



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 4**

**Science and Ecosystem Support Division  
Enforcement and Investigations Branch  
980 College Station Road  
Athens, Georgia 30605-2720**

July 23, 2008

**4SESD-EIB**

**MEMORANDUM:**

**SUBJECT:** Superfund Field Investigation  
Former Columbia and Globe Phosphates facilities  
July 22, 2008  
Project Number: 08-0566

**FROM:** Marty Allen, Environmental Protection Specialist  
Enforcement Section

*Marty Allen* 7/23/08

**THRU:** Danny France, Chief  
Superfund and Air Section

*Danny France*

**TO:** Jeffery Crowley  
Federal On-scene Coordinator  
Superfund Division

Attached is the final report for the field investigation conducted during the week of July 14, 2008 at former Columbia and Globe facilities located in Columbia, South Carolina. Please feel free to contact me at 706/355-8651 if you have any questions.

Attachment

United States Environmental Protection Agency  
Region 4

Science and Ecosystem Support Division  
980 College Station Road  
Athens, Georgia 30605-2720



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**Columbia and Globe Phosphates**

**Columbia, South Carolina  
July 14, 2008**

**SESD Project Identification Number: 08-0566**

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**Requestor: Jeffery Crowley**  
EPA  
61 Forsyth St. SW  
Atlanta, Georgia 30303-8960

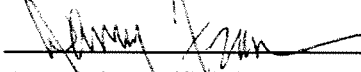
**SESD Project Leader: Marty Allen**  
SESD Organization  
980 College Station Road  
Athens, Georgia 30605-2720

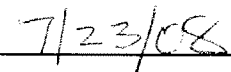
**Title and Approval Sheet**

Title: **Columbia and Globe Phosphates, Columbia, SC**  
**SESD Project Identification Number: 08-0566**

**Approving Official:**

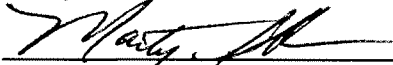
Danny France, Chief, Superfund and Air Section

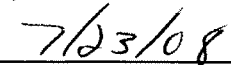
  
\_\_\_\_\_  
Approving Official's Name

  
\_\_\_\_\_  
Date

**SESD Project Leader:**

Marty Allen, Environmental Protection Specialist, RCRA Section

  
\_\_\_\_\_  
Project Leader's Name

  
\_\_\_\_\_  
Date

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**APPENDIX B**                      XRF Field Screening Data ( 10 pages )

**\*END OF REPORT\***

**INVESTIGATION REPORT  
COLUMBIA AND GLOBE PHOSPHATES  
COLUMBIA, SOUTH CAROLINA  
SESD PROJECT IDENTIFICATION NUMBER: 08-0566**

**Introduction**

During the week of July 7, 2008, representatives from United States Environmental Protection Agency (U.S. E.P.A.), Science and Ecosystems Support Division (SESD), collected soil samples at the 700 block of Catawba Street at the former Columbia and Globe Phosphate sites in Columbia, SC. The investigation was requested by Jeffery Crowley, Federal On- Scene Coordinator, USEPA Region 4, Atlanta, GA.

The following people participated in the investigation:

<u>Name</u>	<u>Organization</u>
Marty Allen	USEPA – Athens, GA
Kevin Simmons	USEPA – Athens, GA
Mark Bean	USEPA – Athens, GA
Brock Wampler	USEPA – Athens, GA
Jeffery Crowley	USEPA – Atlanta, GA
Mike Crowe	ILS – Athens GA
Ryan Stubbs	TN & A – Marietta, GA
Darius Soltes	TN & A – Marietta, GA

**Site Background**

The Globe and Columbia Phosphate companies were superphosphate manufacturing facilities. Rock was mined as tricalcium phosphate then dried and treated with sulfuric acid. After the sulfuric acid was leached out, the ore was then mixed with calcium sulfate to yield superphosphate. Sulfuric acid was manufactured on site using the lead chamber process. To make the sulfuric acid, pyrite ores (iron sulfide) were roasted in lead lined chambers to produce hot sulfur dioxide gas. The gas mixed with nitrogen oxides and nitrous vitriol, which catalyzed the oxidation reaction of sulfur dioxide to sulfur trioxide. Some acid was produced from SO<sub>3</sub> reacting with the nitrous vitriol. The sulfur trioxide as well as other gases reacted with water to form H<sub>2</sub>SO<sub>4</sub>. The gases were mixed with cooled acid from the SO<sub>3</sub> and nitrous vitriol reaction. The nitrogen oxides and left over sulfur dioxide were dissolved into the acid and recycled back as nitrous vitriol. The remaining gases were released into the atmosphere.

Samples collected from both properties were screened with a Niton-700 Multi-Element Analyzer X-ray fluorescence spectrometer (XRF), before being relinquished to TN & A personnel for submission to the SESD laboratory for further analysis.

SESD collected a total of 46 soil samples (0 – 4' depth). A total of 231 screenings including were performed including periodic calibration verification and quality control/quality assurance checks. Direct Push Technology and a Geoprobe® Macro-core sampling train was implemented during the process. The data will be used by the Superfund Division in their decision making process. Based on the concentrations of lead and/or arsenic in the soil, relative to the Removal Action Levels (RAL), a decision will be made to either take No Further Action (NFA) or conduct soil removal. The site RAL for lead (Industrial) is 400mg/kg and arsenic (Industrial) is 1.6 mg/kg.

### **Sampling and Analytical Methodology**

Sample collection activities were in accordance with the following SESD Operating Procedures:

- SESD Operating Procedure for Logbooks, SESDPROC-010-R3
- SESDPROC-202-R1, Management of Investigative Derived Waste
- SESDPROC-205-R1, Field Equipment Cleaning and Decontamination
- SESDPROC-209-R1, Packing, Marking Labeling and Shipping of Environmental and Waste Samples
- SESDPROC-300-R1, Soil Sampling
- SESDPROC-110-R2, Global Positioning System
- SESDPROC-107-R1, Field X-RAY Fluorescence (XRF) Measurement

### **Summary**

A total of 28 core samples were collected from the former Columbia Phosphates property and a total of 18 core samples were collected from the former Globe Phosphates property. 34 of the samples screened from Columbia exceeded the RAL for lead and 36 exceeded for arsenic.

7 samples exceeded the RAL for lead and 22 exceed for arsenic at the Globe Phosphates property. The elevated levels ranged from 413 mg/kg to 12600 mg/kg for lead, and 17.8mg/kg to 19600 mg/kg.

### **Field Analytical Results: XRF screening**

The screening results for samples above the RAL are summarized in Tables 1-3. Sampling locations are located in Appendix A, Figure 1. Sampling locations are located in Appendix A, Figure 1.

41 samples that contained elevated levels of lead (above 400mg/kg) and 58 samples contained elevated levels for arsenic (above 1.6 mg/kg). Once the 4' core sample was collected, screening intervals of approximately 12" beginning from the surface layer was obtained per core. Even though sample train was advanced to 4' depths, due to soil

Columbia and Globe Phosphates

Columbia, South Carolina

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stratification sample may exhibit some slight fluctuations in core tube volume. Further laboratory results will be provided by TN and A contractors. Generally the XRF results are within 70% of the laboratory results.

**LEAD RESULTS ABOVE 400 PPM AND  
ARSENIC RESULTS ABOVE 1.6 PPM  
COLUMBIA PHOSPHATES SITE  
COLUMBIA, SOUTH CAROLINA**

**Table 1**

Date	Time	Sample Description	As (ppm)	As error (+/- ppm)	Pb (ppm)	Pb error (+/- ppm)
7/7/2008	1449	CPB01C - 24"	20.5	9.3	<14	
7/7/2008	1521	CPB03C - 18"	<72		1180	59
7/7/2008	1540	CPB04B - 12"	103	48	1030	57
7/7/2008	1543	CPB04C - 24"	<55		732	44
7/7/2008	1548	CPB04D - >26"	74.2	39	922	46
7/7/2008	1554	CPB05B - 12"	71.9	27	495	30
7/7/2008	1558	CPB05C - 20"	73.1	44	1040	52
7/7/2008	1609	CPB06A - SURFACE	<61		1170	49
7/7/2008	1619	CPB06D - 36-38"	265	110	6410	170
7/7/2008	1625	CPB07A - SURFACE	<39		561	30
7/7/2008	1630	CPB07B - 12"	<65		1590	54
7/7/2008	1634	CPB07C - 31"	<85.5	45	1510	56
7/7/2008	1642	CPB08A - SURFACE	43.9	19	321	21
7/7/2008	1644	CPB08B - 12"	<38		507	29
7/7/2008	1647	CPB08C - 24"	64.3	33	897	39
7/7/2008	1650	CPB08D - 36"	1960	160	7140	230
7/7/2008	1657	CPB09B - 12"	<42		569	32
7/7/2008	1701	CPB09C - 24"	20.7	13	68.3	14
7/8/2008	0849	CPB10A - SURFACE	62.9	32	730	37
7/8/2008	0852	CPB10B - 12"	57.5	32	758	37
7/8/2008	0900	CPB10D - 36"	322	97	4330	140
7/8/2008	0905	CPB11A - SURFACE	<36		338	27
7/8/2008	0908	CPB11B - 12"	<42		526	33
7/8/2008	0910	CPB11C - 24"	372	140	12600	260

**LEAD RESULTS ABOVE 400 PPM AND  
ARSENIC RESULTS ABOVE 1.6 PPM  
COLUMBIA PHOSPHATES SITE  
COLUMBIA, SOUTH CAROLINA**

**Table 2**

Date	Time	Sample Description	As (ppm)	As error (+/- ppm)	Pb (ppm)	Pb error (+/- ppm)
7/8/2008	0914	CPB11D - 36"	134	16	70.5	13
7/8/2008	0920	CPB11E - 40-42"	146	18	112	16
7/8/2008	0927	CPB12B - 12"	<49		670	38
7/8/2008	0934	CPB12D - >33"	496	24	46.6	12
7/8/2008	0945	CPB13B - 12"	<54		1060	44
7/8/2008	0956	CPB14A - SURFACE	<40		734	33
7/8/2008	1000	CPB14B - 12"	25.4	14	105	16
7/8/2008	1003	CPB14C - 24"	115	63	4520	89
7/8/2008	1012	CPB15A - SURFACE	<57		1290	47
7/8/2008	1015	CPB15B - 12"	<49		789	39
7/8/2008	1018	CPB15C - 24"	<55		1140	45
7/8/2008	1021	CPB15D - 36"	57.9	21	292	23
7/8/2008	1052	CPB16C - >23"	120	14	18.5	10
7/8/2008	1055	CPB17A - SURFACE	331.0	110	2320	150
7/8/2008	1115	CPB18A - SURFACE	229.0	110	783	130
7/8/2008	1127	CPB18C - 24"	57.4	11	<14	
7/8/2008	1129	CPB18D - >36"	815	32	19.3	12
7/8/2008	1137	CPB19A - SURFACE	60.3	31	365	34
7/8/2008	1143	CPB19C - 24"	34.3	12	19.7	12
7/8/2008	1146	CPB19D - >34"	16.0	9.9	<15	
7/8/2008	1152	CPB20A - SURFACE	38.2	21	379	25
7/8/2008	1154	CPB20B - 12"	37.5	11	16.0	10
7/8/2008	1156	CPB20C - 24"	234	17	22.0	11
7/8/2008	1306	CPB21A - SURFACE	85.9	38	788	44
7/8/2008	1325	CPB21D - >32"	<33		352	25
7/8/2008	1329	CPB22A - SURFACE	<33		193	
7/8/2008	1449	CPB27A - SURFACE	29.3	18	163	20
7/8/2008	1506	CPB27E - >45"	268	61	2100	77
7/9/2008	1234	CPB28A - SURFACE	<40		413	31
7/9/2008	1238	CPB28B - 12"	72.6	34	780	40
7/9/2008	1241	CPB28C - >18"	32.8	18	227	20

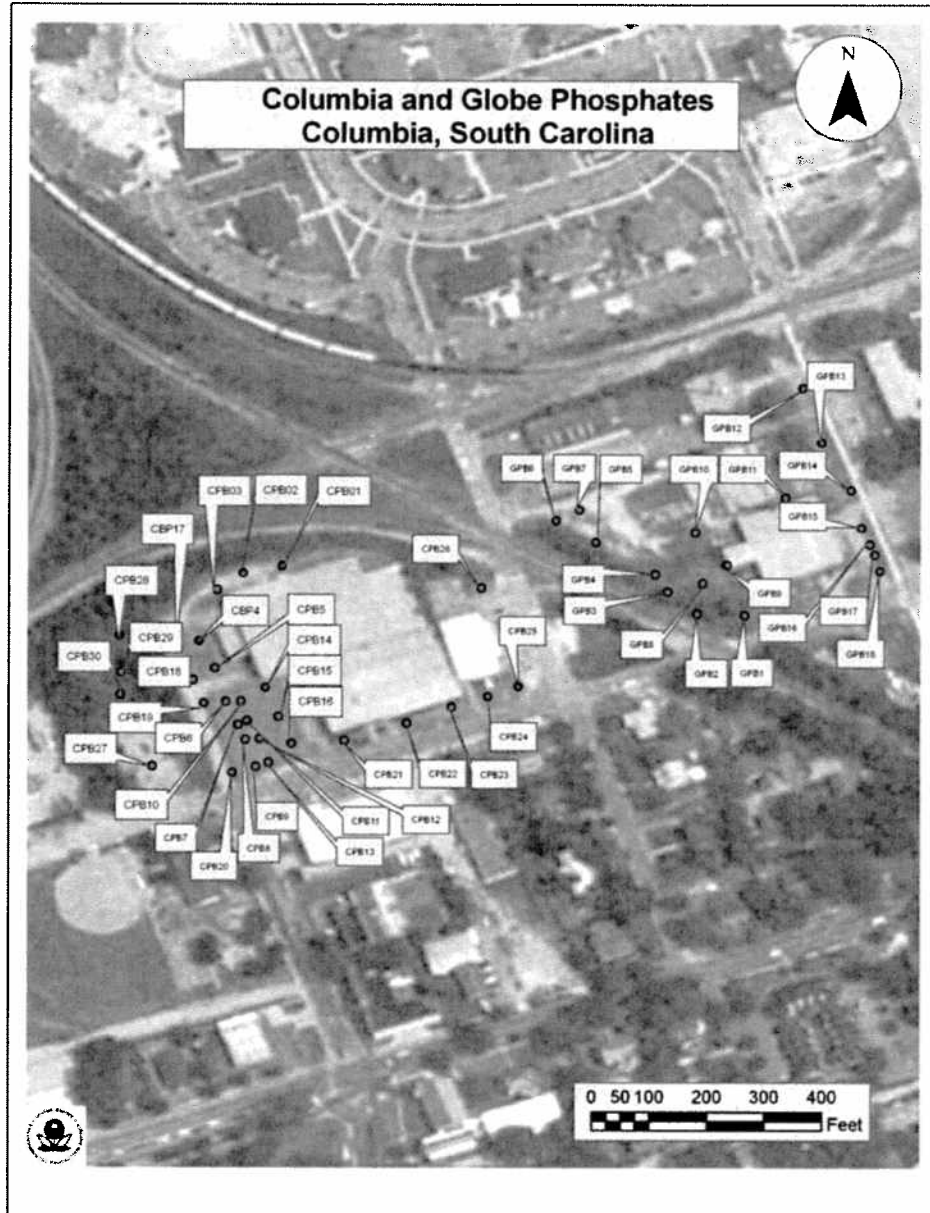


**LEAD RESULTS ABOVE 400 PPM AND  
ARSENIC RESULTS ABOVE 1.6 PPM  
GLOBE PHOSPHATES SITE  
COLUMBIA, SOUTH CAROLINA**

**Table 3**

Date	Time	Sample Description	As (ppm)	As error (+/- ppm)	Pb (ppm)	Pb error (+/- ppm)
7/8/2008	1527	GPB01A - SURFACE	28.4	17	92.1	14
7/8/2008	1531	GPB01B - 12"	49.5	14	51	14
7/8/2008	1534	GPB01C - 24"	84.7	14	<18	
7/8/2008	1544	GPB02B - 12"	91.6	50	986	59
7/8/2008	1620	GPB03B - 18"	40.5	12	<18	
7/8/2008	1623	GPB03C - 24"	44.4	13	<18	
7/8/2008	1625	GPB03D - 36"	51.9	16	<22	
7/8/2008	1634	GPB04B - 12"	86.4	14	38.5	12
7/8/2008	1637	GPB04C - 24"	54.4	13	<17	
7/8/2008	1645	GPB05A - SURFACE	17.8	12	29.7	13
7/8/2008	1705	GPB06C - 18"	91.5	38	628	43
7/8/2008	1715	GPB07B - 13"	27.5	17	159	19
7/9/2008	0902	GPB08B - 12"	741	140	830	130
7/9/2008	0910	GPB08C - 24"	26.9	11	17.9	11
7/9/2008	0930	GPB09C - 12"	153	68	886	78
7/9/2008	0945	GPB09D - 24"	52.2	13	<18	
7/9/2008	0947	GPB09E - 35"	55.9	13	<17	
7/9/2008	0958	GPB10B - 12"	22.2	13	30.7	14
7/9/2008	1002	GPB10C - 24"	21.9	12	73.5	13
7/9/2008	1005	GPB10D - >32"	120	15	<17	
7/9/2008	1022	GPB11B - 18"	207	62	1590	76
7/9/2008	1025	GPB11C - BRICK @24"	23.5	15	<24	
7/9/2008	1329	GPB15A - SURFACE	<71		2030	60
7/9/2008	1348	GPB17A - SURFACE	<28		456	22

**Appendix A**  
**Former Columbia and Globe Phosphates**  
**Figure 1 Sample Location Map**  
**Columbia, South Carolina**



**Appendix B**  
**10 pages**

Columbia and Globe Phosphates  
XRF Field Screening Data  
Columbia, South Carolina

Reading #	Date	Time	Sample Description	As (ppm)	As error (+/- ppm)	Pb (ppm)
1	7/7/2008	1407	Instrument Calibration			
2	7/7/2008	1420	Instrument Calibration			
3	7/7/2008	1425	Instrument Calibration			
4	7/7/2008	1427	NIST 2711	62.0	39	1040
5	7/7/2008	1430	NIST 2711	111.0	40.0	997
6	7/7/2008	1434	SiO2 Blank	<11.0		<12.0
7	7/7/2008	1439	CPB01A - SURFACE	<14		29.0
8	7/7/2008	1445	CPB01B - 12"	<17		<18
9	7/7/2008	1449	CPB01C - 24"	20.5	9.3	<14
10	7/7/2008	1453	CPB01D	<14		<15
11	7/7/2008	1458	CPB02A - SURFACE	<22		34.7
12	7/7/2008	1502	CPB02B - 9"	<25		178
13	7/7/2008	1506	CPB02C - 12"	<14		18.2
14	7/7/2008	1508	CPB02D - 24"	<16		<18
15	7/7/2008	1511	CPB02E - 36"	<18		<19
16	7/7/2008	1515	CPB03A - SURFACE	<18		58.9
17	7/7/2008	1518	CPB03B - 12"	<30		298
18	7/7/2008	1521	CPB03C - 18"	<72		1180
19	7/7/2008	1524	CPB03D - 24"	<17		34.1
20	7/7/2008	1527	NIST 2711	96.3	35	1010
21	7/7/2008	1530	SiO2 Blank	<11		<12
22	7/7/2008	1537	CPB04A - SURFACE	<16		63.4
23	7/7/2008	1540	CPB04B - 12"	103	48	1030
24	7/7/2008	1543	CPB04C - 24"	<55		732
25	7/7/2008	1548	CPB04D - >26"	74.2	39	922
26	7/7/2008	1552	CPB50A - SURFACE	58.7	23	316
27	7/7/2008	1554	CPB05B - 12"	71.9	27	495
28	7/7/2008	1558	CPB05C - 20"	73.1	44	1040
29	7/7/2008	1601	CPB05D - 24"	<19		<22
30	7/7/2008	1609	CPB06A - SURFACE	<61		1170
31	7/7/2008	1611	CPB06B - 12"	45.7	19	234
32	7/7/2008	1614	CPB06C - 24"	<33		379
33	7/7/2008	1619	CPB06D - 36-38"	265	110	6410
34	7/7/2008	1625	CPB07A - SURFACE	<39		561
35	7/7/2008	1630	CPB07B - 12"	<65		1590
36	7/7/2008	1634	CPB07C - 31"	<85.5	45	1510
37	7/7/2008	1642	CPB08A - SURFACE	43.9	19	321
38	7/7/2008	1644	CPB08B - 12"	<38		507
39	7/7/2008	1647	CPB08C - 24"	64.3	33	897
40	7/7/2008	1650	CPB08D - 36"	1960	160	7140
41	7/7/2008	1655	CPB09A - SURFACE	<39		344
42	7/7/2008	1657	CPB09B - 12"	<42		569
43	7/7/2008	1701	CPB09C - 24"	20.7	13	68.3
44	7/7/2008	1704	NIST 2711	65.5	40	1030
45	7/7/2008	1707	NIST 2711	80.8	40	1020
46	7/7/2008	1709	NIST 2711	57.9	38	1020
47	7/7/2008	1712	NIST 2711	63.0	39	1060
48	7/7/2008	1714	SiO2 Blank	<11		<11
49	7/8/2008	0837	Instrument Calibration			
50	7/8/2008	0839	NIST 2711	54.3	34	1070
51	7/8/2008	0843	NIST 2711	91.6	37	990

Columbia and Globe Phosphates  
XRF Field Screening Data  
Columbia, South Carolina

52	7/8/2008 0845	SiO2 Blank	<10		<11
53	7/8/2008 0849	CPB10A - SURFACE	62.9	32	730
54	7/8/2008 0852	CPB10B - 12"	57.5	32	758
55	7/8/2008 0858	CPB10C - 24"	<14		<15
56	7/8/2008 0900	CPB10D - 36"	322	97	4330
57	7/8/2008 0905	CPB11A - SURFACE	<36		338
58	7/8/2008 0908	CPB11B - 12"	<42		526
59	7/8/2008 0910	CPB11C - 24"	372	140	12600
60	7/8/2008 0914	CPB11D - 36"	134	16	70.5
61	7/8/2008 0920	CPB11E - 40-42"	146	18	112
62	7/8/2008 0924	CPB12A - SURFACE	<17		69.6
63	7/8/2008 0927	CPB12B - 12"	<49		670
64	7/8/2008 0929	CPB12C - 24"	<30		376
65	7/8/2008 0934	CPB12D - >33"	496	24	46.6
66	7/8/2008 0939	CPB13A - SURFACE	<31		362
67	7/8/2008 0945	CPB13B - 12"	<54		1060
68	7/8/2008 0948	CPB13C - 24"	<28		270
69	7/8/2008 0953	CPB13D - >28"	<13		36.2
70	7/8/2008 0956	CPB14A - SURFACE	<40		734
71	7/8/2008 1000	CPB14B - 12"	25.4	14	105
72	7/8/2008 1003	CPB14C - 24"	115	63	4520
73	7/8/2008 1007	CPB14D - 36"	<16		48.7
74	7/8/2008 1012	CPB15A - SURFACE	<57		1290
75	7/8/2008 1015	CPB15B - 12"	<49		789
76	7/8/2008 1018	CPB15C - 24"	<55		1140
77	7/8/2008 1021	CPB15D - 36"	57.9	21	292
78	7/8/2008 1025	NIST 2711	56.7	35	1070
79	7/8/2008 1032	Instrument Calibration			
80	7/8/2008	Instrument Calibration			
81	7/8/2008	NIST 2711	110	34	931
82	7/8/2008 1041	SiO2 Blank	<10		<11
83	7/8/2008 1044	CPB16A - SURFACE	<28		341
84	7/8/2008 1047	CPB16B - 12"	<32		301
85	7/8/2008 1052	CPB16C - >23"	120	14	18.5
86	7/8/2008 1055	CPB17A - SURFACE	331.0	110	2320
87	7/8/2008 1100	CPB17B - 12"	21.1	11	54.3
88	7/8/2008 1104	CPB17C - 24"	21.1	13	61.1
89	7/8/2008 1110	CPB17D - >36"	<12		<13
90	7/8/2008 1115	CPB18A - SURFACE	229.0	110	783
91	7/8/2008 1119	CPB18A - SURFACE	180	89	770
92	7/8/2008 1120	CPB18A - SURFACE	350	130	1020
93	7/8/2008 1124	CPB18B - 12"	<16		<16
94	7/8/2008 1127	CPB18C - 24"	57.4	11	<14
95	7/8/2008 1129	CPB18D - >36"	815	32	19.3
96	7/8/2008 1137	CPB19A - SURFACE	60.3	31	365
97	7/8/2008 1139	CPB19B - 12"	<14		<15
98	7/8/2008 1143	CPB19C - 24"	34.3	12	19.7
99	7/8/2008 1146	CPB19D - >34"	16.0	9.9	<15
100	7/8/2008 1152	CPB20A - SURFACE	38.2	21	379
101	7/8/2008 1154	CPB20B - 12"	37.5	11	16.0
102	7/8/2008 1156	CPB20C - 24"	234	17	22.0
103	7/8/2008 1202	CPB20D - 36"	411	22	23.8

Columbia and Globe Phosphates  
XRF Field Screening Data  
Columbia, South Carolina

104	7/8/2008	1207	NIST 2711	76.6		1020
105	7/8/2008	1209	SiO2 Blank	<10		<11
106	7/8/2008	1302	NIST 2711	108	39	1010
107	7/8/2008	1306	CPB21A - SURFACE	85.9	38	788
108	7/8/2008	1309	CPB21A - SURFACE	<48		628
109	7/8/2008	1312	CPB21A - SURFACE	88.5	44	818
110	7/8/2008	1316	CPB21B - 12"	173	61	1780
111	7/8/2008	1319	CPB21C - 24"	<18		48.0
112	7/8/2008	1325	CPB21D - >32"	<33		352
113	7/8/2008	1329	CPB22A - SURFACE	<33		193
114	7/8/2008	1332	CPB22B - 12"	<40		433
115	7/8/2008	1334	CPB22C - 28"	<24		58.6
116	7/8/2008	1339	CPB23A - SURFACE	<30		262
117	7/8/2008	1342	CPB23B - 12"	<14		17
118	7/8/2008	1344	CPB23C - 24"	<14		<15
119	7/8/2008	1347	CPB23D - >32"	<16		19.2
120	7/8/2008	1352	CPB24A - SURFACE	<19		83.3
121	7/8/2008	1355	CPB24B - 12"	<14		<15
122	7/8/2008	1358	CPB24C - 24"	<18		<20
123	7/8/2008	1401	CPB24D - 36"	<15		<16
124	7/8/2008	1403	CPB24E - >46	<14		25.2
125	7/8/2008	1421	NIST 2711	90.4		1020
126	7/8/2008	1424	SiO2 Blank	<10		<12
127	7/8/2008	1430	CPB25A - SURFACE	<16		53.9
128	7/8/2008	1433	CPB25B - 12"	<13		<15
129	7/8/2008	1435	CPB25C - 24"	<14		<15
130	7/8/2008	1441	CPB26A - SURFACE	<26		187
131	7/8/2008	1444	CPB26B - 12"	<19		20.9
132	7/8/2008	1449	CPB27A - SURFACE	29.3	18	163
133	7/8/2008	1453	CPB27B - 12"	<33		291
134	7/8/2008	1455	CPB27C - 24"	<19		49.1
135	7/8/2008	1501	CPB27D - 36"	<13		<14
136	7/8/2008	1506	CPB27E - >45"	268	61	2100
137	7/8/2008	1511	NIST 2711	92.5	39	1020
138	7/8/2008	1514	SiO2 Blank	<11		<13
139	7/8/2008	1527	GPB01A - SURFACE	28.4	17	92.1
140	7/8/2008	1531	GPB01B - 12"	49.5	14	51
141	7/8/2008	1534	GPB01C - 24"	84.7	14	<18
142	7/8/2008	1537	GPB01D - 36"	<23		<24
143	7/8/2008	1541	GPB02A - SURFACE	<22		119
144	7/8/2008	1544	GPB02B - 12"	91.6	50	986
145	7/8/2008	1547	GPB02B - 12"	84.8	49	1010
146	7/8/2008	1549	GPB02C - 24"	<16		23.4
147	7/8/2008	1618	GPB03A - 9"	<24		117
148	7/8/2008	1620	GPB03B - 18"	40.5	12	<18
149	7/8/2008	1623	GPB03C - 24"	44.4	13	<18
150	7/8/2008	1625	GPB03D - 36"	51.9	16	<22
151	7/8/2008	1632	GPB04A - SURFACE	<23		108
152	7/8/2008	1634	GPB04B - 12"	86.4	14	38.5
153	7/8/2008	1637	GPB04C - 24"	54.4	13	<17
154	7/8/2008	1639	GPB04D - 36"	<12		<13
155	7/8/2008	1645	GPB05A - SURFACE	17.8	12	29.7

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156	7/8/2008	1647	GPB05B - 12"	<15		23
157	7/8/2008	1650	GPB05C - 19"	<22		141
158	7/8/2008	1653	GPB05D - >32"	<14		17.6
159	7/8/2008	1659	GPB06A - 5"	<21		106
160	7/8/2008	1701	GPB06B - 12"	<18		49.3
161	7/8/2008	1705	GPB06C - 18"	91.5	38	628
162	7/8/2008	1707	GPB06D - 24"	<14		<15
163	7/8/2008	1713	GPB07A - 3"	<24		132
164	7/8/2008	1715	GPB07B - 13"	27.5	17	159
165	7/8/2008	1718	GPB07C - 18"	<13		17
166	7/8/2008	1720	GPB07D - >34"	<15		<16
167	7/8/2008	1724	NIST 2711	125	40	1010
168	7/8/2008	1726	SiO2 Blank	<10		<11
169	7/9/2008	0837	Instrument Calibration			
170	7/9/2008	0839	NIST 2711	72.3	33	1040
171	7/9/2008	0842	NIST 2711	74.5	32	1030
172	7/9/2008	0846	NIST 2711	94.8	35	1030
173	7/9/2008	0849	SiO2 Blank	<10		<11
174	7/9/2008	0854	GPB08A - SURFACE	<17		42.4
175	7/9/2008	0902	GPB08B - 12"	741	140	830
176	7/9/2008	0905	GPB08B - 12"	868	140	672
177	7/9/2008	0907	GPB08B - 12"	918	140	672
178	7/9/2008	0910	GPB08C - 24"	26.9	11	17.9
179	7/9/2008	0912	GPB08D - 36"	<13		<15
180	7/9/2008	0923	GPB09A - SURFACE	<15		<16
181	7/9/2008	0929	GPB09B - 7"	<16		<17
182	7/9/2008	0930	GPB09C - 12"	153	68	886
183	7/9/2008	0938	GPB09C - 12"	107	67	922
184	7/9/2008	0942	GPB09C - 12"	132	68	894
185	7/9/2008	0945	GPB09D - 24"	52.2	13	<18
186	7/9/2008	0947	GPB09E - 35"	55.9	13	<17
187	7/9/2008	0956	GPB10A - SURFACE 5"	<16		28.5
188	7/9/2008	0958	GPB10B - 12"	22.2	13	30.7
189	7/9/2008	1002	GPB10C - 24"	21.9	12	73.5
190	7/9/2008	1005	GPB10D - >32"	120	15	<17
191	7/9/2008	1019	GPB11A - SURFACE	<24		43.4
192	7/9/2008	1022	GPB11B - 18"	207	62	1590
193	7/9/2008	1025	GPB11C - BRICK @24"	23.5	15	<24
194	7/9/2008	1034	GPB12A - SURFACE	<16		58.8
195	7/9/2008	1037	GPB12B - 12"	<28		326
196	7/9/2008	1039	GPB12C - 24"	<13		<14
197	7/9/2008	1041	GPB12D - 36"	<12		<13
198	7/9/2008	1046	GPB13A - SURFACE	<23		213
199	7/9/2008	1050	GPB13B - 12"	<22		99.8
200	7/9/2008	1052	GPB13C - 24"	<14		<15
201	7/9/2008	1219	Instrument Calibration			
202	7/9/2008	1221	NIST 2711	69.4	40	1050
203	7/9/2008	1223	NIST 2711	73.4	32	1020
204	7/9/2008	1227	NIST 2711	103.0	37	998
205	7/9/2008	1231	SiO2 Blank	<9.1		<9.7
206	7/9/2008	1234	CPB28A - SURFACE	<40		413
207	7/9/2008	1238	CPB28B - 12"	72.6	34	780

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208	7/9/2008	1241	CPB28C - >18"	32.8	18	227
209	7/9/2008	1246	CPB29A - SURFACE	<24		106
210	7/9/2008	1248	CPB29B - 12"	<31		278
211	7/9/2008	1251	CPB29C - 24"	<18		68.6
212	7/9/2008	1259	CPB30A - SURFACE	<28		157
213	7/9/2008	1305	CPB30B - 12"	<17		51.5
214	7/9/2008	1308	CPB30C - 24"	<18		76
215	7/9/2008	1317	GPB14A - SURFACE	<27		300
216	7/9/2008	1319	GPB14B - 12"	<31		345
217	7/9/2008	1322	GPB14C - 24"	<18		30.1
218	7/9/2008	1329	GPB15A - SURFACE	<71		2030
219	7/9/2008	1331	GPB15B - 12"	<20		52.1
220	7/9/2008	1334	GPB15C - 24"	<15		16.5
221	7/9/2008	1338	GPB16A - SURFACE	<67		394
222	7/9/2008	1340	GPB16B - 12"	<26		76.5
223	7/9/2008	1343	GPB16C - 24"	<18		23
224	7/9/2008	1348	GPB17A - SURFACE	<28		456
225	7/9/2008	1352	GPB17B - 12"	<34		370
226	7/9/2008	1355	GPB17C - 24"	<30		274
227	7/9/2008	1400	GPB18A - SURFACE	<21		78.4
228	7/9/2008	1403	GPB18B - 12"	<24		195
229	7/9/2008	1405	GPB18C - 24"	<15		<17
230	7/9/2008	1411	NIST 2711	88.7	40	1020
231	7/9/2008	1413	SiO2 Blank	<11		<12



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Pb error (+/- ppm)	COMMENTS
	Res. = 419eV
	Res. = 439eV
	Res. = 444eV

47

47

11

17

28

10

14

23

59

12

42

13

57

44

46

26

30

52

49

21

25

170

30

54

56

21

29

39

230

29

32

14

48

47

46.0

47

RES.= 406Ev

41

44

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37  
37

140  
27  
33  
260  
13  
16  
13  
38  
23  
12  
24  
44  
21  
9.7  
33  
16  
89  
12  
47  
39  
45  
23  
42

RES. = 436  
RES. = 414

40

22  
25  
10  
150  
12.0  
13

130  
100  
150

REPLICATE  
REPLICATE

12  
34

12

25  
10  
11  
12

Columbia and Globe Phosphates  
XRF Field Screening Data  
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47

47

44

37

REPLICATE

51

REPLICATE

76

14

25

31

17

23

10

12

14

11

12

20

14

20

26

14

77

47

14

BEGIN GLOBE

14

16

59

58

REPLICATE

11

18

17

12

13

Columbia and Globe Phosphates  
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12

16

10

15

14

43

18

19

9.5

47

RES. = 407

39

39

42

13

130

130

REPLICATE

130

REPLICATE

11

78

67

REPLICATE

78

REPLICATE

12

14

13

18

76

12

22

18

16

RES. = 416

48

39

43

31

40

20  
17  
24  
13  
21  
12  
13  
21  
24  
13  
60  
15  
11  
51  
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27  
23  
16  
18  
  
47

End of Report