

APPENDIX G

LABORATORY ACID ROCK TESTING

APPENDIX G

PROPOSED BLUE SKY WEST WIND POWER PROJECT ACID BASE ACCOUNTING - RESULTS SUMMARY

ACID - BASE ACCOUNTING^a

Sample ID	Depth (ft)	NP/ MPA	Rock Type	Fizz	Color	% S	Calcium Carbonate Equivalent Tons/1000 Tons (ppt) of Material				
							Max. From %S (MPA)	N.P. CaCO ₃ Equiv.	Max. Needed (pH-7)	Excess CaCO ₃ (NNP)	Paste pH
B-T57	2.0-16.0	40.9	Madrid	4	10YR 6/1	.047	1.47	60.18		58.71	8.6
B-T18	2.5-19.0	112.3	Carrabasset	0	2.5Y 6/0	.001	.03	3.37		3.34	7.0
B-T39	3.0-20.9	91.0	Carrabasset	0	2.5Y 5/0	.001	.03	2.73		2.70	6.3
B-T46	4.1-20.9	267.5	Madrid	3	10YR 6/1	.006	.19	50.82		50.63	7.8
B-T41	2.0-21.4	3.7	Carrabasset	0	2.5Y 6/0	.030	.94	3.46		2.52	7.2
B-T54	5.1-20.5	486.7	Madrid	1	10YR 6/1	<.001	.03	14.60		14.57	8.0
B-T49	1.3-20.8	2.7	Carrabasset	0	2.5Y 5/0	.046	1.44	3.85		2.41	6.6
B-T22	3.0-16.6	1.8	Carrabasset	0	2.5Y 7/1	.062	1.94	3.58		1.64	6.3
B-T29	4.0-18.5	54.3	Carrabasset	0	2.5Y 6/0	.002	.06	3.26		3.20	5.9
B-T44	4.0-23.2	89.7	Carrabasset	0	2.5Y 5/0	.001	.03	2.69		2.66	5.7
B-T4	5.3-16.5	14.3	Carrabasset	0	2.5Y 6/0	0.002	0.60	8.56		8.50	8.0
B-T8	6.0-17.0	26.3	Carrabasset	0	5Y 6/1	<0.001	0.30	7.89		7.86	7.0
B-T73	4.6-14.9	8.1	Carrabasset	0	5Y 5/1	0.002	0.60	4.85		4.79	6.3
B-T15	20.8-37.0	3.3	Carrabasset	0	2.5Y 6/4	0.087	2.72	8.90		6.18	6.7
B-T21	4.1-17.8	0.3	Carrabasset	0	2.5Y 4/0	0.372*	11.63	3.46	8.17		4.1
T-56	15.0-29.8	770.7	Madrid	2	2.5Y 5/1	<.001	0.03	23.12		23.09	8.8
T-310	5.3-29.3	189.0	Carrabasset	0	2.5Y 6/1	<.001	0.03	5.67		5.64	6.7
T-48	SURFACE	113.7	Carrabasset	0	5Y 5/1	0.001	0.03	3.41		3.38	6.3
T-47	10.0-28.2	745.7	Madrid	1	2.5Y 5/1	0.001	0.03	22.37		22.34	6.7
T-5	17.3-33.8	109.0	Carrabasset	0	2.5Y 6/2	0.001	0.03	3.27		3.24	6.4
T-28	9.0-29.0	223.3	Carrabasset	0	2.5Y 5/1	0.001	0.03	6.70		6.67	7.1
November 2010 data - See December 21, 2010 report for locations and discussion of data											
T 10 B	Outcrop	50.2	Carrabasset	0	5Y 6/1	0.006	0.19	9.54		9.35	6.0
MET - BN	Outcrop	154.5	Carrabasset	0	2.5Y 6/0	0.002	0.06	9.27		9.21	6.2
T 18 B LR	Outcrop	5.7	Madrid?	2	10YR 6/1	0.157	4.91	28.18		23.27	8.2
T 43 B	Outcrop	7.8	Carrabasset	0	5Y 5/1	0.036	1.13	8.85		7.72	5.8
T 34 B-RT16	Outcrop	13.4	Carrabasset	0	2.5Y 6/0	0.015	0.47	6.28		5.81	6.0
T 43 B2-45	Outcrop	44.3	Carrabasset	0	2.5Y 6/0	0.007	0.22	9.74		9.52	6.8
T 36 B	Outcrop	58.7	Carrabasset	0	2.5Y 5/0	0.005	0.16	9.39		9.23	5.0
T 4 B - RD	Outcrop	23.1	Carrabasset	0	5Y 5/1	0.007	0.22	5.09		4.87	5.5

INP - net neutralization potential; MPA - Maximum potential acid

ARD potential, modified from Pennsylvania DEP guidelines.

1. Rocks with NNP (Excess CaCO₃) < -5 ppt CaCO₃ are potentially toxic
2. Rocks with pH <4.0 are considered acid toxic
3. Rocks with greater than 0.5% sulfur may generate significant acidity
4. Rocks with NP >30 ppt CaCO₃ and Fizz are a significant source of alkalinity
5. Rocks with NNP >20 ppt CaCO₃ produce alkaline drainage

* Did sulfur forms - reported value is sulfur as sulfide

6. Rocks with NNP less than -20 ppt CaCO₃ produce acid drainage
7. Rocks with NNP greater than 0 ppt CaCO₃ do not produce acid
8. NP/MPA ratios less than 1 may result in acid drainage
9. Theoretical NP/MPA ratio of 2 or greater is needed for complete acid neutralization
10. Total sulfur is in generally interpreted to occur as sulfide sulfur for calculation of MPA

10-0014.3

APPENDIX G



COMPANY: S. W. COLE ENGINEERING, INC.

SITE: PROJECT: BINGHAM - PROJECT #: 10-0014.5

DATE: DECEMBER 24, 2013

RECEIVED
 JAN 06 2014
 S.W. COLE BANGOR

ACID BASE ACCOUNT

Calcium Carbonate Equivalent
 Tons/1000 Tons of Material

Sample Date & Sample ID	Depth (feet)	Strata Thick (feet)	Fiz	Color	% Sulfur	Max from % Sulfur	N.P. CaCO ₃ Equiv	Max Needed (pH-7)	Excess CaCO ₃	Paste pH
12-09-13 B-T57 R1-R5	2.0-16.0	14.0	4	10YR 6/1	.047	1.47	60.18		58.71	8.6
12-10-13 B-T18 R1-R6	2.5-19.0	16.5	0	2.5Y 6/0	.001	.03	3.37		3.34	7.0
12-11-13 B-T39 R1-R4	3.0-20.9	17.9	0	2.5Y 5/0	.001	.03	2.73		2.70	6.3
12-11-13 B-T46 R1-R5	4.1-20.9	16.8	3	10YR 6/1	.006	.19	50.82		50.63	7.8
12-12-13 B-T41 R1-R4	2.0-21.4	19.4	0	2.5Y 6/0	.030	.94	3.46		2.52	7.2
12-13-13 B-T54 R1-R4	5.1-20.5	15.4	1	10YR 6/1	<.001	.03	14.60		14.57	8.0
12-13-13 B-T49 R1-R4	1.3-20.8	19.5	0	2.5Y 5/0	.046	1.44	3.85		2.41	6.6
12-13-13 B-T22 R1-R4	3.0-16.6	13.6	0	2.5Y 7/1	.062	1.94	3.58		1.64	6.3
12-16-13 B-T29 R1-R5	4.0-18.5	14.5	0	2.5Y 6/0	.002	.06	3.26		3.20	5.9
12-16-13 B-T44 R1-R4	4.0-23.2	19.2	0	2.5Y 5/0	.001	.03	2.69		2.66	5.7

APPROVED _____

COMPANY: S. W. COLE ENGINEERING, INC.

SITE: PROJECT #10-0014.3

DATE: DECEMBER 10, 2013

RECEIVED
DEC 16 2013
S.W. COLE BANGOR

Calcium Carbonate Equivalent
Tons/1000 Tons of Material

ACID BASE ACCOUNT

SAMPLE ID	Depth (feet)	Strata Thick (feet)	Rock Type	Fiz	Color	% Sulfur	Max from % Sulfur	N.P. CaCO ₃ Equiv	Max Needed (pH-7)	Excess CaCO ₃	Paste pH
11-07-13 B-T4				0	2.5Y 6/0	.002	.06	8.56		8.50	8.0
11-07-13 B-T8				0	5Y 6/1	<.001	.03	7.89		7.86	7.0
11-13-13 B-T73				0	5Y 5/1	.002	.06	4.85		4.79	6.3
11-21-13 B-T15				0	2.5Y 6/4	.087	2.72	8.90		6.18	6.7
11-25-13 B-T21				0	2.5Y 4/0	.372*	11.63	3.46	8.17		4.1

* PYRITIC SULFUR

APPROVED _____


COMPANY: S. W. COLE ENGINEERING, INC.
 SITE: PROJECT #10-0014.3
 DATE: DECEMBER 10, 2013

SULFUR FORMS

Sample Number	Total Sulfur %	Pyritic Sulfur %	Sulfate Sulfur %	Organic Sulfur %
11-25-13 B-T21	.798	.372	.391	.035

APPROVED: 



COMPANY: S. W. COLE ENGINEERING, INC.
 SITE: BINGHAM-WIND PROJECT # 10-0014.2
 DATE: NOVEMBER 16, 2012

RECEIVED
 NOV 26 2012
 S.W. COLE BANGOR

ACID BASE ACCOUNT

Calcium Carbonate Equivalent
 Tons/1000 Tons of Material

SAMPLE ID	Depth (feet)	Strata Thick (feet)	Rock Type	Fiz	Color	% Sulfur	Max from % Sulfur	N.P. CaCO ₃ Equiv	Max Needed (pH-7)	Excess CaCO ₃	Paste pH
T-56 11-8-12	15.0-29.8	14.8		2	2.5Y 5/1	<.001	.03	23.12		23.09	8.8
T-310 11-8-12	5.3-29.3	24.0		0	2.5Y 6/1	<.001	.03	5.67		5.64	6.7
T-48 11-5-12	SURFACE			0	5Y 5/1	.001	.03	3.41		3.38	6.3
T-47 11-8-12	10.0-28.2	18.2		1	2.5Y 5/1	.001	.03	22.37		22.34	6.7
T-5 11-8-12	17.3-33.8	16.5		0	2.5Y 6/2	.001	.03	3.27		3.24	6.4
T-28 11-8-12	9.0-29.0	20.0		0	2.5Y 5/1	.001	.03	6.70		6.67	7.1

APPROVED _____




Improving the environment, one client at a time...

225 Industrial Park Drive
Beaver, WV 25813
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FAX: 304.255.2572

3029-C Peters Creek Road
Roanoke, VA 24019
TEL: 540.777.1276
FAX: 540.400.8508

101 17th Street
Ashland, KY 41101
TEL: 606.393.5027

1557 Commerce Road, Suite 201
Verona, VA 24482
TEL: 540.248.0183



November 27, 2012

Ms. Mary Superak
STURM ENVIRONMENTAL SERVICES
P O BOX 650
BRIDGEPORT WV 26330

TEL: (304) 623-6549
FAX (304) 623-6552
S.W. COLE ENGINEERING, INC.
RE: 10-0014.2

Order No.: 1211J67

Dear Ms. Mary Superak:

REI Consultants, Inc. received 6 sample(s) on 11/20/2012 for the analyses presented in the following report.

Please note two changes you may see on your report.

- Results for "Dissolved" parameters will be shown under a separate sample ID, rather than as a separate analysis under the same sample ID. The sample ID for "Dissolved" parameters will include "Field Filtered" or "Lab Filtered", as appropriate.
- Metals results will no longer be identified as "Total" or "Total Recoverable". The methods have not been changed, only their appearance on the report.

If you have any questions regarding these results, please do not hesitate to call.

Sincerely,

Jimmy Suttle
Project Manager



S.W. COLE ENGINEERING, INC.



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Report Narrative

Project Manager: Jimmy Suttle

WO#: 1211J67
Date: 11/27/2012

CLIENT: STURM ENVIRONMENTAL SERVICES
Project: 10-0014.2

The analytical results presented in this report relate only to the samples documented herein. All analyses were performed using documented laboratory SOPs that incorporate appropriate quality control procedures as described in the applicable methods. Any deviation from compliance or method modification is explained below and/or identified within the body of this report by a qualifier footnote which is defined at the bottom of each page.

All sample results are reported on an "as-received" wet weight basis unless otherwise noted.

Results reported for sums of individual parameters, such as Total Trihalomethanes (TTHM) and Total Haloacetic Acids (HAA5), may vary slightly from the sum of the individual parameter results. This apparent anomaly is caused by rounding individual results and summations at reporting, as required by EPA.

The test results in this report meet all NELAP and VELAP requirements for parameters for which accreditations are required or available. Any exceptions are noted in this report. This report may not be reproduced, except in full, without the written approval of REIC.

In compliance with federal guidelines and standard operating procedures, all reports, including raw data and supporting quality control, will be disposed of after five years unless otherwise arranged by the client via written notification or contract requirement.

If you have any questions please contact the project manager whose name is listed above.

Beaver, WV: WVDHHR 00412CM, WVDEP 060, VADCLS 00281, KYDEP 90039, TNDEQ TN02926, NCDWQ 466, PADEP 68-00839, FLDOH (NELAC) E87958, VADCLS (VELAP) 460148
Bioassay (Beaver, WV) WVDEP 060, FLDOH (NELAC) E871055, VADCLS (VELAP) 460149
Roanoke, VA: VADCLS (VELAP) 460150
Verona, VA: VADCLS (VELAP) 460157
Ashland, KY: KYDEP 00094

CLIENT:	STURM ENVIRONMENTAL SERVICES	WorkOrder:	1211J67	Lab ID	1211J67-01A
Client Sample ID:	12337	DateReceived:	11/20/2012		
Project:	10-0014.2	Collection Date:	11/8/2012		
Site ID:	BINGHAM-WIND 11-8-12 T-56 15'-29.8'	Matrix:	SOIL		

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
ANIONS BY IC, WATER SOLUBLE			SW9056			Analyst: CF
Chloride	ND	mg/Kg	NA	20.0		11/21/2012 10:44:00 AM
Sulfate	ND	mg/Kg	NA	100		11/21/2012 10:44:00 AM

Key:	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		

S.W. COLE ENGINEERING, INC.

REI Consultants, Inc.

Analytical Results

Date: 27-Nov-12

CLIENT: STURM ENVIRONMENTAL SERVICES WorkOrder: 1211J67 Lab ID 1211J67-02A
Client Sample ID: 12338 DateReceived: 11/20/2012
Project: 10-0014.2 Collection Date: 11/8/2012
Site ID: BINGHAM-WIND Matrix: SOIL
11-8-12 T-36 5.3'-29.3'

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
ANIONS BY IC, WATER SOLUBLE			SW9056		Analyst: CF	
Chloride	ND	mg/Kg	NA	20.0		11/21/2012 11:03:00 AM
Sulfate	ND	mg/Kg	NA	100		11/21/2012 11:03:00 AM

Key: MCL Maximum Contaminant Level B Analyte detected in the associated Method Blank
MDL Minimum Detection Limit E Estimated Value above quantitation range
NA Not Applicable H Holding times for preparation or analysis exceeded
ND Not Detected at the PQL or MDL S Spike/Surrogate Recovery exceeds REIC control limits
PQL Practical Quantitation Limit * Value exceeds MCL or Regulatory Limits
TIC Tentatively Identified Compound, Estimated Concentration

S.W. COLE ENGINEERING, INC.

REI Consultants, Inc.

Analytical Results

Date: 27-Nov-12

CLIENT:	STURM ENVIRONMENTAL SERVICES	WorkOrder:	1211J67	Lab ID	1211J67-03A
Client Sample ID:	12339	DateReceived:	11/20/2012		
Project:	10-0014.2	Collection Date:	11/5/2012		
Site ID:	BINGHAM-WIND 11-5-12 T-48 SURFACE	Matrix:	SOIL		

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
ANIONS BY IC, WATER SOLUBLE			SW9056			Analyst: CF
Chloride	ND	mg/Kg	NA	20.0		11/21/2012 11:22:00 AM
Sulfate	ND	mg/Kg	NA	100		11/21/2012 11:22:00 AM

Key:	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		

S.W. COLE ENGINEERING, INC.

REI Consultants, Inc.

Analytical Results

Date: 27-Nov-12

CLIENT:	STURM ENVIRONMENTAL SERVICES	WorkOrder:	1211J67	Lab ID	1211J67-04A
Client Sample ID:	12340	DateReceived:	11/20/2012		
Project:	10-0014.2	Collection Date:	11/8/2012		
Site ID:	BINGHAM-WIND 11-8-12 T-47 10.0'-28.2'	Matrix:	SOIL		

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
ANIONS BY IC, WATER SOLUBLE			SW9056			Analyst: CF
Chloride	ND	mg/Kg	NA	20.0		11/21/2012 11:41:00 AM
Sulfate	ND	mg/Kg	NA	100		11/21/2012 11:41:00 AM

Key:	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range*
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		

S.W. COLE ENGINEERING, INC.

REI Consultants, Inc.

Analytical Results

Date: 27-Nov-12

CLIENT: STURM ENVIRONMENTAL SERVICES WorkOrder: 1211J67 Lab ID 1211J67-05A
Client Sample ID: 12341 DateReceived: 11/20/2012
Project: 10-0014.2 Collection Date: 11/8/2012
Site ID: BINGHAM-WIND Matrix: SOIL
11-8-12 T-5 17.3'-33.8'

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
ANIONS BY IC, WATER SOLUBLE			SW9056			Analyst: CF
Chloride	ND	mg/Kg	NA	20.0		11/21/2012 11:59:00 AM
Sulfate	ND	mg/Kg	NA	100		11/21/2012 11:59:00 AM

Key: MCL Maximum Contaminant Level B Analyte detected in the associated Method Blank
MDL Minimum Detection Limit E Estimated Value above quantitation range
NA Not Applicable H Holding times for preparation or analysis exceeded
ND Not Detected at the PQL or MDL S Spike/Surrogate Recovery exceeds REIC control limits
PQL Practical Quantitation Limit * Value exceeds MCL or Regulatory Limits
TIC Tentatively Identified Compound, Estimated Concentration

REI Consultants, Inc.

Analytical Results

Date: 27-Nov-12

CLIENT:	STURM ENVIRONMENTAL SERVICES	WorkOrder:	1211J67	Lab ID	1211J67-06A
Client Sample ID:	12342	DateReceived:	11/20/2012		
Project:	10-0014.2	Collection Date:	11/8/2012		
Site ID:	BINGHAM-WIND 11-8-12 T-28 9.0'-29.0'	Matrix:	SOIL		

Analyses	Result	Units	Qual	MDL	PQL	Date Analyzed
ANIONS BY IC, WATER SOLUBLE			SW9056			Analyst: CF
Chloride	ND	mg/Kg	NA	20.0		11/21/2012 12:18:00 PM
Sulfate	ND	mg/Kg	NA	100		11/21/2012 12:18:00 PM

Key:	MCL	Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
	MDL	Minimum Detection Limit	E	Estimated Value above quantitation range
	NA	Not Applicable	H	Holding times for preparation or analysis exceeded
	ND	Not Detected at the PQL or MDL	S	Spike/Surrogate Recovery exceeds REIC control limits
	PQL	Practical Quantitation Limit	*	Value exceeds MCL or Regulatory Limits
	TIC	Tentatively Identified Compound, Estimated Concentration		