thallium	0.21	10/1/2014
MW-24B	Thallium	0.42	10/3/2012
MW-24B	Thallium	0.59	3/13/2013
MW-24B	Thallium	0.47	6/12/2013
MW-24B	Thallium	0.57	10/2/2013
MW-24B	Thallium	0.23	3/6/2014
MW-24B	Thallium	0.38	6/5/2012
MW-24B	Thallium	0.45	10/1/2014
MW-24C	Thallium	0.1	10/3/2012
MW-24C	Thallium	0.2	3/13/2013
MW-24C	Thallium	0.2	6/12/2013
MW-24C	Thallium	0.23	10/2/2013
MW-24C	Thallium	0.2	3/5/2014
MW-24C	Thallium	0.2	6/3/2014

2L 500 mg/l			
Well	Parameter	Value	Date
MW-23C	TDS	456	10/2/2012
MW-23C	TDS	540	3/4/2013
MW-23C	TDS	470	3/12/2013
MW-23C	TDS	530	6/12/2013
MW-23C	TDS	540	10/2/2013
MW-23C	TDS	540	6/2/2014
MW-24C	TDS	580	10/1/2014
MW-24C	TDS	579	10/3/2012
MW-24C	TDS	530	3/13/2013
MW-24C	TDS	550	6/12/2013
MW-24C	TDS	560	10/2/2013
MW-24C	TDS	610	3/5/2014
MW-24C	TDS	550	6/3/2014
MW-24C	TDS	560	10/1/2014
MW-31C	TDS	490	10/3/2013
MW-31C	TDS	490	3/5/2014
MW-31C	TDS	570	6/3/2014
MW-31C	TDS	550	10/2/2014

2L 20 ug/l			
Well	Parameter	Value	Date
No data in March and June 2012			
MW-27B	Selenium	27.30	10/2/2012
MW-27B	Selenium	37.10	3/13/2013
MW-27B	Selenium	34.60	6/13/2013
MW-27B	Selenium	48.20	10/2/2013
MW-27B	Selenium	61.70	3/5/2014
MW-27B	Selenium	56.70	6/2/2014
MW-27B	Selenium	59.90	10/1/2014

2L 1 ug/l			
Well	Parameter	Value	Date
MW-24B	Antimony	1.10	10/3/2012
MW-24B	Antimony	1.07	3/13/2013
MW-24B	Antimony	1.00	6/12/2013
MW-24B	Antimony	1.00	10/2/2013
MW-24B	Antimony	1.00	3/5/2014
MW-24B	Antimony	1.00	6/3/2014
MW-24C	Antimony	0.50	10/3/2012
MW-24C	Antimony	1.00	3/13/2013
MW-24C	Antimony	1.00	6/12/2013
MW-24C	Antimony	1.00	10/2/2013
MW-24C	Antimony	1.00	3/5/2014
MW-24C	Antimony	1.00	6/3/2014

2L 700 ug/l			
Well	Parameter	Value	Date
MW7	Boron	709	3/6/2012
MW7	Boron	767	6/5/2012
MW7	Boron	157	10/2/2012
MW7	Boron	164	3/12/2013
MW7	Boron	185	6/12/2013
MW7	Boron	312	10/3/2013
MW7	Boron	330	3/4/2014
MW7	Boron	391	6/2/2014
MW12	Boron	1450	3/7/2012
MW12	Boron	1260	6/6/2012
MW12	Boron	1290	10/2/2012
MW12	Boron	1510	3/13/2013
MW12	Boron	1360	6/13/2013
MW12	Boron	1560	10/3/2013
MW12	Boron	928	3/5/2014
MW12	Boron	1050	6/3/2014
MW12	Boron	1300	10/2/2014
MW19	Boron	1960	10/6/2009
MW19	Boron	1920	3/9/2010
MW19	Boron	1830	11/10/2010
MW19	Boron	1960	3/2/2011
MW19	Boron	1710	10/4/2011
MW19	Boron	1920	3/6/2012
MW19	Boron	1940	6/5/2012
MW19	Boron	1680	10/3/2012
MW19	Boron	1830	3/12/2013
MW19	Boron	1710	6/12/2013
MW19	Boron	1990	10/2/2013
MW19	Boron	2020	3/4/2014
MW19	Boron	2110	6/3/2014
MW19	Boron	2190	10/2/2014
MW-21C	Boron	1720	10/3/2012
MW-21C	Boron	1660	3/12/2013
MW-21C	Boron	1730	6/12/2013
MW-21C	Boron	1510	10/2/2013
MW-21C	Boron	1430	3/4/2014
MW-21C	Boron	2000	6/3/2014
MW-21C	Boron	2210	10/2/2014
MW-22C	Boron	2100	10/3/2012
MW-22C	Boron	1840	3/12/2013
MW-22C	Boron	2250	6/12/2013
MW-22C	Boron	2290	10/2/2013
MW-22C	Boron	1950	3/4/2014
MW-22C	Boron	2500	6/2/2014
MW-22C	Boron	2660	10/2/2014
MW-23B	Boron	1330	10/2/2012
MW-23B	Boron	1100	3/12/2013
MW-23B	Boron	1830	6/12/2013
MW-23B	Boron	1140	10/2/2013
MW-23B	Boron	1020	3/4/2014
MW-23B	Boron	758	6/2/2014
MW-23B	Boron	403	10/1/2014
MW-23C	Boron	2580	10/2/2012
MW-23C	Boron	3000	3/4/2013
MW-23C	Boron	2400	3/12/2013
MW-23C	Boron	2710	6/12/2013
MW-23C	Boron	3000	10/2/2013
MW-23C	Boron	2970	6/2/2014
MW-23C	Boron	3600	10/1/2014
MW-24B	Boron	1420	10/3/2012
MW-24B	Boron	1270	3/13/2013
MW-24B	Boron	1190	6/12/2013
MW-24B	Boron	1130	10/2/2013
MW-24B	Boron	1180	3/5/2014
MW-24B	Boron	1140	6/3/2014
MW-24B	Boron	1050	10/1/2014
MW-24C	Boron	1160	10/3/2012
MW-24C	Boron	1030	3/13/2013
MW-24C	Boron	999	6/12/2013
MW-24C	Boron	988	10/2/2013
MW-24C	Boron	1030	3/5/2014
MW-24C	Boron	1090	6/3/2014
MW-24C	Boron	1130	10/1/2014
MW-28C	Boron	652	10/3/2012
MW-28C	Boron	1030	3/12/2013
MW-28C	Boron	1260	6/12/2013
MW-28C	Boron	263	10/2/2013
MW-28C	Boron	711	3/4/2014
MW-28C	Boron	330	6/2/2014
MW-31C	Boron	1120	10/2/2012
MW-31C	Boron	1030	3/13/2013
MW-31C	Boron	985	6/13/2013
MW-31C	Boron	1020	10/3/2013
MW-31C	Boron	1030	3/5/2014
MW-31C	Boron	1410	6/3/2014
MW-31C	Boron	1200	10/2/2014

2L 1 ug/l			
Well	Parameter	Value	Date
MW7	Cadmium	3.34	6/12/2013

The rest of the wells show Cd concentrations between 0.08 and "less than" 1 ug/l

2L 15 ug/l			
Well	Parameter	Value	Date
MW12	Lead	17.30	3/7/2012

The rest of the wells show Pb concentrations between 1 and 5 ug/l

2L 1 ug/l			
Well	Parameter	Value	Date
MW-33C	Mercury	35.00	6/3/2014
MW-33C	Mercury	0.05	10/2/2014

(note 1-Typ)

2L 300 ug/l			
Well	Parameter	Value	Date
MW4	Iron	9700	3/8/1995
MW4	Iron	5700	3/6/1996
MW4	Iron	3200	3/10/1997
No data in 1998			
MW4	Iron	1470	3/17/1999
MW4	Iron	1070	3/6/2000
MW4	Iron	536	3/17/2001
MW4	Iron	755	3/6/2002
MW4	Iron	999	3/5/2003
MW4	Iron	502	3/9/2004
No data in 2005			
MW4	Iron	588	3/2/2006
MW4	Iron	597	12/12/2006
MW4	Iron	607	3/6/2007
MW4	Iron	623	3/6/2007
MW4	Iron	486	3/11/2008
MW4	Iron	405	11/5/2008
MW4	Iron	751	3/10/2009
MW4	Iron	517	10/6/2009
MW4	Iron	516	3/9/2010
MW4	Iron	417.00	11/10/2010
MW4	Iron	763.00	3/2/2011
No data June 2011			
MW4	Iron	1250.00	10/4/2011
MW4	Iron	1460.00	3/6/2012
MW4	Iron	1100.00	6/5/2012
MW4	Iron	1470.00	10/2/2012
MW4	Iron	1650.00	3/12/2013
MW4	Iron	570.00	6/12/2013
MW4	Iron	1720.00	10/2/2013
MW4	Iron	2020.00	3/4/2014
MW4	Iron	891.00	6/2/2014
MW4	Iron	2840.00	10/1/2014
MW5	Iron	1200	3/8/1995
MW5	Iron	<50	3/27/1996
MW5	Iron	340	3/2/2006
MW5	Iron	159	3/16/1999
MW5	Iron	46	3/6/2000
MW5	Iron	285	3/16/2001
MW5	Iron	127	3/7/2002
MW5	Iron	14	3/5/2003
MW5	Iron	373	3/9/2004
MW5	Iron	115	3/2/2006
MW5	Iron	129	3/6/2007
MW5	Iron	2210	3/11/2008
MW5	Iron	50.0	3/10/2009
MW5	Iron	12.0	3/9/2010
MW5	Iron	72.0	3/2/2011
MW5	Iron	56.9	3/7/2012
MW5	Iron	25.0	6/6/2012
MW5	Iron	25.0	10/2/2012
MW5	Iron	26.0	3/13/2013
MW5	Iron	28.0	6/13/2013
MW5	Iron	26.0	10/3/2013
MW5	Iron	21.0	3/5/2014
MW5	Iron	34.0	6/3/2014
MW5	Iron	23.0	10/2/2014
MW8 (Note 3)	Iron	13000 (outlier)	3/8/1

Table 2: Evidence of Exceedances

Parameter	Exceedance Observed (from)	Exceedance Observed (to)	Days in Continuous Violation	Evidence	Remarks
Arsenic 2L Std= 10 ug/l (15A NCAC 02L .0202)	10/2/2013	10/2/2014	365	1) MW-21 C is in violation: in compliance well MW-21C, arsenic concentrations were above the 2L Std of 10 ug/l and exhibited statistical differences when compared to concentrations in background wells MW-4 and MW-5 and in sidegradient (reference) well MW-8 whose concentrations were statistically below detection limits (BDL). 2) Evidence is supported with arsenic exceedances observed inside the compliance boundary; in review boundary wells (MW-2 and MW-17) which are in close proximity (north and south, respectively) of MW-21C.	Priority Pollutant- Primary Drinking Water Contaminant.
Selenium 2L Std= 20 ug/l (15A NCAC 02L .0202)	10/2/2012	10/1/2014	729	MW-27B is in violation: In compliance well MW-27B, selenium concentrations were above the 2L Std of 20 ug/l and exhibited statistical differences when compared to concentrations in background wells MW-4 and MW-5 and in sidegradient (reference) well MW-8 whose concentrations were statistically BDL.	Priority Pollutant- Primary Drinking Water Contaminant
Thallium 2L Std= 0.2 ug/l (15A NCAC 02L .0202)	3/9/2010	10/2/2014	1668	1) MW-19 and MW-24B are in violation: In compliance wells MW-19 and MW-24B Thallium concentrations were above the 2L Std of 0.2 ug/l and exhibited statistical differences when compared to concentrations in background wells MW-4 and MW-5 whose concentrations were statistically BDL. 2) Evidence is supported with thallium exceedances observed in compliance wells MW-22C. 3) Evidence is supported with thallium recurrent exceedances observed inside the compliance boundary; in review boundary wells MW-2 and MW-17. MW-2 and MW-17 are in close proximity to MW-22C.	Priority Pollutant- Primary Drinking Water Contaminant.
Boron 2L Std= 700 ug/l (15A NCAC 02L .0202)	10/6/2009	10/2/2014	1822	MW-12, MW-19, MW-21C, MW-22C, MW-23B, MW-23C, MW-24B, MW-24C, and MW-31C are in violation: In MW-12, MW-19, MW-21C, MW-22C, MW-23B, MW-23C, MW-24B, MW-24C, and MW-31C Boron concentrations were above the 2L of 700 ug/l and exhibited statistical differences when compared to concentrations in background wells MW-4 and MW-5 whose concentrations were statistically BDL	Key indicator of coal ash leachate. Ref: Groundwater Remediation of Inorganic Constituents at Coal Combustion Product Management Sites. Electric Power Research Institute. Technical Report, published in October 2006 (page vi).
Iron 2L Std= 300 ug/l (15A NCAC 02L .0202) Statistically-established comparison concentration for this analysis= 540 ug/l (Note 4, below)	10/2/2012	10/2/2014	730	MW-21C, MW-24C, and MW-31C are in violation: In MW-21C, MW-24C, and MW-31C Iron concentrations were above the concentration of 540 ug/l (statistically established for this analysis).	Secondary Drinking Water Std
Manganese 2L Std= 50 ug/l (15A NCAC 02L .0202) Statistically-established comparison concentration for this analysis= 285 ug/l (Note 5, below)	10/2/2012	10/2/2014	730	MW-19, MW-21C, MW-22C, MW-23C, MW-24C, and MW-31C are in violation: In MW-19, MW-21C, MW-22C, MW-23C, MW-24C, and MW-31C Manganese concentrations were above the concentration of 285 ug/l (statistically established for this analysis).	Secondary Drinking Water Std
TDS 2L Std= 500 mg/l (15A NCAC 02L .0202)	10/3/2012	10/1/2014	728	MW-24C is in violation: in compliance well MW-24C, TDS concentrations were above the 2L Std of 500 mg/l and exhibited statistical differences when compared to concentrations in background wells MW-4 and MW-5 and in sidegradient (reference) well MW-8 whose concentrations were statistically below detection limits (BDL). 2) Evidence is supported with TDS violations observed in compliance well MW-23C.	Secondary Drinking Water Std

Key indicator of coal ash leachate	Priority Pollutant- Primary Drinking Water Contaminant.	Secondary Drinking Water Standard
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Notes

1) NPDES permit (NC0001422) sampling started in 1990. However, BIMS records start in 1995. Monitoring wells were MW-2C, 4B, 5C, 7C, 8, 9, 10, 11, and 12. Until 2011, the NPDES permit required sampling (once per year) of the following parameters: arsenic, chloride, iron, selenium, TDS, water level, and pH. NPDES permit was updated in December 2011 to include the 13 wells listed below: MW- 2C, 4B, 5C, 6C, 7C, 8, 9, 10, 11, 12, 17, 18, and 19.

These wells were sampled for antimony, arsenic, barium, boron, cadmium, chloride, chromium, copper, iron, lead, manganese, mercury, nickel, nitrate, selenium, sulfate, thallium, zinc, pH, water level, and TDS.

3) On October 24 2012, the NPDES groundwater monitoring plan was revised, requiring sampling of the following wells: MW-4B, 5C, 7C, 11, 12, 19, 21C, 22B, 22C, 23B, 23C, 24B, 24C, 27B, 28B, 28C, and 31C. These 17 wells are located at the compliance boundary (or beyond the compliance boundary). Sampling is three times per year (March, June, and October) for the parameters listed in item 2, above.

4) For Iron, a "statistically-established comparison concentration" was determined by using the average of the upper confidence interval bounds at 99% in MW-4, MW-5, and MW-8, as follows:

(a) For background well MW-4, the parametric confidence interval around the true mean at 99% is from 710 to 1297 ug/l (>2L Std=300 ug/l)

(b) For background well MW-5, the parametric confidence interval around the true mean at 99% is from 33 to 123 ug/l (< 2L Std= 300 ug/l)

(c) For side-gradient, reference well MW-8, the parametric confidence interval around the true mean at 99% is from 44 to 200 ug/l (< 2L Std= 300 ug/l)

(d) The resultant " statistically-established comparison concentration" is the average of 1297, 123, and 200 ug/l= 540 ug/l. Refer to enclosed statistical analysis for additional details.

5) For Manganese, a "statistically-established comparison concentration" was determined by using the average of the upper confidence interval bounds at 99% in MW-4, MW-5 (MW-8 does not have enough data for an evaluation):

(a) For background well MW-4, the parametric confidence interval around the true mean at 99% is from 28 to 55 ug/l (<2L Std=50 ug/l)

(b) For background well MW-5, the parametric confidence interval around the true mean at 99% is from 161 to 514 ug/l (> 2L Std= 50 ug/l)

(c) The resultant " statistically-established comparison concentration" is the average of 55 and 514 ug/l= 285 ug/l. Refer to enclosed statistical analysis for additional details.