# COAL MINING AND RECLAMATION PERMIT

**Issued To:** AMERICAN ENERGY CORP
43521 Mayhugh Hill Rd.
Twp Hwy 88
Beallsville, OH 43716

**Telephone:** (740) 926-9152

**Permit Number:** D-425
**Application Number:** D-425-12
**Acreage:** 0
**Underground Acreage:** 1324.1

**Effective:** 05/26/2010
**Expires:** 10/21/2014

**Type of Operation:** Underground (Room and Pillar), Underground (Longwall)

## CONDITIONS

| CONDITION TYPE | DESCRIPTION |
|---|---|
| Archeology | 1. In the event of ground surface damage from mining related actions, prior to repair by the applicant, an archaeological clearance from the Division is necessary that also takes into account the identification and review of access route(s) to the damage when necessary.<br><br>2. The Division is in agreement with the conclusions cited in the Phase 1 Archaeological and Historic Architectural report that two historic properties are eligible for listing in the National Register of Historic Places: The Perkins-Wente property (BEL-1432-15) and the Louden-King Farmstead (BEL-1434-15). In the event of structural damage to these properties due to mining related actions, any and all repairs to them must be made per the 1983 Secretary of The Interior's Historic Building Rehabilitation Standards. |

**LOCATION IS NOT AVAILIABLE**

The issuance of this permit means only that the application to conduct a coal mining operation meets the requirements of Chapter 1513 of the Revised Code, and as such DOES NOT RELIEVE the operator of any obligation to meet other federal, state or local requirements.

This permit is issued in accordance with and subject to the provisions, conditions, and limitations of Chapter 1513 of the Revised Code and Chapters 1501:13-1, 1501:13-3 through 1501:13-14 of the Administrative Code.

The water monitoring plan for this permit shall be:

**Quality:** See Part 3, D of the Permit Application
**Quantity:** See Part 3, D of the Permit Application

**Note:** These monitoring requirements are separate from NPDES monitoring requirements.

**Signature:** John F Hunter BH **Date:** 05/26/2010
Chief, Mineral Resources Management

F46 Rev: 07/01/2001

# PERMIT SUMMARY SHEET
## Division of Mineral Resources Management

**Permit Number:** D-425

**Application Number:** D-425-12

See permit cover sheet for specific conditions and hydrologic monitoring requirements.

**Inspector's Note:**
This summary is designed only to advise you of important provisions of a permit that require your attention and monitoring. Your familiarity with requirements and permitted activities will insure that mining and reclamation occurs as was intended and approved at the time of permit issuance. Please take the time to review relevant provisions of the permit carefully and thoroughly. Should you have questions about this or any permit, please do not hesitate to contact the application manager within the Permitting Section.

**Items marked are applicable to this permit:**

- ☐ Auger Mining/Highwall Mining
- ☐ Alternate Resoiling Material
- ☐ Blasting Plans
- ☐ Buffer Zone Variance Request (BZVR)
- ☐ Coal Waste Disposal
- ☐ Delay in Contemporaneous Reclamation
- ☐ Excess Spoil Disposal
- ☐ Experimental Mining Practices
- ☐ Federal Lands
- ☐ Mountain Top Removal
- ☐ MSHA Impoundment
- ☐ AML No-Cost Area
- ☐ Prime Farmlands
- ☐ Remining (Reduced Maintenance)
- ☐ Remining (Modified effluent)
- ☐ Remining BMP only Permit
- ☐ Special handling of acid-forming/toxic materials.
- ☐ Beneficial Use of CCB's
- ☐ Public Road Permit
- ☐ Small Area Drainage Exemption (SADE)
- ☐ Steep Slope Mining
- ☐ Slurry Impoundment
- ☑ Test Hole Variance
- ☐ Variance from AOC
- ☐ Wetlands Affectment/Avoidance
- ☐ Within 500' of active UG mine
- ☑ Within 500' of abandoned UG mine
- ☐ Within 100' of a cemetery
- ☐ Within 300' of occupied dwelling
- ☐ Within 300' of public building, church, school, community or institutional building or public
- ☐ Within 1000' of wild, scenic or recreational river
- ☐ OEPA 401/COE 404 permits needed for wetlands or stream affectment and/or reconstruction
- ☐ Tree Planting in Reclamation Plans

**Application Manager:** Jeff Emmons, Environmental Specialist **Date:** MAY 26 2010

F103 Rev: 07/01/2001

# APPROVED UNDERGROUND COAL MINING PERMIT APPLICATION

## Applicant:

**Name:** AMERICAN ENERGY CORP
**Address:** 43521 Mayhugh Hill Rd.
Twp Hwy 88
Beallsville, OH 43716

**Application Number:** D-425-12

**Number of acres in underground workings:** 1324.1

**Number of surface acres to be affected:**

**The water monitoring plan for this permit shall be:**

**Quality:** See Part 3, D of the Permit Application
**Quantity:** See Part 3, D of the Permit Application

**Note:** These monitoring requirements are separate from NPDES monitoring requirements.

This application is APPROVED since it demonstrates and the Division has found that the criteria in paragraph (E) of rule 1501: 13-5-01 of the Administrative Code have been met.

**Signature:** John F Hunter BH **Date:** MAY 26 2010

F63 Rev: 07/01/2001

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

# UNDERGROUND COAL MINING AND RECLAMATION PERMIT APPLICATION
## (UNDERGROUND WORKINGS ONLY)

A. Applicant's Name **American Energy Corporation**

Address **43521 Mayhugh Hill R0ad**

City **Beallsville** State **OH** Zip **43716**

Telephone **(740) 926-9152**

Employer Identification No. (EIN) **31-1550443**, or

Social Security No. (last 4 digits) XXX-XX-

B. Type of Operation (check appropriate space(s)):

☐ Room and Pillar, ☐ Pillar Extraction, ☒ Longwall, ☐ Other

C. Name of mine **Century Mine**

D. List below the MSHA identification numbers for the mine and for all mine-associated structures requiring MSHA approval on this application area.

**33-01070**

E. Indicate the exploration permit number(s) or notice of intent (NOI) number(s) that were obtained for this application area.

**07-CA-25**

F. Did a person other than an employee of the applicant prepare this application?

Yes ☒ No ☐ If "yes," provide:

Preparer's Name **Jack A. Hamilton and Associates, Inc.**
Address **P.O. Box 471, 342 High Street**
City **Flushing** State **OH** Zip **43977** Telephone **(740) 968-4947**

G. I, the undersigned, a responsible official of the applicant, do hereby verify the information in the complete permit application as true and correct to the best of my information and belief.

Printed Name **James R. Turner, Jr.** Title **Treasurer**

Signature _____ Date 7/9/09

Sworn before me and subscribed in my presence this 9th day of July, 2009

_____
Notary Public

JULIE WEBB
Notary Public, State of Ohio
My Commission Exp. May 14, 2013

NOTARY PUBLIC * STATE OF OHIO *

H. **FOR REVISION REVIEW ONLY:** This item is to be completed after revisions, if any, have been made to the permit application.

I, the undersigned, a responsible official of the applicant, do hereby verify and acknowledge the revisions made during the permit review process as true and correct to the best of my information and belief.

Printed Name **Greg S. Williams** Title **Permitting Engineer**

Signature Greg S. Williams Date 5/25/2010

Sworn before me and subscribed in my presence this 25 day of May, 20 10

Denise R. Jackson

Notary Public

STATE OF OHIO
NOTARY PUBLIC
DENISE R JACKSON
My Commission Expires Sept 26, 2010

Revised 05/08
DNR-744-9009



MAY 26 2010

# PART 1: LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

## A. IDENTIFICATION OF INTERESTS

(1) Is the applicant a single proprietorship? Yes ☐ No ☒ If "yes," provide the following:

Owner's Name

Address

City State Zip Telephone

EIN , or SSN (last 4 digits) XXX-XX-

Beginning date of ownership

If "no," indicate business structure of applicant.

☐ Partnership (registration no. and date obtained)
☒ Corporation (charter no. and date incorporated) **00842695 4-12-1993**
☐ Association
☐ Other, specify

Provide the following for the applicant's statutory agent and submit Owners and Controllers

Agent's Name **C T Corporation System**

Address **1300 East 9th St.**

City **Cleveland** State **OH** Zip **44114** Telephone **(216) 621-4270**

EIN **See Addendum to Part 1, A**, or SSN (last 4 digits) XXX-XX-

(2) Will there be a mine operator other than the applicant?

Yes ☐ No ☒ If "yes" provide the operator's name and submit Operator Ownership and Control (Note: if more than one operator, indicate operator's name and submit a separate form for each).

Operator's Name

(3) Provide the following for the person or entity who will pay the abandoned mine land reclamation fee for the applicant.

Name **American Energy Corporation**

Address **43521 Mayhugh Hill Road**

City **Beallsville** State **OH** Zip **43716** Telephone **(740) 926-9152**

EIN **See Addendum to Part 1, A**, or SSN (last 4 digits - optional) XXX-XX-

Addendum to Part 1, A
(Officer SSN's and Corporate EIN's)

| NAME | SSN |
|---|---|
| BOYLE, SCOTT A. | Decline |
| CORNELIUS, B.J. | 5023 |
| FAYNE, HENRY W. | 7216 |
| FORRELLI, JOHN R. | 2688 |
| HEIDELBACH, ROY A. | 5011 |
| HILL, P. BRUCE | 6916 |
| LAWSON, RICHARD L. | 4413 |
| LOIACONO, MICHAEL D. | 6784 |
| MCKOWN, MICHAEL O. | 4552 |
| MOORE, ROBERT D. | 9703 |
| MURRAY, ROBERT E. | 8852 |
| MURRAY, RYAN | 0815 |
| MURRAY, JONATHAN | 0811 |
| MURRAY, ROBERT EDWARD | 1320 |
| PUTSOCK, ROBERT L. | 8460 |
| TURNER, JAMES R. | 8372 |
| Van BEVER, CHRISTOPHER G. | 2161 |

| CORPORATION NAME | EIN |
|---|---|
| Murray Energy Corp. | 31-1956752 |
| Murray Energy Holdings Co. | 20-0100463 |
| American Energy Corp. | 31-1550443 |
| Fifth Third Bank Of Northeast Ohio Trustee, (Murray 2003 Trust) | 34-7161341 |
| C T Corporation System | 51-0006522 |

(4) Provide the following for all persons having the authority or ability to commit the financial, real property assets, or working resources of the applicant who are not otherwise identified as officers, directors or owners of the applicant. If none, check box: ☒. If any person listed is a business entity and not an individual, also complete Owners and Controllers for that person.

Name

Address

City State Zip Telephone

EIN , or SSN (last 4 digits) XXX-XX-

O & C relationship to entity

Date O & C relationship began/ended (if applicable) /

If necessary, submit additional pages to complete response.

(5) Provide the following for all persons owning or controlling the coal to be mined by another person under a lease, sublease, or other contract and (a) having the right to receive the coal after mining, or (b) having the authority to determine the manner in which another person conducts coal mining operations. If none, check box: ☒. If any person listed is a business entity and not an individual, also complete Owners and Controllers for that person.

Name

Address

City State Zip Telephone

EIN , or SSN (last 4 digits) XXX-XX-

O & C relationship to entity

Date O & C relationship began/ended (if applicable) /

If necessary, submit additional pages to complete response.

(6) List below the person or persons primarily responsible for ensuring that the applicant will comply with Chapter 1513 of the Revised Code and the rules adopted pursuant thereto while mining and reclaiming the area for which this permit is requested.

**James R. Turner, Jr.**

(7) Has the applicant, any person or entity listed under items A (4) and (5), or any person or entity listed on the Owners and Controllers who "owned or controlled" or "owns or controls" held a coal mining permit in the United States within the five years preceding the date of this application?

Yes ☒ No ☐ If "yes," submit Permit List.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **American Energy Corporation**

Name **James R. Turner**

Street address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1,A**

Title of position within entity **Treasurer**

Date position assumed/ended (if applicable) **03-01-05/**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert Putsock**

Street address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1,A**

Title of position within entity **Assistant Treasurer**

Date position assumed/ended (if applicable) **1-27-04/**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E Murray**

Street address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1,A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **12/15/04/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

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Name of business entity **American Energy Corporation**

Name **Robert E. Murray**

Street address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1,A**

Title of position within entity **President**

Date position assumed/ended (if applicable) **12/15/04 / N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Murray Energy Corporation**

Street address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

EIN **See Addendum to Pt 1,A**, or SSN (last 4 digits) xxx-xx-

Title of position within entity **Sole Shareholder**

Date position assumed/ended (if applicable) **2/23/01/**

Percent of ownership **100%** Date of ownership **2/23/01**

Name **Michael O. McKown**

Street address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1,A**

Title of position within entity **Secretary**

Date position assumed/ended (if applicable) **11-1-99/**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**OWNERS AND CONTROLLERS**

Applicant's Name **American Energy Corporation**

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Name of business entity **Murray Energy Corporation**

Name **Richard L. Lawson**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **01/28/05/N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Chief Executive Officer**

Date position assumed/ended (if applicable) **2/23/01/NA**

Percent of ownership **0** Date of ownership **N/A**

Name **Henry W. Fayne**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **01/28/05/N/A**

Percent of ownership **0** Date of ownership **N/A**

*Submit and identify additional pages necessary to complete response.*

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Corporation**

Name **Robert D. Moore**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President**

Date position assumed/ended (if applicable) **12/17/04/8/01/08**

Percent of ownership **0** Date of ownership **N/A**

Name **P. Bruce Hill**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President**

Date position assumed/ended (if applicable) **12/18/03/11/05/09**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael O. McKown**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Secretary**

Date position assumed/ended (if applicable) **02/23/01/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Corporation**

Name **Robert D. Moore**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Executive Vice President**

Date position assumed/ended (if applicable) **8/01/08 /N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert D. Moore**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Chief Financial Officer**

Date position assumed/ended (if applicable) **9/11/07/NA**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert D. Moore**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **4/23/07/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.



Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Corporation**

Name **John R Forrelli**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President**

Date position assumed/ended (if applicable) **9/11/07 /N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **02/23/01/10/21/03**

Percent of ownership **100** Date of ownership **2/23/01-10/21/03**

Name **Robert E Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**8852**

Title of position within entity **President**

Date position assumed/ended (if applicable) **02/23/01/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Corporation**

Name **Michael D Loiacono**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Chief Financial Officer**

Date position assumed/ended (if applicable) **12/20/05 /4/23/07**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael D Loiacono**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **1/28/05/4/23/07**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael D Loiacono**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Treasurer**

Date position assumed/ended (if applicable) **02/23/01/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

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Name of business entity **Murray Energy Corporation**

Name **John R Forrelli**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President**

Date position assumed/ended (if applicable) **12/18/03 /12/17/04**

Percent of ownership **0** Date of ownership **N/A**

Name **G. Christopher Van Bever**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Assistant Treasurer**

Date position assumed/ended (if applicable) **10/22/07/**

Percent of ownership **0** Date of ownership **N/A**

Name

Street address

City State Zip

EIN , or SSN (last 4 digits) xxx-xx-

Title of position within entity

Date position assumed/ended (if applicable) /

Percent of ownership Date of ownership

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

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Name of business entity **Murray Energy Corporation**

Name **Robert Edward Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President**

Date position assumed/ended (if applicable) **09/11/07 /**

Percent of ownership **0** Date of ownership **N/A**

Name **Ryan M. Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President**

Date position assumed/ended (if applicable) **09/11/07 /**

Percent of ownership **0** Date of ownership **N/A**

Name **Roy A. Heidelbach**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Assistant Vice President**

Date position assumed/ended (if applicable) **09/11/07/**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.



Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Corporation**

Name **B.J. Cornelius**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN **NA**, or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Vice President-Marketing**

Date position assumed/ended (if applicable) **08/01/08/**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael O. McKown**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN **NA**, or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **General Counsel**

Date position assumed/ended (if applicable) **08/01/08 /**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael O. McKown**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Senior Vice President**

Date position assumed/ended (if applicable) **08/01/08/**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Corporation**

Name **Murray Energy Holdings Co.**

Street address **29325 Chagrin Boulevard, suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN **See Addendum to Pt 1, A**, or SSN (last 4 digits) xxx-xx-

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **N/A/N/A**

Percent of ownership **100** Date of ownership **10/21/03**

Name **Robert E. Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Chairman of the Board**

Date position assumed/ended (if applicable) **02/23/01/N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E. Murray**

Street address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **2/23/01/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Robert D. Moore**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **President**

Date position assumed/ended (if applicable) **04/23/07/N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E. Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **06/30/03/N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael D. Loiacono**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Treasurer**

Date position assumed/ended (if applicable) **1/10/05/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.



Revised 05/08
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Michael McKown**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Secretary**

Date position assumed/ended (if applicable) **06/30/03/ N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert Edward Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **06/30/03/N/A**

Percent of ownership **20 - Class B** Date of ownership **06/30/03**

Name **Ryan Michael Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **Oh** Zip **44122**

EIN , or SSN (last 4 digits) xxx-xx-**See Addendum to Pt 1, A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **06/30/03/N/A**

Percent of ownership **20 - Class B** Date of ownership **06/30/03**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

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DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Jonathan Robert Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **06/30/03/ N/A**

Percent of ownership **20 - Class B** Date of ownership **06/30/03**

Name **Robert E Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **07/09/03/ N/A**

Percent of ownership **20 - Class B** Date of ownership **07/09/03**

Name **Robert D Moore**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **4/23/07/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 02/06
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Michael O. McKown**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **06/30/03/ N/A**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E. Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Chairman of the Board**

Date position assumed/ended (if applicable) **6/30/03/ 11/29/05**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert D. Moore**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Chief Executive Officer**

Date position assumed/ended (if applicable) **4/23/07/N/A**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.



Revised 02/06
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Robert E. Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **President**

Date position assumed/ended (if applicable) **06/30/03/ 11/29/05**

Percent of ownership **0** Date of ownership **N/A**

Name **Robert E. Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Chief Executive Officer**

Date position assumed/ended (if applicable) **6/30/03/ 11/29/05**

Percent of ownership **0** Date of ownership **N/A**

Name **Scott A. Boyle**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **Decline**

Title of position within entity **Chief Executive Officer**

Date position assumed/ended (if applicable) **11/29/05/12/20/05**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.



Revised 02/06
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Michael D. Loiacono**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **President**

Date position assumed/ended (if applicable) **1/10/05/ 4/23/07**

Percent of ownership **0** Date of ownership **N/A**

Name **Michael D. Loiacono**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Chief Executive Officer**

Date position assumed/ended (if applicable) **1/10/05/ 4/23/07**

Percent of ownership **0** Date of ownership **N/A**

Name **Scott A. Boyle**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN **20-0100463**, or SSN **Decline**

Title of position within entity **President**

Date position assumed/ended (if applicable) **11/29/05/12/20/05**

Percent of ownership **0** Date of ownership **N/A**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 02/06
DNR-744-9010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OWNERS AND CONTROLLERS

Applicant's Name **American Energy Corporation**

This attachment is to be completed and submitted with the permit application if the applicant is other than a single proprietorship. Provide the following for all partners, officers, directors, and stockholders owning ten percent or more of any class of voting stock or other instruments of ownership, and any other person performing a function similar to a director. Persons holding or who have held multiple positions must be listed separately for each position. If any owner or controller listed is a business entity and not an individual, also complete an Owners and Controllers for that business entity.

Name of business entity **Murray Energy Holdings Company**

Name **Michael D. Loiacono**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Director**

Date position assumed/ended (if applicable) **6/30/03/ 4/23/07**

Percent of ownership **0** Date of ownership **N/A**

Name **Fifth Third Bank Of Northeast Ohio Trustee, (Murray 2003 Trust)**

Street address **24261 Cedar Rd.**

City **Cleveland** State **OH** Zip **44124**

EIN **See Addendum to Pt 1, A**, or SSN **N/A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **N/A/**

Percent of ownership **20 - Class B** Date of ownership **10/13/2003**

Name **Robert E. Murray**

Street address **29325 Chargrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44122**

EIN , or SSN **See Addendum to Pt 1, A**

Title of position within entity **Shareholder**

Date position assumed/ended (if applicable) **NA/**

Percent of ownership **100 - Class A** Date of ownership **6/27/2003**

Submit and identify additional pages necessary to complete response.

**Part 1: Section A**

Revised 02/06
DNR-744-9010

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entitv **The Ohio Valley Coal Company**
Address **56854 Pleasant Ridge Road**
City **Alledonia** State **OH** Zip **43902**
Telephone **740-926-1351**
EIN **34-1041610** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **D-0360** | **OH** | **DMRM** | **33-01159/5-27-88** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Part 1: Section A**

Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **American Energy Corporation**
Address **43521 Mayhugh Hill Road Twp. Highway 88**
City **Beallsville** State **OH** Zip **43716**
Telephone **740-926-9152**
EIN **31-1550443** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **D-0425** | **OH** | **DMRM** | **33-01070/10-22-84** |
| **D-1159** | **OH** | **DMRM** | **33-02122/01-26-98** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, shareholder 100%**

**Part 1: Section A**

Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Belmont Coal, Inc.**
Address **P.O. Box 146**
City **Powhatan Point** State **OH** Zip **43942**
Telephone **740-795-5200**
EIN **31-1536602** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **D-1020** | **OH** | **DMRM** | **33-04397/7-31-97** |
| **D-0241** | **OH** | **DMRM** | **33-03048/7-2-93** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, shareholder 100%**

**Part 1: Section A**

Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Energy Resources, Inc.**
Address **PO Box 259**
City **Brockway** State **PA** Zip **15824**
Telephone **814-265-8021**
EIN **31-1044044** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **24010101** | **PA** | **DEP** | **36-02695/05-25-88** |
| **24900104** | **PA** | **DEP** | **36-02695/05-25-88** |
| **24900103** | **PA** | **DEP** | **36-02695/05-25-88** |
| **24960101** | **PA** | **DEP** | **36-02695/05-25-88** |
| **24970102** | **PA** | **DEP** | **36-02695/05-25-88** |
| **24970103** | **PA** | **DEP** | **36-02695/05-25-88** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, shareholder 100%**

**Part 1: Section A**

Revised 02/06
DNR-744-9014

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Energy Resources, Inc.**
Address **PO Box 259**
City **Brockway** State **PA** Zip **15824**
Telephone **814-265-8021**
EIN **31-1044044** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| 24030102 | PA | DEP | 36-02695/05-25-88 |
| 33901602 | PA | DEP | 36-02695/05-25-88 |
| 17930120 | PA | DEP | 36-02695/05-25-88 |
| 24880101 | PA | DEP | 36-02695/05-25-88 |
| 24880103 | PA | DEP | 36-02695/05-25-88 |
| 24890101 | PA | DEP | 36-02695/05-25-88 |
| 24890102 | PA | DEP | 36-02695/05-25-88 |
| 24990101 | PA | DEP | 36-02695/05-25-88 |
| 24970101 | PA | DEP | 36-02695/05-25-88 |
| 24980101 | PA | DEP | 36-02695/05-25-88 |

If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, shareholder 100%**

**Part 1: Section A**

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DNR-744-9014

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Maple Creek Mining Company**
Address **981 Route 917**
City **Bentlevville** State **PA** Zip **15314**
Telephone **724-258-2056**
EIN **25-1755305** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **63841302** | **PA** | **DEP** | **36-00970/6-30-95** |
| **63733706** | **PA** | **DEP** | **36-00970/6-30-95** |
| **63723707** | **PA** | **DEP** | **36-00970/6-30-95** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, Director**

**Part 1: Section A**

Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **OHIOAMERICAN ENERGY, INCORPORATED**
Address **29325 Chagrin Blvd., Suite 300**
City **Pepper Pike** State **OH** Zip **44122**
Telephone **216-765-1240**
EIN **20-3044610** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **D-2180** | **OH** | **DMRM** | **33-04387/10-26-07** |
| **D-2291** | **OH** | **DMRM** | **33-04550/3-12-07** |
| **D-2304** | **OH** | **DMRM** | **33-0455010-26-07** |
| **D-2312** | **OH** | **DMRM** | **33-04550/2-26-08** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Part 1: Section A**

Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Mon-Valley Transportation Center, Inc.**
Address **PO Box 135, 1060 Ohio Ave.**
City **Glassport** State **PA** Zip **15054**
Telephone **412-673-1500**
EIN **15-1490495** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **02851602** | **PA** | **DEP** | **36-08678/6-8-1995** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Part 1: Section A**

Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Andalex Resources Management, Inc.**
Address **P.O. Box 902, 6750 N. Airport Rd.**
City **Price** State **UT** Zip **84501**
Telephone **435-637-5385**
EIN **61-0731325** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **C/007/019** | **UT** | **DOGM** | **42-02028/4-1-89**<br>**42-01474/7-1-78** |
| **C/007/033** | **UT** | **DOGM** | **42-01864/2-1-84** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Part 1: Section A**

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PERMIT LIST

Applicant's Name **AMERICAN ENERGY CORPORATION**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Andalex Resources, Inc.**
Address **P.O. Box 10**
City **Drakesboro** State **KY** Zip **42337**
Telephone **502-476-2287**
EIN **Unavailable** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **8750028** | **KY** | **DSMRK** | **1503998 / Unavailable** |
| **8890107** | **KY** | **DSMRK** | **1512302 / Unavailable** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Murray Energy Corp., owner 100%**



Revised 02/06
DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **PENNAMERICAN COAL, LP**
Address **PO Box 459**
City **Black Lick** State **PA** Zip **15716-0459**
Telephone **724-248-1327**
EIN **25-1800870** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **32951301** | **PA** | **DEP** | **36-08525** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, Shareholder**

**Part 1: Section A**

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# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **The American Coal Company**
Address **29325 Chagrin Blvd**
City **Pepper Pike** State **OH** Zip **44122**
Telephone **216-765-1240**
EIN **73-1546124** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **02** | **IL** | **OFFICE OF MINES AND MINERALS** | **11-02752/10-14-98** |
| **255** | **IL** | **OFFICE OF MINES AND MINERALS** | **11-02752/10-14-98** |
| **257** | **IL** | **OFFICE OF MINES AND MINERALS** | **11-02752/10-14-98** |
| **306** | **IL** | **OFFICE OF MINES AND MINERALS** | **11-02752/10-14-98** |
| **352** | **IL** | **OFFICE OF MINES AND MINERALS** | **11-02752/10-14-98** |
| **1410** | **IL** | **OFFICE OF MINES AND MINERALS** | **11-02752/10-14-98** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, President**

**Part 1: Section A**

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **TDK Coal Sales**
Address **PO Box 259**
City **Brockway** State **PA** Zip **15824**
Telephone **814-865-8021**
EIN **25-1422374** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| 03960103 | PA | DEP | 36-07707/1-14-97 |
| 03940101 | PA | DEP | 36-07707/6-6-95 |
| 16910104 | PA | DEP | 36-07707/5-11-92 |
| 33960109 | PA | DEP | 36-07707/3-03-98 |
| 16980102 | PA | DEP | 36-07707/9-10-98 |
| 24970104 | PA | DEP | 36-08867/9-10-98 |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Part 1: Section A**

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## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **The Oklahama Coal Company**
Address **29325 Chagrin Blvd**
City **Pepper Pike** State **OH** Zip **44122**
Telephone **216-765-1240**
EIN **34-1673480** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **D-0230** | **OH** | **DMRM** | **N/A** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, shareholder 100%**

**Part 1: Section A**

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DNR-744-9014

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **UMCO Energy Inc.**
Address **981 Route 917**
City **Bentlevville** State **PA** Zip **15314**
Telephone **724-258-2056**
EIN **52-1615668** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **63921301** | **PA** | **DEP** | **36-08375/6-8-94** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, Director**

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **UtahAmerican Energy, Inc.**
Address **794 North C Canyon Road**
City **East Carbon** State **Utah** Zip **81520**
Telephone **435-888-4000**
EIN **34-1874726** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **ACT/007/013** | **UT** | **DOGM** | **42-02241/2-24-99** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Robert E. Murray, shareholder 100%**

**Part 1: Section A**

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **Genwal Resources Inc.**
Address **794 North C Canyon Road**
City **East Carbon** State **Utah** Zip **84520**
Telephone **435-564-4010**
EIN **87-0533099** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **ACT/015/032** | **UT** | **DOGM** | **4202356/1-05-95** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

**Part 1: Section A**

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# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## PERMIT LIST

Applicant's Name **American Energy Corporation**

Submit the following information for each coal mining operation owned or controlled by either the applicant or by any person who owns or controls the applicant.

Name of Business Entity **West Ridge Resources Inc**
Address **794 North C Canyon Road**
City **Price** State **Utah** Zip **84501**
Telephone **435-564-4000**
EIN **87-0585129** or SSN

| Permit Number | State | Regulatory Authority | MSHA Number and Date Issued |
|---|---|---|---|
| **ACT/007/041** | **UT** | **DOGM** | **4202233/8-09-06** |
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If not previously provided, indicate the ownership or control relationship of the business entity with the applicant, including percent of ownership and location in organizational structure:

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(8) Does the applicant, any person or entity listed under items A (4) and (5), or any person or entity listed on Owners and Controllers have a pending coal mining application in any state of the United States?

Yes ☒ No ☐ If "yes," submit Pending Application List.

(9) Submit Certificate of Insurance.

## B. COMPLIANCE INFORMATION

(1) Has the applicant, any subsidiary, affiliate or persons controlled by or under common control with the applicant:

(a) Had a federal or state coal mining permit suspended or revoked in the five years preceding the data of submission of this application?

Yes ☐ No ☒ If "yes," submit Suspension, Revocation & Forfeiture List.

(b) Forfeited a mining bond or similar security deposited in lieu of bond?

Yes ☐ No ☒ If "yes," submit Suspension, Revocation & Forfeiture List.

(2) Has the applicant been issued notices of violation (NOVs) in connection with any coal mining and reclamation operation during the three years preceding the date of submission of this application for violations of Chapter 1513 of the Revised Code or the Administrative Code, or of any federal or state law, rule, or regulation pertaining to air or water environmental protection?

Yes ☒ No ☐ If "yes," submit NOV List.

(3) Have any unabated federal or state cessation orders (COs) and unabated air and water quality notices of violations (NOVs) been received prior to the submission date of this application by any coal mining and reclamation operation owned or controlled by either the applicant or by any person who owns or controls the applicant?

Yes ☐ No ☒ If "yes," submit Unabated Violations.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### PENDING APPLICATION LIST

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **Energy Resources, Inc.**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| **17841607** | **DEP** | **PA** |
| **17823701** | **DEP** | **PA** |
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**Part 1: Section A**

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## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## PENDING APPLICATION LIST

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **KENAMERICAN COAL COMPANY**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| **889-5009 R-8** | **natural resources & environmental cabinet - Dept of surface mining reclamation and enforcement** | **KY** |
| **889-9004** | **natural resources & environmental cabinet - Dept of surface mining reclamation and enforcement** | **KY** |
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## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## PENDING APPLICATION LIST

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **OhioAmerican Energy, Inc.**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| **10395** | **ODNR, DMRM** | **OHIO** |
| **D-2180-1** | **ODNR, DMRM** | **OHIO** |
| **D-2304-1** | **ODNR, DMRM** | **OHIO** |
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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PENDING APPLICATION LIST**

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **TDK Coal Sales, Inc.**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| **17814607** | **DEP** | **PA** |
| **17823701** | **DEP** | **PA** |
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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PENDING APPLICATION LIST**

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **THE OHIO VALLEY COAL COMPANY**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| D-0360-14 | DMRM | OHIO |
| D-0360-22 | DMRM | OHIO |
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## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### PENDING APPLICATION LIST

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **UMCO Energy, Inc. - High Quality Mine**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| **63921301** | **PA DEP** | **PA** |
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## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## PENDING APPLICATION LIST

Applicant's Name **American Energy Corporation**

Provide the following information for each pending coal mining application for either the applicant or any person who owns or controls the applicant.

Indicate the business entity for which this listing has been completed **American Energy Corporation**

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| D-0425-8 | DMRM | OH |
| D-0425-11 | DMRM | OH |
| D-0425-12 | DMRM | OH |
| D-0425-13 | DMRM | OH |
| D-0425-14 | DMRM | OH |
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**Part 1: Section A**

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# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## CERTIFICATE OF INSURANCE

Name of Insured **American Energy Corporation**

This is to certify that the policy of insurance listed below has been issued to the above named insured and is in force at this time. The policy provides bodily injury and property damage insurance for all coal mining and reclamation operations of the insured in the state of Ohio as required by 1501:13-7-07 of the Administrative Code stated below.

Name of Insurer **Federal Insurance Company**

Policy Number **37104410**

Policy Period **6/1/09-6/1/2010**

Name of Underwriting Agent **Reschini Agency, Inc.**

Address of Underwriting Agent **922 Philadelphia ST.**
**Indiana, PA 15701**

Telephone No. of Underwriting Agent **800 828 5040**

In the event of cancellation or non-renewal of this policy, including non-payment of policy premiums, the insurer agrees to promptly notify: The Division of Mineral Resources Management, 2045 Morse Road, Building H-3, Columbus, Ohio 43229-6693.

6/26/09
Date

K Williams
Signature of Underwriting Agent

This certificate is issued as a matter of information only and confers no rights upon the Division of Mineral Resources Management. This certificate does not amend, extend or alter the coverage afforded by the policy listed above.

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1501:13-7-07(B) THE PUBLIC LIABILITY INSURANCE POLICY SHALL:

(1) BE IN EFFECT DURING THE TERM OF THE PERMIT OR ANY RENEWAL, INCLUDING THE LENGTH OF ALL RECLAMATION OPERATIONS;

(2) PROVIDE FOR PERSONAL INJURY AND PROPERTY DAMAGE PROTECTION IN AMOUNTS ADEQUATE TO COMPENSATE ANY PERSONS INJURED OR PROPERTY DAMAGED AS A RESULT OF COAL MINING AND RECLAMATION OPERATIONS, INCLUDING THE USE OF EXPLOSIVES. THE MINIMUM INSURANCE COVERAGE FOR BODILY INJURY AND PROPERTY DAMAGE SHALL BE THREE HUNDRED THOUSAND DOLLARS FOR EACH OCCURRENCE AND FIVE HUNDRED THOUSAND DOLLARS IN THE AGGREGATE; AND

(3) INCLUDE A RIDER REQUIRING THAT THE INSURER NOTIFY THE CHIEF WHENEVER SUBSTANTIVE CHANGES ARE MADE IN THE POLICY, INCLUDING ANY TERMINATION OR FAILURE TO RENEW.

**Part 1: Section A**

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## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### NOV LIST

Applicant's Name **American Energy Corporation**

| Permit Number | Violation Number | Date of Issuance | Issuing Agency | State | Brief Description of NOV | Action Taken to Abate NOV | Current Status of NOV (*) |
|---|---|---|---|---|---|---|---|
| D-0425 | 21807 | 1-25-05 | ODNR | OH | W-401Water Buffalo is out of water at the Neal Moore dairy farm site | Restored W-401 water buffalo by filling with water | terminated 1/25/05 9:00 P.M. |
| D-0425 | 19695 | 4-27-05 | ODNR | OH | Operator failed to maintain Pond 008-A and sump (next to 018-A) | Reconstruct embankment to pond 008-A and sump | Terminated 6/10/05 |
| D-0425 | 19696 | 4-27-05 | ODNR | OH | Coal has come off and accumulated downslope of the raw stockpile increasing PH and Iron levels in Pond 008-A | remove all coal that has accumulated downslope of the raw stockpile | Terminated 6/10/05 |
| D-0425 | 19697 | 4-27-05 | ODNR | OH | Failure to maintain haul road/access road between pond 011 and 008 series pond | construct sumps to control drainage coming off roadway | Terminated 6/10/05 |
| D-0425 | I-11726 | 8-23-05 | ODNR | OH | uncontrolled discharge | isolate and clean spill | Terminated 6/30/05 |
| D-0425 | 21871 | 10-3-05 | ODNR | OH | Failure to submit site specific plans and time schedule for repair or mitigation for the Moore farm | came to an agreement with land owner on remedial actions | Terminated 8/2/06 |
| D-1159 | 21860 | 9-15-06 | ODNR | OH | Failure to segregate and stockpile prime farmland soils prior to disturbance | Segregate stockpile and protect prime farmland soild necessary for PFL restoration | Terminated 12/31/06 |
| D-0425 | 28434 | 6-27-07 | ODNR | OH | Failure to provide written notice to surface owner at least six months prior to undermining | non-remedial | |

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AEC 03092

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(*) If administrative or judicial proceedings have been initiated concerning any of the violations, identify the violation and provide an addendum indicating the date, location, type of proceeding, and current status.





AEC 03093

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Terry & Mickey Craig**<br>ADDRESS: **38730 State Route 7**<br>CITY, STATE, ZIP: **Sardis, OH 43946**<br>TELEPHONE: **740-483-9041** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **26, 27** | **N/A** | **2-13-177**<br>**2-13-178**<br>**2-13-179** | **5** | **4** |
| OWNER NAME: **Brian L. & Kimberly G. Hawthorne**<br>ADDRESS: **54890 Pugh Ridge Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-1397** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20, 26** | **N/A** | **2-13-110**<br>**2-13-111** | **5** | **4** |
| OWNER NAME: **David A. & Judith Crooks**<br>ADDRESS: **54980 Stucky Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-1769** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **26** | **N/A** | **2-13-180**<br>**2-13-181**<br>**2-13-111** | **5** | **4** |
| OWNER NAME: **Nelson G. Lindsey**<br>ADDRESS: **P. O. Box 34**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-1333** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20, 21, 26, 27** | **N/A** | **2-13-110, 2-13-111, 2-21-10, 2-21-11, 2-21-12, 2-13-179, 2-13-178** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Bobby V. & Susan L. King**<br>ADDRESS: **7987 Beach Road**<br>CITY, STATE, ZIP: **Wadsworth, OH 44281**<br>TELEPHONE: **Unlisted** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-21-15**<br>**2-13-118**<br>**2-13-117** | **5** | **4** |
| OWNER NAME: **Ira O. & Katherine L. Lepley**<br>ADDRESS: **12756 Warwick Road**<br>CITY, STATE, ZIP: **Marshalville, OH 44645**<br>TELEPHONE: | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20, 26** | **N/A** | **2-13-110**<br>**2-13-111** | **5** | **4** |
| OWNER NAME: **Charlotte Kovacs**<br>ADDRESS: **54931 McGary Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-9936** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-161**<br>**2-13-162** | **5** | **4** |
| OWNER NAME: **Fred & Cheryl Wente**<br>ADDRESS: **54971 McGary Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-1472** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-161**<br>**2-13-162** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Steven & Charlotte Kovacs**<br>ADDRESS: **54931 McGary Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-9936** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-161**<br>**2-13-162** | **5** | **4** |
| OWNER NAME: **John S. & Diane E. Brezo**<br>ADDRESS: **6476 Church Street**<br>CITY, STATE, ZIP: **Belmont, OH 43718**<br>TELEPHONE: **330-673-1526** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-162**<br>**2-13-163** | **5** | **4** |
| OWNER NAME: **John E. & Norma J. Diver**<br>ADDRESS: **9700 Berlin Sta. Rd.**<br>CITY, STATE, ZIP: **Canfield, OH 44406**<br>TELEPHONE: | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **14, 20** | **N/A** | **2-13-165**<br>**2-13-19**<br>**Parcel 2** | **5** | **4** |
| OWNER NAME: **Edward D. & Debra K. Palmer**<br>ADDRESS: **54655 McGary Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **Unlisted** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-161** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Roy R. & Mary M. Miller**<br>ADDRESS: **9650 Dover Road**<br>CITY, STATE, ZIP: **Apple Creek, OH 44606**<br>TELEPHONE: **330-698-8131** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **14** | **N/A** | **2-8-2** | **5** | **4** |
| OWNER NAME: **John L. Christman**<br>ADDRESS: **121 North Paul Street**<br>CITY, STATE, ZIP: **Woodsfield, OH 43793**<br>TELEPHONE: **740-472-1845** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **14** | **N/A** | **Parcel 5** | **5** | **4** |
| OWNER NAME: **Vincent L. III & Melanie A. Thompson**<br>ADDRESS: **7004 S. Dewey Road**<br>CITY, STATE, ZIP: **Amherst, OH 44001**<br>TELEPHONE: **Unlisted** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **15, 21** | **N/A** | **Parcel 9, Tracts 2 and 3, 2-13-1, 2-13-190 Parcel 1** | **5** | **4** |
| OWNER NAME: **Matthew J. Thompson**<br>ADDRESS: **33107 Northwood Circle**<br>CITY, STATE, ZIP: **Avon Lake, OH 44012-3140**<br>TELEPHONE: **440-930-0727** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **15** | **N/A** | **Parcel 12** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **North American Coal Royalty Company**<br>ADDRESS: **14785 Preston Road, Suite 1100**<br>CITY, STATE, ZIP: **Dallas, TX 75254-7891**<br>TELEPHONE: | ☐ Surface – UG Workings area<br>☒ Coal<br>☐ Non-coal mineral | **Belmont** | **Washington** | **14, 15** | | **Parcels 1, 2, 5, 9 (Tracts 2 & 3), 11, 12** | **5** | **4** |
| OWNER NAME: **Terry L. & Yolanda M. Hess**<br>ADDRESS: **111 Elm Street**<br>CITY, STATE, ZIP: **Powhatan Point, OH 43942**<br>TELEPHONE: | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-161** | **5** | **4** |
| OWNER NAME: **Leroy Lucas**<br>ADDRESS: **46519 E. Captina Hwy. Rd.**<br>CITY, STATE, ZIP:**Alledonia, OH 43902**<br>TELEPHONE: 740-926-1663 | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20, 21** | **N/A** | **2-21-13, 2-21-14, 2-21-15, 2-21-12 2-13-117, 2-13-2 2-13-118** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Kenneth E. & Virginia Blakely**<br>ADDRESS: **55059 McGary Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902-9707**<br>TELEPHONE:**740-926-2002** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **21** | **N/A** | **2-13-2** | **5** | **4** |
| OWNER NAME: **Trevor H. & Dawnell L. Moore**<br>ADDRESS: **54457 Clover Ridge Road**<br>CITY, STATE, ZIP: **Powhatan Point,** OH **43942**<br>TELEPHONE: **740-926-2002** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **21** | **N/A** | **2-13-2** | **5** | **4** |
| OWNER NAME: **Lloyd E. & Carol E. Baker**<br>ADDRESS: **55341 Pugh Ridge Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE:**740-926-1875** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **21** | **N/A** | **2-21-16** | **5** | **4** |
| OWNER NAME: **Eric R. Butterfield**<br>ADDRESS: **11769 Farm Creek Ave. NW**<br>CITY, STATE, ZIP: **Uniontown, OH 44685-6873**<br>TELEPHONE: **330-877-1735** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **21** | **N/A** | **2-13-2, 2-21-16** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **William L. Lupton**<br>ADDRESS: **55483 Pugh Ridge Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-9248** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **21** | **N/A** | **2-21-16** | **5** | **4** |
| OWNER NAME: **Consolidated Land Co.**<br>ADDRESS: **29325 Chagrin Blvd., Suite 300**<br>CITY, STATE, ZIP: **Pepper Pike, OH 44122**<br>TELEPHONE: **216-765-8333** | ☐ Surface – UG Workings area<br>☒ Coal<br>☐ Non-coal mineral | **Belmont** | **Washington** | **14, 15, 20, 21, 26, 27** | **N/A** | **2-8-2, 2-13-19, 2-13-110, 2-13-111, 2-13-117, 2-13-118, 2-13-161, 2-13-162, 2-13-163, 2-13-165, 2-13-153, 2-13-177, 2-13-178, 2-13-179, 2-13-180, 2-13-190, 2-13-1, 2-13-2, 2-21-10, 2-21-11, 2-21-12, 2-21-13, 2-21-14, 2-21-15, 2-21-16, 2-13-10, 2-13-11, 2-13-12, 2-13-176, 2-13-181** | **5** | **4** |
| OWNER NAME: **Charles F. Orum**<br>ADDRESS: **99 E. Court Street**<br>CITY, STATE, ZIP: **Woodsfield, OH 43973**<br>TELEPHONE: **740-472-0289** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-176** | **5** | **4** |

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Ronald R. & Sara Reger, Sr**<br>ADDRESS: **457 West 45th Street**<br>CITY, STATE, ZIP: **Shadyside, OH 43947**<br>TELEPHONE: **740-676-5732** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **14, 20** | **N/A** | **2-13-10, 2-13-11, 2-13-12** | **5** | **4** |
| OWNER NAME: **John F. & Johanna F. Thomas**<br>ADDRESS: **45601 Oak Ridge Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **Unlisted** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **26** | **N/A** | **2-13-153** | **5** | **4** |
| OWNER NAME: **Wilfred K. & Linda C. Perkins**<br>ADDRESS: **54451 Pugh Ridge Road**<br>CITY, STATE, ZIP: **Alledonia, OH 43902**<br>TELEPHONE: **740-926-1037** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **26** | **N/A** | **2-13-111** | **5** | **4** |

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DNR-744-9009

AEC 03101

## C. RIGHT OF ENTRY INFORMATION

| LAND OWNER INFORMATION | OWNERSHIP INFORMATION | COUNTY | TOWNSHIP | SECTION | LOT | DEED PARCEL NO. | T- | R- |
|---|---|---|---|---|---|---|---|---|
| OWNER NAME: **Chris E. Perkins**<br>ADDRESS: **42561 Williamson Road**<br>CITY, STATE, ZIP: **Beallsville, OH 43716**<br>TELEPHONE: **740-929-1855** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-110** | **5** | 4 |
| OWNER NAME: **Scott M. Sanders**<br>ADDRESS: **2970 Cliffside Drive**<br>CITY, STATE, ZIP: **Copley, OH 44321**<br>TELEPHONE: **330-666-6858** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-161, 2-13-162, 2-13-163** | **5** | 4 |
| OWNER NAME: **William E. Oros**<br>ADDRESS: **3618 Work Road**<br>CITY, STATE, ZIP: **Ravenna, OH 44266**<br>TELEPHONE: **330-626-2473** | ☒ Surface – UG Workings area<br>☐ Coal<br>☒ Non-coal mineral | **Belmont** | **Washington** | **20** | **N/A** | **2-13-162, 2-13-163** | **5** | 4 |

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DNR-744-9009

(2) Provide the following information for the holders of record of any leasehold interest in the coal to be mined.

Leaseholder Name **Consolidated Land Company**

Address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **OH** Zip **44124** Telephone **(216) 765-8333**

Leaseholder Name **American Energy Corporation**

Address **43521 Mayhugh Hill Road**

City **Beallsville** State **OH** Zip **43716** Telephone **(740) 926-9152**

Submit and identify additional pages necessary to complete response.

(3) Are there purchasers of record under a real estate contract of the coal to be mined?

Yes ☐ No ☒ If "yes," submit Purchasers of Record.

(4) Is any owner, holder or purchaser listed in items C (1) or (2), a business entity other than a single proprietorship?

Yes ☒ No ☐ If "yes," submit Other Business Entities.

(5) Does the applicant hold lands, interests in lands, options or pending bids on interests for lands that are contiguous to this application area?

Yes ☒ No ☐ If "yes," list those that are contiguous to this application area.

**Lands in Washington Township, T-5 R-4, Sections 3, 4, 9, 10, and 15. See Future Areas Map as an Addendum to this item.**

(6) Is it anticipated that mining permits would be sought for any of those lands described in item C (5) above?

Yes ☒ No ☐ If "yes," describe contiguous properties for which permits may be sought, to include the size, sequence and timing of future mining permits.

**AEC is planning to continue mining operations into an area directly to the Northeast of this application that will consist of 1,458 total acres will be mined from 2011 to 2013.**

(7) Identify the right of entry documentation that is being provided that allows for coal mining operations within the underground workings:

☐ A copy of the right-of-entry documents attached as addenda, or
☒ A Right-of-Entry Affidavit



MAY 0 3 2010

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OTHER BUSINESS ENTITIES

Applicant's Name **American Energy Corporation**

A separate attachment is to be submitted for each business entity.

Name of business entity **American Energy Corporation**

Statutory agent **A & H Statutory Service Corporation**

Street Address **1100 Huntington Bldg**

City **Cleveland** State **Ohio** Zip **44114-1425**

Person's name **Robert E. Murray** Position **Director, President**

Street Address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

Person's name **Michael McKown** Position **Secretary**

Street Address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

Person's name **James Turner Jr.** Position **Treasurer**

Street Address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

Person's name **Robert Putsock** Position **Assistant Treasurer**

Street Address **43521 Mayhugh Hill Road**

City **Beallsville** State **Ohio** Zip **43716**

**Part 1: Section C**

Revised 02/06
DNR-744-9012

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OTHER BUSINESS ENTITIES

Applicant's Name **American Energy Corporation**

A separate attachment is to be submitted for each business entity.

Name of business entity **Consolidated Land Company**

Statutory agent **Stephen C. Ellis #842696**

Street Address **925 Euclid Avenue, Suite 1100**

City **Cleveland** State **Ohio** Zip **44115**

Person's name **Robert D. Moore** Position **President, Treasurer, Assistant Secretary**

Street Address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Ohio** Zip **44124**

Person's name **Michael O. McKown** Position **Secretary**

Street Address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Ohio** Zip **44124**

Person's name **Elmer A. Mottillo** Position **Assistant Secretary**

Street Address **29325 Chagrin Boulevard, Suite 300**

City **Pepper Pike** State **Ohio** Zip **44124**

Person's name Position

Street Address

City State Zip

**Part 1: Section C**

Revised 02/06
DNR-744-9012

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## OTHER BUSINESS ENTITIES

Applicant's Name **American Energy Corporation**

A separate attachment is to be submitted for each business entity.

Name of business entity **North American Coal Royalty Company**

Statutory agent **CSC Lawyers Inc Service (Corporation Service Company)**

Street Address **50 West Broad Street Suite 1800**

City **Columbus** State **Ohio** Zip **43215**

Person's name **Thomas Koza** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Thomas Koza** Position **Vice President**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Thomas Koza** Position **Secretary**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Robert Benson** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

**Part 1: Section C**

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## OTHER BUSINESS ENTITIES

Applicant's Name **American Energy Corporation**

A separate attachment is to be submitted for each business entity.

Name of business entity **North American Coal Royalty Company**

Statutory agent

Street Address

City State Zip

Person's name **Andrew Good** Position **Secretary**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Dan Swetich** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **James Melchior** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **James Melchior** Position **Vice President**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

**Part 1: Section C**

Revised 02/06
DNR-744-9012

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### OTHER BUSINESS ENTITIES

Applicant's Name **American Energy Corporation**

A separate attachment is to be submitted for each business entity.

Name of business entity **North American Coal Royalty Company**

Statutory agent

Street Address

City State Zip

Person's name **Douglas Darby** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Bob Carlton** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Bob Carlton** Position **Vice President**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Michael Gregory** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

**Part 1: Section C**

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# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## OTHER BUSINESS ENTITIES

Applicant's Name **American Energy Corporation**

A separate attachment is to be submitted for each business entity.

Name of business entity **North American Coal Royalty Company**

Statutory agent

Street Address

City State Zip

Person's name **Lee Burton** Position **Controller**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name **Otes Bennett Jr** Position **Director**

Street Address **14785 Preston Road Suite 100**

City **Dallas** State **Texas** Zip **75240-7891**

Person's name Position

Street Address

City State Zip

Person's name Position

Street Address

City State Zip

**Part 1: Section C**

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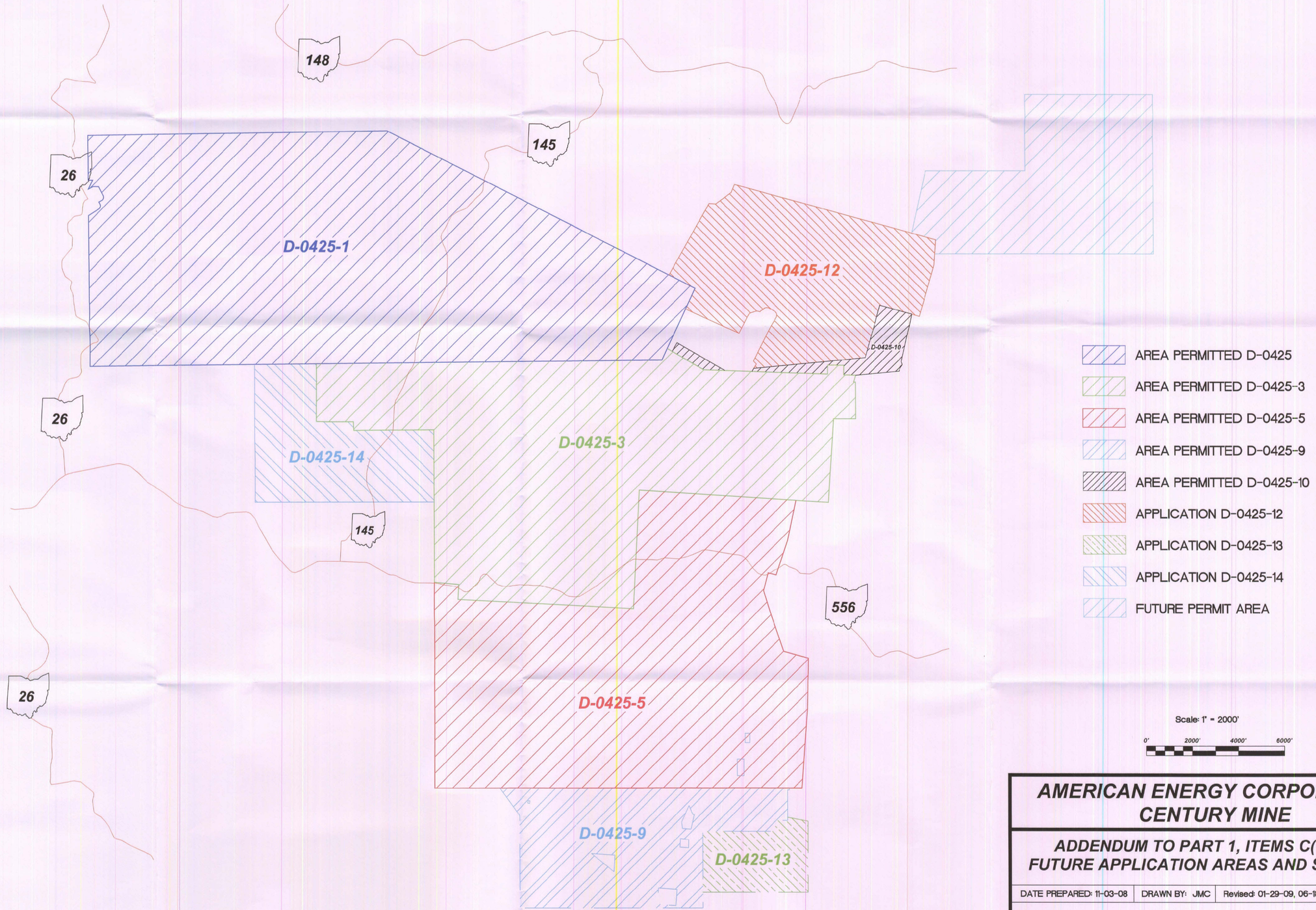
DNR-744-9012




# AMERICAN ENERGY CORPORATION
# CENTURY MINE

## ADDENDUM TO PART 1, ITEMS C(5 and 6)
## FUTURE APPLICATION AREAS AND SEQUENCE

| DATE PREPARED: 11-03-08 | DRAWN BY: JMC | Revised: 01-29-09, 06-18-09, 08-11-09 |
|---|---|---|


Jack A. HAMILTON & Associates, Inc.
342 High St., Box 471
Flushing, Ohio 43977
Ph: (740) 968-4947
Fax: (740) 968-4225
e-mail: hamilton@1st.net
www.hamiltonandassoc.com

Addendum to Part 1, Item C (7), American Energy Corporation

# MEMORANDUM OF LEASE

Instrument
200300007911

Made this 16th day of June, 2003.

BETWEEN

**NORTH AMERICAN COAL ROYALTY COMPANY**, a Delaware corporation with offices at 14785 Preston Road, Suite 1100, Dallas, Texas 75254-7891, hereinafter called "Lessor",

AND

**CONSOLIDATED LAND COMPANY**, an Ohio corporation with offices at Suite 300, 29325 Chagrin Boulevard, Pepper Pike, OH 44122, hereinafter called "Lessee".

WITNESSETH:

WHEREAS, by a certain Lease, made and entered into November 11, 1996, Lessor did lease to Lessee all the minable and merchantable coal, and the coal seam gas incident thereto, in the Pittsburgh No. 8 seam of coal in and underlying those certain pieces, parcels or tract of land which are situated in Washington Township, Belmont County, Ohio, as more particularly shown and described on Schedule 1, attached hereto and made a part hereof; and

WHEREAS, in lieu of recording said Lease, the parties hereto have executed and acknowledged and desire to place on record this Memorandum of Lease.

LESSOR: North American Coal Royalty Company
14785 Preston Road, Suite 1100
Dallas, TX 75254-7891

LESSEE: Consolidated Land Company
29325 Chagrin Boulevard
Suite 300
Pepper Pike, OH 44122

200300007911
Filed for Record in
BELMONT COUNTY, OHIO
MARY CATHERINE NIXON
07-14-2003 At 12:25 pm.
LEASE 22.00
Volume 112 Page 191 - 194

DATE OF LEASE: November 11, 1996

LEASED PREMISES: All those certain Pittsburgh No. 8 seam of coal properties in Wahington Township, Belmont County, Ohio described on Schedule 1

TERM : Lease commences on November 11, 1996 and shall continue in force and effect until the exhaustion of all the subject merchantable and minable coal fom the Leased Premises.

TRANSFER NOT NECESSARY
7-14-03
J.A. PAPPANO, AUDITOR
DEPUTY

Addendum to Part 1, Item C (7), American Energy Corporation

ACKNOWLEDGEMENT

STATE OF TEXS

COUNTY OF DALLAS

On this 16th day of June, 2003, before me, a Notary Public, personally appeared Thomas A. Koza and Andrew S. Good who acknowledged themselves to be the President and Secretary of North American Coal Royalty Company, and that as such officers being duly authorized to do so, executed the foregoing instrument on behalf of such corporation for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

NANCY F. LEMAY
MY COMMISSION EXPIRES
December 26, 2005

Nancy F. LeMay
Notary Public

ACKNOWLEDGEMENT

STATE OF OHIO

COUNTY OF Belmont

On this 20th day of June before me, a Notary Public, personally appeared Peter I. Vuljanic and Robert D. Moore who acknowledged themselves to be the President and Treasurer of Consolidated Land Company, and that as such officers being duly authorized to do so, executed the foregoing instrument on behalf of such corporation for the purposes therein contained.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Barbara L. Rush
Notary Public

NOTARIAL SEAL STATE OF OHIO

BARBARA L. RUSH
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 9-01-04

Prepared by: Consolidated Land Company

VOL 112 PAGE 194

# SCHEDULE 1
# TO
# LEASE AGREEMENT

## LANDS COMPRISING THE LEASED PREMISES

| PARCEL NO. | TRACT | GRANTEE | GRANTOR | REMARKS | VOL. | PAGE |
|---|---|---|---|---|---|---|
| 1 | | North American Coal Royalty Company | Bellaire Corp. | 7.956 Ac. | 668 | 307 |
| 2 | | " " " | " " " | 39.430 Ac. | 668 | 308 |
| 3 | | " " " | " " " | 1.555 Ac. | 668 | 309 |
| 4 | | " " " | " " " | 105.00 Ac. | 668 | 311 |
| 5 | | " " " | " " " | 137.00 Ac. | 668 | 311 |
| 6 | 1 | " " " | " " " | 40.00 Ac. | 668 | 313 |
| | 2 | " " " | " " " | 18.00 Ac. | 668 | 313 |
| 7 | | " " " | " " " | 19.979 Ac. | 668 | 313 |
| 8 | | " " " | " " " | 41.344 Ac. | 668 | 315 |
| 9 | 1 | " " " | " " " | 29.672 Ac. | 668 | 316 |
| | 2 | " " " | " " " | 10.712 Ac. | 668 | 317 |
| | 3 | " " " | " " " | 1.500 Ac. | 668 | 317 |
| | 4 | " " " | " " " | 61.00 Ac. | 668 | 317 |
| | 5 | " " " | " " " | 55.00 Ac. | 668 | 318 |
| 10 | | " " " | " " " | 9.304 Ac. | 668 | 319 |
| 11 | | " " " | " " " | 0.080 Ac. | 668 | 320 |
| 12 | | " " " | " " " | 25.00 Ac. | 668 | 322 |
| 13 | 1 | " " " | " " " | 40.00 Ac. | 668 | 322 |
| | 2 | " " " | " " " | 101.00 Ac. | 668 | 322 |
| 14 | 1 | " " " | " " " | 80.00 Ac. | 668 | 323 |
| | 2 | " " " | " " " | 80.24 Ac. | 668 | 323 |
| 15 | | " " " | " " " | 15.916 Ac. | 668 | 324 |

Instrument 200300006636

# MEMORANDUM OF LEASE

THIS MEMORANDUM OF LEASE (this "Memorandum"), dated as of May 23, 2003, by and between Consolidated Land Company, an Ohio corporation having a mailing address at 29325 Chagrin Boulevard, Suite 300, Pepper Pike, Ohio 44122 (the "Lessor"), and American Energy Corporation, an Ohio corporation having a mailing address at 43521 Mayhugh Hill Road, Township Highway 88, Beallsville, Ohio 43716 (the "Lessee"). The Lessor and the Lessee are parties to that certain Lease Agreement dated February 1, 2002 (the "Lease"), pursuant to which the Lessor leased to the Lessee certain land described on Exhibit A attached hereto and incorporated herein by reference and the improvements located thereon.

1. The name of the Lessor under the Lease is: Consolidated Land Company.

2. The name of the Lessee under the Lease is: American Energy Corporation.

3. The address of the Lessor is: 29325 Chagrin Boulevard, Suite 300, Pepper Pike, Ohio 44122. The address of the Lessee is: 43521 Mayhugh Hill Road, Township Highway 88, Beallsville, Ohio 43716.

4. The date of execution of the Lease is: February 1, 2002.

5. The Lessor leased to the Lessee the land described on Exhibit A attached hereto and incorporated herein by reference and the improvements located thereon.

6. The date of commencement of the term of the Lease was: February 1, 2002.

7. The term of the Lease is for a period lasting until all mineable and merchantable coal has been depleted.

8. This Memorandum is executed for recording. The Lease contains and sets forth other important terms and provisions which are incorporated herein by reference.

9. This Memorandum shall not limit, expand, supplement or modify the Lease, and in the event of any conflict between the terms of this Memorandum and the Lease, the Lease shall control.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

TRANSFER NOT NECESSARY
EDI BENNETT, P.E., P.S.
COUNTY ENGINEER 06-16-03

TRANSFER NOT NECESSARY
6-16-03
A. PAPPANO, AUDITOR
DEPUTY

Prepared By:
NAME: AMERICAN ENERGY CORPORATION
CO/ST: BELMONT CO., OH (4)

MII:\132093\02\2TX902LDOC\68535.0146

IN WITNESS WHEREOF, the Lessor and the Lessee have duly executed this Memorandum as of the day and year first above written.

**LESSOR:**

CONSOLIDATED LAND COMPANY

By: _____
Name: PETER J. VULETINICH
Title: PRESIDENT

**LESSEE:**

AMERICAN ENERGY CORPORATION

By: _____
Name: Robert D. Moore
Title: President

CERTIFICATE OF RESIDENCE

The undersigned certifies that the residence of the Lessee is 43521 Mayhugh Hill Road, Beallsville, OH 43716 Attention: Steven Hill.

_____
On Behalf of the Lessee

200300006636
Filed for Record in
BELMONT COUNTY, OHIO
MARY CATHERINE NIXON
06-16-2003 01:11 pm.
LEASE 30.00
Volume 112 Page 161 - 166

MH:\132093\02\2TX9021.DOC\68535.0146

Addendum to Part 1, Item C (7), American Energy Corporation

## CERTIFICATES OF ACKNOWLEDGEMENT

STATE OF PENNSYLVANIA )
) ss:
COUNTY OF JEFFERSON )

On this, the 27th day of May, 2003, before me, a Notary Public, the undersigned officer, personally appeared Peter J. Vuljanic, who acknowledged himself/herself to be the President of CONSOLIDATED LAND COMPANY, a corporation organized and existing under the laws of the State of Ohio, and that he/she, as such he, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation by himself/herself as President.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Name: Ronald E. Armstrong
Title: Notary Public

My commission expires: 09/04/2004

Notarial Seal
Ronald E. Armstrong, Notary Public
Snyder Twp., Jefferson County
My Commission Expires Sept. 4, 2004
Member, Pennsylvania Association of Notaries

STATE OF Ohio )
) ss:
COUNTY OF Belmont )

On this, the 23 day of May, 2003, before me, a Notary Public, the undersigned officer, personally appeared Robert D. Moore, who acknowledged himself/herself to be the President of AMERICAN ENERGY CORPORATION, a corporation organized and existing under the laws of the State of Ohio, and that he/she, as such he, being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation by himself/herself as President.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

Name:
Title: Notary Public

My commission expires: 9-01-04

NOTARIAL SEAL STATE OF OHIO
BARBARA L. RUSH
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 9-01-04

MH:M132093\02\2TX902L.DOC\68535.0146

EXHIBIT A

Situate in the Counties of Belmont and Monroe, State of Ohio:

Beginning at the SW corner of Section 12, T5N, R5W, Sunsbury Township, Monroe County, Ohio;

Thence northerly with the west section line of said Section 12 to the NW corner of Section 12;

Thence easterly with the north section line of said Section 12 to the SW corner of Section 7, T6N, R5W, Wayne Township, Belmont County, Ohio;

Thence northerly with the west section lines of Sections 7, 8, 9, 10 and 11, T6N, R5W, to the quarter section line of Section 11, T6N, R5W;

Thence westerly with the quarter section line of the adjoining Section 17 to the center of Section 17, T6N, R5W;

Thence northerly with the quarter section line of said Section 17 to the south section line of Section 18, T6N, R5W;

Thence westerly with the south section line of said Section 18 to the SW corner of said Section 18;

Thence northerly with the west section line of said Section 18 to the SE corner of Section 19, T7N, R5W, Goshen Township;

Thence westerly with the south section lines of said Section 19 and Section 25 to the quarter section line of Section 25, T7N, R5W;

Thence northerly with the quarter section line of said Section 25 to the south section line of Section 26, T7N, R5W;

Thence continuing northerly with the quarter section line of said Section 26 to the north section line of said Section 26;

Thence easterly with the north section lines of Sections 26, 20, 14, 8 and 2 to the NE corner of Section 2, T7N, R5W, Goshen Township;

Thence southerly with the east section line of said Section 2 to the NW corner of Section 32, T6N, R4W, Smith Township;

Thence easterly with the north section line of said Section 32 to the NE corner of said Section 32;

Thence southerly with the east section line of Sections 32 and 31 to a point on said east section line which marks the SE corner of Consolidated Land Company's coal ownership in Section 31, T6N, R4W;

Thence westerly, parallel to the south section line of said Section 31, to a point on the section line between said Section 31 and Section 1, T7N, R5W, Goshen Township;

Thence southerly with the east section line of said Section 1 to the NE corner of Section 6, T6N, R5W, Wayne Township;

Thence southerly with the east section lines of Sections 6, 5, 4 and 3 to a point on the east section line of Section 3, T6N, R5W, which point marks the intersection of said east section line of Section 3 with the Exchange Line established by The Youghiogheny and Ohio Coal Company and The Cambria Land Company on May 12, 1959;

Thence southeasterly with said Exchange Line to a point which marks the intersection of said Exchange Line with the east section line of Section 15, T5N, R4W, Washington Township;

Thence southerly with the east section lines of Sections 15, 14 and 13 to the NE corner of Section 18, T4N, R4W, Switzerland Township, Monroe County;

Thence westerly with the north section line of said Section 18 to the NW corner of said Section 18;

Thence southerly with the west section lines of Sections 18, 17 and 16 to the SW corner of Section 16, T4N, R4W;

Thence easterly with the south section lines of Sections 16 and 10 to the quarter section line of Section 10, T4N, R4W;

Thence southerly with the quarter section line of the adjoining Section 9 to the center of Section 9, T4N, R4W;

Thence westerly with the quarter section line of said Section 9, and continuing westerly along the quarter section lines of Sections 15, 21 and 27 to a point on the west section line of Section 27, T4N, R4W, Sunsbury Township;

Thence northerly with the west section lines of Sections 27, 28 and 29 to the SE corner of Section 36, T4N, R4W;

Thence westerly with the south section line of said Section 36 to the SW corner of said Section 36;

Thence northerly with the west section line of said Section 36 to the SE corner of Section 6, T5N, R5W, Sunsbury Township;

Thence westerly with the south section lines of Sections 6 and 12 to the SW corner of Section 12, T5N, R5W, the place of beginning.

Excluding from the above described area any coal lands not owned in fee by Consolidated Land Company.

MI1:\132093\02\2TX902!.DOC\68535.0146

208512

PAID $12.00

State of Delaware

PAGE 1

VOL 659 PAGE 861

# Office of Secretary of State

I, MICHAEL HARKINS, SECRETARY OF STATE OF THE STATE OF DELAWARE DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE RESTATED CERTIFICATE OF INCORPORATION OF NORTEX ROYALTY COMPANY FILED IN THIS OFFICE ON THE EIGHTEENTH DAY OF JULY, A.D. 1988, AT 10 O'CLOCK A.M.

: : : : : : : : : :

BELMONT CO. RECORD OF Deeds
VOL. 659 PAGE 861
RECEIVED
JAN 4 3 25 PM '90
RECORDED JAN 5 1990
STANLEY SIMONCIC
RECORDER

DEPARTMENT OF STATE
OFFICE OF THE SECRETARY OF STATE
DELAWARE

Michael Harkins, Secretary of State

AUTHENTICATION: 2109416

DATE: 03/20/1989

[illegible]

TRANSFER NOT NECESSARY
1-4-90
J.A. PAPPANO, AUDITOR
Shunil R. Kapler DEPUTY

TRANSFER NOT NECESSARY
By R E Bennett
FRED F. BENNETT
County Engineer

98

862



7-13-88

VOL 659 PAGE 862

RESTATED CERTIFICATE OF INCORPORATION
OF NORTEX ROYALTY COMPANY

1. The name of this corporation (the "Corporation") on the date of filing of the original Certificate of Incorporation of the Corporation with the Delaware Secretary of State on March 9, 1987, was Nortex Royalty Company. Upon the effectiveness of this Restated Certificate of Incorporation, the name of the Corporation will be North American Coal Royalty Company.

2. This Restated Certificate of Incorporation was duly adopted in accordance with the provisions of Section 245 of the General Corporation Law of the State of Delaware, having been duly proposed by the directors and adopted by the sole stockholder of the Corporation in accordance with Section 242 of the General Corporation Law of the State of Delaware.

FIRST: The name of the corporation (hereinafter called the Corporation) is North American Coal Royalty Company.

SECOND: The address of the Corporation's registered office in the State of Delaware is Corporation Trust Center, 1209 Orange Street, City of Wilmington, County of New Castle. The name of the Corporation's registered agent at such address is The Corporation Trust Company.

THIRD: The purpose of the Corporation is to engage in any lawful act or activity for which corporations may be organized under the General Corporation Law of Delaware.

FOURTH: The total number of shares of common stock which the Corporation shall have authority to issue is Seven Hundred and Fifty (750). All such shares shall be of the par value of $1.00 per share.

FIFTH: The board of directors of the Corporation shall have power to make, alter or amend the By-Laws of the Corporation.

SIXTH: The Corporation reserves the right at any time and from time to time to amend, alter, change or repeal any provision contained in this Restated Certificate of Incorporation, and other provisions authorized by the laws of the State of Delaware at the time in force may be added or inserted, in the manner now or hereafter prescribed by law; and all rights, preferences and privileges of whatsoever nature conferred upon stockholders, directors or any other persons whomsoever by and pursuant to this Restated Certificate of Incorporation in its present form or as hereafter amended are granted subject to the right reserved in this Article.

SEVENTH: To the full extent permitted by the General Corporation Law of the State of Delaware or any other applicable laws as presently or hereafter in effect, no member of the Board of Directors of the Corporation shall be personally liable to the Corporation or its stockholders for or with respect to any acts or omissions in the performance of his or her duties as a member of the Board of Directors of the Corporation. No amendment to or repeal of this Article Seventh shall apply to or have any effect on the liability or alleged liability of any member of the Board of Directors of the Corporation for or with respect to any acts or omissions of such member occurring prior to such amendment.

IN WITNESS WHEREOF, the undersigned does make this Restated Certificate of Incorporation, hereby declaring and certifying under penalties of perjury that this is his act and deed and the facts stated herein are true, and accordingly has hereunto set this hand this 13th day of July, 1988.

Thomas A. Koza, Vice President,
General Counsel and Secretary

I, Daniel G. Mitchell, the Assistant Secretary of the Corporation, do hereby attest that the foregoing Restated Certificate of Incorporation was duly adopted in accordance with the provisions of Section 245 of the General Corporation Law of the State of Delaware and, in witness whereof, I have hereunto set my hand this 13th day of July, 1988.

Daniel G. Mitchell,
Assistant Secretary

Addendum to Part 1, Item C (7), American Energy Corporation

208682

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LIMITED WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS, that THE NORTH AMERICAN COAL CORPORATION, an Ohio corporation ("Grantor"), in consideration of the sum of One Dollar ($1.00) and other good and valuable consideration received, does hereby GIVE, GRANT, BARGAIN, SELL AND CONVEY, with limited warranty covenants, unto NORTEX ROYALTY COMPANY, a Delaware corporation which is an affiliate of Grantor and whose tax mailing address is 2000 Schafer Street, Box No. 5500, Bismarck, North Dakota 58502-5500 ("Grantee"), its successors and assigns, upon the terms and conditions hereinafter set forth, all of those interests in the surface of and the coal, oil, gas and other minerals in and underlying and that can be produced from lands situated in the County of Belmont, State of Ohio, which interests were conveyed to Grantor by the deeds listed in Exhibit I which is attached hereto and made a part hereof, together with all improvements existing thereon and all appurtenant rights, privileges and easements thereunto belonging and all rents, issues and profits thereof.

PAID $20.00

EXCEPTING AND RESERVING from the above described premises all portions or areas of all seams or veins of coal in which mining operations previously have been conducted by any person, it being the intent of the Grantor to convey unmined portions or areas of coal seams only.

TO HAVE AND TO HOLD the above described premises unto the said Grantee, its successors and assigns forever.

This deed is subject to all leases, covenants, conditions, exceptions, reservations, restrictions, easements, legal highways, limitations and other matters now of record or that would be revealed by an inspection of the above described premises and zoning restrictions, if any, and Grantee, in accepting this deed, does, for itself and its successors and assigns, assume and agree to pay any and all taxes and assessments of every kind and description now due or which hereafter may become due.

IN WITNESS WHEREOF, the Grantor has caused this deed to be executed by its duly authorized officer on this 30th day of June, 1988.

SIGNED AND ACKNOWLEDGED
IN THE PRESENCE OF:

George W. Bartlett, Jr.

Lynda Dailey

THE NORTH AMERICAN COAL CORPORATION

By Clifford R. Miercort
Clifford R. Miercort, President

VOL 660 PAGE 87

NA$4/LWDB



87

ACKNOWLEDGMENT

VOL 660 PAGE 88

STATE OF TEXAS )
) SS
COUNTY OF DALLAS )

BEFORE ME, the undersigned authority, a Notary Public in and for said County and State, personally appeared Clifford R. Miercort, known to me (or satisfactorily proven) to be the person and officer whose name is subscribed to the within instrument, and acknowledged that the same was the act of said The North American Coal Corporation and that he executed the same for the purposes therein expressed and in the capacity therein stated.

IN WITNESS WHEREOF, I hereunto set my hand and official seal this 30th day of June, 1988.

Margaret H. Cain
Notary Public

MARGARET H. CAIN
MY COMMISSION EXPIRES
March 25, 1993

THIS INSTRUMENT WAS PREPARED BY:

Andrew S. Good, Esq.
12800 Shaker Boulevard
Cleveland, Ohio 44120

NEW DESCRIPTION
NECESSARY FOR FUTURE
TAX MAP TRANSFER
BY F.F. Bennett
FRED F. BENNETT
BELMONT COUNTY ENGINEER

RECORDED
STANLEY SIMONCIC
RECORDER
JAN 22 1990
Jan 19 12 33 PM '90
VOL 660 PAGE 88
RECEIVED
BELMONT CO. RECORD OF

TRANSFERRED
FEE 19.50 DATE 1-19-90
SECT. 319.202 R.C. FEE EX-H
J. PAPPANO, AUDITOR
Shirl R. Kaplet DEPUTY

NA#4/LWDB

EXHIBIT I



BELMONT COUNTY PROPERTY

| Tract No. | Parcel | Grantor | Grantee | Remarks | Volume | Page |
|---|---|---|---|---|---|---|
| 83 | 1 | Rail & River Coal Company | The North American Coal Corporation | 161.24 ac. | 388 | 424 |
| 99 | 8 | " " " " | " " " | 153.29 ac. | " | " |
| 105 | | " " " " | " " " | 224.50 ac. | " | " |
| 106 | 1 | " " " " | " " " | 159.98 ac. | " | " |
| | 2 | " " " " | " " " | 43.48 ac. | " | " |
| | 3 | " " " " | " " " | 10.0 ac. | " | " |
| | 4 | " " " " | " " " | 24.52 ac. | " | " |
| 107 | 1 | " " " " | " " " | 12.0 ac. | " | " |
| | 2 | " " " " | " " " | 51.65 ac. | " | " |
| 108 | | " " " " | " " " | 38.45 ac. | " | " |
| 109 | | " " " " | " " " | 66.96 ac. | " | " |
| 110 | 2 | " " " " | " " " | 8.0 ac. | " | " |
| 111 | | " " " " | " " " | 212.05 ac. | " | " |
| 112 | | " " " " | " " " | 145.44 ac. | " | " |
| 113 | 1 | " " " " | " " " | 71.5 ac. | " | " |
| | 2 | " " " " | " " " | 1.0 ac. | " | " |
| 114 | 1 | " " " " | " " " | 67.64 ac. | " | " |
| | 2 | " " " " | " " " | 80.00 ac. | " | " |
| | 3 | " " " " | " " " | 12.5 ac. | " | " |
| 115 | | " " " " | " " " | 90.18 ac. | " | " |
| 116 | 3 | " " " " | " " " | 6.49 ac. | " | " |
| 123 | 1 | " " " " | " " " | 160.21 ac. | " | " |
| 125 | 1 | " " " " | " " " | 161.0 ac. | " | " |
| | 2 | " " " " | " " " | 103.0 ac. | " | " |

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EXHIBIT I



BELMONT COUNTY PROPERTY

| Tract No. | Parcel | Grantor | Grantee | Remarks | Volume | Page |
|---|---|---|---|---|---|---|
| 126 | | Rail & River Coal Company | The North American Coal Corporation | 100.0 ac. | 388 | 424 |
| 127 | 1 | " " " " | " " " | 15.98 ac. | " | " |
| | 2 | " " " " | " " " | 6.52 ac. | " | " |
| 128 | 1 | " " " " | " " " | 134.51 ac. | " | " |
| 129 | | " " " " | " " " | 75.0 ac. | " | " |
| 130 | 1 | " " " " | " " " | 25.2 ac. | " | " |
| | 2 | " " " " | " " " | 5.39 ac. | " | " |
| 131 | | " " " " | " " " | 31.15 ac. | " | " |
| 132 | | " " " " | " " " | 25.23 ac. | " | " |
| 133 | | " " " " | " " " | 38.0 ac. | " | " |
| 134 | 1 | " " " " | " " " | 154.0 ac. | " | " |
| | 2 | " " " " | " " " | 42.0 ac. | " | " |
| | 3 | " " " " | " " " | 6.0 ac. | " | " |
| | 4 | " " " " | " " " | 14.52 ac. | " | " |
| | 5 | " " " " | " " " | 1.0 ac. | " | " |
| 135 | | " " " " | " " " | 45.0 ac. | " | " |
| 136 | | " " " " | " " " | 93.21 ac. | " | " |
| 137 | | " " " " | " " " | 45.56 ac. | " | " |
| 138 | | " " " " | " " " | 22.54 ac. | " | " |
| 139 | 3 | " " " " | " " " | 78.0 ac. | " | " |
| 140 | 1 | " " " " | " " " | 53.79 ac. | " | " |
| | 3 | " " " " | " " " | 8.98 ac. | " | " |
| 141 | | " " " " | " " " | 7.0 ac. | " | " |

EXHIBIT I

BELMONT COUNTY PROPERTY



| Tract No. | Parcel | Grantor | Grantee | Remarks | Volume | Page |
|---|---|---|---|---|---|---|
| 142 | 1 | Rail & River Coal Company | The North American Coal Corporation | 87.55 ac. | 388 | 424 |
| 143 | | " " " " | " " " | 160.0 ac. | " | " |
| 144 | | " " " " | " " " | 65.0 ac. | " | " |
| 145 | 1 | " " " " | " " " | 87.0 ac. | " | " |
| | 3 | " " " " | " " " | 40.0 ac. | " | " |
| 146 | | " " " " | " " " | 30.0 ac. | " | " |
| 147 | 1 | " " " " | " " " | 64.5 ac. | " | " |
| 148 | | " " " " | " " " | 66.45 ac. | " | " |
| 149 | 1 | " " " " | " " " | 109.73 ac. | " | " |
| 150 | 1 | " " " " | " " " | 122.0 ac. | " | " |
| 151 | | " " " " | " " " | 39.75 ac. | " | " |
| 152 | | " " " " | " " " | 49.68 ac. | " | " |
| 153 | | " " " " | " " " | 111.0 ac. | " | " |
| 155 | 2 | " " " " | " " " | 40.786 ac. | " | " |
| 156 | | " " " " | " " " | 155.293 ac. | " | " |
| | 1 | Youghiogheny & Ohio Coal Co. | " " " | 44.225 ac. | 514 | 564 |
| 1 | | Thomas M. Minder | " " " | 40.63 ac. | 417 | 409 |
| 2 | | " " " | " " " | 4.89 ac. | " | " |
| 3 | | " " " | " " " | 4.89 ac. | " | " |

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EXHIBIT 1

BELMONT COUNTY PROPERTY

| Tract No. | Parcel | Grantee | Grantor | Remarks | Volume | Page |
|---|---|---|---|---|---|---|
| 1 | 1 | Powhatan Mining Company | Belmont County Sheriff, Cloyd L. Barricklow | 164.61 ac. | 357 | 623 |
| 1 | 2 | " " " | " " " | 9.26 ac. | " | " |
| 2 | | " " " | " " " | 136.1 ac. | " | " |
| 3 | 1 | " " " | " " " | 81.00 ac. | " | " |
| 3 | 2 | " " " | " " " | 52.00 ac. | " | " |
| 4 | 1 | " " " | " " " | 148.79 ac. | " | " |
| 4 | 2 | " " " | " " " | 140.0 ac. | " | " |
| 4 | 3 | " " " | " " " | 13.66 ac. | " | " |
| 4 | 4 | " " " | " " " | 88.83 ac. | " | " |
| 4 | 5 | " " " | " " " | 150.0 ac. | " | " |
| 5 | 1 | " " " | " " " | 35.86 ac. | " | " |
| 5 | 2 | " " " | " " " | 6.19 ac. | " | " |
| 5 | 3 | " " " | " " " | 18.74 ac | " | " |
| 5 | 4 | " " " | " " " | 11.55 ac. | " | " |
| 6 | 1 | " " " | " " " | 101.00 ac. | " | " |
| 6 | 2 | " " " | " " " | 160.0 ac. | " | " |
| 6 | 3 | " " " | " " " | 55.68 ac. | " | " |
| 6 | 4 | " " " | " " " | 50.79 ac. | " | " |
| 6 | 5 | " " " | " " " | 12.69 ac. | " | " |

EXHIBIT I

Page 5 of 7

BELMONT COUNTY PROPERTY

| Tract No. | Parcel | Grantee | Grantor | Remarks | Volume | Page |
|---|---|---|---|---|---|---|
| 6 | 6 | Powhatan Mining Company | Belmont County Sheriff, Cloyd L. Barricklow | 32.5 ac. | 357 | 623 |
| 6 | 7 | " " " | " " " | 8.72 ac. | " | " |
| 6 | 8 | " " " | " " " | 14.66 ac. | " | " |
| 6 | 9 | " " " | " " " | 62.93 ac. | " | " |
| 7 | 1 | " " " | " " " | 145.10 ac. | " | " |
| 7 | 2 | " " " | " " " | 151.07 ac. | " | " |
| 7 | 3 | " " " | " " " | 143.0 ac. | " | " |
| 7 | 4 | " " " | " " " | 64.23 ac. | " | " |
| 8 | 1 | " " " | " " " | 24.0 ac. | " | " |
| 8 | 2 | " " " | " " " | 7.5 ac. | " | " |
| 9 | 1 | " " " | " " " | 32.39 ac. | " | " |
| 9 | 2 | " " " | " " " | 21.31 ac. | " | " |
| 9 | 3 | " " " | " " " | 71.69 ac. | " | " |
| 9 | 4 | " " " | " " " | 103.02 ac. | " | " |
| 10 | | " " " | " " " | 4.4 ac. | " | " |
| 11 | | " " " | " " " | 83.61 ac. | " | " |
| 12 | 1 | " " " | " " " | 108.42ac. | " | " |
| 12 | 2 | " " " | " " " | 70.79 ac. | " | " |
| 13 | 1 | " " " | " " " | 42.98 ac. | " | " |
| 13 | 2 | " " " | " " " | 10.0 ac. | " | " |

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EXHIBIT 1

BELMONT COUNTY PROPERTY

| Tract No. | Parcel | Grantee | Grantor | Remarks | Volume | Page |
|---|---|---|---|---|---|---|
| 1 | | Powhatan Mining Company | W. T. McCort, Belmont County Auditor | 28.84 ac. | 417 | 143 |
| 2 | 1 | " " " | " " " | 18.69 ac. | " | " |
| 2 | 2 | " " " | " " " | 10.0 ac. | " | " |
| 3 | | " " " | " " " | 80.88 ac. | " | " |
| 1 | | " " " | George & Mary Thornburg | 88.83 ac. | 361 | 27 |

Addendum to Part 1, Item C (7), American Energy Corporation

AEC 03131

95

VOL 660 PAGE 95

EXHIBIT 1

BELMONT COUNTY PROPERTY (SURFACE & COAL)



| Tract No. | Grantor | Grantee | Remarks | Volume | Page |
|---|---|---|---|---|---|
| 8 | Henderson Gable Coal Co. | Crabapple Coal Co. | 2.50 ac. | 217 | 237 |
| 9 | Henderson Gable Coal Co. | Crabapple Coal Co. | 23.5 ac. | 217 | 238 |
| 1 | David Lyle | Warner Collieries * | 101.99 ac. | 370 | 153 |
| 1 | Warner Wheeling Co. | Warner Collieries * | 144.74 ac. | 298 | 548 |
| 2 | Warner Wheeling Co. | Warner Collieries * | 104.23 ac. | 298 | 549 |
| 1 | Stanley A. Lyle | Warner Collieries * | 1.25 ac. | 332 | 585 |
| 5 | Warner Wheeling Co. | Warner Collieries* | 35.19 | 298 | 548 |
| 8 | Warner Wheeling Co. | Warner Collieries* | 2.82 | 298 | 548 |

*Warner Collieries and The North American Coal Corporation merged on March 12, 1959, Volume 452, Page 158.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## RIGHT-OF-ENTRY AFFIDAVIT

Applicant's Name **American Energy Corporation**

## RIGHT-OF-ENTRY AFFIDAVIT

State of **Ohio**, **Belmont** County, ss. **James R. Turner, Jr.** being first duly sworn, says that the following described documents convey to the applicant the legal right explained below and is a subject of litigation as shown below.

Type of document **Lease**

Execution Date **February 1, 2002**

Expiration Date **Until all mineable and merchantable coal has been depleted**

Parties: From **Consolidated Land Company** to **American Energy Corporation**

Description of land: Number of Acres **1698.367**

County **Belmont** Township **Washington**

Section **14, 15, 20, 21, 26, and 27** Lot

Explanation of legal rights claimed **See Addendum to Right-of-Entry Affidavit**

Pending litigation Yes ☐ No ☒

| Signature of Affiant | 7/9/09 Date | TREASURER Position |
|---|---|---|

Sworn to before me and subscribed in my presence this 9th day of, July, 2009

Notary Public

JULIE WEBB
Notary Public, State of Ohio
My Commission Exp. May 14, 2013

**Part 1: Section C**

02/06
DNR-744-9060

# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION

PAID 3134 — 11787 — VOL 707 PAGE 1

LIMITED WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS: THAT, WYOMING POCAHONTAS LAND CO., (fka Youghiogheny and Ohio Coal Company) an Ohio corporation, with office at 39 Robin Place, Beckley, WV 25801, hereinafter called "GRANTOR", in consideration of the sum of Ten Dollars ($10) and other valuable considerations to it paid by Consolidated Land Company, an Ohio corporation, whose tax mailing address is Box 505, 34208 Aurora Road, Solon, Ohio 44139, hereinafter called "GRANTEE", the receipt and sufficiency of which are hereby acknowledged, does hereby GRANT, BARGAIN, SELL AND CONVEY with limited warranty covenants, to the Grantee, its successors and assigns, all of the remaining coal contained in or underlying the tracts of land more particularly described on Exhibit "A", attached hereto and made a part hereof.

TOGETHER with such mining rights and other rights and privileges pertinent to the tracts set forth on Exhibit "A".

(HEREINAFTER CALLED THE "Premises").

The Grantor makes no guarantee or warranty with respect to the quality or quantity of coal remaining in said premises herein conveyed and Grantee accepts said premises known as the Allison Mine in its present condition and circumstance.

TO HAVE AND TO HOLD such premises, unto the said Grantee, its successors and assigns, forever, EXCEPT AND SUBJECT as hereinbefore provided, and expressly SUBJECT to all legal highways, exceptions, reservations, conditions, servitudes, easements, rights, limitations and restriction shown by instrument of record.

AND the said Grantor hereby covenants with the said Grantee that said premises are free and clear from all encumbrances by, from or through the said Grantor, and except and subject as hereinbefore provided, and that the Grantor will warrant and defend the same to the Grantee, only as against the lawful claims

# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION



and demands of all persons claiming by, through or under the said Grantor herein, but against none other.

All of the aforedescribed Parcels are conveyed SUBJECT TO:

(1) All matters of record as of the 1st day of March, 1995, said matters of record include but are not limited to the provisions contained in the description hereinbefore set forth and the provisions contained in all prior conveyances of record;

(2) All liens for nondelinquent real property taxes and assessments;

IT is the intent of the Grantor herein to convey to the Grantee, its successors and assigns all of the Pittsburgh No. 8 coal and mining rights appurtenant thereto, situated in Belmont County, Ohio, of which the Grantor is seized at the date hereof.

IN WITNESS WHEREOF, Grantor has caused its name to be hereunto subscribed by its duly authorized officers, this 24th day of February, 1995.

Signed and acknowledged in the presence of:

Rama Blevins
Rama Blevins

David Dove
David Dove

Denise V. Stewart
Denise V. Stewart

Karen Joseph
Karen Joseph

[NOTE: TYPE OR PRINT NAME OF WITNESSES UNDER EACH SIGNATURE]

WYOMING POCAHONTAS LAND CO.,
an Ohio Corporation

By _____
Hubert Payne
Its President

By Lauren Slone
Lauren Slone
Its Secretary

STATE OF West Virginia,
COUNTY OF Raleigh, SS:

On this the 24th day of February, 1995, before me, the undersigned Notary Public, personally appeared Hubert Payne, who acknowledged himself to be President of Wyoming Pocahontas Land Co., an Ohio corporation, and that as such officer being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation as President.

IN WITNESS WHEREOF, I hereunto set my hand and Notarial seal.

Rama R Blevins
Notary Public
My Commission Expires: Dec 25, 2001

OFFICIAL SEAL
NOTARY PUBLIC
STATE OF WEST VIRGINIA
RAMA R. BLEVINS
P.O. BOX 1546
SOPHIA, WV 25921
My Commission Expires Dec. 25, 2001

# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION

STATE OF Kentucky, VOL 707 PAGE 3
COUNTY OF Floyd, SS:

On this the 2nd day of March, 1995, before me, the undersigned Notary Public, personally appeared Lauren Slone, who acknowledged herself to be Secretary of Wyoming Pocahontas Land Co., an Ohio corporation, and that as such officer being authorized to do so, executed the foregoing instrument for the purposes therein contained by signing the name of the corporation as Secretary.

IN WITNESS WHEREOF, I hereunto set my hand and Notarial seal.

Denise V. Stewart
Notary Public
My Commission Expires: March 3, 1997

DENISE V. STEWART NOTARY PUBLIC STATE AT LARGE, KY.

This Instrument Prepared By:
HANLON, DUFF, PALEUDIS & ESTADT CO., LPA
46457 National Road West
St. Clairsville, OH 43950

NEW DESCRIPTION
NECESSARY FOR FUTURE
TAX MAP TRANSFER
BY R E Hanlon
FRED F. BENNETT
BELMONT COUNTY ENGINEER

TRANSFERRED
FEE $62.00 DATE 3-24-95
SECT. 319.202 R.C. FEE $14,400.00
J.A. RAPPANO, AUDITOR
Diane Appolloni DEPUTY

BELMONT CO. RECORD OF Deeds
VOL 707 PAGE 1
MAR 24 3 45 PM '95
RECORDED MAR 27 1995
STANLEY S. [illegible]
RECORDER

South 86°-07'-36" East 1159.81 feet to a point of intersection between line of exchange herein and North line of Section 13, said point also being the Northeast corner of said Tract No. 1; thence leaving the North line of Section 13 and with the line of exchange herein South 15°-20'-00" West 2051.46 feet to a point on said line of exchange which is also the Southeast corner of said Tract No. 1; thence with said line of exchange North 60°-26'-46.76" West distance to a point on the West line of Section 13 which is also the Southwest corner of said Tract No. 1; thence leaving the line of exchange herein and with the West line of Section 13 North 3°-48'-42" East 1649.71 feet to the place of beginning, containing 40.969 acres, more or less.

TOGETHER with the free and uninterrupted right of way into, upon and under said coal and land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining, ventilating and carrying away said coal; hereby waiving all surface damages and right of support to overlying strata, and damages of any sort arising therefrom or through the removal of all the said coal; together with the privilege of mining and removing through and over said described premises other coal belonging to said party of the second part, his heirs, and assigns, or which may hereafter be acquired by said party of the second part. Said parties of the first part reserve the right to drill for oil and gas through the said coal.

TRACT NO. 2 2-8-2

Situated in Washington Township and being a part of the Southwest quarter of Section 14, Township 5, Range 4; beginning at the Northwest corner of said tract, which is also the Northwest corner of the East half of the Southwest quarter of Section 14, which bears South 86°-07'-36" East 1327.49 feet; thence North 3°-35'-44" East 2635.68 feet from the Southwest corner of Section 14; thence with the North line of the East half of the Southwest quarter South 86°-30'-05" East 379.93 feet to a point of intersection between the North line of the East half of the Southwest quarter and the line of exchange herein, which is also the Northeast corner of said TRACT NO. 2; thence leaving the North line of the East half of the Southwest quarter of Section 14, and with the line of exchange herein South 15°-20'-00" West 1867.58 feet to a point of intersection between the said line of exchange herein and the West line of the East half of the Southwest quarter of Section 14, which is also the southerly most point of said TRACT NO. 2; thence leaving the line of exchange herein and with the said West line of the East half of the Southwest quarter of Section 14 North 3°-35'-44" East 1827.88 feet to the place of beginning, containing 7.971 acres, more or less.

The total acreage of said coal lands herein conveyed in TRACTS 1 and 2 of PART 8 being 48.940 acres, more or less.

TOGETHER with the free and uninterrupted right of way into, upon and under said coal and land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining, ventilating and carrying away said coal; hereby waiving all surface damages, or damages of any sort arising therefrom or through the removal of all the said coal; together with the privilege of mining and removing through and over said described premises other coal belonging to said party of the second part, his heirs, and assigns, or which may hereafter be acquired by said party of the second party. Said parties of the first part reserve the right to drill for oil and gas through the coal, but not so as to interfere with any entry or opening that may have been made through said coal for the purpose of mining or removing same, and in case any oil or gas well should be drilled through said coal or coal mines, such well shall be cased through the coal with iron or steel pipe, which shall be allowed to remain permanently to protect such coal or coal mine from being

injured by either water or gas escaping into said coal or coal mine.

The above described TRACTS 1 and 2 are a part of the premises conveyed to The Powhatan Mining Company by John Howard Pew, et al. by Deed dated September 14, 1943, recorded in Volume 343, Page 355 Deed Records of Belmont County, Ohio.

The previous Grantor, North American Coal Corporation, claimed title to the above described premises by virtue of Merger Agreement dated January 1, 1959, recorded in Volume 441, Page 630, Deed Records of Belmont County, Ohio.

The total acreage of said coal lands herein conveyed in TRACTS 1 and 2 being 48.940 acres.

PRIOR DEED REFERENCE: Volume 552, Page 289, Belmont County Deed Records.

PART 9

ALL the Pittsburgh No. 8 coal in and under the hereinafter described tracts of land:

Situated in Goshen and Warren Townships, Belmont County, Ohio, and being described as follows:

TRACT NO. 1: Situated in Goshen Township, Belmont County, Ohio, and in Section 34, Township 7, Range 5, and being the whole of said Section 34, but excepting therefrom the following described parcels:

Parcel No. 1: Being a part of the Southeast quarter of said Section 34, beginning at the southeast corner of said Section 34; thence with the south line of said Section 34, West, 1740.00 feet to a point; thence North 0° 30' East, 99.00 feet to a point; thence North 50° 00' East, 201.30 feet to a point; thence North, 79.70 feet to a point; thence North 83° 45' East, 1169.85 feet to a point; thence North, 14° 00' West, 221.92 feet to a point; thence North 28° 15' West, 118 feet to a point; thence South 75° 30' West, 312.84 feet to a point; thence North 24° 00' West, 328.02 feet to a point; thence North 77° 15' East, 262.84 feet to a point; thence North 22° 15' West, 300 feet to a point; thence North 27° 15' West, 727.98 feet to a point; thence South 75° 30' West, 23.88 feet to a point; thence North 27° 00' West, 66 feet to a point; thence North 63° 00' East, 478.50 feet to a point; thence North 70° 45' East, 830.25 feet to a point on the east line of said Section 34; thence with the east line of said Section 34, South, 2551.00 feet to the beginning, containing 57.73 acres, more or less. Being the same tract of coal and mining rights, that were conveyed by O. J. Mechling, Jr., et ux., to Amy R. Robinson, as First Tract in deed dated June 3, 1948, and recorded in Volume 381, Page 426, of Belmont County Deed Records.

Parcel No. 2: Being a part of the southeast quarter of said Section 34, beginning at a point at the southwest corner of said Parcel No. 2; from which the southeast corner of said Section 34 bears South, 79.70 feet; thence South 50° 00' West, 201.30 feet; thence South 0° 30' East, 99.00 feet to the south line of said Section 34; thence East, 1740.50 feet with the south line of said Section 34 to the said southeast corner of same; thence from said place of beginning, North, 1578.555 feet to a point; thence North 76° 30' East, 440.88 feet to a point; thence South 27° 15' East, 727.98 feet to a point; thence South 22° 15' East, 299.97 feet to a point; thence South 77° 15' West, 262.845 feet to a point; thence South 24° 00' East, 328.02 feet to a point; thence North 75° 30' East, 312.84 feet to a point ;thence South 28° 15' East, 117.97 feet to a point; thence South 14° 00' East, 221.92 feet to



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deed dated April 23, 1919, and recorded in Volume 220, Page 176, of Belmont County, Ohio, Deed Records; and the same, an undivided one-half interest in which was conveyed, as "Twelfth", by Chester D. Sensenich, et ux., to Zelma S. Kuhn, Ila M. Sensenich, Chester G. Sensenich, Louis E. Sensenich, Boyd S. Sensenich, Gray F. Sensenich and Earl W. Sensenich in deed dated January 21, 1937, and recorded in Volume 310, Page 99, of Belmont County, Ohio, Deed Records; and the same, an undivided one-half interest in which was conveyed, as part of TRACT NINE, by Cloyd L. Barricklow, Sheriff of Belmont County, Ohio, to Louis E. Sensenich, Earl W. Sensenich, Boyd S. Sensenich, Chester G. Sensenich, Ila M. Sensenich, Zelma S. Kuhn and Gray F. Sensenich in deed dated November 5, 1945, and recorded in Volume 359, Page 368, of Belmont County, Ohio, Deed Records.

The acreages of Pittsburgh or No. 8 seam of coal conveyed herein, in Warren Township, Township 8, Range 6, are, Section 1, 289.194 acres, Section 7, 519.410 acres, and Section 8, 11.21 acres, or a total of 819.814 acres of said coal.

TOGETHER with all and singular, the improvements, ways, water, water courses, rights, liberties, privileges, hereditaments and appurtenances whatsoever thereunto belonging, or in anywise appertaining, and the reversions and remainders, rents, issues and profits thereof; and all the estate, right, title, interest, property, claim and demand whatsoever of the said parties of the first part, in law, equity or otherwise, howsoever, of, in and to the same and every part thereof.

TO HAVE AND TO HOLD the said coal as hereinabove described, the hereditaments and premises hereby granted, or mentioned, and intended so to be, with the appurtenances, unto the said party of the second part, its successors and assigns, to and for the only proper use and behoof of the said party of the second part, its successors and assigns, FOREVER.

PRIOR DEED REFERENCE: Volume 500, Page 1, Belmont County Deed Records.

PART 13

BLOCK I

All the stone coal contained in the vein commonly known as the Pittsburgh Vein and geologically known as Seam No. 8, in and underlying all the following tracts or parcels of land described in this Block numbered I hereof, situated in the County of Belmont and State of Ohio:

PARCEL NO. 1 - WASHINGTON TOWNSHIP

First Tract 2-13-1

Known as and being the southeast quarter of the southeast quarter of Section Twenty-One (21), Township Five (5), Range Four (4), in the District of Lands formerly subject to sale at Marietta, Ohio; containing Forty (40) Acres, more or less.

Second Tract 2-13-2

Known as and being the southwest quarter of the southeast quarter of Section Twenty-one (21), Township Five (5), Range Four (4), in the District of Lands formerly subject to sale at Marietta, Ohio; containing Forty (40) Acres, more or less.



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# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION

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PARCEL NO. 5 (1-8) - WASHINGTON TOWNSHIP

The undivided four-fifths (4/5) interest in the east half of the west half of the southwest quarter of Section thirty-three (33), Township Five (5), Range four (4), in the Marietta District, containing forty (40) acres, more or less;

Also all that part of the east half of said southwest quarter lying on the west side of Wildcat Run, the meanderings of said Wildcat Run are the boundaries, containing in said last mentioned tract thirty (30) acres, more or less, and containing in both tracts seventy (70) acres, more or less.

PARCEL NO. 6 (10) - WASHINGTON TOWNSHIP 2-13-10, 2-13-11, 2-13-12

Known as and being the southwest quarter of the southwest quarter of Section 14, Township 5, Range 4, in the District of Lands subject to sale at Marietta, Ohio, containing 40 acres, more or less.

Also the southeast quarter of the southeast quarter of Section 20, Township 5, Range 4, in the District of Lands subject to sale at Marietta, Ohio, containing 40 acres, more or less.

Also the southwest quarter of the southeast quarter of Section 20, Township 5, Range 4, in the District of Lands subject to sale at Marietta, Ohio, containing 40 acres, more or less.

Also the northeast quarter of the northeast quarter of Section 19, Township 5, Range 4, containing 39.95 acres, more or less. 2-13-13

PARCEL NO. 7 (12) - WAYNE TOWNSHIP 2-13-14

Known as and being the middle part of the southeast quarter of Section one (1), Township six (6), and Range five (5); beginning for the same at a stone in the quarter section line 38.72 rods east from the center of said section one; thence running with the quarter section line south 87½ degrees east 13.06 chains to a stake; thence south 2½ degrees west 11.50 chains to a stake in the center of County Road; thence with said road North 74½ degrees east 7.70 chains to a stake; thence south 39¼ degrees east 6.15 chains to a stake in the center of the B. Z. & C. Railroad track; thence south 30½ degrees west 1 chain; south 37-3/4 degrees west 1 chain; south 40-3/4 degrees west 4 chains; south 37 degrees west 2 chains; south 31½ degrees west 1.50 chains; south 24¼ degrees west 6.50 chains to a stake in the center of the R. road; thence north 87-3/4 degrees west 18.29 chains to the east side of orchard; thence north 63¼ degrees west 5.94 chains to the west side of orchard; thence north 58-3/4 degrees west 4.38 chains to a locust tree, 6 inches in diameter; thence north 51 degrees east 1.54 chains to center of the County Road; thence with said road north 32 degrees east 1.80 chains; thence north 38 degrees east 5.59 chains; north 44 degrees east 2.27 chains; north 55½ degrees east 1.79 chains; north 38½ degrees east 4.50 chains to a stake, witness R. oak 15 inches bearing north 4 degrees east distance 90½ links; thence north 2½ degrees east 9.22 chains to the place of beginning, containing sixty (60) acres, more or less.

PARCEL NO. 8 (13) - WAYNE TOWNSHIP

Known as and being the north end of the east half of the southeast quarter of Section Nine (9), Township Six (6), Range Five (5); beginning at the original quarter corner on the east boundary of said section, station 1; thence south seven minutes east 45.84 poles to station 2 in Long Run; thence up said Run with its meanderings south 74-3/4 degrees west 12.7 poles to station 3; thence south 79½ degrees west 33.3 poles to station 4; thence south 87½ degrees west 18 poles to station 5; thence south 75 degrees west 17.8 poles to station 6 where the west boundary

of said half quarter crosses said run; thence with said west boundary of said half quarter north eighteen minutes east 62 poles to station 7, the north west corner of said half quarter; thence with the north boundary of said half quarter south 89¼ degrees east 80.2 poles to the place of beginning, containing twenty-seven Acres and Twenty-nine and one-half poles, more or less. Being the same tract of land devised by John Creighton in his last will and testament to Sarah Creighton, Jane Creighton and Elizabeth Creighton, dated January 21st, 1873.

2-13-16

PARCEL NO. 9 (16) - WAYNE TOWNSHIP

Known as and being the east half of the northeast quarter of Section Nine (9), Township Six (6), Range Five (5), in the District of Lands subject to sale at Marietta, Ohio, containing Eighty (80) Acres, more or less.

PARCEL NO. 10 (17) - WAYNE TOWNSHIP

Known as and being a part of the east half of the southwest quarter of Section 2, Township 6, Range 5, described as follows: Beginning for the same at the northwest corner of said half quarter; thence east 40 rods and 6 links to Pina Fork of Captina Creek; thence up said Pina Fork south 40¾ degrees west 18 rods and 11 links; thence south 71 degrees west 32 rods to the western boundary of said half quarter; thence north 28¾ rods to the place of beginning, containing 4¾ acres, more or less.

PARCEL NO. 11 (18) - WAYNE TOWNSHIP

Known as being the northeast quarter of Section One (1), Township Six (6), Range Five (5), EXCEPTING THEREFROM the following described tracts:

First Tract

Being a northeast part of the northeast quarter of said section, bounded as follows: Commencing at the northeast corner of said Section 1; thence south on the township line 46.76 rods to a stone; thence north 73 degrees west 15.36 rods; thence north 66 degrees west 24.84 rods to a stone in a bottom; thence north 9 degrees east 32.62 rods to a Black Walnut on section line; thence east 32.76 rods to the place of beginning, containing 8.73 Acres, be the same more or less.

Second Tract

Being a part of the northeast quarter of said Section, bounded as follows: Commencing at the southeast corner of said quarter section; thence west 80 rods to a stone; thence north 20 rods to a stone; thence east 80 rods to a B. Walnut on the township line; thence south 20 rods to the place of beginning, containing 10 acres, more or less.

Third Tract

Being a part of the northeast quarter of said section; beginning for the same at the southwest corner of said quarter section and running thence north 20 rods to a stone; thence east 80 rods to a stone; thence south 20 rods to a stone; thence west 80 rods to the place of beginning, containing 10 acres, more or less.

Leaving in said northeast quarter of Section 1, after said exceptions, 130.60 acres, more or less.

PARCEL NO. 12 (19) - WASHINGTON TOWNSHIP 2-13-19

Known as and being the northwest quarter of the southeast quarter of Section Twenty (20), Township Five (5), Range Four (4), in the



AEC 03141

District of Lands formerly sold at Marietta, Ohio, containing Forty (40) Acres, more or less.

PARCEL NO. 13 (20) - WAYNE TOWNSHIP

Known as and being a part of the southwest quarter of the northeast quarter of Section One (1), Township Six (6), Range Five (5), beginning for the same at the southwest corner of said quarter section and running thence north 20 rods to a stone; thence east 80 rods to a stone; thence south 20 rods to a stone; thence west 80 rods to the place of beginning, containing Ten (10) Acres, more or less.

PARCEL NO. 14 (21) - WASHINGTON TOWNSHIP

Known as and being the southeast quarter of the northeast quarter of Section Nineteen (19), Township Five (5), Range Four (4), in the District of lands formerly subject to sale at Marietta, Ohio, containing Forty (40) Acres; also Twelve Acres, off the north side of the south-west quarter of the northeast quarter of Section Ninetten (19), Township Five (5), Range Four (4), in the District of Lands formerly subject to sale at Marietta, Ohio. The premises above conveyed are same which were conveyed to Martha J. Carpenter by her husband, Wesley B. Carpenter, by deed dated July 1st, 1897, and recorded in Volume 140 at Page 557 of deed records of said County.

PARCEL NO. 15 (22) - WAYNE TOWNSHIP

Known as and being the south east part of the south east quarter of the south east quarter of Section One (1), Township Six (6), Range Five (5), beginning for the same at the southeast corner of said section running thence north 87½ degrees west 18.22 chains to the center of the B. Z. & C. Railroad track; thence with the center of said railroad track north 23 degrees east 3.81 chains; north 18¼ degrees east 5.21 chains; north 24¼ degrees east 7.57 chains to a stake; thence south 66½ degrees east 13.53 chains to a stone in the section line; thence with said line south 2½ degrees west 10 chains to the place of beginning; containing Twenty (20) Acres, more or less.

PARCEL NO. 16 (23) - WASHINGTON TOWNSHIP

First Tract

Known as and being the northwest quarter of the northeast quarter of Section Nineteen (19), in Township Five (5), Range Four (4), in the District of Lands subject to sale at Marietta, Ohio, containing Thirty-nine and ninety-five hundredths acres (39.95).

Second Tract

Situated in the Township of Washington, County of Belmont and State of Ohio, and known as and being the north part of the east half of the northwest quarter of Section Nineteen (19), Township Five (5), Range Four (4), commencing for the same at the northwest corner of said half quarter, running south ninety three and one third rods to a stake or stone; thence east eighty rods to a stone; thence north ninety-three and one-third rods to a stone; thence west eighty rods to the place of beginning, containing Forty-six and two-thirds acres, (46.66).

Third Tract

Situated in the Township of Washington, County of Belmont and State of Ohio, and known as and being part of the Southeast quarter of the northwest quarter of Section Nineteen (19), Township Five (5), Range Four (4) and bounded as follows, to-wit: on the north by the forty six and two thirds acre tract of said John S. Davis, last above described, on the south by the lands



AEC 03142

rods; thence north 31 rods; thence southeast 31 rods to the place of beginning, containing One acre, more or less.

PARCEL NO. 49 (58) - WASHINGTON TOWNSHIP

First Tract

The southeast Quarter of the southeast quarter of Section Thirty-two (32), Township five (5), Range four (4), containing forty acres more or less.

Second Tract

The northeast quarter of the northeast quarter of Section thirty-one (31), Township and Range aforesaid, containing forty acres, more or less.

Third Tract

Situate in the southwest quarter of the southeast quarter of Section 32, and in the northwest quarter of the northeast quarter of Section 31, Township and Range aforesaid; bounded and described as follows: Beginning at the northeast corner of the southwest quarter of the southeast quarter of Section 32; thence west with the north boundary of said quarter quarter, 38 poles to a corner on the east side of a small run; thence down said run to its junction with a large run, and to a large sand rock in a small drain near the top of the first bank on the south side of said large run; thence in a straight line to a white oak tree on a line dividing the northwest quarter of the northeast quarter of Section 31, east and west in the center; thence east with said center line 12 poles to the center of the west boundary of the northeast quarter of the northeast quarter of said Section 31; thence north with said west boundary and with the west boundary of the southeast quarter of the southeast quarter of Section 32, 120 poles to the place of beginning, containing Twenty acres, more or less.

Fourth Tract

Situate in the northwest corner of Section 25, Township and Range aforesaid, bounded and described as follows: Beginning for the same on the south bank of the right hand fork of Crabapple Creek and on the west boundary line of said Section; thence south with said line so far as will include one acre by running a line from the said Section line due east to the west bank of the left hand fork of said Crabapple Creek; thence down the said left hand fork to its junction with the right hand fork; thence up said right hand fork to the place of beginning, containing One Acre. And containing in all of said tracts, One Hundred and One (101) Acres, more or less; and being a part of the premises of which Jesse Taylor died seized.

PARCEL NO. 50 (59) - WASHINGTON TOWNSHIP

Known as and being the southwest quarter of the southwest quarter of Section thirty-one (31), Township five (5), Range four (4); also the southeast quarter of the southwest quarter of Section thirty-one (31), Township Five (5), Range four (4), containing in all Eighty Acres, more or less.

PARCEL NO. 51 (60) - WASHINGTON TOWNSHIP

First Tract 2-13-110

Being a part of the west half of Section 20, Township 5, Range 4, and a part of the northeast quarter of Section 26, Township 5, Range 4; Beginning for the same at the northwest corner of said Section 20; thence south 25° east 265 poles; thence west 69 poles to a post planted in the run on the south boundary of said tract;



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thence north 12½° west 50 poles to a small ironwood; thence north 30-3/4° west 63 poles to a White Walnut standing on the west boundary of said Section 20; thence with said section line north 37 poles; thence north 35½° west 40 poles to a stone; thence north 37° west 85.70 poles to a stone on the north boundary of said Section 26; thence east 74.60 poles to the place of beginning; containing Ninety (90) Acres and Eighty-six (86) Perches, more or less.

Second Tract 2-13-111

Being a part of the west half of Section 20, Township 5, Range 4, and a part of the east half of Section 26, Township 5, Range 4; Beginning for the same at the northwest corner of the east half of said Section 26; thence south 187.15 poles; thence east 40 poles; thence south 13.35 poles to a stone; thence east 40 poles to the east boundary of said Section 26; thence south 40 poles to a stone; thence east 43 poles to a post planted in the run; thence north 12½° west 57 poles to an Ironwood; thence north 30¼° west 63 poles to a White Walnut on the west boundary of said Section 20; thence north 37 poles to a stone; thence north 35½° west 40 poles to a stone; thence north 37° west 85.70 poles to a stone on the north boundary of said Section 26; thence west 5.40 poles to the place of beginning; containing Ninety (90) Acres and Eighty (80) Perches, more or less.

EXCEPTING therefrom the following described tract, conveyed by Mathias Shipman to John Wright; beginning at a stone at the northwest corner of the east half of the northeast quarter of said Section 26; thence east 2 rods; thence south 32° east 27½ rods to a stone; thence South 45° west 25 rods to a stone; thence north 40 rods to the place of beginning; containing 2 acres and 33 perches, more or less.

EXCEPTING ALSO the following described tract, being a part of the east half of the southeast quarter of Section 26, and commencing for the same at a point in said east half quarter, 40 rods south of the north boundary and 14.55 rods west of the east boundary of said east half quarter section; thence west 25.45 rods; thence north 13.35 rods; thence west 40 rods to a stone planted; thence north 9/10 rods; thence east 60.36 rods; thence in a southerly direction 15.45 rods to the place of beginning; containing 3 acres, more or less.

Third Tract

Situated in the Township of Washington, County of Belmont and State of Ohio, and known as and being a part of the east half of the southeast quarter of Section 26, Township 5, Range 4, and beginning for the same at a point in the section line between Section 26 and Section 20, 61.81 rods south of the northeast corner of said half quarter section, and running thence north with said section line 21.81 rods to a point in said line 40 rods south of said northeast quarter corner; thence west 14.55 rods; thence in a straight line 26.22 rods to the place of beginning; containing 1 acre, more or less.

PARCEL NO. 52 (63) - WAYNE TOWNSHIP

Known as and being all that part of the southeast quarter of the northwest quarter of Section 2, Township 6, Range 5, which lies east of the middle of Piney Creek, containing Ten (10) Acres, more or less.

PARCEL NO. 53 (64) - WAYNE TOWNSHIP

Being the north half of the northwest quarter of Section two (2), Township six (6), Range five (5), containing seventy-nine and one-half (79½) acres, more or less.



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# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION



PARCEL NO. 54 (65) - WAYNE TOWNSHIP

First Tract

Being the east half of the northeast quarter of Section Three (3), Township six (6), Range five (5); excepting therefrom Ten (10) acres in the northwest corner of said half quarter, described as follows: Beginning at the northwest corner of said half quarter, running thence east with the north boundary line of said half quarter, forty (40) poles; thence southwest in a straight line to the exact center of the said northeast quarter of said Section 3; thence north with the west boundary line of said half quarter eighty (80) poles to the place of beginning.

Also excepting a tract in the southeast corner of said half quarter, containing about Three (3) acres and Three (3) rods, described as follows: Beginning at the southeast corner of said half quarter; running thence north with the east boundary of said half quarter, thirty-two (32) poles to a stone marked "D"; thence southwesterly twenty (20) poles to a corner marked "E"; thence south twenty-four (24) poles to a stone in the south boundary of said half quarter marked "F"; thence east with said boundary twenty (20) poles to the beginning.

Also excepting a tract in the northeast corner of said half quarter containing about One (1) acre, and being the same premises described in the deed of Charles Wheeler and wife to Milton Danford, dated February 14, 1853, and recorded in Volume 37, at page 25, of the Records of Deeds of Belmont County, Ohio.

Leaving in the premises hereinbefore conveyed Sixty-five (65) acres, more or less; but subject to all legal highways.

Second Tract

Being all that part of the southeast quarter of the northwest quarter of Section Two (2), Township Six (6), Range Five (5), which lies west of the middle of Pina Creek, containing Thirty (30) Acres, more or less.

And containing in both of said tracts Ninety-five (95) Acres, be the same more or less.

PARCEL NO. 55 (66) - WASHINGTON TOWNSHIP

First Tract 2-13-117

Known as and being a part of Section 20, Township 5, Range 4, and commencing for the same at the southeast corner of the northeast quarter of the southwest quarter of said Section 20, running thence north 240.6 poles to the northeast corner of the northwest quarter of said section; thence with the north boundary of said section west 61 poles; thence south 105 poles; thence west 51 poles; thence south 25° east 147.5 poles; thence east 48.5 poles to the place of beginning, containing one hundred and eight acres and twenty-five poles more or less, EXCEPTING therefrom the following described premises, to-wit: Situated in the Township of Washington, County of Belmont, and State of Ohio and commencing for the same at the northeast corner of the northwest quarter of Section 20; thence with the north boundary of said section west 61 poles; thence south 20.98 poles; thence east 61 poles; thence north 20.98 poles to the place of beginning, containing eight acres, more or less.

Second Tract 2-13-118

A part of Section 20, Township 5, Range 4, beginning for the same at the northwest corner of said Section; thence south 23½° east 116 rods to a stone; thence east 49 rods to a stone; thence north 105 rods to a stone; thence west 99 rods to a stone, the place of



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beginning, containing forty-eight acres and ninety-nine perches, more or less, EXCEPTING therefrom the following described premises, to-wit: Situated in the Township of Washington, County of Belmont and State of Ohio, beginning for the same at the northwest corner of Section 20, Township 5, Range 4; thence south 23½ degrees east 22.91 rods; thence east 89.84 rods; thence north 20.98 rods; thence west 99 rods to the place of beginning, containing 12.38 acres, more or less.

PARCEL NO. 56 (67) - WAYNE TOWNSHIP

Known as and being the southwest quarter of the northwest quarter of Section Two (2), Township Six (6), and Range Five (5), containing Forty (40) Acres, more or less.

EXCEPTING therefrom the following described real estate: Beginning for said exception at the southwest corner of the northwest quarter of said Section 2, at a stone marked letter "J"; thence running east 45 rods to a run; thence up the run in a northwest direction 45 rods (Part of description omitted, see "Parcel 27 (34), Sixth Tract" supra, recorded in Volume 141, Page 260, Tract Six, which omission is not in deed from Thomas McGilton and wife to Peter M. Hitchcock and William D. Rees) to the place of beginning, containing 4½ acres, more or less; and containing after said exception 35½ acres, more or less.

PARCEL NO. 57 (68 AND 69) - WASHINGTON TOWNSHIP

THIS PARCEL IS INTENTIONALLY LEFT BLANK.

PARCEL NO. 58 (71) - WAYNE TOWNSHIP

First Tract 2-13-121

Beginning for the same at the southwest corner of Section One, Township Six and Range five; thence north with the section line, 72 perches to a stone, witness a white oak 15 inches south 45 degrees east 9 links, also white oak 16 inches south 89 degreees west 6 links; thence south 49½ degrees east 50 perches to a stone corner established by Charles DeHass, surveyor, for one Solomon Moore in 1845; thence east parallel with the section line 159.61 perches to a stone; thence south 40.20 perches to a post in the section line; thence west with the section line 198.18 perches to the place of beginning, containing Fifty-four acres, more or less, forty-four acres thereof being in the south part of the southwest quarter of said section one and ten acres thereof being in the southwest corner of the southeast quarter of said section.

PARCEL NO. 59 (74) - WASHINGTON TOWNSHIP

THIS PARCEL LEFT INTENTIONALLY BLANK.

PARCEL NO. 60 (77) - WAYNE TOWNSHIP

First Tract and Second Tract

FIRST AND SECOND TRACTS LEFT INTENTIONALLY BLANK.

Third Tract

Situated in the Township of Wayne, County of Belmont and State of Ohio, and being a part of the southeast quarter of the northwest quarter of Section 9, Township 6, Range 5, beginning for the same at the northwest corner of the southeast quarter of northwest quarter of said section. Running thence south 85½ degrees east 166 feet to a ravine; thence south 14-3/4 degrees west 473 feet to a point in the middle of the public road; thence with said road south 67½ degrees west 78 feet; thence leaving said road running north 4½ degrees east 509.8 feet to the place of beginning, containing 1¼ acres, more or less.

district of lands formerly for sale at Marietta, Ohio, containing 20 acres, more or less, and being the same lands conveyed by Martha Kirkbride to Ebenezer Taylor by deed dated July 1, 1849, and recorded in Volume 33, at page 444.

Fourth Tract

Being a part of the southwest quarter of the southeast quarter of Section 32, Township 5, Range 4, together with a part of the northwest quarter of the northeast quarter of Section 31, Township 5, Range 4; beginning for the same at the northwest corner of said southwest quarter of the southeast quarter of Section 32; thence east with the north boundary of said quarter 42 poles to a corner on the east side of a small run; thence down said run to its junction, with a larger run, and to a large sand rock in a small drain near the top of the first bank on the south side of said larger run; thence on a straight to a White Oak tree on the east and west line dividing in the center the said northwest quarter of the northeast quarter of Section 31; thence west with said center line 68 poles to a corner on the west boundary of said last mentioned quarter of quarter; thence north 120 poles to the place of beginning; containing 40 acres more or less.

PARCEL NO. 62 (82) - WAYNE TOWNSHIP

PARCELS NO. 62 THROUGH 71 LEFT INTENTIONALLY BLANK.

Said tracts of coal hereinabove described under the headings "PARCEL NO. 1" to "PARCEL NO. 71", inclusive, being the same tracts of coal respectively described under the headings "PARCEL NO. 1", to "PARCEL NO. 71" inclusive, in the deed from The Cleveland Trust Company, Trustee under the Last Will and Testament of William D. Rees, deceased, to S. H. Robbins, dated July 1st, 1918, recorded in Volume 218, Page 2 et seq. of the Deed Records of Belmont County, Ohio; which tracts of coal are respectively referred to under the headings "PARCEL NO. 1" to "PARCEL NO. 71", inclusive, in said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, as having been conveyed to Peter M. Hitchcock and William D. Rees from the various grantors therein respectively named, by the various deeds therein respectively specified by date and by volume and page of record; to which deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, and to each of which deeds from various grantors to Peter M. Hitchcock and William D. Rees, therein mentioned, reference is hereby made.

Together with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1st, 1918, under said headings, "PARCEL NO. 1" to "PARCEL NO. 71", inclusive, thereof, which easements, options, rights and privileges are therein defined as being those described in the respective deeds from the various grantors to Peter M. Hitchcock and William D. Rees, above referred to, and as being contained in said various deeds in form and language as follows:

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises other coal belonging to said Grantees, their heirs and assigns, or which may hereafter be acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all of the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns; and



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said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and for the operation of railroads; and the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs, and assigns, a good and sufficient deed of General Warranty, (and furnish therewith a complete Abstract of Title showing said lands to be free and clear of liens and encumbrances), conveying in fee simple, clear of liens and encumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth, And said Grantees agree to purchase the same at not exceeding said above stipulated price per acre."

"The Grantors reserve the rights to bore or dig through said vein of coal for oil or gas, but such boring or digging shall not interfere with the mining or removal of said coal."

It being expressly understood and agreed that the words "Grantor" or "Grantors", as used in the foregoing grant of rights and options, refer to the Grantors of Peter M. Hitchcock and William D. Rees, and not to The Cleveland Trust Company, Trustee, as Grantor in said deed to S. H. Robbins, or to said S. H. Robbins, as Grantor in former deed, and that in the execution and delivery of the former deed, said S. H. Robbins did assign and make over to The Cleveland Trust Company, as Grantee therein, only the interest which said S. H. Robbins had in such rights and options.

PARCEL NO. 72 (2) - WASHINGTON TOWNSHIP

Known as and being the northwest quarter of the northwest quarter of Section twenty-six (26) and the northeast quarter of the northeast quarter of Section thirty-two (32), in Township Five (5), of Range four (4), in the district of Marietta and State of Ohio, containing eighty acres, more or less.

Being the same tract of coal described under the heading "PARCEL NO. 72" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Elizabeth Myers (unmarried) to Peter M. Hitchcock and William D. Rees, by deed dated April 9, 1903, and recorded in Vol. 145, Page 201 of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust



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Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 72" thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are herein referred to as being contained in said abovementioned deed from Elizabeth Myers to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said seam of coal under said premises other coal belonging to said grantees, their heirs and assigns, or which may be hereafter acquired, together with the right and privilege to make drains on the surface and air holes and change the same as the convenience of mining may require, together with all the mining privileges on said surface or under it necessary for the removal of all of said seam of coal underlying said premises and for the removal of coal underlying neighboring properties now owned or hereafter acquired, by said grantees, their heirs and assigns, through said seam of coal under said premises.

"And the said grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly agreed and understood that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said grantees, by virtue of the within grant of coal and mining privileges."

"Said grantor reserves the free right and privilege to operate through said seam of coal for oil, gas or other material lying below said seam No. 8."

PARCEL NO. 73 (4) - WASHINGTON TOWNSHIP

First Tract

The southeast quarter of the northwest quarter of Section 26, Township 5 of Range 4.

Second Tract 2-13-153

The southwest quarter of the northeast quarter of Section 26, Township 5, Range 4.

Third Tract

The northwest quarter of the southeast quarter of Section 25, Township 5, of Range 4.

(Containing in all of the three above described tracts 119.46 acres.)

Being the same tracts of coal described under the heading "PARCEL NO. 73" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Volume 218, page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by E. B. Armstrong, Administrator of the estate of Jacob Perkins, to Peter M. Hitchcock and William D. Rees, by deed dated October 15, 1902, and recorded in Vol. 139, Page 443 of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.



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# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION



"The Grantor reserves the right to operate through said coal for oil and gas."

PARCEL NO. 77 (11) - WASHINGTON TOWNSHIP

First Tract 2-13-161

The Northeast quarter of the northeast quarter of Section Twenty, Township Five, Range Four, in the District of Lands subject to sale at Marietta, Ohio, containing thirty-nine acres and fifty hundredths of an acre.

Second Tract 2-13-162

The northwest quarter of the northeast quarter of Section Twenty, Township Five, Range Four, in the District of Lands subject to sale at Marietta, Ohio, containing thirty-nine acres and fifty hundredths of an acre.

Third Tract 2-13-163

The southwest quarter of the northeast quarter of Section Twenty, Township Five, Range Four, in the District of Lands subject to sale at Marietta, Ohio, containing thirty-nine acres and fifty hundredths of an acre. The three tracts above conveyed contain, in all, one hundred and eighteen acres and fifty hundredths of an acre.

Being the same tracts of coal described under the heading "PARCEL NO. 77" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Isaac Perkins and Florence O. Perkins, husband and wife, to Peter M. Hitchcock and William D. Rees, by deed dated February 12, 1903, and recorded in Vol. 143, Page 91 of the Deed Records of Belmont County, Ohio: to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 77" thereof (and under subsequent clauses thereof as to rights and options,) which easements, options, rights and privileges are therein referred to as being contained in said above-mentioned deed from Elizabeth Myers to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said Grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said Grantees, their heirs and assigns, by virtue of the within grant of coal and mining privileges."



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# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION



"It is expressly understood and agreed that the enumeration herein is an enlargement and not a restriction of the incidental rights accruing to said grantees, by virtue of the within grant of coal and mining privileges."

"And the said grantor for himself and his heirs, executors, administrators and assigns, covenants and agrees with said grantees, their heirs and assigns, that he will upon demand and the payment therefor by said grantees, their heirs or assigns, at the rate of One Hundred Dollars per acre, convey by good and sufficient deed of general warranty in fee simple to said grantees, their heirs or assigns, such amount of said above described surface as may, in the opinion of said grantees, their heirs or assigns, from time to time, be useful for the purpose of mining said coal, or for exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business, or for the erection of the necessary buildings and machinery and tenement houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."

"Said Grantor reserves the right to operate through said seam of coal for oil, gas or other minerals."

PARCEL NO. 79 (15) - WASHINGTON TOWNSHIP 2-13-165

Being the northwest quarter of Section Fourteen (14), Township Five (5) and Range four (4), and the northwest quarter of the Southwest quarter of Section Fourteen (14), Township Five (5), Range Four (4), and the southeast quarter of the northeast quarter of Section Twenty (20), Township Five (5), Range Four (4), and the northeast quarter of the southeast quarter of Section Twenty (20), Township Five (5), Range Four (4), containing in all two hundred and eighty (280) acres, more or less.

Being the same tract of coal described under the heading "PARCEL NO. 79" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by John McGary and David McGary (both unmarried) to Peter M. Hitchcock and William D. Rees, by deed dated February 13, 1903, and recorded in Vol. 143, Page 70, of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 79", thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are therein referred to as being contained in said above-mentioned deed from John McGary and David McGary to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating and mining and removing said coal, together with the privilege of mining and removing through said described premises, other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right and privilege to make drains on the surface and air holes, and change the same as the convenience of mining may require, together with all the mining privileges on said surface or under it necessary for the removal of all the Pittsburgh vein underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for



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failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges.

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges."

"And said grantors, for themselves and their heirs, executors, administrators and assigns, covenant and agree with said grantees, their heirs and assigns, that they will upon demand and the payment therefor by said grantees, their heirs or assigns, at the rate of not exceeding One hundred dollars per acre, convey by good and sufficient deed of general warranty in fee simple to said grantees, their heirs or assigns, such amount of said above described surface as may, in the opinion of said grantees, their heirs or assigns, from time to time, be useful for the purpose of mining said coal, or for exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenement houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads.

"Said grantors reserve the right to operate through said seam of coal for oil, gas, coal and all minerals and to reasonable compensation for any damage done to growing crops on said lands by said grantees, their agents, heirs or assigns."

PARCEL NO. 80 (55) - WASHINGTON TOWNSHIP

Being a part of the northeast quarter of Section 25, Township 5, Range 4; beginning for the same at a stone marked "A", the northeast corner of said Section 25; running thence with the eastern line of said Section 25, south 4 degrees 15 minutes west 1614.4 feet to a stake in a run; thence north 87 degrees 15 minutes west 473.2 feet; thence south 36 degrees 30 minutes west 1216.4 feet to a point on the south line of said quarter; thence with said line north 86 degrees 30 minutes west 291 feet to a stone, the southeast corner of Elizabeth Riley's land; thence with her line north 3 degrees east 2643 feet to a stone planted in a Wild Cherry tree, on the Section line between Sections 25 and 26, on the south line of the cemetery; thence with said section line south 87 degrees 15 minutes east 1454.6 feet to the place of beginning; containing 69.65 Acres, more or less.

EXCEPTING therefrom the following described real estate, the same having been conveyed by Iva Noffsinger and husband to Jane G. Gates by deed dated July 31, 1883, and recorded in Volume 81, at Page 519, Records of Deeds of said County, to-wit: Being the north part of the northeast quarter of Section 25, Township 5, Range 4; beginning 10 rods west of the northeast corner of Section 25, at a stone in a run; thence up said run, following the road making the middle of the road the line, south 61½ degrees west 18.16 rods; thence south 68 degrees west 11.28 rods to a small drain; thence north 74 degrees west 23.80 rods; thence south 88 degrees west 16 rods; thence north 49½ degrees west 9.88 rods to a stone at a corner of the graveyard, on the section line between Sections 25 and 26, 72.8 feet east of the stone planted in the Wild Cherry tree, the northeast corner of Iva Noffsinger's land; thence with said section line east 73.92 rods to the place of beginning; containing Three and one-fourth (3¼) acres, more or less.

Being the same tract of coal described under the heading "PARCEL NO. 80" in the deed from The Cleveland Trust Company, Trustee, to



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# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
# AMERICAN ENERGY CORPORATION



"The Grantors reserve the right to operate through said coal for oil and gas and all other minerals."

PARCEL NO. 85 (72) - WASHINGTON TOWNSHIP

First Tract

The West half of the northwest quarter of Section Nineteen (19), Township Five (5), Range Four (4), containing eighty acres, three roods and twenty-nine perches.

Second Tract 2-13-175

The Southwest quarter of the southwest quarter of Section Twenty (20), Township Five (5), Range Four (4), containing forty acres and twenty-four perches.

Third Tract 2-13-176

The southeast quarter of the southwest quarter of Section Twenty (20), Township Five (5), Range Four (4), containing forty acres, and twenty-two perches.

Being the same tracts of coal described under the heading "PARCEL NO. 85" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins dated July 1, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Thomas J. Pugh and Susanna Pugh, husband and wife, to Peter M. Hitchcock and William D. Rees, by deed dated June 17, 1904, and recorded in Vol. 149, Page 316, of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 85" thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are therein referred to as being contained in said above mentioned deed from Thomas J. Pugh and Susanna Pugh to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said grantees, their heirs and assigns, and hereby waiving and releasing said grantees, their heirs and assigns, from all liabilities for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said grantees, their heirs and assigns, by virtue of this grant of coal and mining privileges."

"The grantors shall upon the payment by the grantees, their heirs and assigns, at the rate of one hundred dollars per acre therefor, convey to the said grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of the said grantees, their heirs and assigns, be useful for the purpose of mining said coal or exercising any right



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incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads, provided, however, that no surface shall be appropriated or sold within the distance of five hundred (500) feet from any building on said lands."

"The grantors do hereby reserve for themselves and their heirs and assigns, the right to operate through said coal for oil and gas and other minerals."

PARCEL NO. 86 (1-73) - WASHINGTON TOWNSHIP

The undivided one-sixth interest in the following premises:

First Tract 2-13-177

The northwest quarter of the northeast quarter of Section 26, Township 5 of Range 4, EXCEPTING therefrom 10 acres heretofore conveyed by Gratigny Stukey and wife to John Wright, bounded and described as follows: Beginning at the southeast corner of the said quarter quarter; thence north 40 rods to a stone; thence west 40 rods to a stone; thence south 40 rods to a stone; thence east 40 rods to the place of beginning, containing in said exception 10 acres, and leaving in said first tract after said exception thirty acres, more or less.

Second Tract

The south half of the southeast quarter of Section 27, Township 5, of Range 4, containing 79 acres, more or less.

Third Tract

Being 14 acres, more or less, situated on the south side of the north half of southeast quarter of Section 27, beginning at the northeast corner of south half of said quarter on the section line; thence north 8¼ rods; thence west 20 rods to the mouth of a small run; thence up said run following its meanderings to its source, to a sugar tree; thence west to the west boundary line of said quarter section; thence south 14.4 rods to the middle of said boundary line; thence east through the middle of said quarter section to the place of beginning, and containing in all the three above described tracts 123 acres, more or less.

Being the same tracts of coal described under the heading "PARCEL NO. 86" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Mary Stukey, unmarried, to Peter M. Hitchcock and William D. Rees, by deed dated August 19, 1903, and recorded in Vol. 147, Page 226, of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 86" thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are therein referred to as being contained in said above-mentioned deed from Mary Stukey to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said described land at such points, and in such manner as may be useful for the purpose of digging, draining and



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ventilating and mining and removing said coal, together with the privilege of mining and removing through said described premises, other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantee, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and for the operation of railroads; and the said Grantor does, for herself and her heirs, executors, administrators and assigns, covenant and agree that Grantor will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs and assigns, a good and sufficient deed of general warranty, (and furnish therewith a complete abstract of title showing said lands to be free and clear of liens and incumbrances), conveying in fee simple, clear of liens and incumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth. And the said Grantees agree to purchase the same at not exceeding said above stipulated price per acre."

"The Grantor reserves the right to bore or dig through said vein of coal for oil or gas, but such boring or digging shall not interfere with the mining or removal of said coal."

PARCEL NO. 87 (2-73) - WASHINGTON TOWNSHIP

The undivided five-sixths interest in the following described premises:

First Tract 2-13-177

The northwest quarter of the northeast quarter of Section 26, Township 5 of Range 4, EXCEPTING therefrom ten acres heretofore conveyed by Gratigny Stukey and wife to John Wright, bounded and described as follows: beginning at the southeast corner of the said quarter quarter; thence north 40 rods to a stone; thence west 40 rods to a stone; thence south 40 rods to a stone; thence east 40 rods to the place of beginning, containing in said exception Ten Acres, and leaving in said first tract Thirty Acres, more or less.



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Second Tract 2-13-178 VOL 707 PAGE 548

The south half of the southeast quarter of Section 27, Township 5, of Range 4, containing Seventy-nine Acres, more or less.

Third Tract 2-13-179

Being 14 acres, more or less, situated on the south side of the north half of southeast quarter of Section 27, beginning at the northeast corner of south half of said quarter on the section line; thence north 8¼ rods; thence west 20 rods to the mouth of a small run; thence up said run following its meanderings to its source to a sugar tree; thence west to the west boundary line of said quarter section; thence south 14.4 rods to the middle of said boundary line; thence east through the middle of said quarter section to the place of beginning, containing in the three above described tracts 123 acres, more or less.

Being the same tracts of coal described under the heading "PARCEL NO. 87" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Winfield Moore, Administrator of the Estate of Gratigny Stukey, to Peter M. Hitchcock and William D. Rees, by deed dated August 21, 1903, and recorded in Vol. 147, Page 231, of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 87" thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are therein referred to as being contained in said above mentioned deed from Winfield Moore, Administrator, to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said lands at such points and in such manner as may be proper for the purpose of digging, draining and ventilating and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all of said coal underlying the same and neighboring properties now owned or hereafter acquired by said grantees, their heirs and assigns; and waiving and releasing said grantees, their heirs and assigns from all liability for damages for failure to support the overlying surface or for sinking or for falling in of said surface or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said grantees, their heirs and assigns, by virtue of the said grant of coal and mining privileges."

PARCEL NO. 88 (76) - WASHINGTON TOWNSHIP

First Tract 2-13-180

Being a part of the northeast quarter of the northeast quarter of Section Twenty-six (26) of Township Five (5), of Range Four (4) in the District of Lands formerly subject to sale at Marietta, Ohio, beginning for the same at a stone at the northwest corner of said quarter quarter; thence east two rods; thence south 32 degrees east 27½ rods to a stone; thence south 45 degrees west 25 rods to a stone; thence north 40 rods to the place of beginning;



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containing two (2) acres and thirty-three (33) poles, be the same more or less.

Second Tract 2-13-181

Being a part of the northwest quarter of the northeast quarter of Section Twenty-six (26) in Township Five (5) of Range Four (4) in the District of Lands formerly subject to sale at Marietta, Ohio; beginning for the same at the southeast corner of said quarter quarter; thence north forty (40) rods to a stone; thence west forty (40) rods to a stone; thence south forty (40) rods to a stone; thence east forty (40) rods to the place of beginning; containing ten acres, more or less.

Being the same tracts of coal described under the heading "PARCEL NO. 88" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Vol. 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Ada W. Crooks and George W. Crooks, her husband, to Peter M. Hitchcock and William D. Rees, by deed dated July 22, 1903, and recorded in Vol. 147, Page 228, of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 88" thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are therein referred to as being contained in said above-mentioned deed from Ada W. Crooks and George W. Crooks, to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said Grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said Grantees, their heirs and assigns, by virtue of the within grant of coal and mining privileges."

"And the said Grantors do for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will, upon demand and payment of at the rate of One Hundred Dollars per acre by the Grantees, their heirs and assigns, convey in fee simple unto the said Grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."



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"And the said Grantees, do for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the purpose herein next above set forth at the rate of $100 per acre."

"The Grantors reserve the right to operate through said coal for oil, gas and other minerals."

PARCEL NO. 89 (78) - WASHINGTON TOWNSHIP

Known as and being the northeast quarter and the north half of the southeast quarter of the southwest quarter of Section Twenty-six (26), Township Five (5), Range Four (4), in the Marietta District of Lands, together with a part of the west half of the aforesaid southwest quarter of Section Twenty-six, beginning for the same at the southwest corner of said quarter section running east 4 perches and 4 links to a post in the east bank of Crabapple Creek; thence north 2 degrees east 61 perches to a post, thence north 34 degrees east 21 perches to a post; thence north 38.5 degrees east 7 perches and three links to a post; thence east 58 perches to a post at the east side of said half quarter; thence north to the northeast corner of said half quarter; thence west to the section line at the quarter stake; thence south to the place of beginning, which will include the west side and the north end of said half quarter, containing in all ninety-nine acres.

Also the northeast quarter of the northwest quarter and the northwest quarter of the northeast quarter of Section thirty-two (32) and the southwest quarter of the southeast quarter of Section thirty-three (33), Township Five (5), Range four (4), Belmont County, Ohio, containing one hundred and twenty acres.

Containing in all two hundred and nineteen (219) acres, more or less, and being the same premises of which Samuel Danford died seized.

Being the same tracts of coal described under the heading "PARCEL NO. 89" in the deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, recorded in Volume 218, Page 2, et seq., of the Deed Records of Belmont County, Ohio; and being therein referred to as having been conveyed by Dewitt Danford, et al. to Peter M. Hitchcock and William D. Rees, by deed dated April 9, 1903, and recorded in Vol. 145, Page 199, of the Deed Records of Belmont County, Ohio; to which deeds reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from The Cleveland Trust Company, Trustee, to S. H. Robbins, dated July 1, 1918, under said heading "PARCEL NO. 89" thereof (and under subsequent clauses thereof as to rights and options), which easements, options, rights and privileges are therein referred to as being contained in said above-mentioned deed from Dewitt Danford, et al., to said Hitchcock and Rees, as follows:

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining, and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said seam of coal under said described premises, other coal belonging to said grantees, their heirs and assigns, or which may be hereafter acquired, together with the right and privilege to make drains on the surface and air holes and change the same as the convenience of mining may require, together with all the mining privileges on said surface or under it necessary for the removal of all of said seam of coal underlying said premises and for the removal of coal underlying neighboring properties now owned or hereafter acquired

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BLOCK II

Parcel 1. Situated in the Township of Washington, County of Belmont and State of Ohio, and known as a part of Section No. Twenty-six (26), Township Five (5), Range Four (4), bounded and described as follows:

Beginning for the same at the northeast corner of the southwest quarter of the northwest quarter; thence with east boundary line of said quarter quarter to the southeast corner of said quarter quarter; thence west with the south boundary line of said quarter quarter to the center of Crabapple Creek; thence down said Creek with the meanders thereof and in the middle thereof to the north boundary of said quarter quarter; thence east with the north line of said quarter quarter to the place of beginning. Containing twenty-six (26) acres, be the same more or less, but subject to all legal highways.

But subject to the right of way of the Ohio River and Western Railroad (formerly the Bellaire and Southwestern), and also to an outstanding oil lease (if any now exists) given to Bush and Russell, the grantor reserving all rentals which may accrue under said lease.

Being the same premises described in the deed from The Cleveland Trust Company, Trustee under the Last Will and Testament of William D. Rees, deceased, to S. H. Robbins, dated July 1st, 1918, and recorded in Volume 215, Page 593, of the Deed Records of Belmont County, Ohio.

Together with the mining rights and privileges reserved to The Youghiogheny and Ohio Coal Company, its successors and assigns, in Volume 645, Page 329, of the Belmont County Deed Records.

Parcel 2. Situated in the Township of Washington, County of Belmont, and State of Ohio, and described as follows:

2-13-190 First Tract: Being the southwest quarter of Section Fifteen (15) in Township Five (5), of Range Four (4), Marietta District.

Being part of the tract of land described in the deed from Washington E. Lindsey et al. to S. H. Robbins, dated 1921, and recorded April 11, 1921, in Volume 231, page 524 of the Deed Records of Belmont County, Ohio, and in the deed from A. J. Lindsey et al. to S. H. Robbins, dated 1921, and recorded April 11, 1921, in Volume 231, page 526 of the Deed Records of said County; also described in the deed from John A. Lindsey, et al., to S. H. Robbins, dated 1921, and recorded April 11, 1921, in Volume 231, page 527 of the Deed Records of said County, and in the deed from David V. Lindsey and wife to S. H. Robbins, dated March 25, 1921, and recorded in Volume 231, page 528 of the Deed Records of said County.

The properties and rights herein described as comprising Block No. II are the same properties and rights described in the deed from S. H. Robbins to The Cleveland Trust Company, dated September 23, 1925, and recorded in Volume 255, Page 601 of Belmont County, Ohio, Deed Records.

Together with all necessary or convenient rights-of-way under the surface of said lands for the purposes of approaching, mining, removing, and transporting said coal thereunder and therefrom and other coal now owned or hereafter acquired by said Grantor, its successors

and assigns, and at the pleasure to place, maintain, remove or replace under the surface all fixtures, structures, manchinery, and appliances deemed necessary or convenient to the operation of mines and to do all things required to ventilate and drain the workings and also the right to mine and remove all of said coal with or without leaving support to the surface of said lands, the Grantees hereby waiving all damages whatsoever for any injury to the surface or to water courses or roads or ways by reason of said mining and remove, draining, and ventilating of said coal.

Prior Deed Reference to mining rights - Volume 647, Page 155, Belmont County Deed Records.

BLOCK III

Parcel 1. All the Pittsburgh or Number Eight (8) Seam of coal underlying the following described tracts of land, all situated in the Township of Washington, County of Belmont and State of Ohio, and in Township Five (5) and Range Four (4):

First Tract: Known as and being the South one-half of the Northeast Quarter of Section thirty-two (32), and a part of the Northwest Quarter of Section twenty-six (26), BEGINNING for the same at the Southwest corner of said Quarter Section 32; thence South 84 degrees 32 minutes 20 seconds East 3311.1 feet to a point in Crab Apple Creek; thence by the said Creek, North 17 degrees 38 minutes West 213.9 feet; thence by the same, North 18 degrees 30 minutes West 486 feet; thence by the same, North 14 degrees East 350 feet; thence by the same, North 1 degree 15 minutes West 350 feet; thence North 83 degrees 45 minutes 40 seconds West 3052.4 feet; thence South 5 degrees 05 minutes West 1375.9 feet to the place of BEGINNING.

CONTAINING Ninety-seven (97) acres, according to survey made by McCully Engineering Co., Feb., 1919.

Being the same tract of coal described under the heading "First Tract" in the deed from T. Riley Huffman and Bertha Huffman, his wife, to S. H. Robbins, dated March 1, 1919 and recorded in Volume 220, Page 169 of the Deed Records of Belmont County, Ohio; to which deed reference is hereby made.

TOGETHER with all easements, options, rights and privileges described in, and granted by, said deed from T. Riley Huffman and wife to S. H. Robbins under the said heading "First Tract" thereof, which easements, options, rights and privileges are therein set forth as follows:

"TOGETHER with the free, uninterrupted use and enjoyment of right of way into, upon and under said lands at such points and in such manner as may be considered proper and necessary for the advantageous and economical operation thereof, and in the digging and mining of said coal and draining and ventilating of the mines, and without liability therefor, and hereby waiving any or all damages that might or could arise therefrom by reason of such digging, mining, draining and ventilating and carrying away of all of said coal, or the manufacture of said coal or other coal into coke or other products, together with the privilege of carrying or transferring and removing through the described premises this and other coal and mine supplies now owned or hereafter acquired by said grantee, his heirs and assigns, generally freed, clear and discharged of any servitude whatever to the overlying land or anything therein or thereon, reserving, however, the right to drill through said coal for oil or gas in such manner as not to endanger the working of said mines. Said Grantee, his heirs and assigns, shall have all the legal rights which we may have "to purchase at any time within twenty-five (25) years from 1917, so much of said land as may be necessary for railroad, and in mining, manufacturing and marketing said coal, at the price of $200.00 per acre, (no land to be taken

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Containing 63.809 acres, more or less.

The aforegoing described Tract No. 9 is a part of the lands as described indeed of Osman Caldwell and Marilda Caldwell, his wife, and Lavina Caldwell, to Henry James, dated May 23, 1895, and recorded in Volume 109, Page 393, of Belmont County Record of Deeds, and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 9, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of Osman Caldwell, et al., to Henry James, namely:

"with the right to enter, mine and carry away the same from under the described tract of land,

"with the right of passage through and under the above described lands by means of main entries, passages, or tunnels for the purpose of transporting coal that may be mined from the lands of other parties.

"but subject to all legal highways."

The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damage to the surface over this Tract No. 9 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which this said surface over this Tract No. 9 is a part, owned by Edwin Allen Caldwell and Annabel Caldwell, his wife, to The Cambria Land Company by Quit-Claim deed dated September 16, 1955, and recorded in Volume 421, Page 576, of the Deed Records of Belmont County, Ohio.

There is excepted, however, from this waiver of surface damages, a parcel of land 400 feet wide by 300 feet deep, with the present dwelling located in the center thereof, and said 400 feet width being parallel with the side of the house in an eastwardly and westwardly direction and 300 feet depth being at right angles thereto in a northerly and southerly direction.

TRACT NO. 10 2-21-10

Designated as part of the George W. Shallcross lands and situate in Section 27, Township 5, Range 4, and being a part of the Southeast quarter of the Northeast quarter, and part of the North half of the Southeast quarter of said Section 27, and beginning for the same at a white oak, the Northwest corner of the Southeast quarter of said Section 27; thence, with the North line of the said Southeast quarter of Section 27, and the line between this Tract No. 10 and Tract No. 9, hereinbefore described, South 86° 38' 25" East, 1296.77 feet to a point, the Southwest corner of the Southeast quarter of the Northeast quarter of said Section 27; thence, with the West line of said Southeast quarter of the Northeast quarter of Section 27, and with the line between this Tract No. 10 and said Tract No. 9, North 3° 48' 30" East, 760.76 feet to a point on the SECOND LINE OF EXCHANGE hereinbefore described; thence, across said lands formerly owned by George W. Shallcross, and with the SECOND LINE OF EXCHANGE, South 75° 00' 00" East, 1337.59 feet to a point on the East line of said Section 27; thence, leaving said SECOND LINE OF EXCHANGE, and with the said East line of Section 27, and the line between this Tract No. 10 and Tract No. 11, hereinafter described, South 3° 44' 44" West, 490.88 feet to a point, the Northeast corner of the



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Southeast quarter of said Section 27; thence, still with the said East line of Section 27, and a line between this Tract No. 10, and Tract No. 13, hereinafter described, South 3° 44' 44" West, 1171.57 feet to a point, the Southeast corner of this Tract No. 10; thence, leaving said East line of Section 27, with the south line of this Tract No. 10, the following courses and distances; North 88° 25' 00" West, 311.00 feet; North 69° 10' 00" West, 590.00 feet; South 67° 00' 00" West, 120.00 feet; North 70° 05' 00" West, 215.00 feet; South 74° 25' 00" West, 200.00 feet; North 87° 17' 11" West, 1221.03 feet to a point on the West line of the Southeast quarter of said Section No. 27; thence, leaving said south line of this Tract No. 10, and with the said West line of the Southeast quarter of Section 27, North 3° 07' 58" East, 274.02 feet to a point, and a corner of Tract No. 9, hereinbefore described; thence, still with the said West line of the Southeast quarter of Section 27, North 3° 07' 58" East, 800.75 feet to the place of beginning;

Containing 83.324 acres, more or less.

The aforegoing described tract is a part of Tract No. 101, as described in deed of Rail and River Coal Company to The Cambria Collieries Company, dated March 23, 1934, and recorded in Volume 294, Page 164, of the Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 10, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of Rail and River Coal Company to The Cambria Collieries Company, namely:

"Party of second part to have the free and uninterrupted right of way into, upon, and under said land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining and ventilating, and carrying away said coal (hereby waiving all surface damages or damages of any sort arising therefrom, or from the removal of all of said coal), together with the privilege of mining and removing through said described premises, other coal belonging to said party of the second part, its successors and assigns, or which may hereafter be acquired.

"The grantors reserve the right to drill for oil or gas or any other minerals.

"but subject to all legal highways".

TRACT NO. 11 2-21-11

Designated as part of the George W. Shallcross lands and situate in Section 21, Township 5, Range 4, and being a part of the Southwest quarter of the Northwest quarter of said Section 21, and beginning for the same at a point at the intersection of the SECOND LINE OF EXCHANGE hereinbefore described, and the West line of said Southwest quarter of the Northwest quarter of Section 1, which point lies South 3° 44' 44" West 2136.01 feet from an oak, the Northwest corner of said Section 21; thence, across said lands formerly owned by George W. Shallcross, and with the said SECOND LINE OF EXCHANGE, South 75° 00' 00" East, 518.76 feet to a point on the east line of said lands formerly owned by George W. Shallcross; thence, leaving said SECOND LINE OF EXCHANGE and with the said east line of lands formerly owned by George W. Shallcross, and the line between this Tract No. 11 and Tract No. 12, hereinafter described, South 6° 08' 55" West, 386.66 feet to a post on the South line of the Southwest quarter of the Northwest quarter of said Section 21; thence, leaving said east line of lands formerly belonging to George W. Shallcross and with

said South line of the Southwest quarter of the Northwest quarter of said Section 21, a line between this Tract No. 11 and Tract No. 13, hereinafter described, North 86° 38' 25" West, 492.59 feet to a point on the West line of said Southwest quarter of the Northwest quarter of Section 21; and on the east line of Tract No. 10, hereinbefore described; thence, leaving said South line of the Southwest quarter of the Northwest quarter of said Section 21, and with the said West line of the Southwest quarter of the Northwest quarter of Section 21, and the line between this Tract No. 11 and said Tract No. 10, North 3° 44' 44" East, 490.88 feet to the place of beginning;

Containing 5.050 acres, more or less.

The aforegoing described tract is a part of Tract No. 102 described in deed of Rail and River Coal Company to The Cambria Collieries Company dated March 23, 1934, and recorded in Volume 294, Page 164, of Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 11, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of the Rail and River Coal Company to The Cambria Collieries Company, namely:

"Party of second part to have the free and uninterrupted right of way into, upon, and under said land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining and ventilating, and carrying away said coal (hereby waiving all surface damages or damages or any sort, arising therefrom, or from the removal of all of said coal), together with the privilege of mining and removing through said described premises, other coal belonging to said party of the second part its successors and assigns or which may hereafter be acquired.

"The grantors reserve the right to drill for oil or gas or any other minerals.

"but subject to all legal highways."

TRACT NO. 12 2-21-12

Designated as part of the Lewis G. Lindsey, Philip Shafer and Frank B. Armstrong lands and situate in Section 21, Township 5, Range 4, and being a part of the South half of the Northwest quarter of said Section 21, and beginning for the same at a post, the Southeast corner of Tract No. 11, hereinbefore described; thence, on the line between this Tract No. 12 and said Tract No. 11, North 6° 08' 55" East, 386.66 feet to a point on the SECOND LINE OF EXCHANGE hereinbefore described; thence, across lands formerly owned by Lewis G. Lindsey, Philip Shafer and Frank B. Armstrong, and with the said SECOND LINE OF EXCHANGE, South 75° 00' 00" East, 2020.18 feet to a point on the South line of the Northwest quarter of said Section 21; thence, leaving the said SECOND LINE OF EXCHANGE, and with the South line of the Northwest quarter of said Section 21, and the line between this Tract No. 12 and Tract No. 13, hereinafter described, North 86° 01' 35" West, 1997.55 feet to the place of beginning;

Containing 8.859 acres, more or less.

The aforegoing described tract is a part of the lands as described in deed of Lewis G. Lindsey and Celestial Lindsey, his wife, to S. L. Mooney, dated April 22, 1901, and recorded in Volume 135, Page 78, Belmont County Record of Deeds; also a part of the sixth tract as described in deed of Phillip Shafer to S.



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L. Mooney, dated April 29, 1901, and recorded in Volume 129, Page 573, Belmont County Record of Deeds; and also part of the lands as described in deed of Frank B. Armstrong to S. L. Mooney, dated April 27, 1901, and recorded in Volume 131, Page 5, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 12, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deeds of Lewis G. Lindsey, and wife, Philip Shafer, and Frank B. Armstrong to S. L. Mooney, namely:

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to transport coal through said main entries, passages and tunnels, that may be mined from the lands of other parties.

"Said grantor reserves the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee.

"but subject to all legal highways".

The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damage to the surface over this Tract No. 12 and/or anything contained thereon or therein, caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this Tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which a part of this surface over this Tract No. 12 is a part, owned by E. V. Lindsey and Leota Estella Lindsey, his wife, to the Grantor herein, by quit claim deed dated May 23, 1955, and recorded in Volume 423, Page 631, of the Deed Records of Belmont County, Ohio;

and as was likewise quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which a part of this surface over this Tract No. 12 is a part, owned by Mrs. Addie Schaffer Polson, et al., to the Grantor herein, by quit-claim deed dated April 29, 1955, and recorded in Volume 421, Page 54, of the Deed Records of Belmont County, Ohio.

The above "Waiver of Surface Damages" do not include 2.8 acres, more or less, of surface over the East end of this Tract No. 12, which surface is owned by Opal Schafer, Ray Stukey and Paul Stukey.

TRACT NO. 13 2-21-13

Designated as part of the Philip Shafer lands and situate in Section 21, Township 5, Range 4, and being a part of the North half of the Southwest quarter of said Section 21, and beginning for the same at a stone on the West line of said Section 21, which stone lies North 2° 38' 33" East, 1315.28 feet distant from a stone, the Southwest corner of said Section 21; thence, with the West line of the Southwest quarter of said Section 21, North 3° 44' 44" East, 136.14 feet to a point, a corner of Tract No. 10, hereinbefore described; thence, still with said West line of the Southwest quarter of Section 21, a line between this Tract No. 13 and said Tract No. 10, North 3° 44' 44" East, 1171.57 feet to a point, the Northwest corner of the Southwest quarter of said Section 21, and a corner of Tract No. 11 hereinbefore described; thence, leaving said West line of the Southwest quarter of Section 21, and with the North line of the Southwest quarter of said Section 21, and the line between this Tract No. 13, and said Tract No. 11, South 86° 38' 25" East, 492.59 feet to a post, a



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common corner of said Tract No. 11 and Tract No. 12, hereinbefore described; thence, still with said North line of the Southwest quarter of Section 21, and the line between this Tract No. 13 and said Tract No. 12, South 86° 01' 35" East, 1997.55 feet to a point on the SECOND LINE OF EXCHANGE hereinbefore described; thence, across lands formerly owned by Philip Shafer, and with the said SECOND LINE OF EXCHANGE, South 75° 00' 00" East, 134.62 feet to a point on the East line of the Southwest quarter of said Section 21; thence, leaving the said SECOND LINE OF EXCHANGE, and with the said East line of the Southwest quarter of Section 21, and the line between this Tract No. 13 and Tract No. 16, hereinafter described, South 1° 51' 58" West, 1276.54 feet to a stone, the Southeast corner of the North half of the Southwest quarter of said Section 21, and a corner of said Tract No. 16; thence, leaving said East line of the Southwest quarter of Section 21, and with the South line of said North half of the Southwest quarter of said Section 21, and the line between this Tract No. 13 and Tract No. 14, hereinafter described, North 86° 16' 30" West, 2664.00 feet to the place of beginning;

Containing 79.238 acres, more or less.

The aforegoing described Tract No. 13 is a part of the fifth tract as described in deed of Philip Shafer to S. L. Mooney, dated April 29, 1901, and recorded in Volume 129, Page 573, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 13, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of Philip Shafer to S. L. Mooney, namely:

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to transport coal through said main entries, passages and tunnels, that may be mined from the lands of other parties.

"Said grantor reserves the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee.

"but subject to all legal highways".

The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damage to the surface over this Tract No. 13 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which this said surface over this Tract No. 13 is a part, owned by Mrs. Addie Schaffer Polson, widow, Mrs. Bettie Schaffer Banfield and her husband Sherman Banfield, Mrs. Emma Schaffer Palmer, widow, Miss Lena Schaffer, ummarried, Mrs. Della Schaffer Anderson and her husband Joseph Anderson, Mrs. Leonia Schaffer Nething, widow, Mrs. Hilda Schaffer Workman and her husband, George Workman, heirs of Melissa Schaffer, to The Cambria Land Company by quit claim deed dated April 29, 1955, and recorded in Volume 421, Page 54, of the Record of Deeds of Belmont County, Ohio.

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TRACT NO. 14 2-21-14 VOL 707 PAGE 683

Designated as part of the Mint Pugh lands and situate in Section 21, Township 5, Range 4, and being the South half of the Southwest quarter of said Section 21, and beginning for the same at a stone, the Southwest corner of the said Southwest quarter of Section 21; thence, with the West line of said Section 21, North 2° 38' 33" East, 1315.28 feet to a stone, the Northwest corner of the South half of the Southwest quarter of said Section 21, and a corner of Tract No. 13, hereinbefore described; thence, leaving said West line of Section 21, and with the North line of said South half of the Southwest quarter of Section 21, and a common corner of said Tract No. 13, Tract No. 16, hereinafter described, and this Tract No. 14; thence, leaving said North line of the South half of the Southwest quarter of Section 21, and with the East line of said South half of the Southwest quarter of Section 21, South 2° 31' 10" West, 1304.09 feet to a point at the Southeast corner of the South half of the Southwest quarter of said Section 21; thence, leaving said East line of the South half of the Southwest quarter of said Section 21, and with the South line of said Southwest quarter of Section 21, and the line between this Tract No. 14, and Tract No. 15, hereinafter described, North 86° 31' 00" West, 60.53 feet to a stone; thence, still with said South line of the Southwest quarter of Section 21, and the line between this Tract No. 14, and said Tract No. 15 North 86° 31' 00" West, 2606.07 feet to the place of beginning;

Containing 80.123 acres, more or less.

The aforegoing described tract is the first tract as described in deed of H. G. Pugh and Mint Pugh, his wife, to S. L. Mooney, dated April 10, 1902, and recorded in Volume 140, Page 18, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 14, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of H. G. Pugh and wife to S. L. Mooney, namely:

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to convey through such entries, passages and tunnels, coal that may be mined from the lands of other parties.

"Said grantors reserve the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee.

"but subject to all legal highways."

The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface over this Tract No. 14 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on this surface, by Leroy Lucas, who owned a one-half interest, to The Cambria Land Company by quit claim deed dated June 28, 1955, and recorded in Volume 421, Page 258, of the Belmont County Records of Deeds;

And the Grantor herein also conveys to Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface and/or anything thereon or therein caused by or resulting from the mining and/or removal of the Pittsburgh or No. 8 seam of coal from and under this Tract No. 14, as was Granted, Bargained, Sold and Conveyed in an Administrator's Deed,



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dated August 8, 1955, by David H. James, Administrator of the Estate of Flora Lucas, deceased, who owned a one-half interest, to The Cambria Land Company which deed is recorded in Volume 421, Page 415, of the Belmont County Record of Deeds.

TRACT NO. 15 2-21-15

Designated as a part of the Mint Pugh Lands and situate in Section 20, Township 5, Range 4, and being a part of the North part of the Northwest quarter of said Section 20, and beginning for the same at a stone, the Northwest corner of said Section 20, and the Northwest corner of this tract; thence, along the North line of said Section 20, and along the line between this Tract No. 15 and Tract No. 14, hereinbefore described, South 86° 31' 00" East, 2606.07 feet to a stone; thence, still along said North line of Section 20, and the line between this Tract No. 15 and said Tract No. 14, South 86° 31' 00" East, 60.53 feet to a point, the Northeast corner of the Northwest quarter of said Section 20, and a corner of said Tract No. 14; thence, leaving said North line of Section 20 and with the East line of the Northwest quarter of said Section 20, and with a line between coal lands owned by the Grantor and Grantee herein, South 3° 50' 00" West, 346.17 feet to a point; thence, leaving said East line of the Northwest quarter of Section 20, and with the south line of this Tract No. 15, and a line between coal lands owned by Grantor and Grantee herein, North 86° 27' 50" West, 2507.44 feet to a point; thence, leaving said south line of this Tract No. 15, and with a line between coal lands owned by the Grantor and Grantee herein, North 21° 03' 50" West, 378.03 feet to the place of beginning;

Containing 20.488 acres, more or less.

The aforegoing described tract is the Second and Third tracts as described in deed of H. G. Pugh and Mint Pugh, his wife, to S. L. Mooney, dated April 10, 1902, and recorded in Volume 140, Page 18, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 15, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of H. G. Pugh and wife, to S. L. Mooney, namely:

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to convey through such entries, passages and tunnels, coal that may be mined from the lands of other parties.

"Said grantors reserve the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee.

"but subject to all legal highways".

The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface over this Tract No. 15 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on 9.50 acres, more or less, of surface situated over the western portion of this Tract No. 15, owned by Floyd Perkins and Geraldine Perkins, his wife, to The Cambria Land Company by Quit-Claim deed dated April 18, 1955, and recorded in Volume 423, Page 520, of the Belmont County Record of Deeds;

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And the Grantor herein also quit claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface over this Tract No. 15 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit claimed and waived in a "Waiver of Surface Damages" on 11.0 acres, more or less, situated over the eastern part of this Tract No. 15, by Leroy Lucas, who owned a one-half interest, to The Cambria Land Company by quit claim deed dated June 28, 1955, and recorded in Volume 421, Page 258, of the Belmont County Record of Deeds;

And the Grantor herein also conveys to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface of the above mentioned 11.0 acres, and to anything thereon or therein, caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this Tract No. 15 as was Granted, Bargained, Sold and Conveyed in an Administrator's Deed, dated August 8, 1955, by David H. James, Administrator of the Estate of Flora Lucas, deceased, who owned a one-half interest, to The Cambria Land Company, which deed is recorded in Volume 421, Page 415, of Belmont County Record of Deeds.

TRACT NO. 16 2-21-16

Designated as part of the N. B. Evans lands and situate in Section 21, Township 5, Range 4, and being a part of the North half of the Southeast quarter of said Section 21, and starting for the same at a stone, the Southwest corner of said Section 21; thence, along the South line of said Section 21, South 86° 31' 00" East, 2666.60 feet to a point, the Southwest corner of the Southeast quarter of said Section 21; thence, along the West line of said Southeast quarter, North 2° 31' 10" East, 1304.09 feet to a stone, the place of beginning of this tract; thence, with the West line of the North half of the Southeast quarter of said Section 21, and with the line between this Tract No. 16 and Tract No. 13, hereinbefore described, North 1° 51' 58" East, 1276.54 feet to a point on the SECOND LINE OF EXCHANGE hereinbefore described; thence, across lands formerly owned by N. B. Evans, and with the said SECOND LINE OF EXCHANGE, South 75° 00' 00" East, 2723.71 feet to a point on the East line of said North half of the Southeast quarter of Section 21; thence, leaving said SECOND LINE OF EXCHANGE, and with the said East line of the North half of the Southeast quarter of Section 21, South 3° 20' 30" West, 753.63 feet to a point, the Southeast corner of the said North half of the Southeast quarter of Section 21; thence, leaving said East line of the North half of the Southeast quarter of Section 21, and with the South line of said North half of the Southeast quarter of Section 21, North 86° 03' 05" West, 2634.79 feet to the place of beginning;

Containing 61.657 acres, more or less.

The aforegoing described tract is a part of the Parcels 1, 2, and 3 as described in deed of N. B. Evans, to The Cambria Collieries Company, dated February 11, 1921, and recorded in Volume 231, Page 364, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 16, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of N. B. Evans to The Cambria Collieries Company, namely:

# ADDENDUM TO RIGHT-OF-ENTRY AFFIDAVIT
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Together with the free and uninterrupted right of way into and under said parcels, (1), (2), and (3), as above described, at such points, and in such manner as may be proper and necessary for the purpose of digging, mining, draining and ventilating an carrying away said coal, (hereby waiving all surface damage or damages of any sort arising therefrom or from the removal of all of said coal), together with the privilege of mining and removing through said premises other coal belonging to the purchaser or purchasers, its or their heirs, successors and assigns, or which may be hereafter acquired by the purchaser or purchasers, its or their heirs, successors or assigns; reserving, however, to the owner of said surface, their heirs and assigns, the right to drill or shaft through said vein of coal for oil, gas or other minerals.

The total acreage of said coal lands herein conveyed in Tracts No. 6 to No. 16, both inclusive, being 455.381 acres.

The hereinbefore described Tracts Numbered 6, 7, 8, 9, 12, 13, 14 and 15 having a total acreage of 305.350 acres, are a part of the acreage of coal conveyed by the Ohio River and Western Coal Company to The Cambria Collieries Company by deed dated April 26, 1917, and recorded in Volume 211, Page 1, of Belmont County, Ohio, Record of Deeds; and Tracts Numbered 10 and 11, having a total acreage of 88.374 acres, are a part of the acreage of coal conveyed by Rail and River Coal Company to The Cambria Collieries Company by deed dated March 23, 1934, and recorded in Volume 294, Page 164, of Belmont County, Ohio, Record of Deeds; and Tract No. 16, having an acreage of 61.657 acres, is a part of the coal acreage conveyed by N. B. Evans to The Cambria Collieries Company by deed dated February 11, 1921, and recorded in Volume 231, Page 364, of Belmont County, Ohio, Record of Deeds.

Together with all and singular such mining and other rights as the Grantor has or is entitled to use and enjoy, so far as the same are appurtenant to the premises herein described, whether by operation of law or by virtue of the express grants and provisions contained in the various deeds under and by virtue of which The Cambria Land Company has acquired and owns said premises, but subject to all the terms and conditions and limitations contained in said deeds.

In addition to the several exceptions and reservations particularly hereinbefore set forth, this conveyance is made subject to all oil and gas leases of record made and given prior to the severance of said coal, to all existing oil and gas wells, and to all surface rights of way for public roads, pipe, power transmission, telephone and telegraph lines, and all other easements of way which are either of record or are now visible upon the surface.

The Cambria Land Company, the former Grantor is the same entity as The Cambria Collieries Company, said The Cambria Collieries Company having had its corporate name changed to The Cambria Land Company by amendment to the Articles of Incorporation dated the 12th day of March, 1945, and bearing Number 42322 of the Secretary of State, and recorded in Volume 352, Page 54, of the Deed Records of Belmont County, Ohio.

PRIOR DEED REFERENCE: Volume 443, Page 277, Belmont County Deed Records.



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Addendum to Right of Entry Affidavit
American Energy Corporation

Table A
Summary of Exhibit "A"
Limited Warranty Deed, Volume 707 Page 1
Wyoming Pocahontas Land Co. to Consolidated Land Company

| Deed Volume/Page | Parcel/Tract | Map Identification No. |
|---|---|---|
| 707/419 | Tract No. 2 | 2-8-2 |
| 707/504 | No. 1/First | 2-13-1 |
| 707/504 | No. 1/Second | 2-13-2 |
| 707/506 | No. 6(10) | 2-13-10, 2-13-11, 2-13-12 |
| 707/507 | No. 12(19) | 2-13-19 |
| 707/523-524 | No. 51(60)/First | 2-13-110 |
| 707/523-524 | No. 51(60)/Second | 2-13-111 |
| 707/525 | No. 55(66)/First | 2-13-117 |
| 707/525 | No. 55(66)/Second | 2-13-118 |
| 707/530 | No. 73(4)/Second | 2-13-153 |
| 707/535 | No. 77(11)/First | 2-13-161 |
| 707/535 | No. 77(11)/Second | 2-13-162 |
| 707/535 | No. 77(11)/Third | 2-13-163 |
| 707/537 | Parcel No. 79(15) | 2-13-165 |
| 707/545 | No. 85(72)/Third | 2-13-176 |
| 707/547 | Parcel No. 87(2-73) | 2-13-177 |
| 707/547 | No. 87(2-73)/Second | 2-13-178 |
| 707/547 | No. 87(2-73)/Third | 2-13-179 |
| 707/548 | No. 88(76)/First | 2-13-180 |
| 707/548 | No. 88(76)Second | 2-13-181 |

Addendum to Right of Entry Affidavit
American Energy Corporation

Table A
Summary of Exhibit "A"
Limited Warranty Deed, Volume 707 Page 1
Wyoming Pocahontas Land Co. to Consolidated Land Company

| Deed Volume/Page | Parcel/Tract | Map Identification No. |
|---|---|---|
| 707/553 | No. 2/First | 2-13-190 |
| 707/678 | Tract No. 10 | 2-21-10 |
| 707/679 | Tract No. 11 | 2-21-11 |
| 707/680 | Tract No. 12 | 2-21-12 |
| 707/681 | Tract No. 13 | 2-21-13 |
| 707/683 | Tract No. 14 | 2-21-14 |
| 707/684 | Tract No. 15 | 2-21-15 |
| 707/685 | Tract No. 16 | 2-21-16 |
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**American Energy Corporation**
**Addendum to Right-of-Entry Affidavit**
**Explanation of Legal Rights Claimed**

**Mining rights conveyed by Wyoming Pocahontas Land Co., (fka Youghiogheny and Ohio Coal Company) to Consolidated Land Company in Volume 707 Page 1, Recorder's Office, Belmont County, Ohio: Page 419, Tract No. 2 (2-8-2); Page 504, Parcel No. 1 First Tract (2-13-1), Second Tract (2-13-2); Page 506, Parcel No. 6(10) (2-13-10) (2-13-11) (2-13-12); Page 507, Parcel No. 12(19) (2-13-19); Pages 523-524, Parcel No. 51(60), First Tract (2-13-110), Second Tract (2-13-111); Page 525, Parcel No. 55(66), First Tract (2-13-117), Second Tract (2-13-118); Page 530, Parcel No. 73(4), Second Tract (2-13-153); Page 535, Parcel No. 77(11), First Tract (2-13-161), Second Tract (2-13-162), Third Tract (2-13-163); Page 537, Parcel No. 79(15) (2-13-165); Page 545, Parcel No. 85(72), Third Tract (2-13-176); Page 547, Parcel No. 87(2-73) (2-13-177), Second Tract (2-13-178), Third Tract (2-13-179); Page 548, Parcel No. 88, First Tract (2-13-180), Second Tract (2-13-181); Page 553, Parcel No. 2, First Tract (2-13-190); Page 678, Tract No. 10 (2-21-10); Page 679, Tract No. 11 (2-21-11); Page 680, Tract No. 12 (2-21-12); Page 681, Tract No. 13 (2-21-13); Page 683, Tract No. 14 (2-21-14); Page 684, Tract No. 15 (2-21-15); Page 685, Tract No. 16 (2-21-16).**

**Addendum to Part 1, C(7)**
**Summary of Mining Rights**
**North American Coal Royalty Company**
**to**
**Consolidated Land Company**

**ITEM 1.** Lease rights to Parcel 1, Parcel 2, Parcel 5, Parcel 9 (Tracts 2 and 3), Parcel 11, and Parcel 12.

"Together with the right to mine and remove such coal by any underground or deep mining methods, and together with any and all mining rights owned by the Lessor relative to the Leased Premises, to the extent and only to the extent, that Lessor owns and has the right to grant the same, excepting and reserving unto Lessor all such coal which lies within, or within three hundred (300) feet of the boundary of, the workings of Bellaire Corporation's Powhatan No. 1 Mine."

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**Consolidated Land Company**
**to**
**American Energy Corporation**

**ITEM 1.** Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 419, Tract No. 2 (2-8-2).

"Together with the free and uninterrupted right of way into, upon and under said coal and land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining, ventilating and carrying away said coal; hereby waiving all surface damages, or damages of any sort arising therefrom or through the removal of all the said coal; together with the privilege of mining and removing through and over said described premises other coal belonging to said party of the second part, his heirs, and assigns, or which may hereafter be acquired by said party of the second party. Said parties of the first part reserve the right to drill for oil and gas through the coal, but not so as to interfere with any entry or opening that may have been made through said coal for the purpose of mining or removing same, and in case any oil or gas well should be drilled through said coal or coal mines, such well shall be cased through the coal with iron or steel pipe, which shall be allowed to remain permanently to protect such coal or coal mine from being injured by either water or gas escaping into said coal or coal mine."

**ITEM 2.** Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 504, Parcel No. 1, 1st Tract (2-13-1), 2nd Tract (2-13-2).

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises other coal belonging to said Grantees, their heirs and assigns, or which may hereafter be acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all of the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns, and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and or the operation of railroads; and the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs, and assigns execute and deliver unto said Grantees, their heirs and assigns, a good and sufficient deed of General Warranty, (and furnish therewith a complete Abstract of Title showing said lands to be free and clear of liens and encumbrances), conveying in fee simple, clear of liens and encumbrances, such amount of the above described land as Grantees in their opinion may require for the purposed herein next above set forth. And said Grantees agree to purchase the same at not exceeding said above stipulated price per acre."

"The Grantors reserve the rights to bore or dig through said vein of coal for oil or gas, but such boring or digging shall not interfere with the mining or removal of said coal."

Item 3. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 506, Parcel No. 6(10) (2-13-10) (2-13-11) (2-13-12).

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises other coal belonging to said Grantee, their heirs and assigns, or which may hereafter be acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all of the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and for the operation of railroads; and the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs, and assigns, a good and sufficient deed of General Warranty, (and furnish therewith a complete Abstract of Title showing said lands to be free and clear of liens and encumbrances), conveying in fee simple, clear of liens and encumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth, and said Grantees agree to purchase the same at not exceeding said stipulated price per acre."

ITEM 4. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 507, Parcel No. 12(19) (2-13-19); Pages 523-524, Parcel No. 51(60), First Tract (2-13-110), Second Tract (2-13-111); Page 525, Parcel No. 55(66), First Tract (2-13-117), Second Tract (2-13-118).

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises other coal belonging to said Grantee, their heirs and assigns, or which may hereafter be acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all of the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and for the operation of railroads; and the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs, and assigns, a good and sufficient deed of General Warranty, (and furnish therewith a complete Abstract of Title showing said lands to be free and clear of liens and encumbrances), conveying in fee simple, clear of liens and encumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth, and said Grantees agree to purchase the same at not exceeding said stipulated price per acre."

"The Grantors reserve the rights to bore or dig through said vein of coal for oil or gas, but such boring or digging shall not interfere with the mining or removal of said coal."

ITEM 5. Mining rights to the following Parcel contained in Deed Volume 707 Page1: Page 530, Parcel No. 73(4), Second Tract (2-13-153).

"Together with the free and uninterrupted right-of-way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging,

draining and ventilating and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to the grantees, their heirs and assigns, or which may be hereafter acquired by said grantee, their heirs or assigns, together with the right to make drains on the surface and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all the said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface or for destroying any spring or well of water or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to said grantees, their heirs or assigns, by virtue of said grant of coal and mining privileges."

ITEM 6. Mining rights to the following Parcels contained in Deed Volume 707 Page1: Page 535, Parcel No. 77(11), First Tract (2-13-161), Second Tract (2-13-162), Third Tract (2-13-163).

"Together with the free and uninterrupted right-of-way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to the grantees, their heirs and assigns, or which may be hereafter acquired by said grantee, their heirs or assigns, together with the right to make drains on the surface and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all the said coal underlying the same and neighboring properties now owned or hereafter acquired by said Grantees, their heirs and assigns, and waiving and releasing said grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface or for destroying any spring or well of water or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to said grantees, their heirs or assigns, by virtue of said grant of coal and mining privileges."

"And the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of at the rate of One Hundred Dollars per acre by the Grantees, their heirs and assigns, convey in fee simple unto the said Grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said Grantees, their heirs

and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads. No surface privilege other than air shafts."

"And said Grantees do for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the purpose herein next above set forth at the rate of $100 per acre."

"The Grantors reserve the right to operate through said coal for oil and gas."

ITEM 7. Mining rights to the following Parcel contained in Deed Volume 707 Page1: Page 537, Parcel No. 79(15) (2-13-165)

"Together with the free and uninterrupted rights of way into, upon and under said described land, at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the privilege of mining and removing through said described premises other coal belonging to said Grantee, their heirs and assigns, or which may hereafter be acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it necessary for the removal of all of the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"And said grantors, for themselves and their heirs, executors, administrators, and assigns, covenant and agree with said grantees, their heirs and assigns, that they will upon demand and the payment therefor by said grantees, their heirs and assigns, at the rate of not exceeding One hundred dollars per acre, convey by good and sufficient deed of general warranty in fee simple to said grantees, their heirs or assigns, such amount of said above described surface as may, in the opinion of said grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal, or for exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenement houses, and all other buildings necessary to carry on the coal business, or for the construction

thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."

"Said grantors reserve the right to operate through said seam of coal for oil, gas,coal and all minerals and to reasonable compensation for any damage done to growing crops on said lands by said grantees, their agents, heirs or assigns."

ITEM 8. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 545, Parcel No. 85(72), Third Tract (2-13-176).

"Together with the free and uninterrupted rights of way into, upon and under said land at such points and in such manner as may be proper for the purpose of digging, draining and ventilating and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said grantees, their heirs and assigns, or which may be hereafter acquired, together with the right to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface, or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned or hereafter acquired by said grantees, their heirs and assigns, and hereby waiving and releasing said grantees, their heirs and assigns, from all liabilities for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said grantees, their heirs and assigns, by virtue of this grant of coal and mining privileges."

"The grantors shall upon the payment by the grantees, their heirs and assigns, at the rate of one hundred dollars per acre therefor, convey to the said grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of the said grantees, their heirs and assigns, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads, provided, however, that no surface shall be appropriated or sold within the distance of five hundred (500) feet from any building on said lands."

"The grantors do hereby reserve for themselves and their heirs and assigns, the right to operate through said coal for oil and gas and other minerals."

**ITEM 9.** Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 545, Parcel No. 85(72), Third Tract (2-13-176); Page 547, Parcel No. 87(2-73)(2-13-177), Second Tract (2-13-178), and Third Tract (2-13-179).

"Together with the free and uninterrupted rights of way into, upon and under said described land at such points, and in such manner as may be useful for the purpose of digging, draining and ventilating and mining and removing said coal, together with the privilege of mining and removing through described said premises, other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all the Pittsburgh Vein underlying the same and neighboring properties now owned, or hereafter acquired by said Grantee, their heirs and assigns; and said Grantees, their heirs and assigns, shall in no wise be liable for damages for failure to support the overlying surface, or for the sinking or falling in of said surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of said coal or the exercise of any of the above mining privileges."

"It is expressly understood and agreed that the enumeration herein is in enlargement and not in restriction of the incidental rights accruing to said Grantees, by virtue of the within grant of coal and mining privileges."

"And together with the right to use and occupy such amount of surface of the above described land as may in the opinion of said Grantees, their heirs and assigns, from time to time be useful for the purpose of mining said coal or exercising any rights incidental thereto, or that may be useful for the deposit of gob or refuse from said mines, or for carrying on the coal business and for the erection of buildings and machinery and tenant houses, and all other buildings needful or useful to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and other structures, and for the operation of railroads; and the said Grantor does, for herself and her heirs, executors, administrators and assigns, covenant and agree that Grantor will upon demand and payment of, at the rate not exceeding One Hundred Dollars per acre, by the Grantees, their heirs and assigns, execute and deliver unto said Grantees, their heirs and assigns, a good and sufficient deed of general warranty, (and furnish therewith a complete abstract of title showing said lands to be free and clear of liens and incumbrances), conveying in fee simple, clear of liens and incumbrances, such amount of the above described land as Grantees in their opinion may require for the purposes herein next above set forth. And the said Grantees agree to purchase the same at not exceeding said above stipulated price per acre."

"The Grantor reserves the right to bore or dig through said vein of coal for oil or gas, but such boring or digging shall not interfere with the mining or removal of said

coal."

ITEM 10. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 548, Parcel No. 88 (76), First Tract (2-13-180), Second Tract (2-13-181).

"Together with the free and uninterrupted rights of way into, upon and under said land, at such points, and in such manner as may be proper for the purpose of digging, draining and ventilating, and mining and removing said coal, together with the right of mining and removing through said premises other coal belonging to said Grantees, their heirs and assigns, or which may be hereafter acquired, together with the right and privilege to make drains on the surface, and air holes, and change the same as the convenience of mining may require, together with all mining privileges on said surface or under it, necessary for the removal of all said coal underlying the same and neighboring properties now owned, or hereafter acquired by said Grantees, their heirs and assigns; and waiving and releasing said Grantees, their heirs and assigns, from all liability for damages for failure to support the overlying surface, or for sinking or falling in of such surface, or for destroying any spring or well of water, or for diverting any water flow or natural stream by reason of the removal of such coal or the exercise of any of the above mining privileges, together with all incidental rights that shall or may accrue to the said Grantees, their heirs and assigns, by virtue of the within grant of coal and mining privileges."

"And the said Grantors do, for themselves and their heirs, executors, administrators and assigns, covenant and agree that Grantors will upon demand and payment of at the rate of One Hundred Dollars per acre by the Grantees, their heirs and assigns, convey in fee simple unto the said Grantees, their heirs and assigns, such amount of said above described surface as may, in the opinion of said Grantees, their heirs and assigns, from time to time, be useful for the purpose of mining said coal or exercising any right incidental thereto, or that may be useful for the deposit of gob or refuse from said mines or for carrying on the coal business, or for the erection of necessary buildings and machinery and tenant houses, and all other buildings necessary to carry on the coal business, or for the construction thereon of tracks, shafts, mine openings and necessary structures, and for the operation of railroads."

"And the said Grantees, do for themselves, their heirs and assigns, agree to pay for such real estate as may be used for the purpose herein next above set forth at the rate of $100 per acre."

"The Grantors reserve the right to operate through said coal for oil, gas and other minerals."

ITEM 11. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Block II, Page 553, Parcel No. 2, 1st Tract (2-13-190).

"Together with all necessary or convenient rights-of-way under the surface of said lands for the purposes of approaching, mining, removing, and transporting said coal thereunder and therefrom and other coal now owned or hereafter acquired by said Grantor, its successors and assigns, and at the pleasure to place, maintain, remove or replace under the surface all fixtures, structures, machinery, and appliances deemed necessary or convenient to the operation of mines and to do all things required to ventilate and drain the workings and also the right to mine and remove all of said coal with or without leaving support to the surface of said lands, the Grantees hereby waiving all damages whatsoever for any injury to the surface or to water courses or roads or ways by reason of said mining and remove, draining, and ventilating of said coal."

"Prior Deed Reference to mining rights - Volume 647 Page 155, Belmont County Deed Records."

ITEM 12. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 678, Tract No. 10 (2-21-10).

"The aforegoing described tract is a part of Tract No. 101, as described in deed of Rail and River Coal Company to the Cambria Collieries Company, dated March 23, 1934, and recorded in Volume 294, Page 164, of the Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and signs, the same additional rights and privileges in this Tract No. 10, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were, granted and restricted in the aforesaid deed of Rail and River Coal Company to The Cambria Collieries Company, namely:"

"Party of second part to have the free and uninterrupted right of way into, upon, and under said land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining and ventilating, and carrying away said coal (hereby waiving all surface damages or damages of any sort arising therefrom, or from the removal of all of said coal), together with the privilege of mining and removing through said described premises, other coal belonging to said party of the second part, its successors and assigns, or which may hereafter be acquired."

"The grantors reserve the right to drill for oil or gas or any other minerals."

"... but subject to all legal highway."

ITEM 13. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 679, Tract No. 11 (2-21-11).

"The aforegoing described tract is a part of Tract No. 102, as described in deed of Rail and River Coal Company to the Cambria Collieries Company, dated March 23, 1934, and recorded in Volume 294, Page 164, of the Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and signs, the same additional rights and privileges in this Tract No. 11, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were, granted and restricted in the aforesaid deed of Rail and River Coal Company to The Cambria Collieries Company, namely:"

"Party of second part to have the free and uninterrupted right of way into, upon, and under said land, at such points and in such manner as may be proper and necessary for the purpose of digging, mining, draining and ventilating, and carrying away said coal (hereby waiving all surface damages or damages of any sort arising therefrom, or from the removal of all of said coal), together with the privilege of mining and removing through said described premises, other coal belonging to said party of the second part, its successors and assigns, or which may hereafter be acquired."

"The grantors reserve the right to drill for oil or gas or any other minerals."

"... but subject to all legal highway."

ITEM 14. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 680, Tract No. 12 (2-21-12).

"The aforegoing described tract is a part of the lands as described in deed of Lewis G. Lindsey and Celestial Lindsey, his wife, to S.L. Mooney, dated April 22, 1901, and recorded in Volume 135, Page 78, Belmont County Record of Deeds; also a part of the sixth tract as described in deed of Phillip Shafer to S.L. Mooney, dated April 29, 1901, and recorded in Volume 129, Page 573, Belmont County Record of Deeds; and also part of the lands as described in deed of Frank B. Armstrong to S.L. Mooney, dated April 27, 1901, and recorded in Volume 131, Page 5, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 12, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deeds of Lewis G. Lindsey, and wife, Phillip Shafer, and Frank B. Armstrong to S.L. Mooney, namely:"

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to transport coal through said main entries, passages and tunnels that may be mined from the lands of other parties."

"Said grantor reserves the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done

without unnecessary damage to the mining operations of said grantee."

"... but subject to all legal highways."

"The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damage to the surface over this Tract No. 12 and/or anything contained thereon or therein, caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this Tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which a part of this surface over this Tract No. 12 is a part, owned by E.V. Lindsey and Leota Estella Lindsey, his wife, to the Grantor herein, by quit-claim deed dated May 23, 1955, and recorded in Volume 423, Page 631, of the Deed Records of Belmont County, Ohio;"

"And as was likewise quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which a part of this surface over this Tract No. 12 is a part, owned by Mrs. Addie Schaffer Polson, et al., to the Grantor herein, by quit-claim deed dated April 29, 1955, and recorded in Volume 421, Page 54, of the Deed Records of Belmont County, Ohio."

"The above "Waiver of Surface Damages" do not include 2.8 acres, more or less, of surface over the East end of this Tract No. 12, which surface is owned by Opal Schafer, Ray Stukey and Paul Stukey."

ITEM 15. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 681, Tract No. 13 (2-21-13).

"The aforegoing described Tract No. 13 is a part of the fifth tract as described in deed of Philip Shafer to S.L. Mooney, dated April 29, 1901, and recorded in Volume 129, Page 573, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 13, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of Philip Shafer to S.L. Mooney, namely:"

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to transport coal through said main entries, passages and tunnels, that may be mined from the land of other parties."

"Said grantor reserves the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee."

"... but subject to all legal highways."

"The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damage to the surface over this Tract No. 13 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on surface, of which this said surface over this Tract No. 13 is a part, owned by Mrs. Addie Schaffer Polson, widow, Mrs. Bettie Schaffer Banfield and her husband Sherman Banfield, Mrs. Emma Schaffer Palmer, widow, Miss Lena Schaffer, unmarried, Mrs. Della Schaffer Anderson and her husband Joseph Anderson, Mrs. Leonia Schaffer Nething, widow, Mrs. Hilda Schaffer Workman and her husband, George Workman, heirs of Melissa Schaffer, to The Cambria Land Company by quit claim deed dated April 29, 1955, and recorded in Volume 421, Page 54, of the Record of Deeds of Belmont County, Ohio."

ITEM 16. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 683, Tract No. 14 (2-21-14).

"The aforegoining described tract is the first tract as described in deed of H.G. Pugh and Mint Pugh, his wife, to S.L. Mooney, dated April 10, 1902, and recorded in Volume 140, Page 18, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 14, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of H.G. Pugh and wife to S.L. Mooney, namely:"

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to convey through such entries, passages and tunnels, coal that may be mined from the lands of other parties."

"Said grantors reserve the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee."

"... but subject to all legal highways."

"The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface over this Tract No. 14 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on this surface, by Leroy Lucas, who owned a one-half interest, to The Cambria Land Company by quit-claim deed dated June 28, 1955, and recorded in Volume 421, Page 258, of the Belmont County Record of Deeds;"

"And the Grantor herein also conveys to Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface and/or anything thereon or therein caused by or resulting from the mining and/or removal of the Pittsburgh or No. 8 seam of coal from and under this Tract No. 14, as was Granted, Bargained, Sold and Conveyed in an Administrator's Deed, dated August 8, 1955, by David H. James, Administrator of the Estate of Flora Lucas, deceased, who owned a one-half interest, The Cambria Land Company which deed is recorded in Volume 421, Page 415, of the Belmont County Record of Deeds."

ITEM 17. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 684, Tract No. 15 (2-21-15).

"The aforegoing described tract is the Second and Third tract as described in deed of H.G. Pugh and Mint Pugh, his wife, to S.L. Mooney, dated April 10, 1902, and recorded in Volume 140, Page 18, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 15, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of H.G. Pugh and wife, S.L. Mooney, namely:"

"Together with the right to enter, mine and carry away said coal by means of main entries, passages and tunnels, and the right to convey through such entries, passages and tunnels, coal that may be mined from the lands of other parties."

"Said grantors reserve the right to operate and drill for oil and gas, including the right to penetrate or drill through said coal for said purposes, the same to be done without unnecessary damage to the mining operations of said grantee."

"... but subject to all legal highways."

"The Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface over this Tract No. 15 and/or anything contained thereon or therein caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on 9.50 acres, more or less, of surface situated over the western portion of this Tract No. 15, owned by Floyd Perkins and Geraldine Perkins, his wife, to The Cambria Land Company by Quit-Claim deed dated April 18, 1955, and recorded in Volume 423, Page 520, of the Belmont County Record of Deeds;"

"And the Grantor herein also quit-claims and grants to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface over this Tract No. 15 and/or anything contained thereon or therein caused

or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this tract, as was quit-claimed and waived in a "Waiver of Surface Damages" on 11.0 acres, more or less, situated over the eastern part of this Tract No. 15, by Leroy Lucas, who owned a one-half interest, to The Cambria Land Company by quit-claim deed dated June 28, 1955, and recorded in Volume 421, Page 258, of the Belmont County Record of Deeds;"

"And the Grantor herein also conveys to the Grantee herein, its successors and assigns, the same waiver of any and all claims for damages to the surface of the above mentioned 11.0 acres, and to anything thereon or therein, caused or resulting from the mining and/or removal of the Pittsburgh No. 8 seam of coal from and under this Tract No. 15 as was Granted, Bargained, Sold and Conveyed in an Administrator's Deed, dated August 8, 1955, by David H. James, Administrator of the Estate of Flora Lucas, deceased, who owned a one-half interest, to The Cambria Land Company, which deed is recorded in Volume 421, Page 415, of Belmont County Record of Deeds."

ITEM 18. Mining rights to the following Parcels contained in Deed Volume 707 Page 1: Page 685, Tract No. 16 (2-21-16).

"The aforegoing described tract is a part of the Parcels 1, 2 and 3 as described in deed of N.B. Evans, to The Cambria Collieries Company, dated February 11, 1921, and recorded in Volume 231, Page 364, Belmont County Record of Deeds; and the present Grantor gives and grants to the Grantee herein, its successors and assigns, the same additional rights and privileges in this Tract No. 16, and imposes on Grantee herein, its successors and assigns, the same restrictions therein as were given, granted and restricted in the aforesaid deed of N.B. Evans to The Cambria Collieries Company, namely:"

"Together with the free and uninterrupted right of way into and under said parcels, (1), (2), and (3), as above described, at such points, and in such manner as may be proper and necessary for the purpose of digging, mining, draining and ventilating and carrying away said coal, (hereby waiving all surface damage or damages of any sort arising therefrom or from the removal of all of said coal), together with the privilege of mining and removing through said premises other coal belonging to the purchaser or purchasers, its or their heirs, successors and assigns, or which may be hereafter acquired by the purchaser or purchasers, its or their heirs, successors or assigns; reserving, however, to the owner of said surface, their heirs and assigns, the right to drill or shaft through said vein of coal for oil, gas or other minerals."

## D. AREAS WHERE MINING IS PROHIBITED OR LIMITED

(1) Is this application area within an area designated unsuitable for coal mining operations or under study for designation in an administrative proceeding?

Yes ☐ No ☒

If "yes," did the applicant make substantial legal and financial commitments in this application area prior to January 4, 1977? Yes ☐ No ☐ If "yes," provide documentation supporting the assertion that the commitments were made prior to January 4, 1977.

## E. PERMIT TERM AND RELATED INFORMATION

(1) Anticipated/actual date for:

(a) Starting mining operations **May, 2010**

(b) Terminating mining operations **October, 2014**

(2) Does the applicant propose a permit term in excess of five (5) years?

Yes ☐ No ☒ If "yes," submit an addendum with the information required by 1501:13-4-03(E)(3), Ohio Administrative Code.

(3) Horizontal extent of shadow area over life of permit in acres:

(a) Full Coal Recovery/Longwall Mining Acreage **934.5**

(b) Room and Pillar Acreage **389.6**

(c) Total Acres **1324.1** (Shadow Area)

## F. PUBLIC NOTICE

(1) In the space below, provide the name and address of the public office where a complete copy of this permit application is to be filed.

**Belmont County Courthouse**
**Recorder's Office**
**101 West Main Street**
**St. Clairsville, Ohio 43950**

(2) In the space below, list the name and address of the newspaper and provide the text of the advertisement that is to be published in a newspaper of general circulation in the locality of this application area. Provide proof of publication.

**The Times Leader**
**200 South 4th Street**
**Martins Ferry, Ohio 43935**

**Public Notice**

**American Energy Corporation, 43521 Mayhugh Hill Road, Beallsville, Ohio 43716, has submitted an underground Permit Application Number D-0425-12 to the Ohio Department of Natural Resources, Division of Mineral Resources Management. The application area is located in Belmont County, Ohio, Washington Township, T-5 R-4 in Sections 14, 15, 20, 21, 26, and 27. The application contains 1324.1 underground acres and is located on the Armstrong Mills and Cameron 7 1/2 Minute USGS Quadrangle Maps, approximately 1.5 miles southwest of Armstrong Mills, Ohio. This coal mining application will remove coal using the underground mining methods, specifically the longwall mining method.**

**The application is on file at the Belmont County Courthouse, Recorder's Office, 101 West Main Street, St. Clairsville, Ohio 43950 for public viewing. Written comments or requests for an informal conference may be sent to the Division of Mineral Resources Management, 2050 E. Wheeling Avenue, Cambridge, Ohio 43725-2159 within thirty (30) days after the last date of publication of this notice.**

The State of Ohio
County of Belmont, ss:

The undersigned, being sworn, says that he or she is an employee of Eastern Ohio Newspapers, Inc., A Corporation, publisher of the Times Leader a newspaper published in Martins Ferry, Belmont County, Ohio, each day of the week and of general circulation in said city and county; that it is a newspaper meeting the requirements of sections 7.12 and 5721.01 Ohio Revised Code as amended effective September 24, 1957; that affiant has custody of the records and files of said newspaper; and that the advertisement of which the annexed is a true copy, was published in said newspaper on each of the days in the month and year stated, as follows:

Sept. 24, October 1, 8, 15 2009

Candace L Criswell

Subscribed by Affiant and sworn to before me, this 15th day of October, A.D. 2009.

Rebecca L Anderson
Notary Public

NOTARIAL SEAL STATE OF OHIO

REBECCA L. ANDERSON
Notary Public, State of Ohio
My Commission Expires Nov. 25, 2011

Printer's Fee $ 246.30

Notary's Fee $_____

The Times Leader
Martins Ferry, Ohio

Public Notice

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TL Adv. - 4 Thurs. - Sept. 24, Oct. 1, 8, 15

## PART 2: ENVIRONMENTAL RESOURCES INFORMATION

### A. CULTURAL, HISTORIC, AND ARCHEOLOGICAL INFORMATION

(1) In order to address the nature of cultural, historic and archeological resources in planned subsidence operations, submit Archeology - Underground.

(2) Submit an addendum indicating the method to be used to identify historic properties on planned subsidence areas as mining progresses.

### B. GEOLOGY DESCRIPTION

(1) Submit an addendum describing the geology within the proposed shadow and adjacent areas and down to and including the deeper of either the first stratum below the lowest coal seam to be mined or any aquifer below the lowest coal seam to be mined which may be adversely affected by mining. The description shall also include information on the areal and structural geology of the shadow and adjacent areas and any other geologic parameters, which may influence the probable hydrologic consequences and protection of the hydrologic balance from material damage outside of the permit area, and which may influence the required reclamation.

(2) Submit an addendum describing how the areal and structural geology may affect the occurrence, availability, movement, quantity, and quality of potentially affected surface and ground waters.

(3) For those areas within the shadow area where the stratum above the coal seam to be mined will not be removed, submit Drilling Report - Underground. Submit approved test hole variance request, if applicable.

### C. GROUND WATER INFORMATION

(1) Submit Ground Water Description that describes the ground water hydrology of the proposed shadow area and adjacent area. The Ground Water Description is to include information on each water-bearing stratum or zone, including the first water-bearing stratum below the coal to be mined.

(2) Are there any wells on the proposed shadow area and adjacent area? Yes ☒ No ☐ If "yes," submit Ground Water Inventory.

(3) Are there any developed springs on the shadow area and adjacent area? Yes ☒ No ☐ If "yes," submit Ground Water Inventory, and show location on the hydrology map. Also, show location of undeveloped springs on the hydrology map.

(4) Are there any public water supply sources on the proposed shadow area and adjacent area? Yes ☐ No ☒ If "yes," submit Ground Water Inventory, and show location on the hydrology map.

AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 2, ITEM A(2)

# PROCESS USED TO IDENTIFY ELIGIBLE AND LISTED NATIONAL REGISTER OF HISTORIC PLACES DURING FULL COAL RECOVERY MINING OPERATIONS

Potential historic properties have been identified in the application. Properties that are deemed eligible for listing on the National Register for historic Places (National Register) will be identified by the SHPO and will be noted as such by American Energy Corporation. As mining progresses, American Energy Corporation will identify
properties to be undermined and proper mitigative efforts will be implemented. These steps will be followed:

1. The applicant will complete the underground archaeology form on all structures 50 years or older, not as indicated the old Attachment 27 A, and applicant will complete the surface archaeology form prior to any surface affectment or surface repair.

2. The applicant will provide clear photographic documentation for all prehistoric and historic structures 50 years or older and identify their locations on the application map.

3. The applicant will submit two copies of the archaeology form(s), including photographs and map to the Division.

4. The Division archaeologist will perform completeness review of survey report in the field to insure all historic structures have been documented.

5. The Division will send report (revised or original if no revisions are necessary) to the Ohio Historic Preservation Office (OHPO) for comment.

6. If eligible National Register properties are identified by OHPO, the applicant will provide mitigation plans, prior to undermining the eligible property that will outline the procedures for prevention or minimization from the adverse effects of mining to the properties deemed eligible for inclusion on the National Register.

7. Prior to making surface repairs, including access route construction to the repair site on eligible or listed National Register historic properties for damage caused by subsidence or associated mining operations, the applicant will first coordinate with the Division who will then coordinate with the Ohio Historic Preservation Office for comment. The Division will then inform the applicant whether:
    a.) Further coordination is necessary prior to such repairs, i.e., Phase 1 archaeology surveyor
    b.) No additional research is required prior to the applicant repairing the land surface.

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## ARCHEOLOGY - UNDERGROUND

1. Applicant's Name: **American Energy Corporation**
   Permit No: **D-0425-12**
   Address: **43521 Mayhugh Hill Road**
   City: **Beallsville** State: **Ohio** Zip Code: **43716**

2. Contact Person: **James Turner Jr.** Phone: **(740) 926-9152**

3. Location and Acreage Information:
   County: **Belmont** Township: **Washington**
   Section(s)/Lot(s): **14, 15, 20, 21, 26, & 27** T- **5**, R-**4**
   USGS Quadrangle: **Armstrong Mills/Cameron** Acreage: **1324.1**

4. Full Coal Recovery Area Map Attached: (USGS Quadrangle with full coal recover are delineated).

5. Historic and Prehistoric Structures:

   Definitions:

   A historic or prehistoric structure is a work made up on interdependent and interrelated parts in a definite pattern of organization. Constructed by humans, and 50 years or older, it is usually an engineering project.

   Types:

   Historic structures include, but are not limited to dwellings, buildings, barns, farmstead outbuildings, bridges, culverts, churches, schools, halls, iron furnaces (and associated buildings), canals, forts, abandoned coal mine buildings, mine entrances, tipples and related structures, etc.

   Prehistoric structures include, but are not limited to, earthworks and mounds.

   List all known historic and prehistoric structures below **and** locate each on the map to be sent to the SHPO **including** corresponding labeled back and front and rear photographs of each structure. Attach addendum, if necessary.

| Structure Type | Construction Date | Map Reference | Photo No. Front | Photo No. Rear |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |



Revised 05/08
DNR-744-9040

6. Previous historic and/or archeological surveys: (describe any surveys known to applicant on the planned subsidence areas)

**None known.**

7. SHPO please send this form to:

Ohio Department of Natural Resources
Division of Mineral Resources Management
Attn: Archeologist
2045 Morse Road, Building H-3
Columbus, Ohio 43229-6693

---

**FOR USE BY THE STATE HISTORIC PRESERVATION OFFICE ONLY**

(check appropriate space)

A. ☐ This is a recommendation for an archeological survey of the application based on the following reasons (attach addendum, if necessary):

A SHPO review of the area shown on the application map has provided a listing below of all known historic and prehistoric properties listed and eligible for listing on the "National Register of Historic Places" and known historic and prehistoric sites on the application area and adjacent areas (in a 1.5 mile radius). The listing includes, when appropriate, those historic and prehistoric structures identified by the applicant in items 5 and 6 above.

Listed and Eligible National Register Sites

| Site Name (#) | Type | Application Area | Adjacent Area |
|---|---|---|---|
| | | | |
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Known Historic and Prehistoric Sites

| Site Name (#) | Type | Application Area | Adjacent Area |
|---|---|---|---|
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Revised 05/08
DNR-744-9040

B. ☐ A SHPO review of the area shown on the application map and information contained in this form finds that the proposed mining does not have a reasonable probability of affecting any properties listed or eligible for listing on the "National Register of Historic Places." Therefore, no further coordination will be necessary with this office unless the scope of the application area changes.

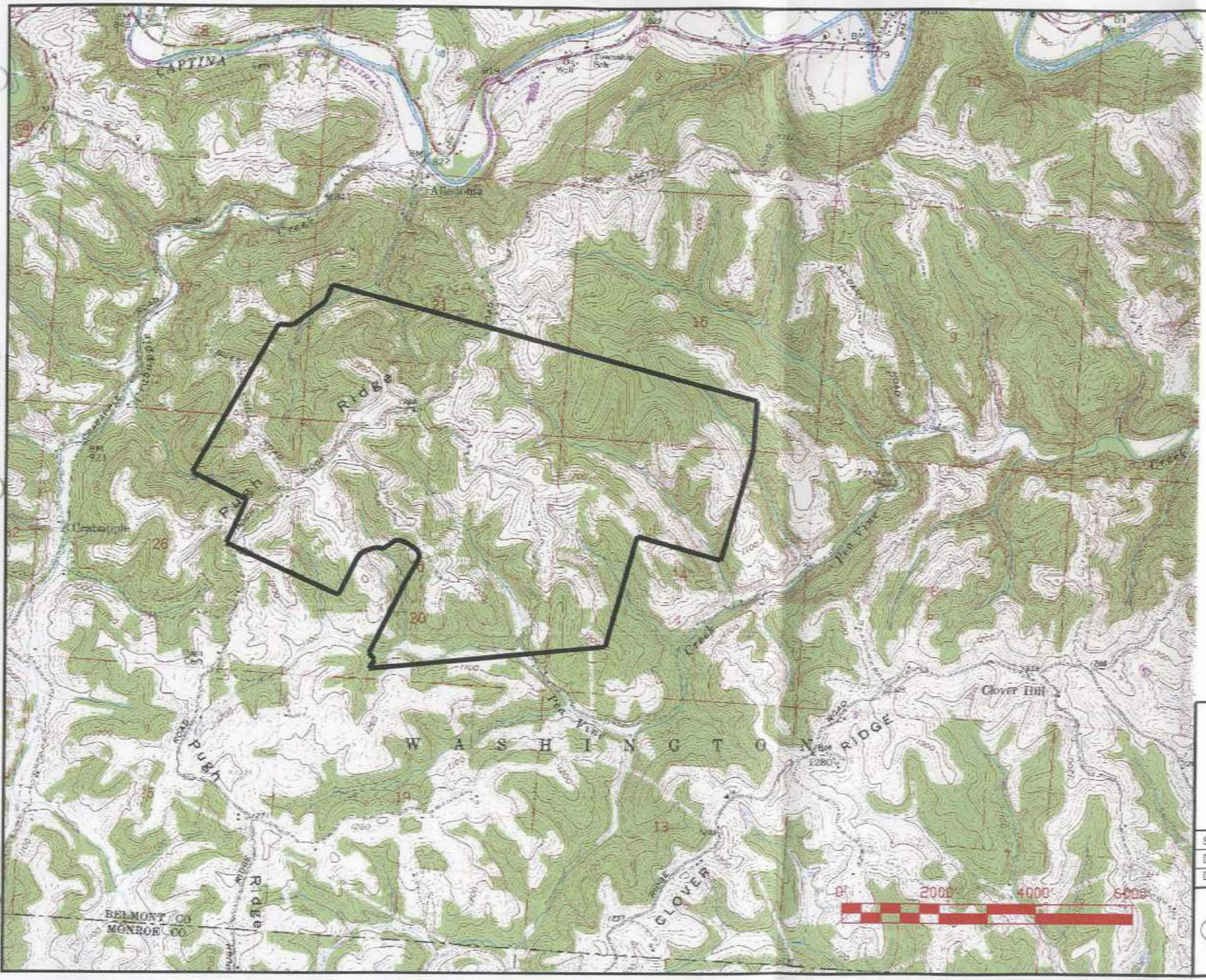
State Historic Preservation Officer _____

SHPO # _____

Date _____



Revised 05/08
DNR-744-9040



Located on the Armstrong Mills & Cameron
7 1/2 Minute U.S.G.S. Quadrangle Map

—— Full Coal Recovery/Longwall Mining 1324.1 acres

## American Energy Corporation

Peavine Southwest Permit D-0425-12

Located in: Sections 14, 15, 20, 21, 26 & 27
Washington Township, T-5-N R-4-W, Belmont County, Ohio

Archaeology - Underground

Full Coal Recovery Area Map

Denotes Full Coal Recovery

| | | | |
|---|---|---|---|
| Scale: | 1" = 2000' | Contour Interval: | 20' |
| Drawn By: | DJB | Comm. #: | 02001-62-5 |
| Date: 10-22-08 | Revised Date: 06-18-09, 08-11-09 | | |


Jack L. HAMILTON & Associates, Inc.
342 High St., Box 471
Flushing, Ohio 43977
Ph: (740) 968-4947
Fax: (740) 968-4225
e-mail: hamilton@1st.net
www.hamiltonandassoc.com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ADDENDUM TO ARCHEOLOGY-UNDERGROUND, ITEM 5
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12

8/29/08

| STRUCTURE TYPE | CONST. DATE | MAP REF. | PHOTO FRONT | PHOTO BACK | OWNER |
|---|---|---|---|---|---|
| Barn ruins | 1900 | 9-42 | 42 BR F | 42 BR B | Trevor & Dawnell Moore |
| House | 1900 | 9-42 | 42 H F | 42 H B | |
| Privy | 1900 | 9-42 | 42 P F | 42 P B | |
| Shed | 1900 | 9-42 | 42 S1 F | 42 S1 B | |
| Shed | 1900 | 9-42 | 42 S2 F | 42 S2 B | |
| Shed | 1900 | 9-42 | 42 S3 F | 42 S3 B | |
| Shed | 1900 | 9-42 | 42 S4 F | 42 S4 B | |
| Shed | 1900 | 9-42 | 42 SR F | no photo | |
| | | | | | |
| Barn | 1900 | 9-43 | 43 B F | 43 B B | Leroy Lucas |
| House | 1900 | 9-43 | 43 H F | 43 H B | |
| | | | | | |
| Barn | 1900 | 9-44 | 44 B1 F | 44 B1 B | Bobby V. & Susan L. King, Jr. |
| Barn | 1900 | 9-44 | 44 B2 F | 44 B2 B | |
| Barn ruins | 1900 | 9-44 | 44 BR F | 44 BR B | |
| House | 1900 | 9-44 | 44 H F | 44 H B | |
| Shed | 1900 | 9-44 | 44 S1 F | 44 S1 B | |
| Shed | 1900 | 9-44 | 44 S2 F | 44 S2 B | |
| Shed | 1900 | 9-44 | 44 S3 F | 44 S3 B | |
| Shed | 1900 | 9-44 | 44 S4 F | 44 S4 B | |
| Shed | 1900 | 9-44 | 44 S5 F | 44 S5 B | |



*Structures shown on 1950 Aerial Photo

AEC 03197

ADDENDUM TO ARCHEOLOGY-UNDERGROUND, ITEM 5
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12

| STRUCTURE TYPE | CONST. DATE | MAP REF. | PHOTO FRONT | PHOTO BACK | OWNER |
|---|---|---|---|---|---|
| Shed ruins | 1900 | 9-44 | 44 SR F | 44 SR B | |
| | | | | | |
| Barn | 1900 | 9-45 | 45 B F | 45 B B | David A. & Judith Crooks |
| House | 1868 | 9-45 | 45 H F | 45 H B | |
| Shed | 1900 | 9-45 | 45 S F | 45 S B | |
| | | | | | |
| Barn | 1900 | 9-46 | 46 B F | 46 B B | Ira O. & Katherine L. Lepley |
| Shed | 1900 | 9-46 | 46 S1 F | 46 S1 B | |
| Shed | 1900 | 9-46 | 46 S2 F | 46 S2 B | |
| Shed | 1900 | 9-46 | 46 S3 F | 46 S3 B | |
| | | | | | |
| House ruins | 1900 | 9-48 | 48 HR F | 48 HR B | Terry & Mickey Craig |
| Summer kitchen | 1900 | 9-48 | 48 SK F | 48 SK B | |
| | | | | | |
| House | 1870 | 9-49 | 49 H F | 49 H B | Fred & Cheryl Wente |
| Barn | 1870 | 9-49 | 49 B F | 49 B B | |
| | | | | | |
| House | 1900 | 9-50 | 50 H F | 50 H B | Steven & Charlotte Kovacs |
| | | | | | |
| Barn | 1900 | 9-51 | 51 B F | 51 B B | James & Joan Miller |
| House | 1930 | 9-51 | 51 H F | 51 H B | |



*Structures shown on 1950 Aerial Photo

AEC 03198

ADDENDUM TO ARCHEOLOGY-UNDERGROUND, ITEM 5
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12

8/29/08

| STRUCTURE TYPE | CONST. DATE | MAP REF. | PHOTO FRONT | PHOTO BACK | OWNER |
|---|---|---|---|---|---|
| Shed | 1900 | 9-51 | 51 S F | 51 S B | |
| Silo | 1900 | 9-51 | 51 Si F | no photo | |
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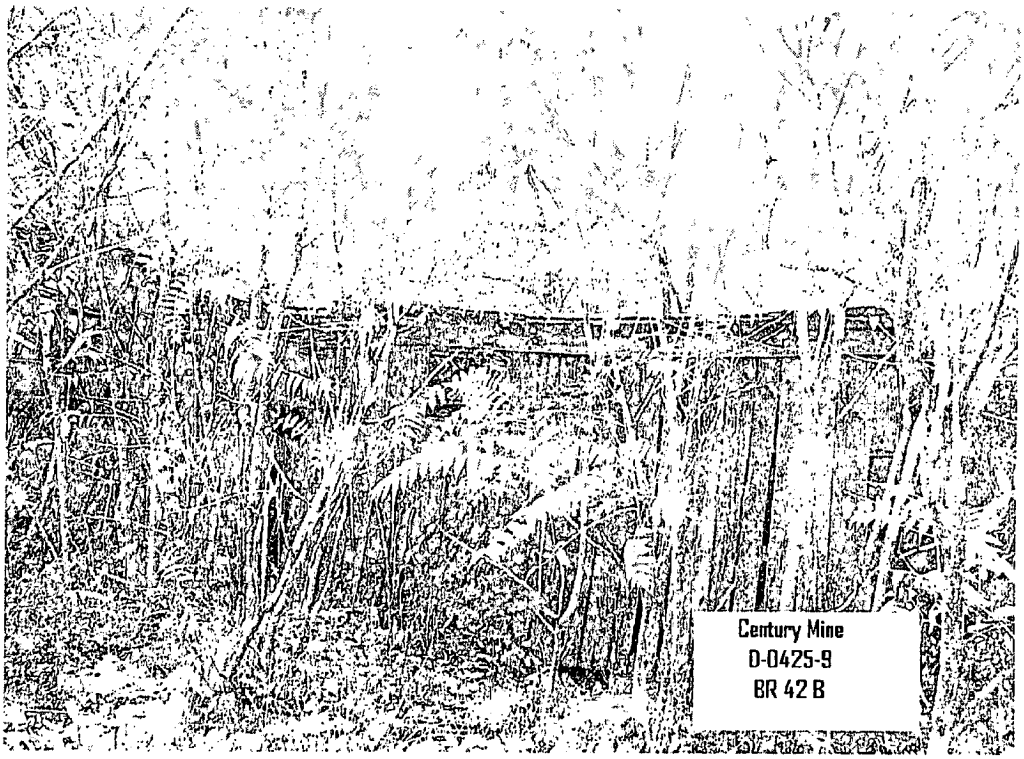
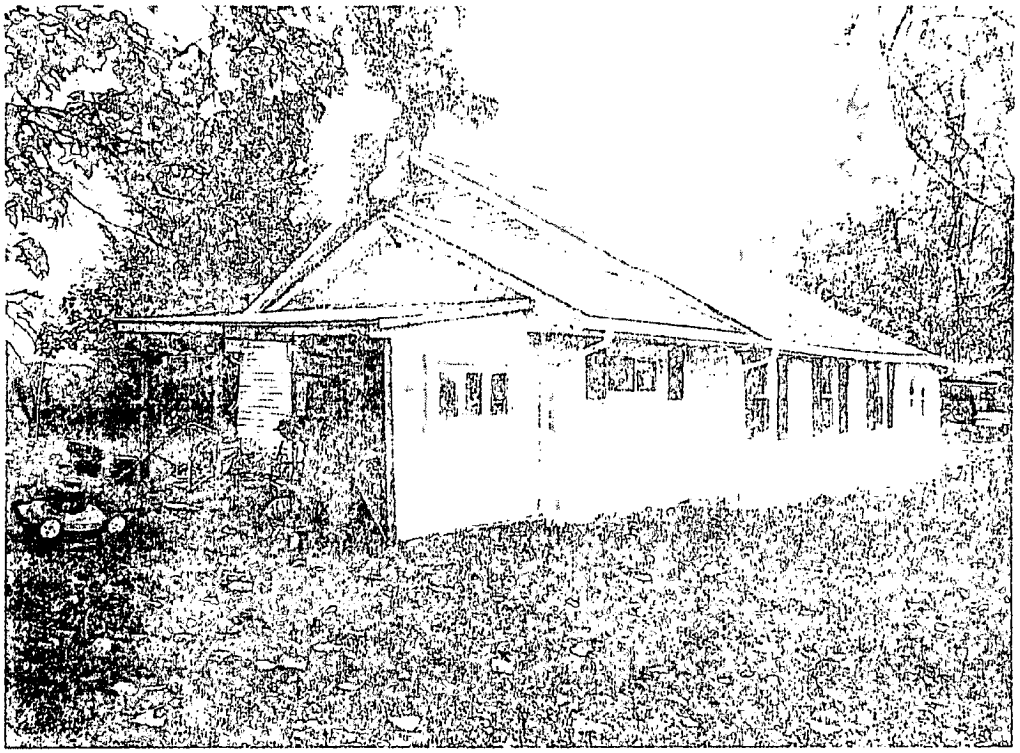
*Structures shown on 1950 Aerial Photo

AEC 03199

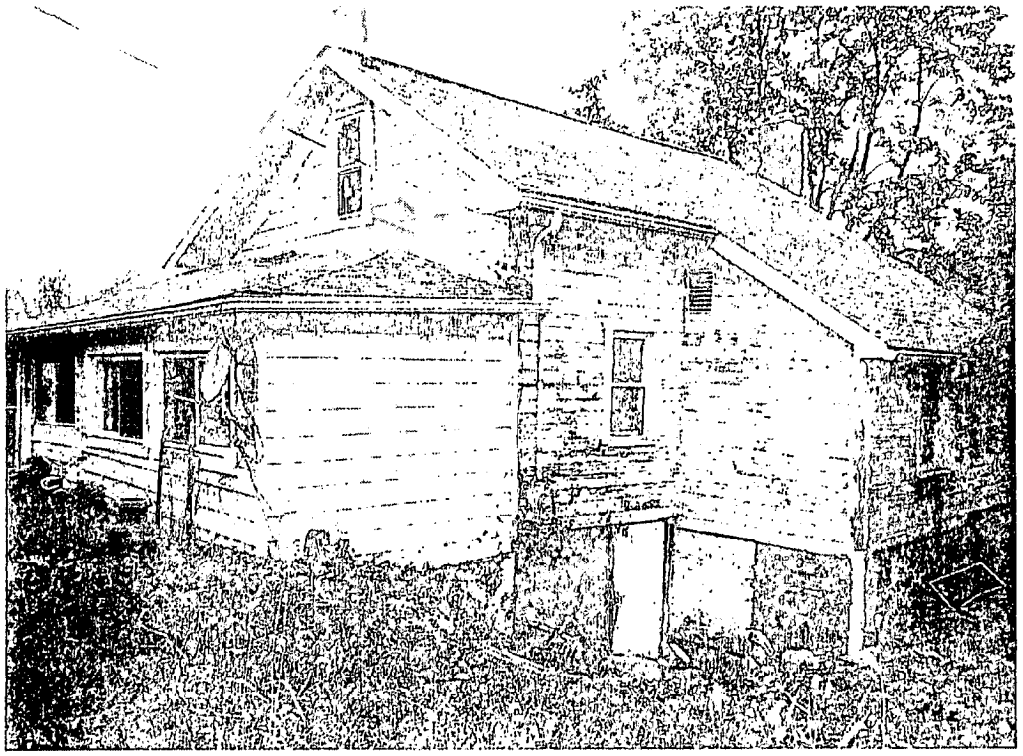



Barn Ruins 42 BR B

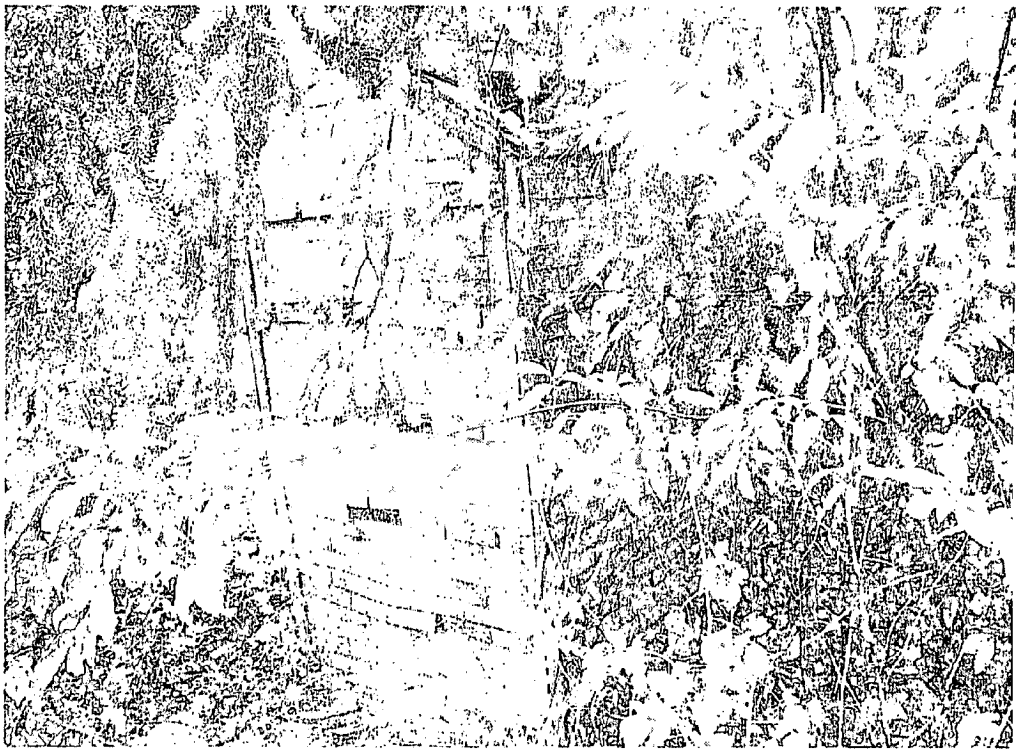
Barn Ruins 42 BR F



House 42 H F



House 42 H B

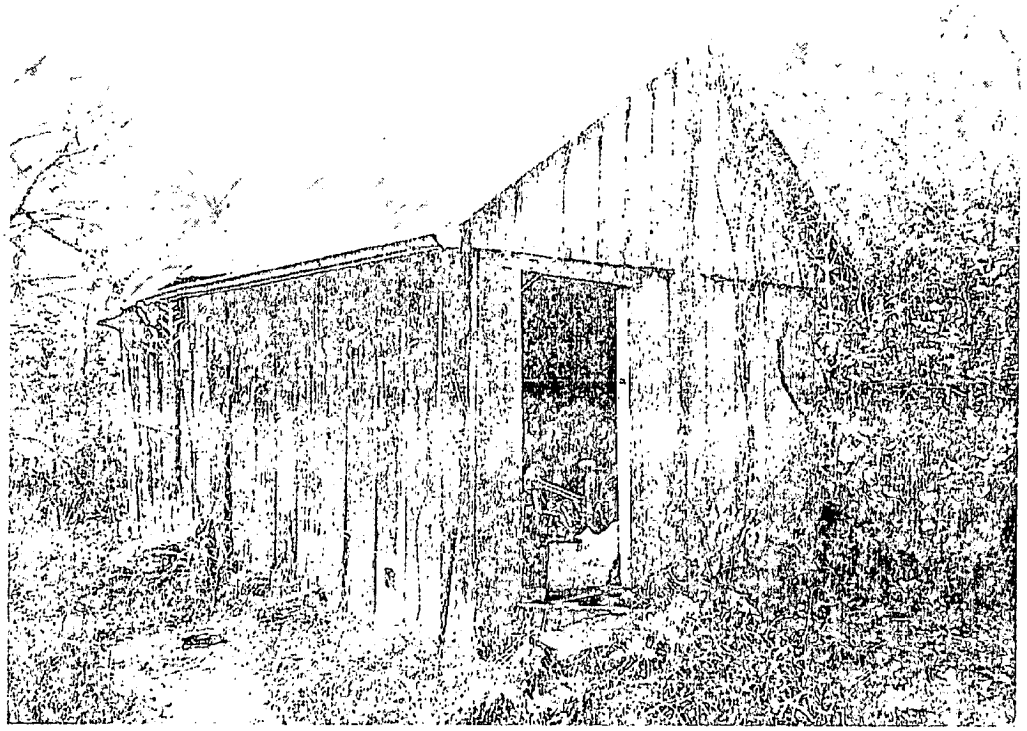


Privy 42 P F

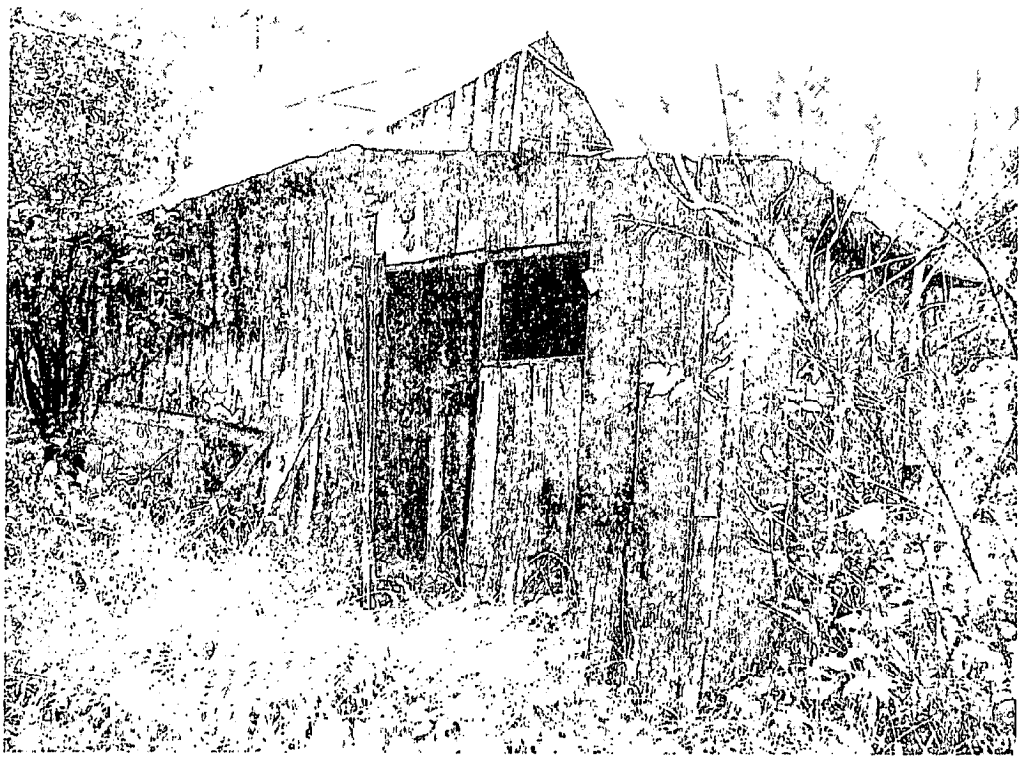
Privy 42 P B

Shed 42 S1 F

Shed 42 S1 B

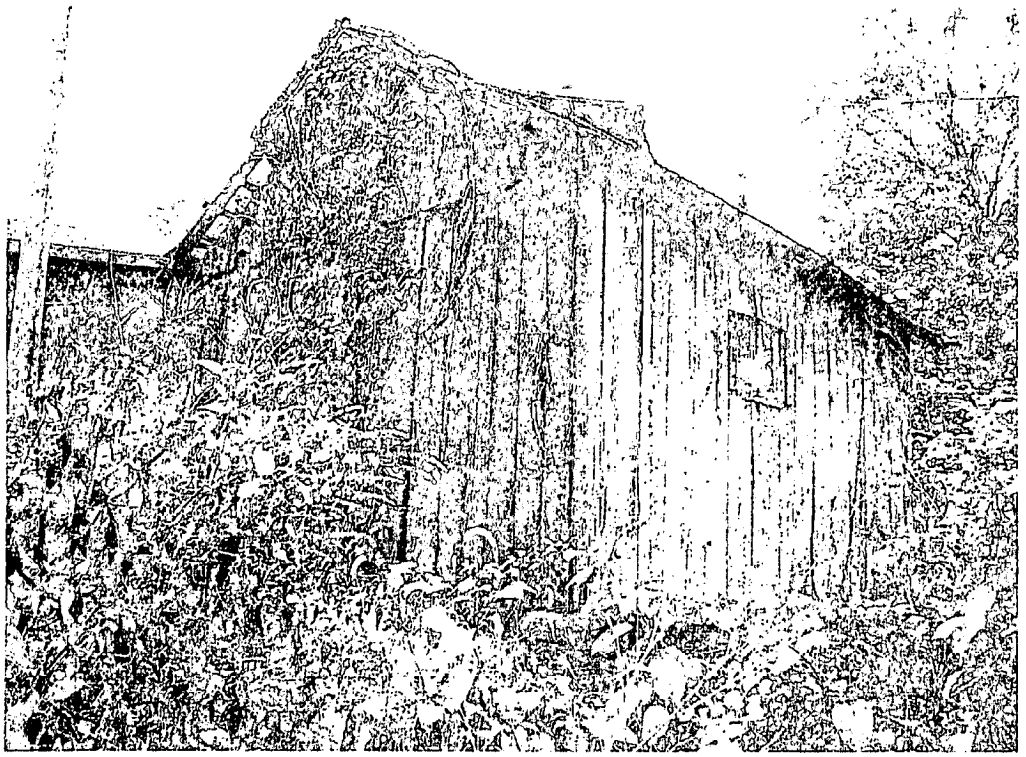


Shed 42 S2 F



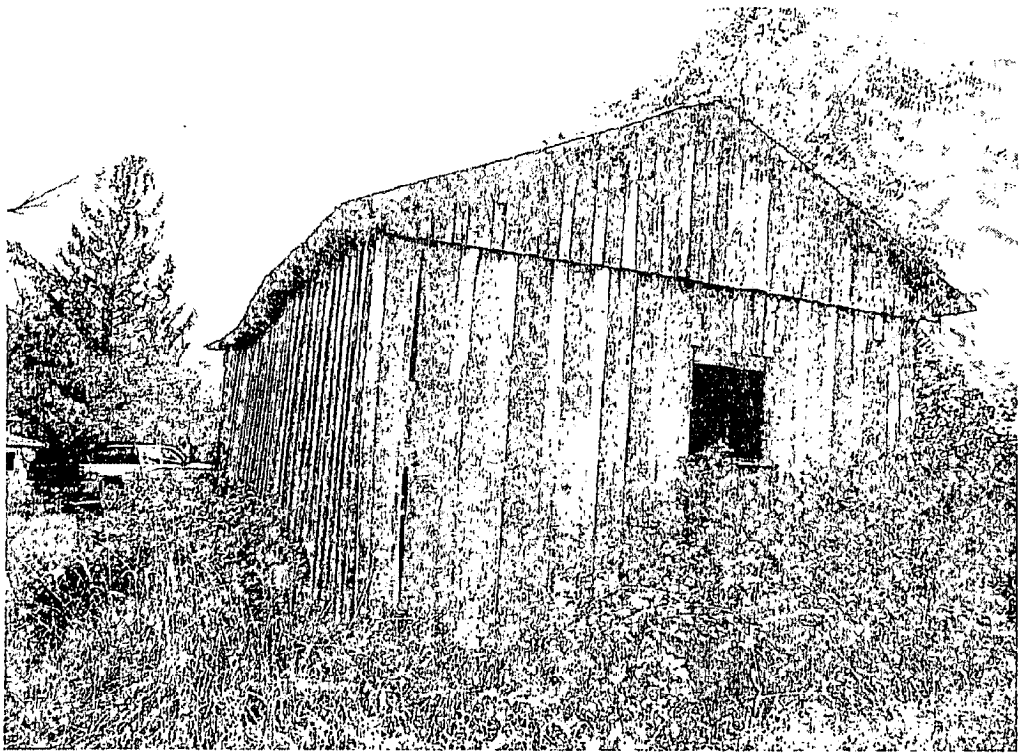
Shed 42 S2 B

Shed 42 S3 F

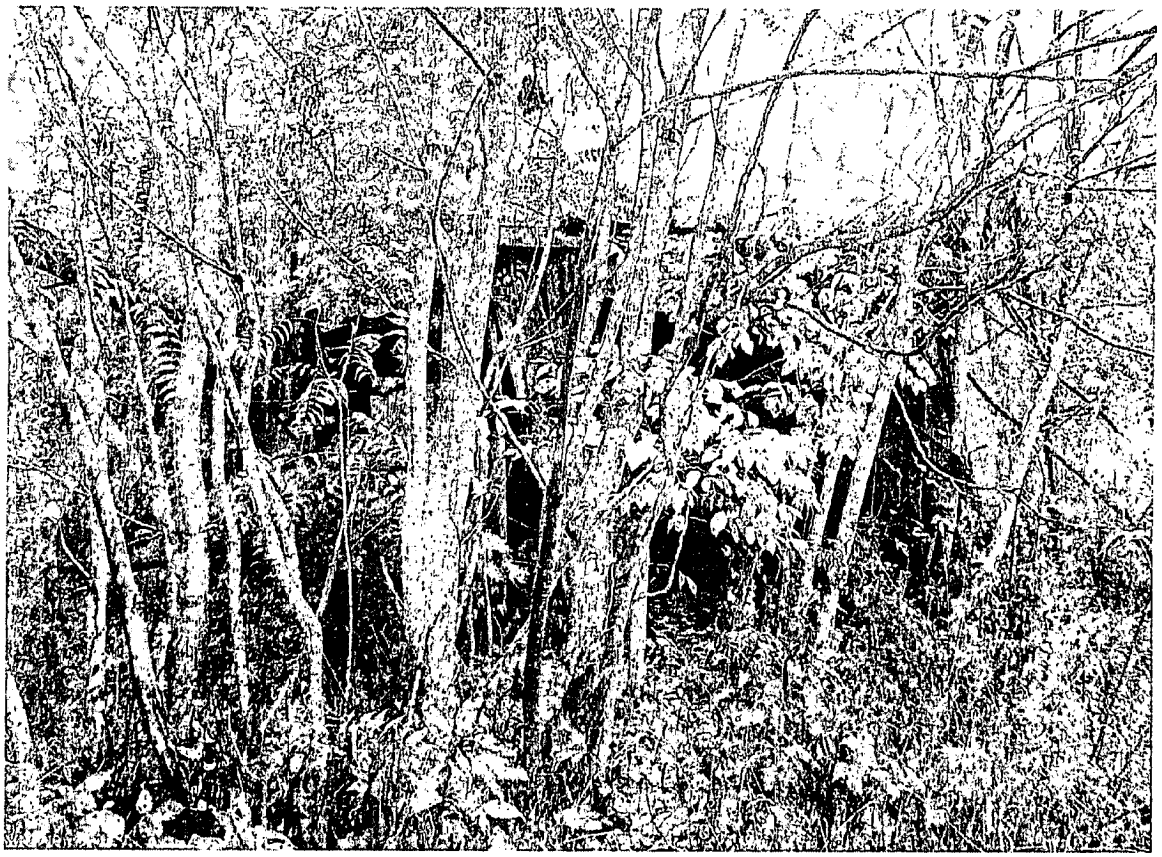


Shed 42 S3 B

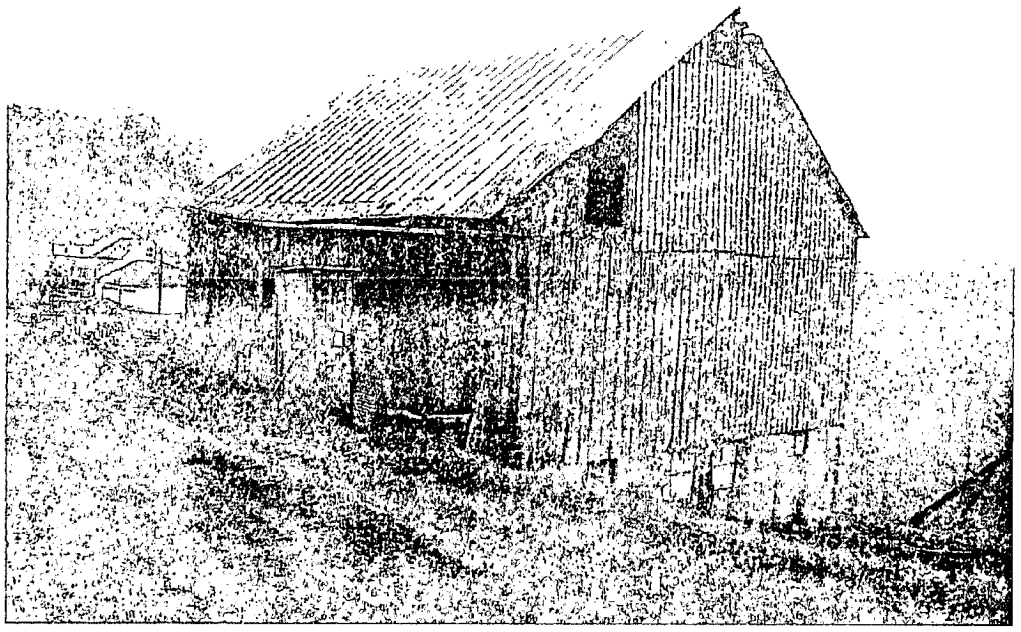
Shed 42 S4 F



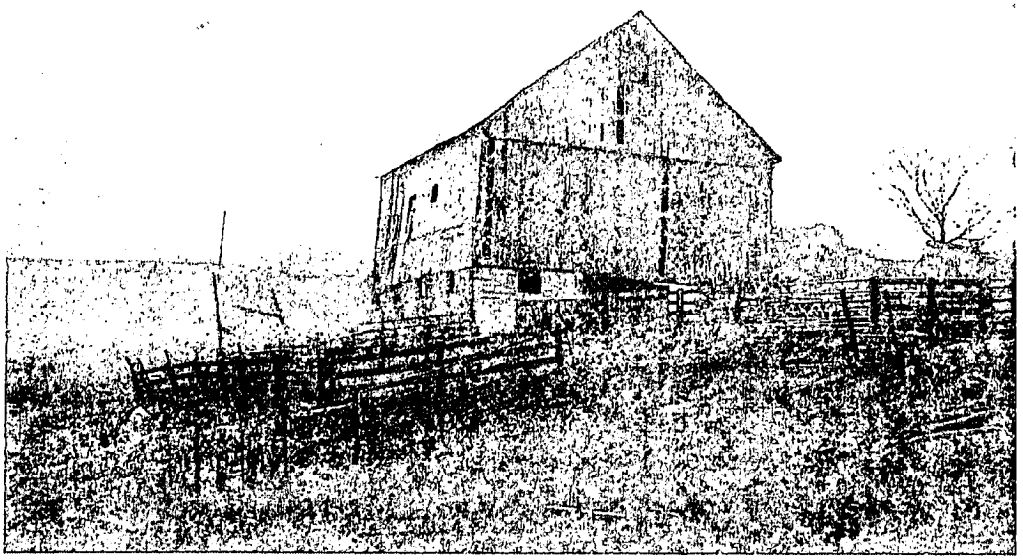
Shed 42 S4 B



Shed Ruins 42 SR F

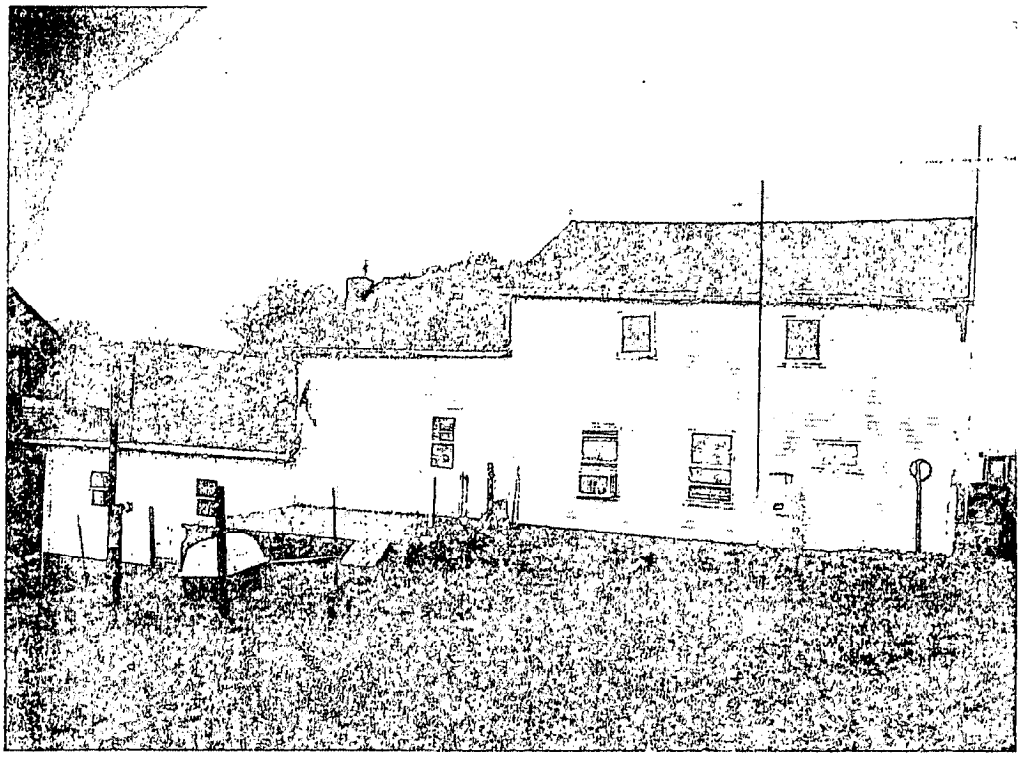


Barn 43 B F



Barn 43 B B

House 43 H F



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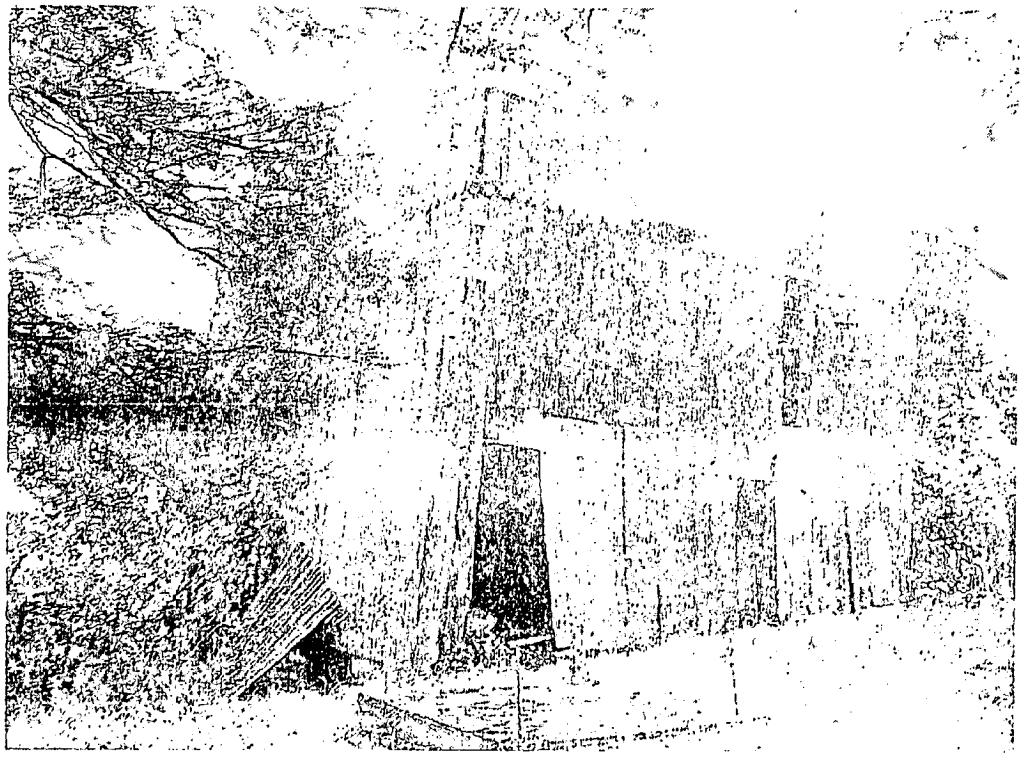

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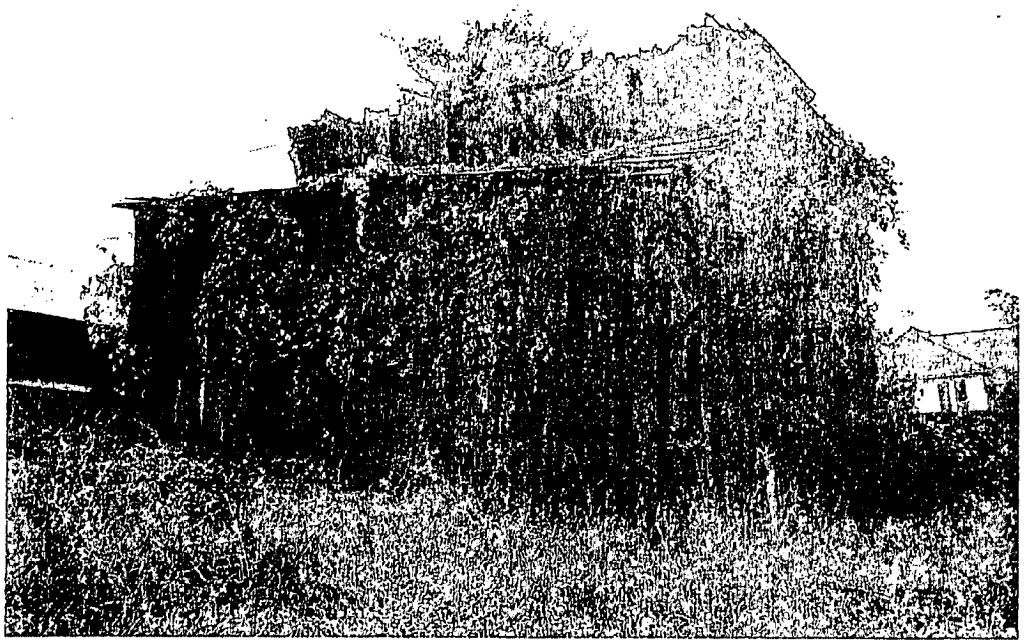

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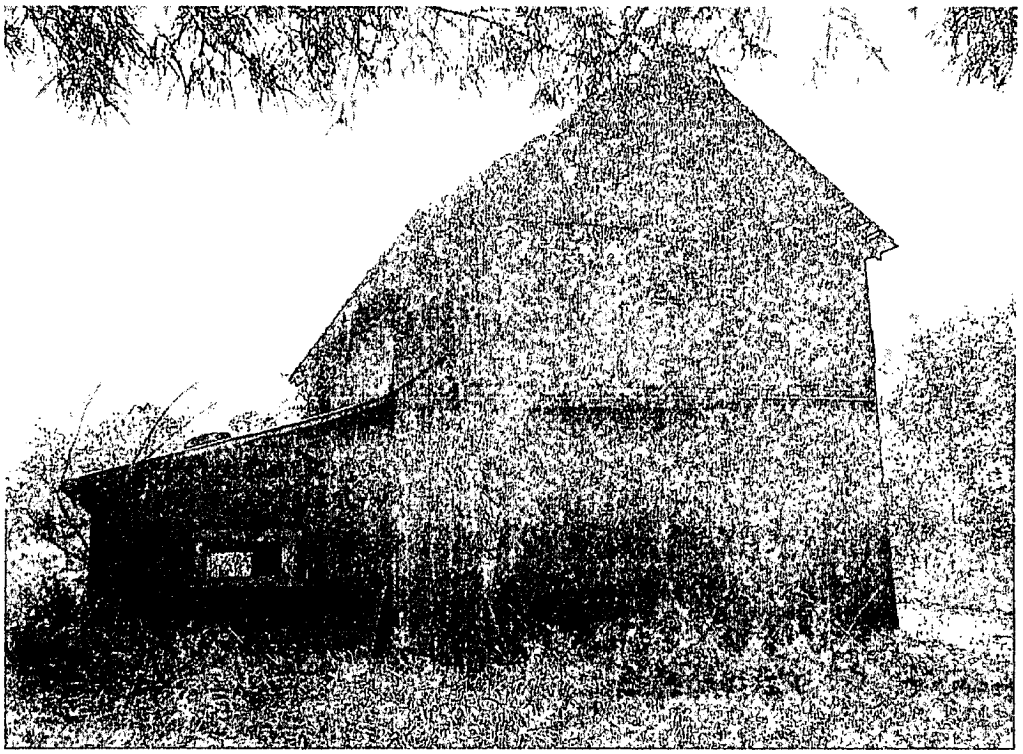

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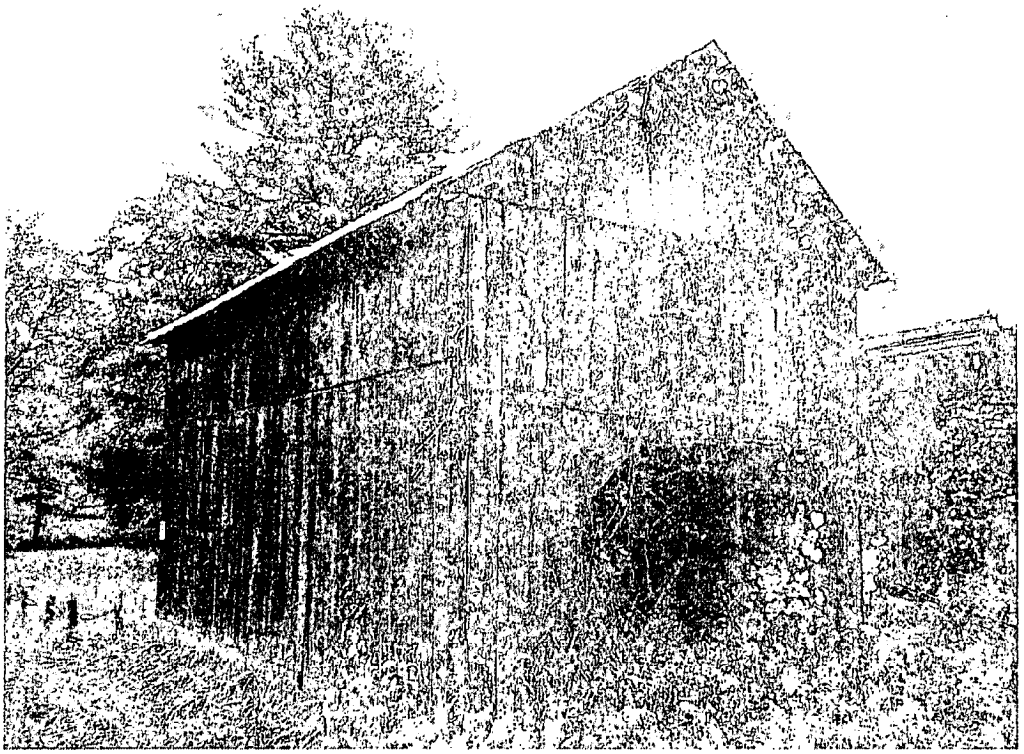


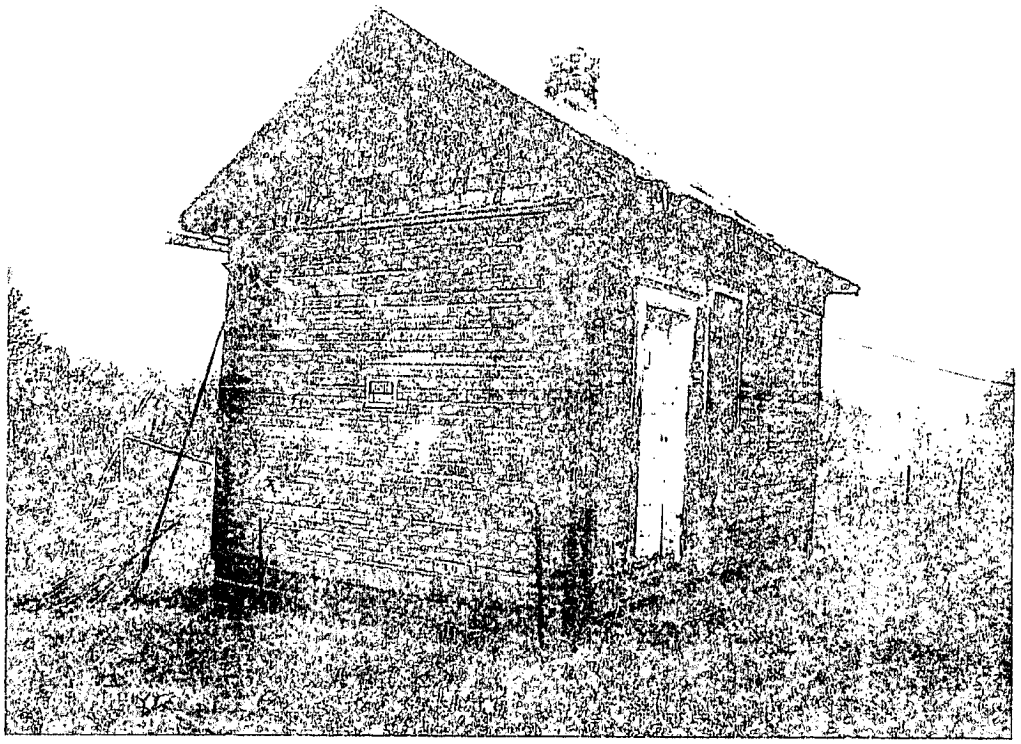
Barn 44 B2 B

Barn Ruins 44 BR F

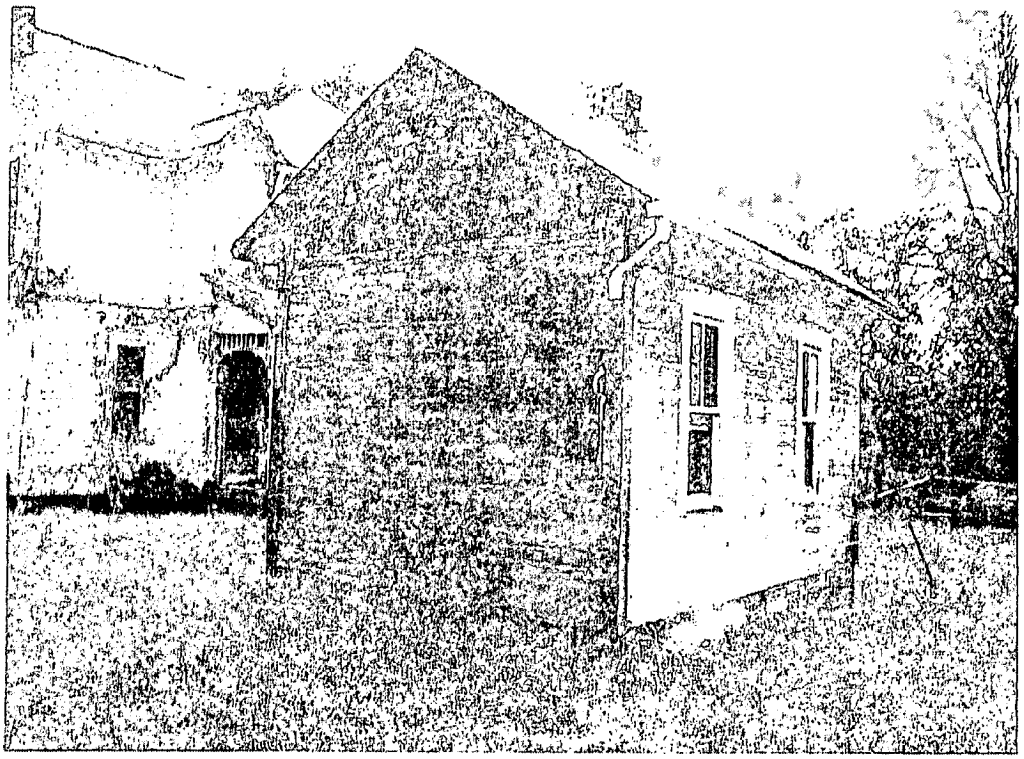
Barn Ruins 44 BR B

House 44 H F

House 44 H B



Shed 44 S1 F



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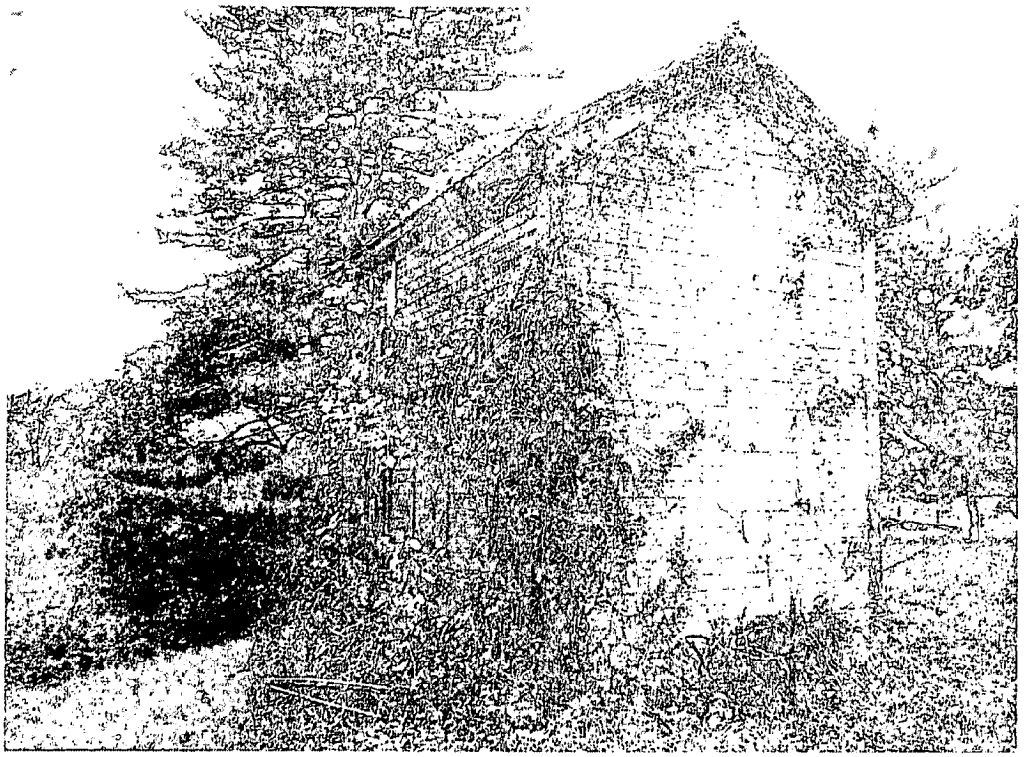
Shed 44 S2 F

Shed 44 S2 B

Shed 44 S3 F



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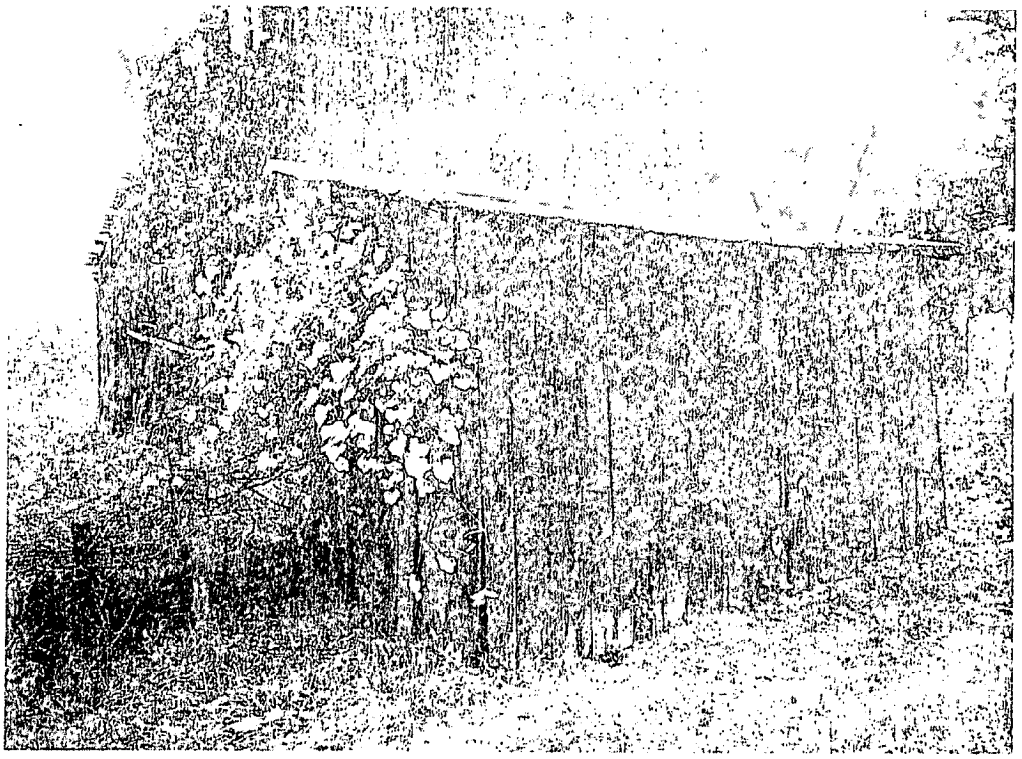
Shed 44 S4 F

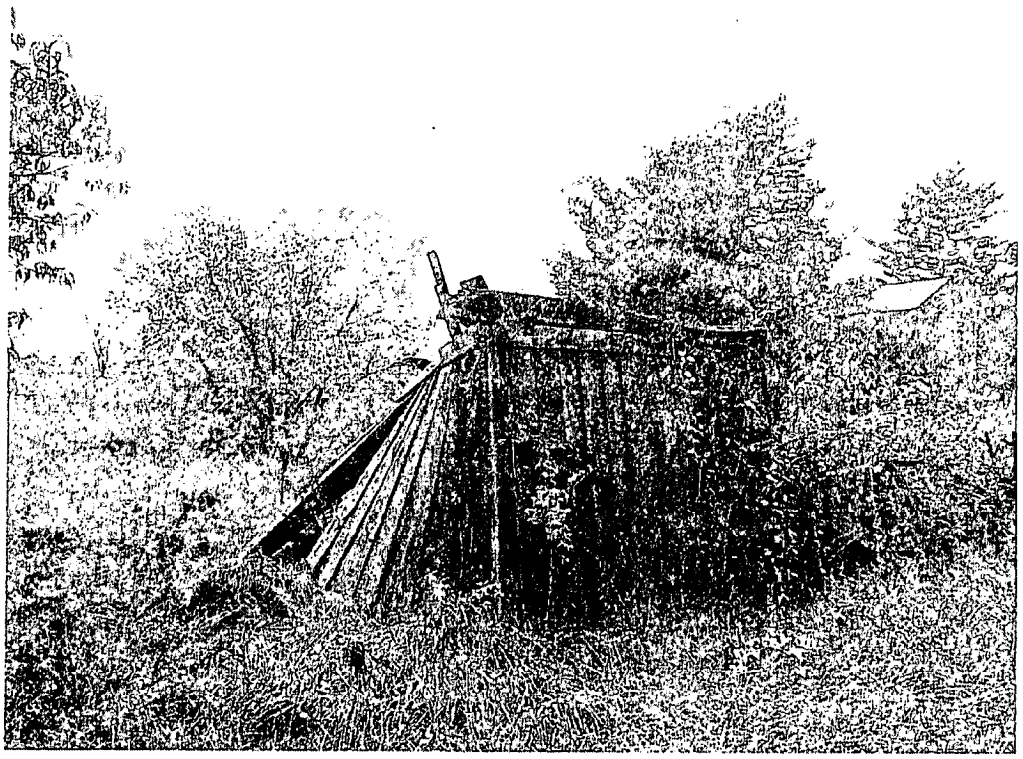


Shed 44 S4 B

Shed 44 S5 F

Shed 44 S5 B

Shed Ruins 44 SR F



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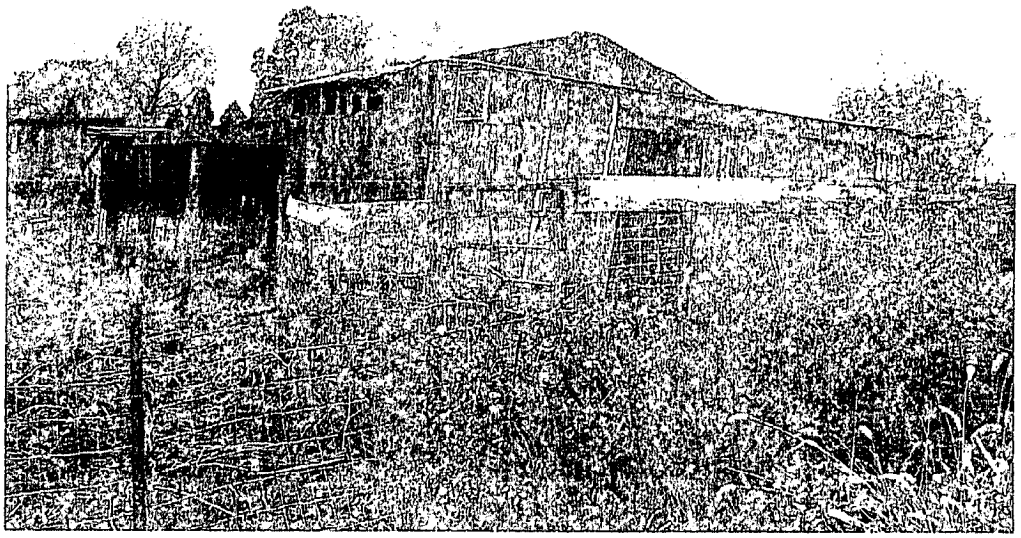

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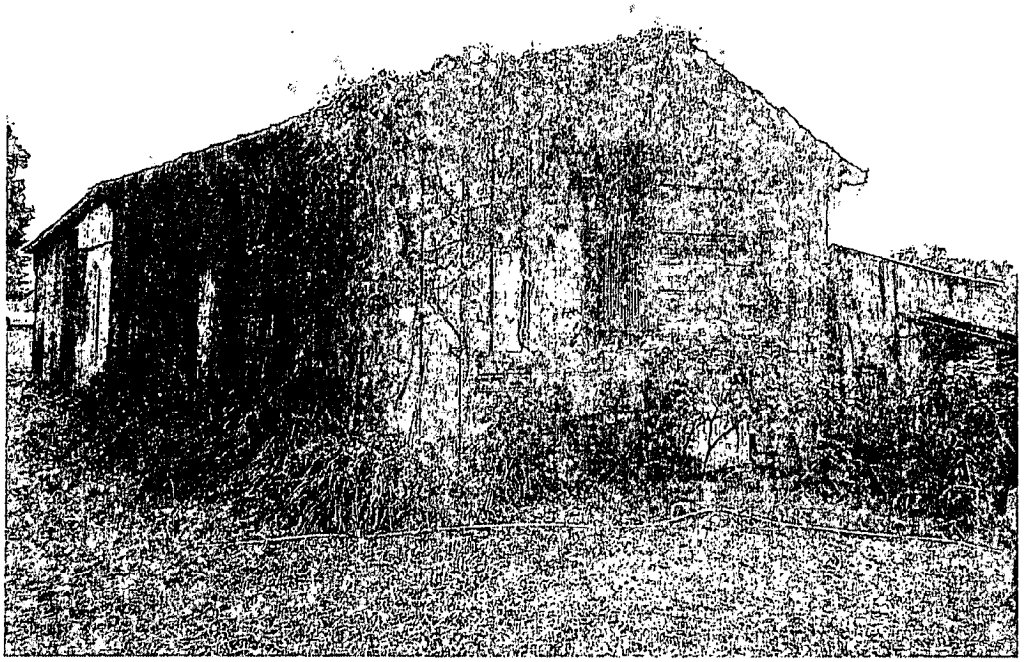

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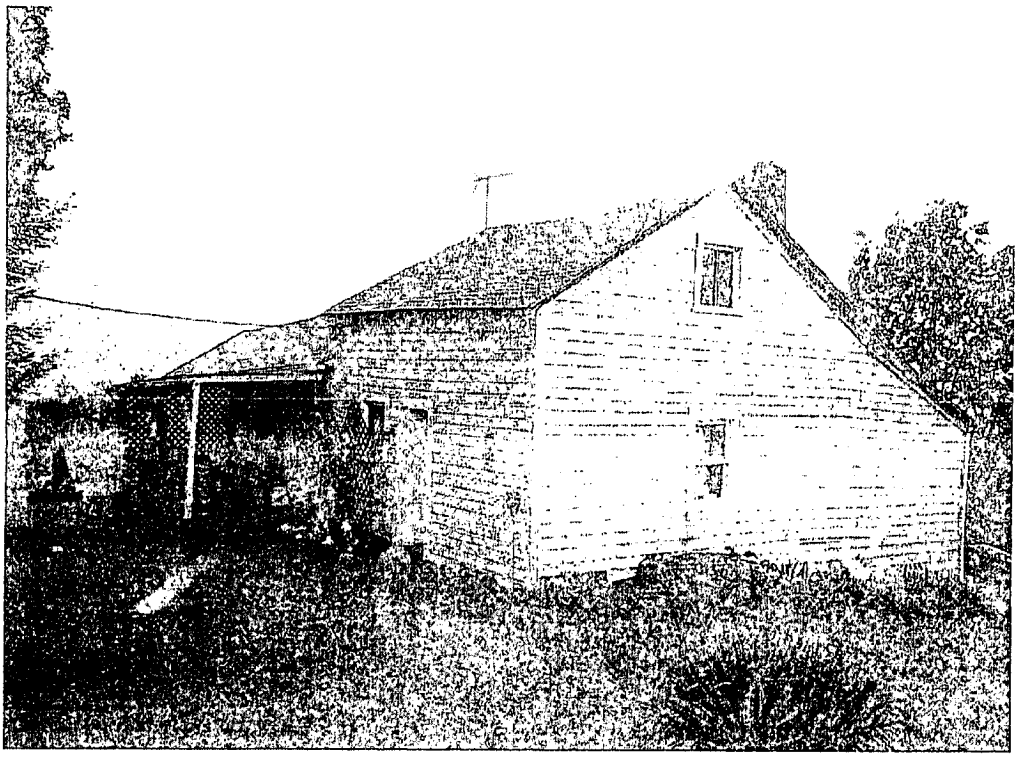
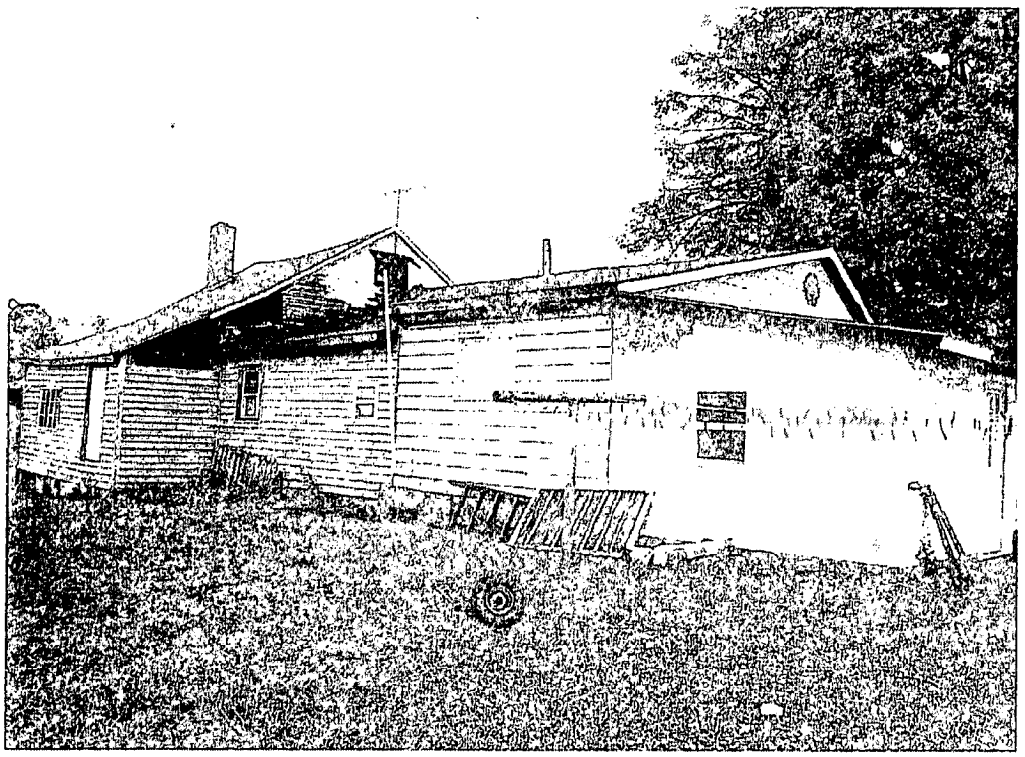


House 45 H F



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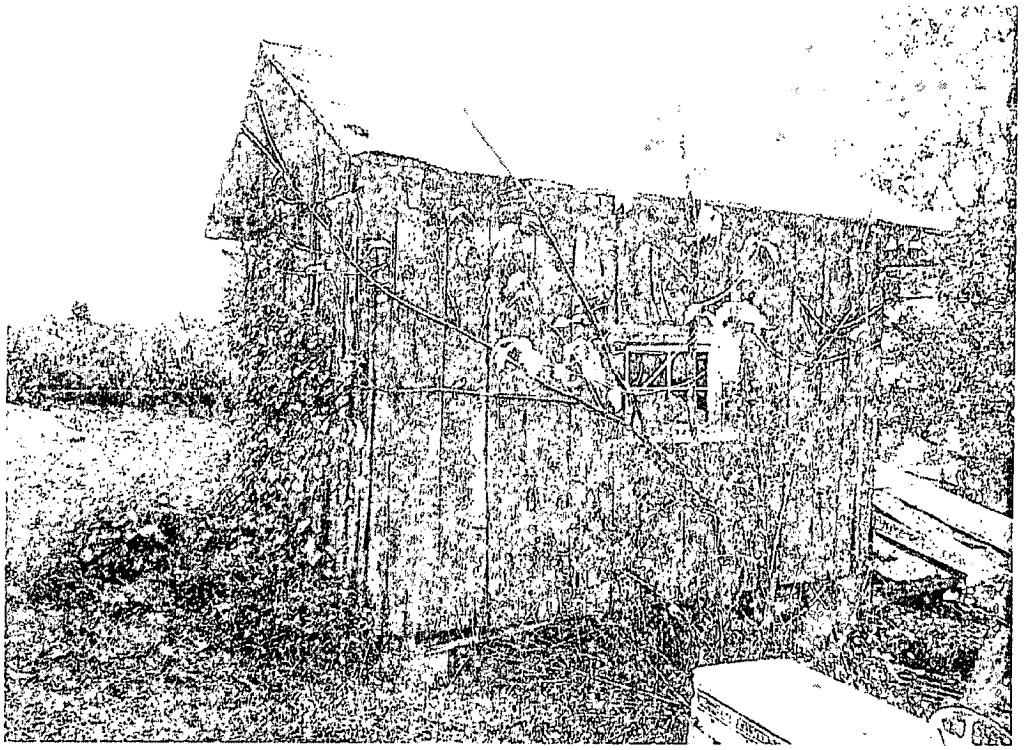

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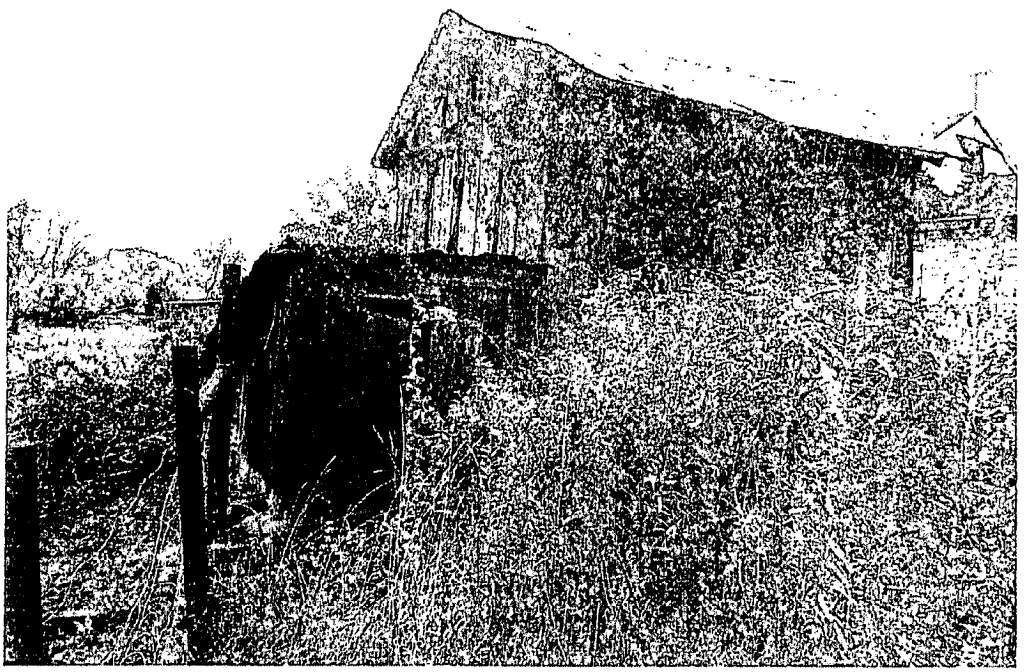

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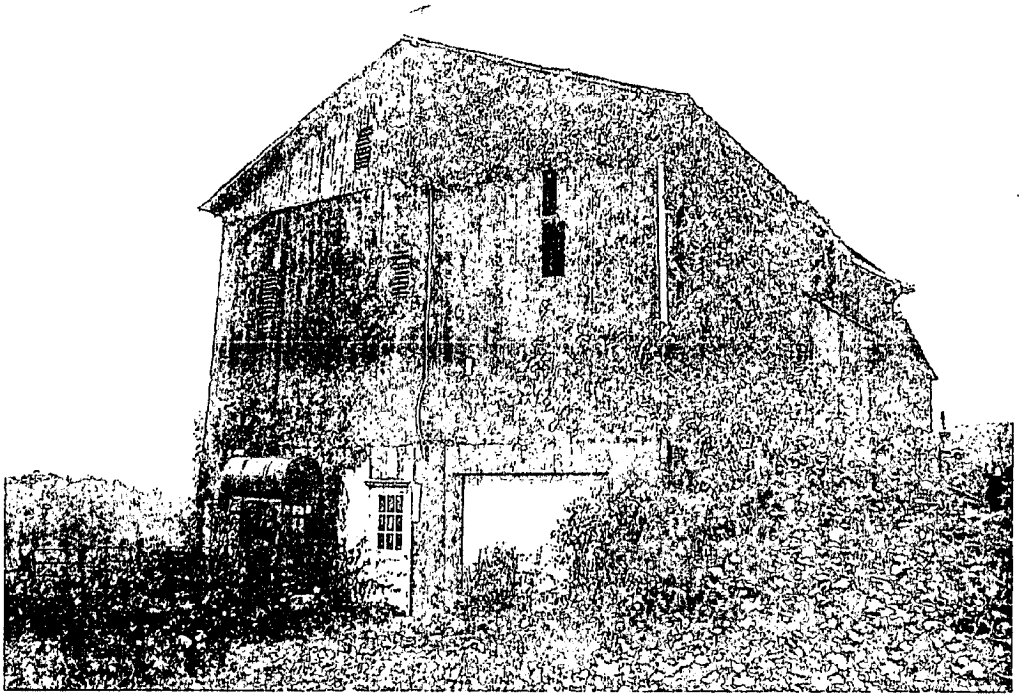

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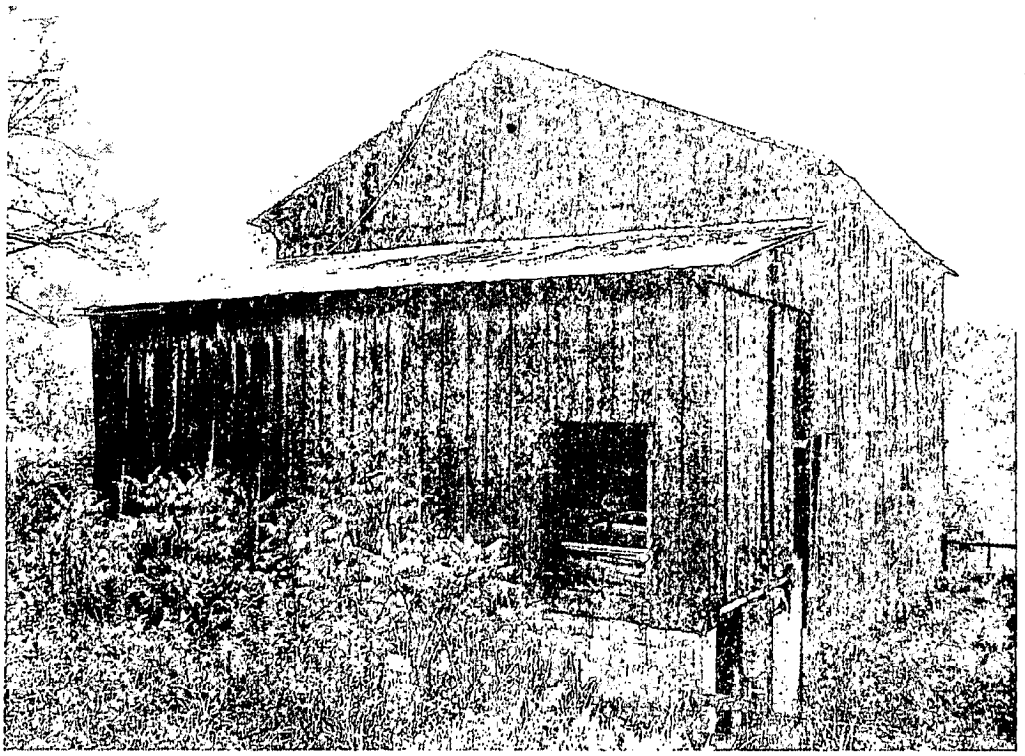

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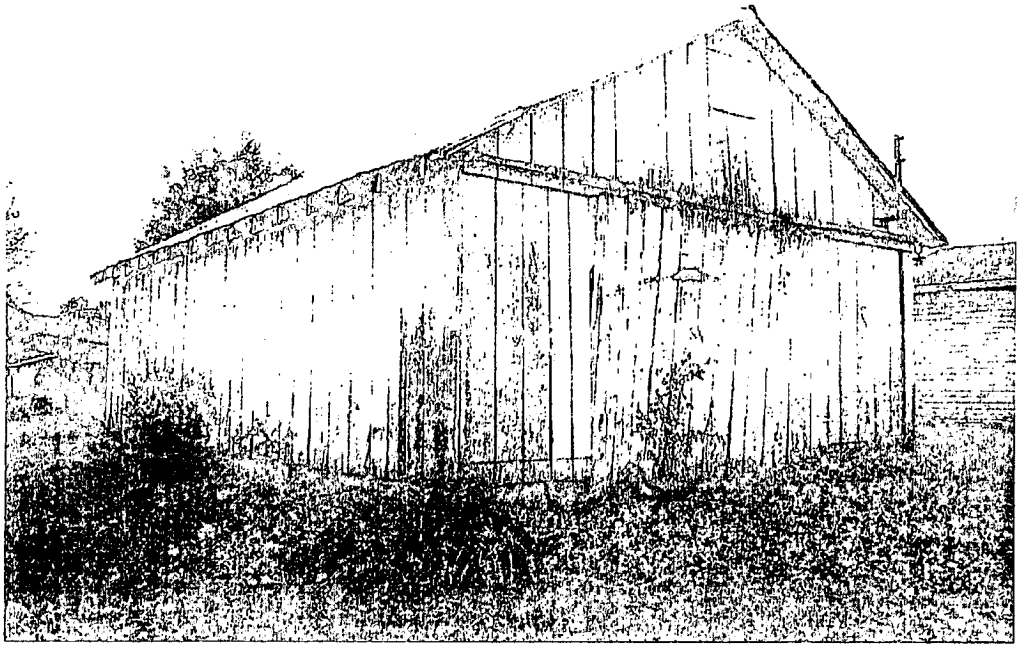

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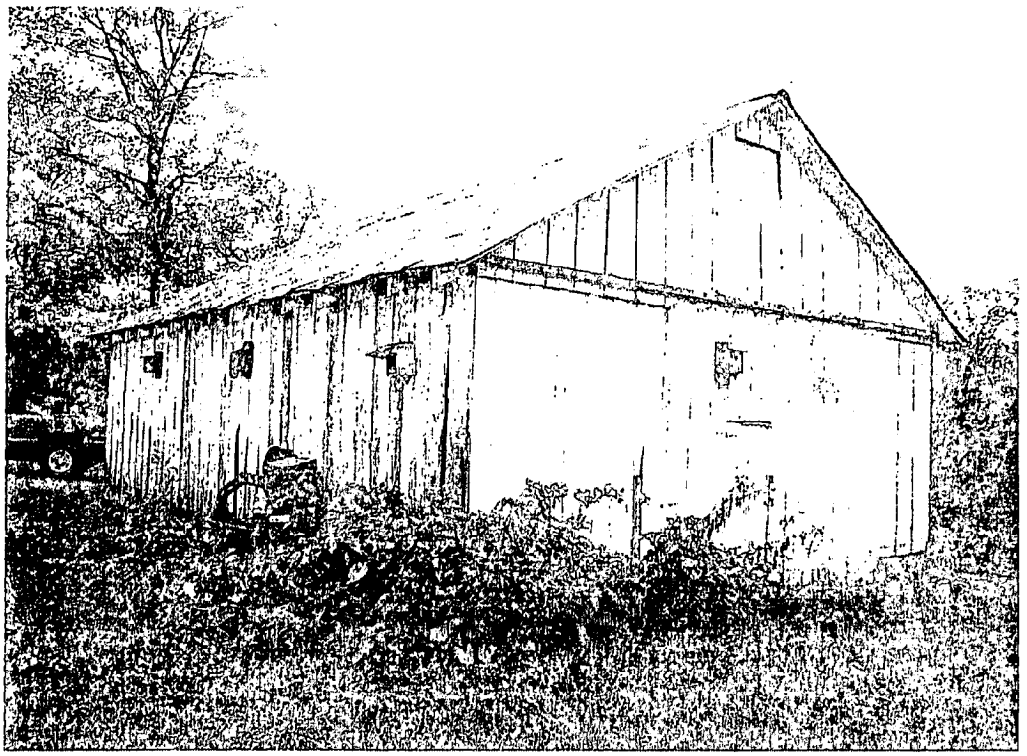

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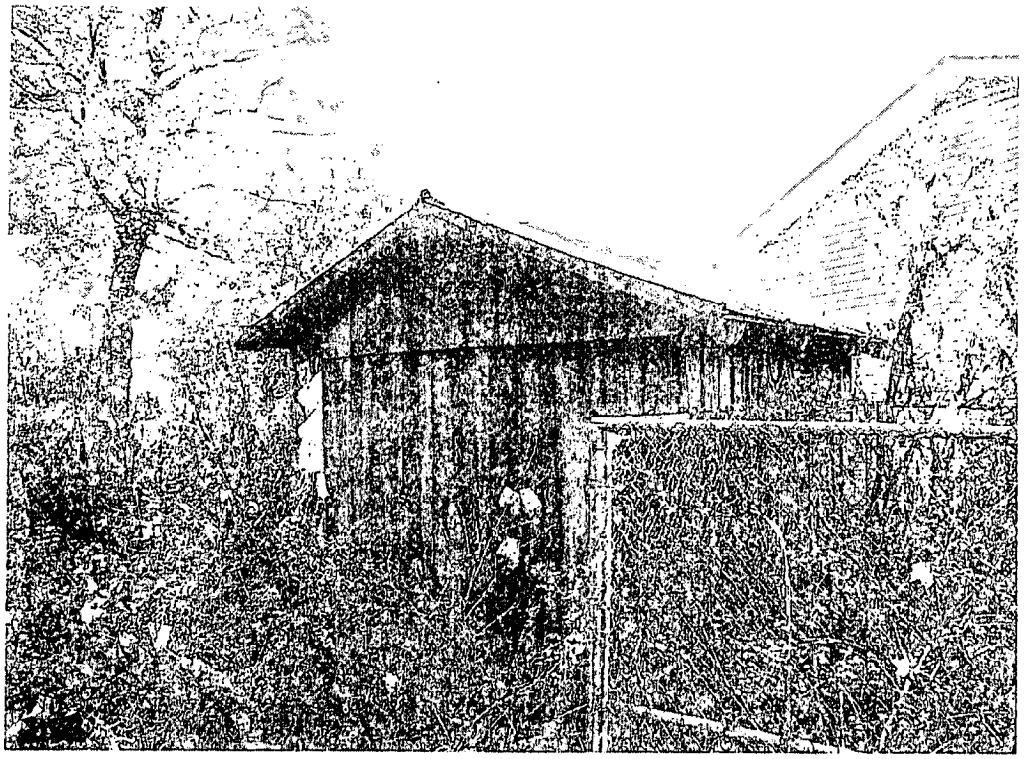

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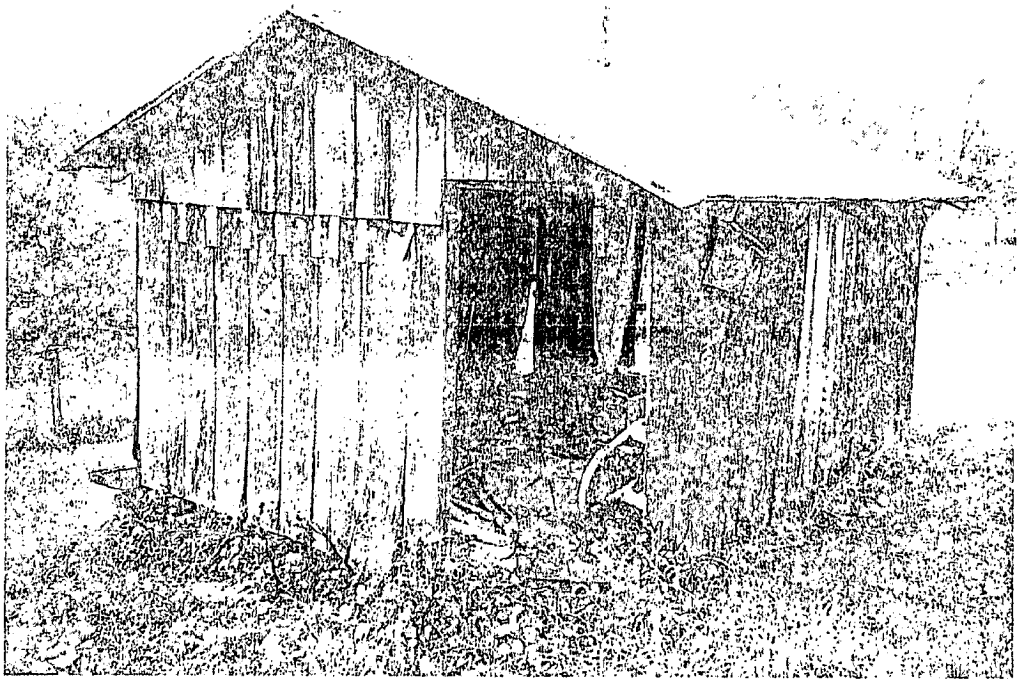

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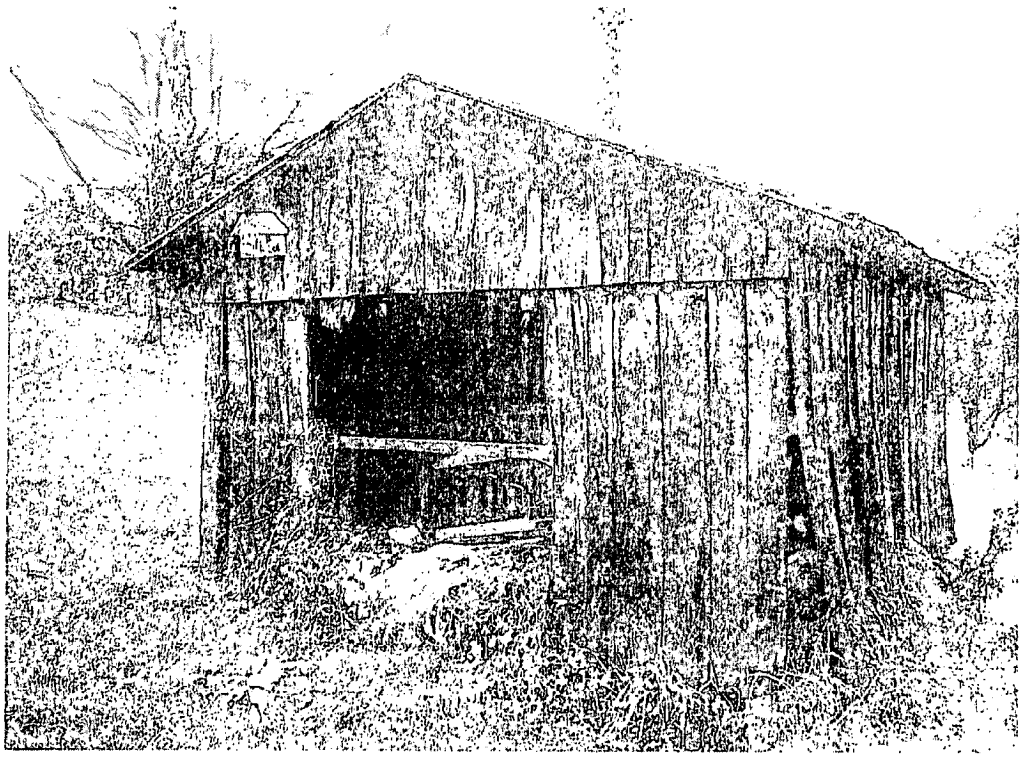

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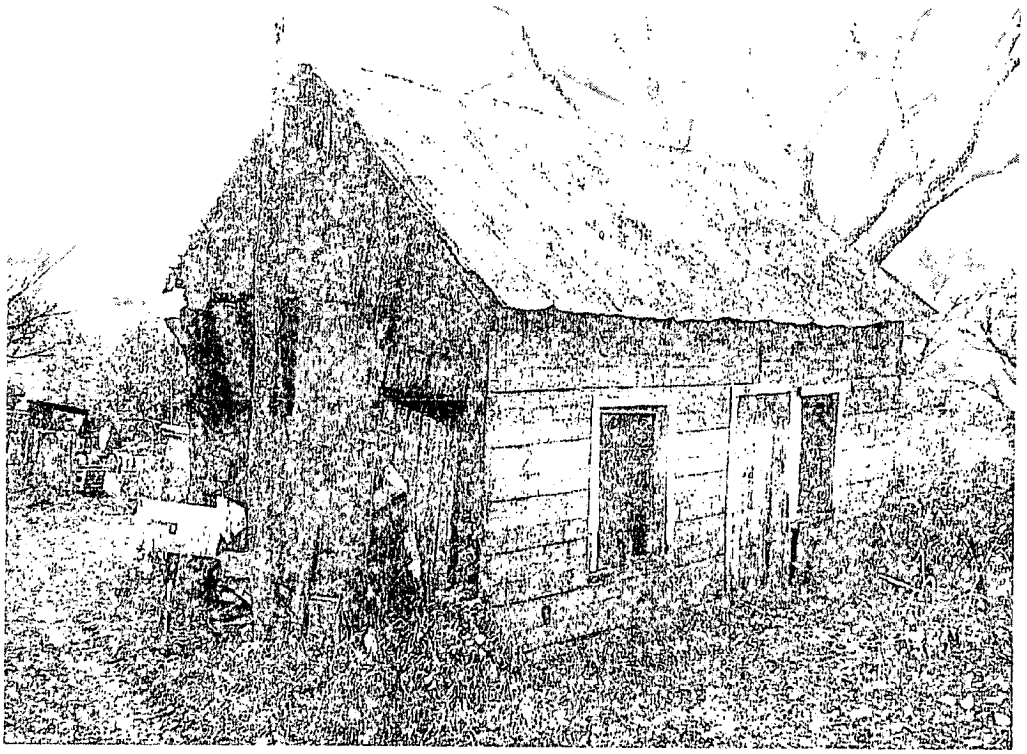
House Ruins 48 HR F

House Ruins 48 HR B



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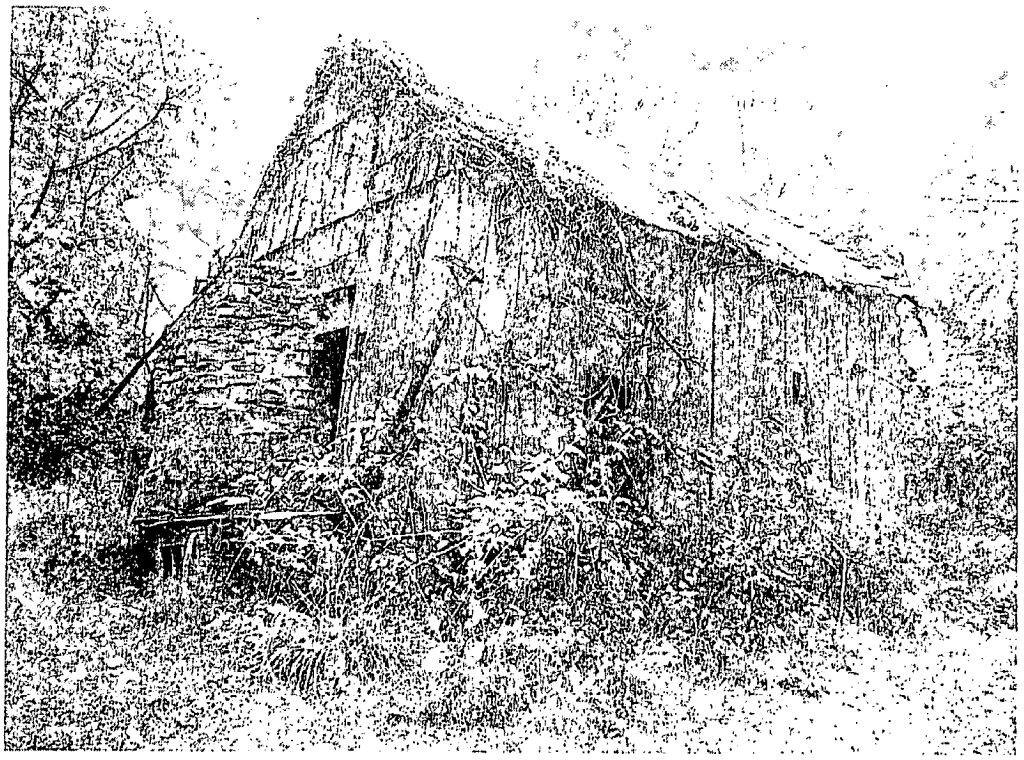

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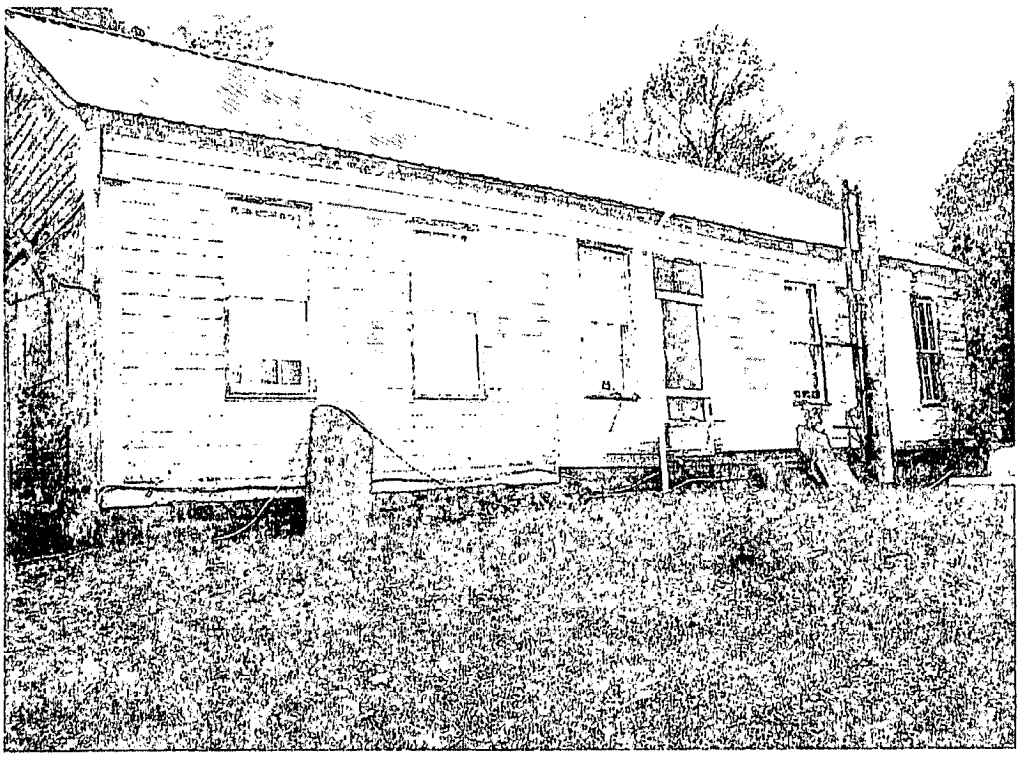
House 49 H F



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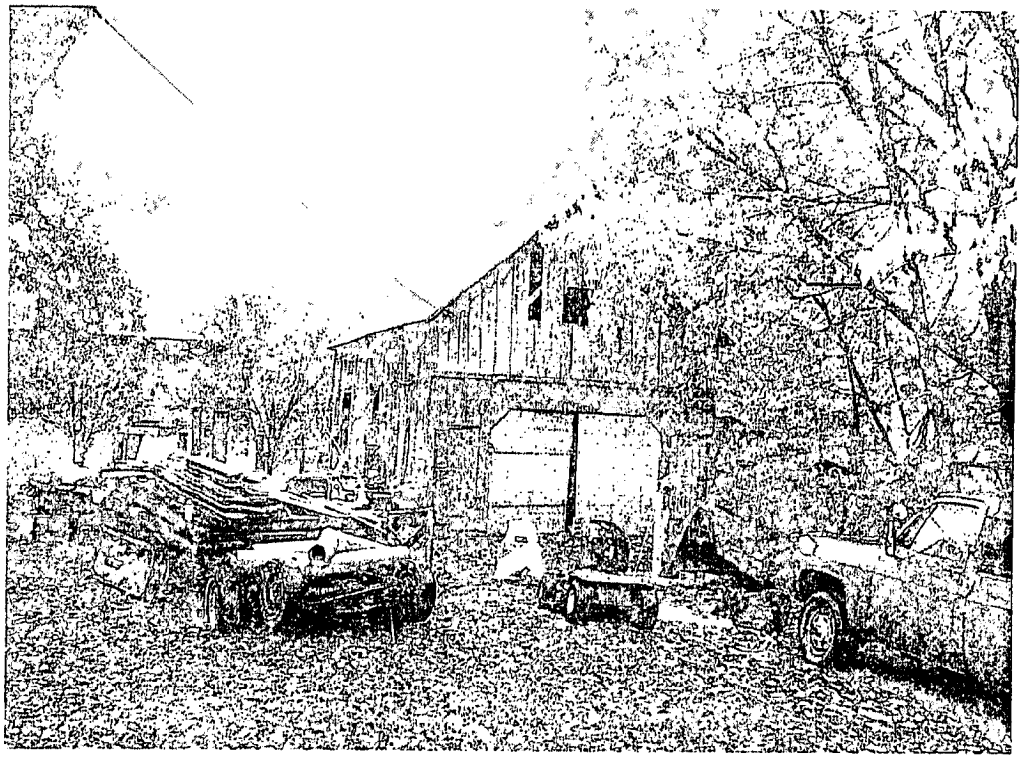

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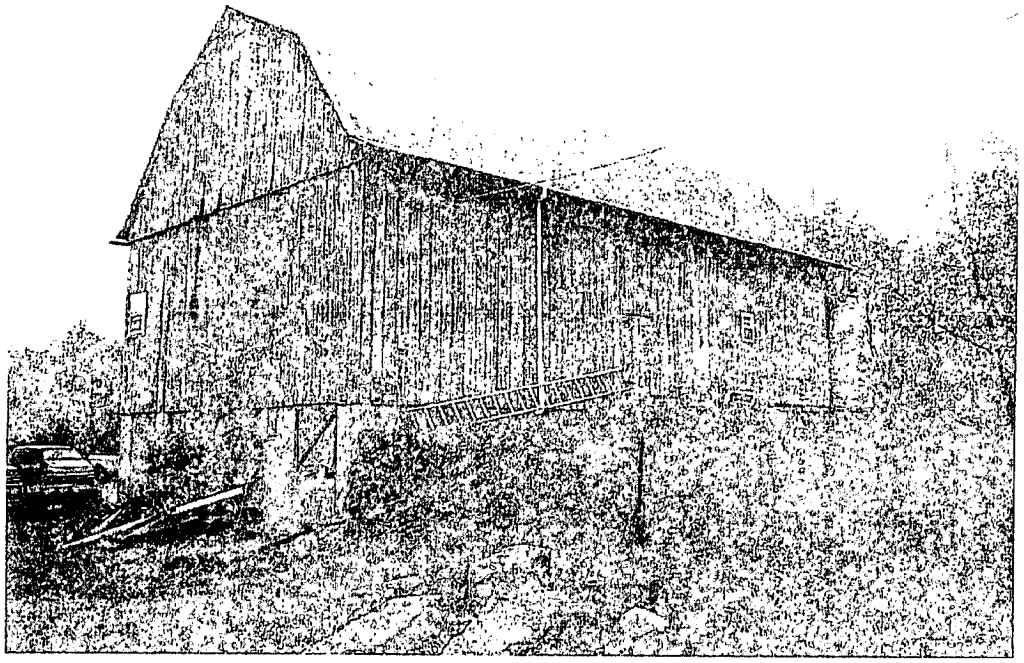
Barn 49 B B



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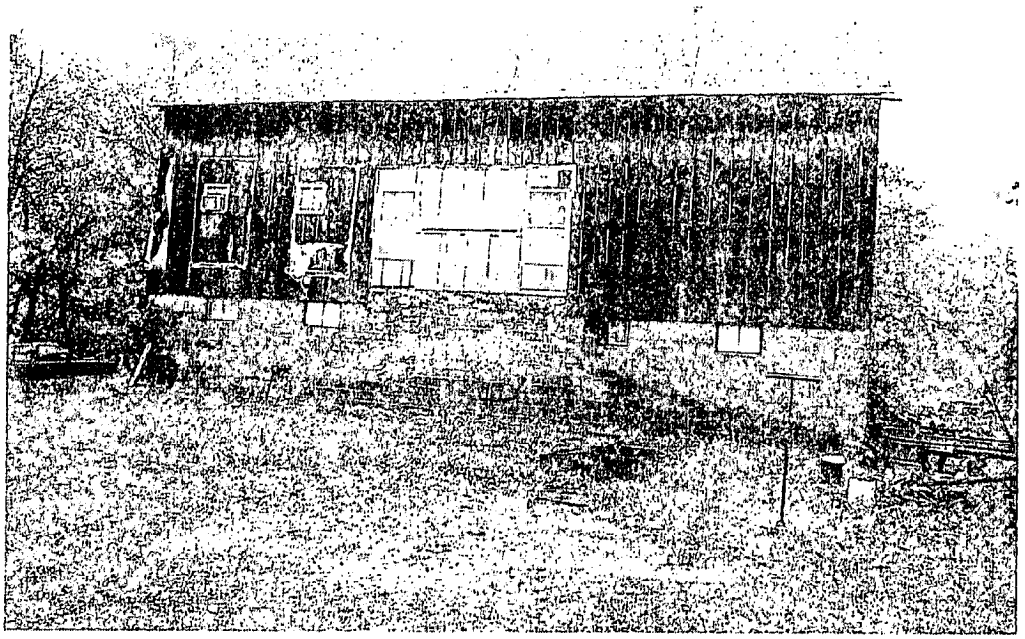

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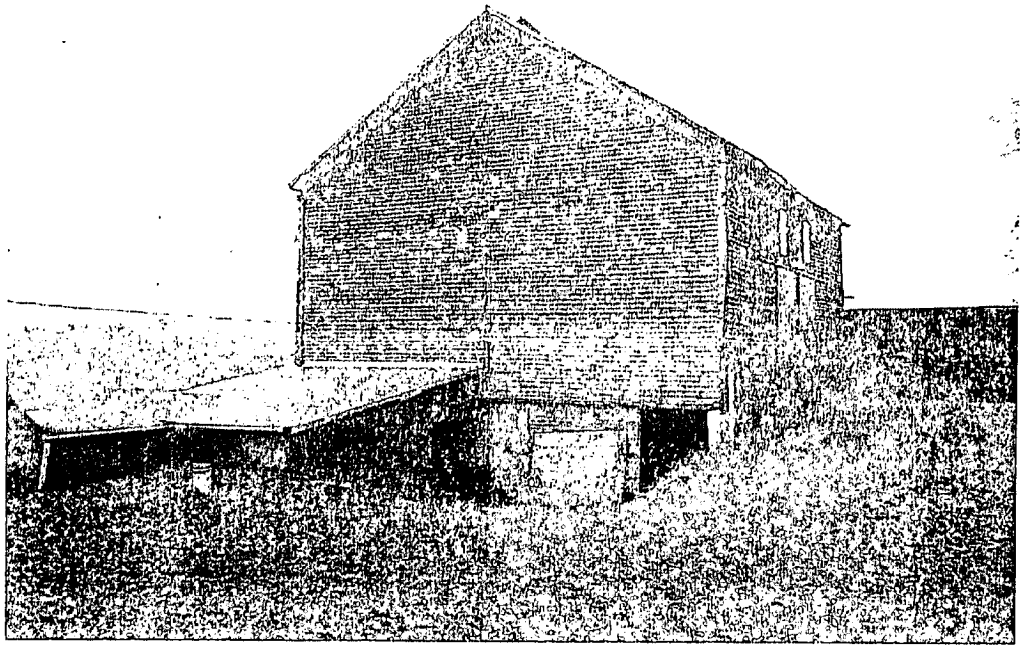

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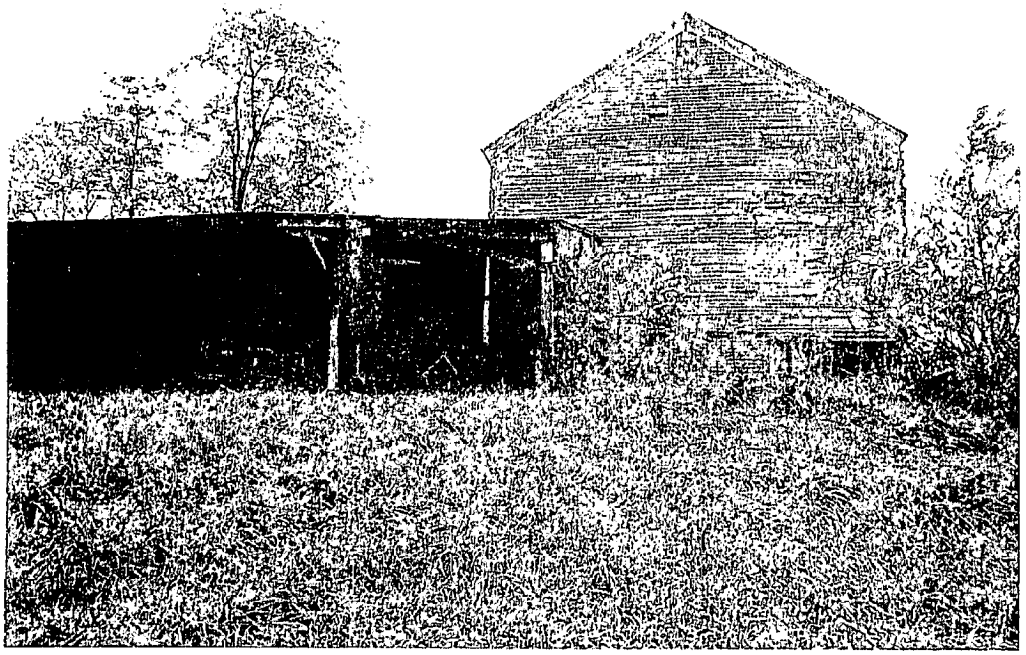

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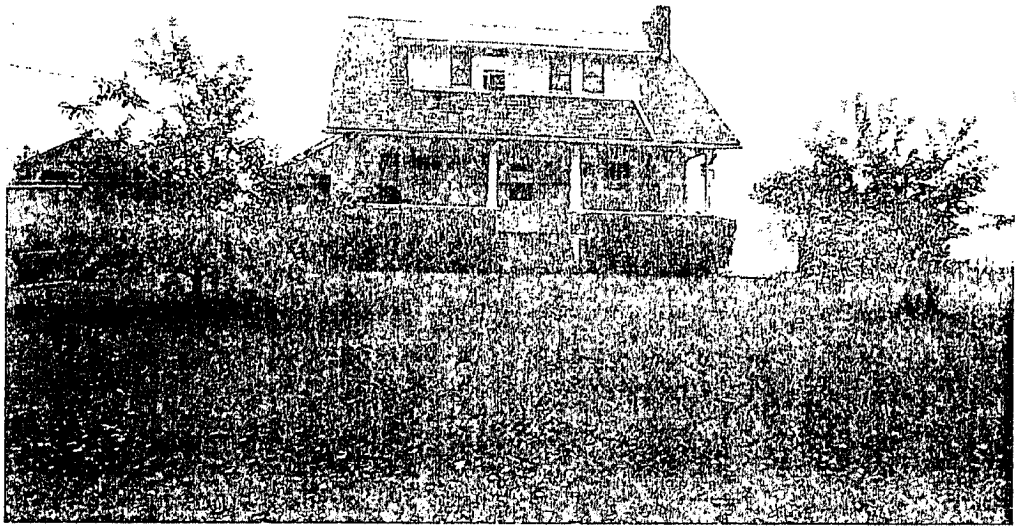

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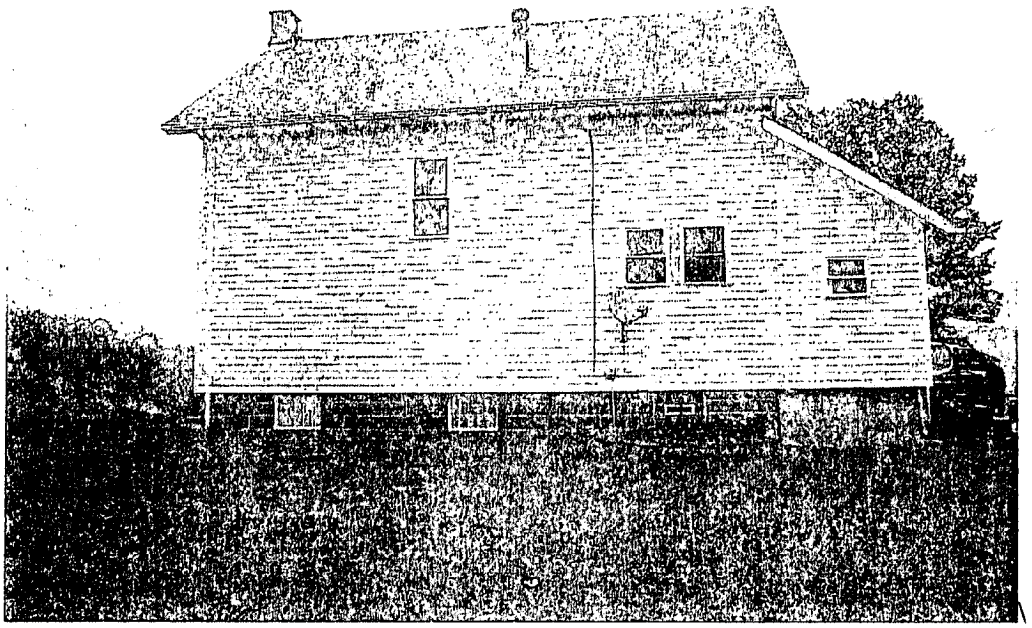

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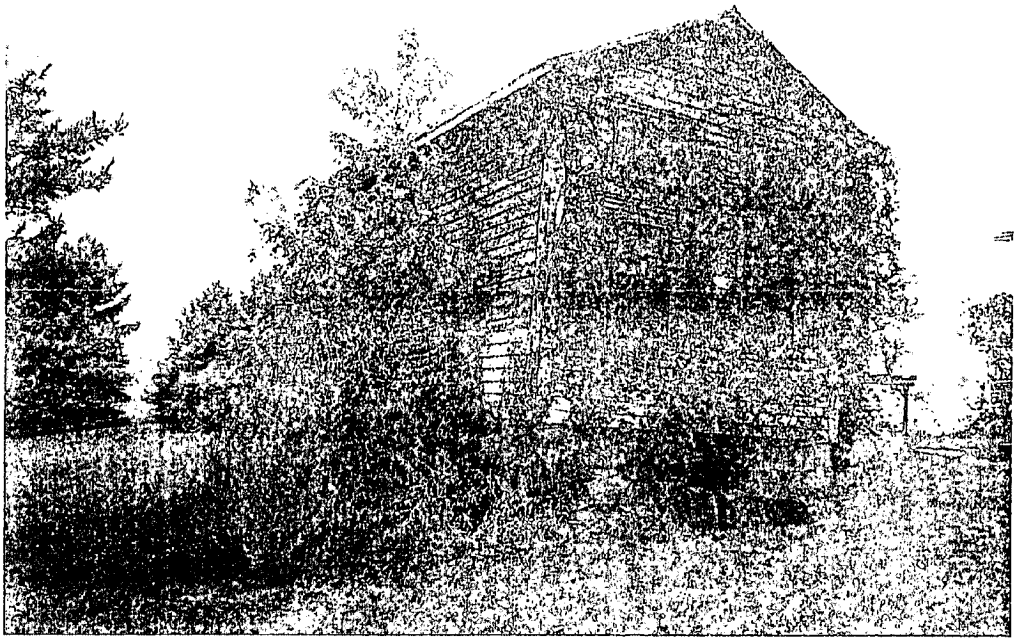

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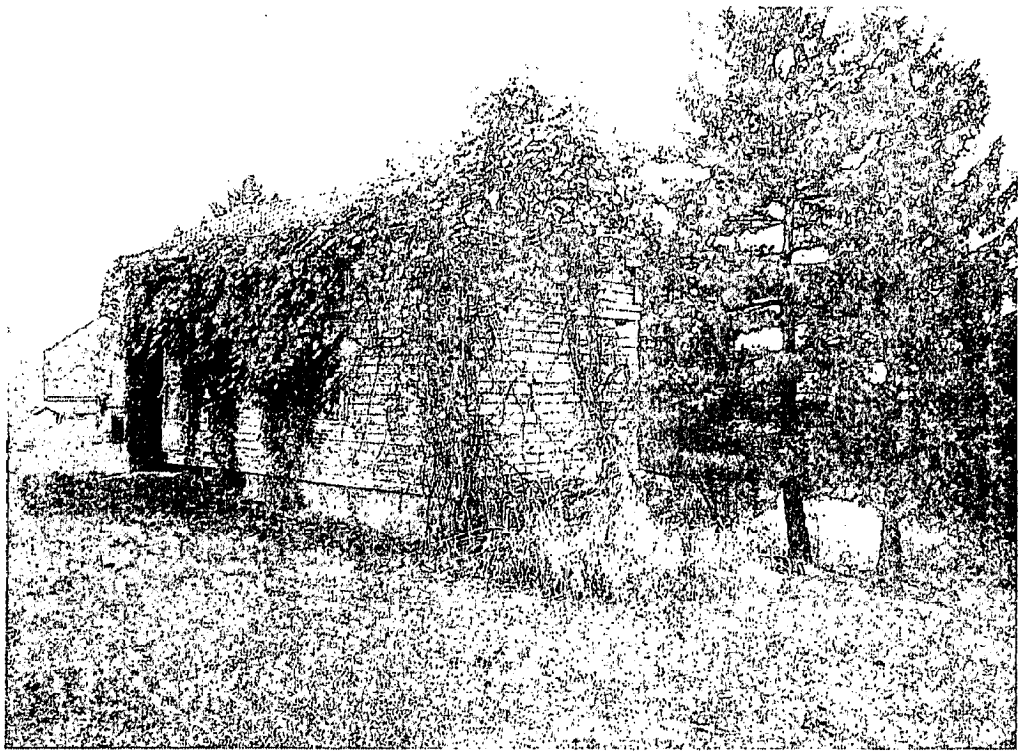

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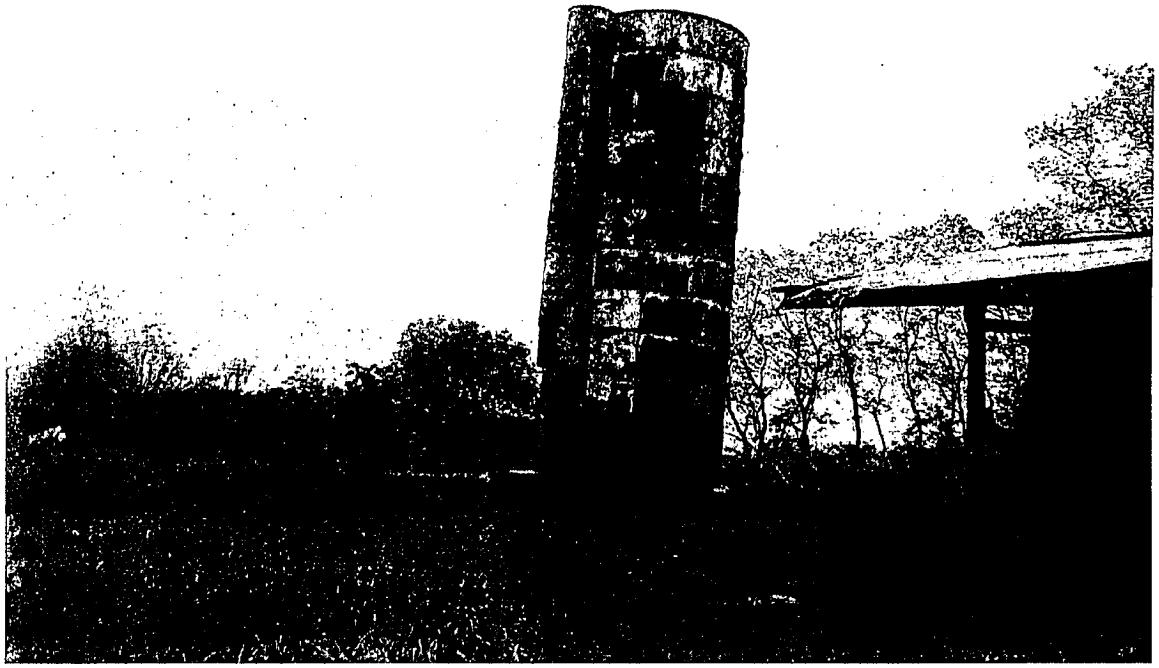

Silo 51 Si F

ADDENDUM TO PART 2, ITEM B(1)
AMERICAN ENERGY CORPORATION
CENTURY MINE
D-0425-12

## GEOLOGY DESCRIPTION

The D-0425-12 area of the Century Mine is located in Belmont County in southeastern Ohio. The topography of the entire application area is typical of the Appalachian Plateau Province and is characterized by narrow rounded ridges and deep V-shaped valleys dissecting the terrain, which is underlain by essentially horizontal sedimentary rocks. Topographic relief with the D-0425-12 Application Area is approximately 428 feet. The lowest surface elevation within the application area is approximately 915 feet located in a stream valley in the NW on the Nelson G Lindsey property. The highest surface elevation within the application area is approximately 1348 located approx. 200' north of Co Hwy. 86 on the Leroy Lucas property. The maximum elevation of the Pittsburgh (No. 8) coalbed within the D-0425 Permit area is approximately 880 feet, mean sea level (msl). This occurs in the D-0425-11 Application. The lowest surface elevation within the proposed shadow area of D-0425-12 is 915 feet, msl.

Stratigraphy of the proposed application area is formed by the Monongahela formation of the Pennsylvanian period, and the Dunkard Group of Permian time. The primary strata of both sections consists of an alternating sequence of limestone, sandstone, shale, claystone, and coal.

The Monongahela formation averages 250 feet in thickness within the proposed shadow area. In ascending order, it occupies the interval from the Pittsburgh #8 coal seam to the Waynesburg #11 coal seam. The primary rock units are limestone, shale, and claystone. Limestone forms 15 to 63% of this stratigraphic interval. As a result of longwall mining, the immediate strata overlying the Pittsburgh #8 coal seam will cave to a height of 3 to 6 times the mining height, depending on the bulking factor of roof strata. The beds above this caved zone are provided some support by the caved rock but may sag and give rise to bed separation and may be subject to fracturing to heights 24 to 54 times the mining height (120 to 270 feet above the mine).

The Dunkard group is approximately 425 feet thick within the proposed shadow area, occupying the interval from the Waynesburg #11 coal seam to the ground surface. The primary rock units here are shale and claystone. These soft units form about 76 percent of this stratigraphic interval. This strata is primarily located within the constrained zone of disturbance resulting from longwall mining. The constrained zone is defined as that interval above 24 to 54 times the mining height and below 50 feet from the ground surface. This strata is expected to be sufficiently confined to prevent development of any fractures. Rock beds here will tend to absorb most of the strain energy without fracturing. Coal seams above the #8 will not be affected by the mining operation.

Strata close to the surface, however, are not sufficiently confined and may move in any direction. Surface cracks may be produced from tensile strains resulting from longwall mining. The depth of these cracks is generally estimated to be less than 50 feet.

The main safety against inflow of groundwater into the Century Mine is afforded by the constrained zone. The nature and thickness of the individual beds found here are of particular importance. Through extensive core drilling, multiple beds of claystone, with total thicknesses of 2 to 197 feet, have been identified. These claystone beds are relatively impermeable and generally capable of absorbing large amounts of strain energy before fracturing. It is the applicants opinion the sufficient claystones are in-place to provide an adequate barrier against inflow from surface water and shallow groundwater disruptions caused by longwall mining. Where stream valleys are encountered, longwall operations are generally not planned under less than about 200 feet of cover to further protect the mine and overlying groundwater resources. Consequently, no longwall operations will occur in areas with less than 220 feet of cover with lowest cover within the mining panels being 260'. The rock strata of Belmont County typically form a gentle monocline that dips southeasterly at grades less than one percent. This dip trend accurately represents the proposed application area with the base elevation of the #8 coal seam ranging from approximately 650 feet in the east to approximately 680 feet in the northwest corner.

There is an east plunging syncline as indicated by the nosing of the structure contours on the base of the #8 Coal seam, as presented on the Test Hole Variance Request Map. Note that this syncline originates to the west of the proposed AAA, and its axis approximately runs through the following test holes: C98-3, Y&O-6, C98-5, AEC-2008-06, CLC-2002-27, CLC-2002-30, and AEC-2008-09. This could lead to increased fracturing in the E-W direction with increased groundwater flow to the east along this axis.

## GEOLOGICAL IMPACT OF COAL REMOVAL UPON GROUNDWATER

The geological impact of coal removal is expected to vary from short term to long term. The Pittsburgh #8 coal seam will be mined, and in this area has dip of approximately 0.5 % to the southeast, with the strike to the northeast. Groundwater occurs in this area in several disconnected saturated zones associated with the occurrence of the coal seams and underlying claystone units that prevent downward migration of the groundwater. Groundwater is generally limited to within 100 feet of the surface. Since primary porosity in the rock units is poor, nearly all of the ground water in this area of Ohio occurs as secondary porosity in the joints, cleats, fractures, and bedding planes of the rocks.

As longwall mining progresses, a caved area occurs immediately over the coal seam mined. Above this area, fractures occur in hard rocks and extend upward to about 200 feet above the coal seam. In the area above these fracture, a zone known as the continuous deformation zone develops where rocks bend down and form the classic subsidence basin. In the center of the basin, the rocks may be fractured and bedding planes may open as a result of this deformation. This process provides new openings to contain additional ground water, with a lowering of the phreatic surface of the water in the area. After mining, the aquifers are more connected and provide a larger source of water for well recharge.

The potential exists to re-drill existing wells or to drill new wells after mining. Groundwater still is available after subsidence. When subsidence occurs, the water levels in some wells drops, sometimes to below the bottom of the well bore. Groundwater is not lost to the mine, but the water table is lowered in response to changes in rock permeability. The Century mine is a dry mine which indicates that the groundwater does not flow into the mine. Rather, layers of rock that act as aquatards prevent downward migration of water into the mine. The other layers of rock, being more plastic than elastic, tend to fracture or the bedding planes separate and make more channels for the ground water to reside. Existing wells can be deepened or new ones drilled to encounter the new water table and to increase well bore reservoir storage to provide similar quantities of water after mining.

The geologic structures in the application area consist of gently folded rocks that dip to the southeast at approximately 22 feet per mile. Overburden thickness above the Pittsburgh seam ranges from a low of approximately 220 feet just upstream from D-11-15A within the shadow area, to approx. 680 feet under the hilltop with a measured elevation of 1348' located in the SW quarter of Section 21 of the proposed permit area on the Leroy Lucas property . While geologic structure can influence regional groundwater flow patterns, local variations in hydraulic properties of the rocks tend to accentuate localized flow systems.

In summary, the coal removal is expected to have an impact on the ground water in the Applications area. The impacts are described in Part 3 Item C.

# Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR

SEAN D. LOGAN, DIRECTOR

*John F. Husted, Chief*
*Division of Mineral Resources Management*
*2045 Morse Road, Bldg. H-3*
*Columbus, OH 43229-6693*
*Phone: (614) 265-6633 Fax: (614) 265-7998*

November 18, 2008

Mr. Jim Chuckery
Jack A. Hamilton & Associates, Inc.
342 High St., Box 471
Flushing, Ohio 43977

RE: Test hole variance request for a proposed 2189.1-acre adjacent area application for The American Energy Corporation Permit D-0425

Dear Mr. Chuckery:

The requested test hole variance request for the proposed above-referenced American Energy Corporation D-0425 adjacent area has been approved and is enclosed.

This test hole variance request is approved for a variance from Ohio Administrative Code 1501:13-4-13(C)(2)(e)(ii), which addresses the number of required test holes. Data from 97 test holes on and near the proposed adjacent area have been submitted. Four cross sections also have been enclosed.

For this proposed adjacent area, the Division has determined that the above-captioned variance request contains equivalent information in a satisfactory form, per OAC 1501:13-4-13(C)(3). Therefore, the requested test hole variance has been approved and is attached. Due to the amount of material submitted, the test hole data, the map, and the cross sections are being retained in Division files for reference when the adjacent area application is submitted for review. Please include this cover letter, the approved variance request, the test holes, the map, and the cross sections with the application submittal.

Note that this variance request approval does not limit the assessment by the Division of all aspects of the application once the application is submitted. Note also that if the extent of mining increases during the review process, additional test holes may be required.

Feel free to contact me at 614-265-6628 or at mike.dillman@dnr.state.oh.us if you have any questions.

Sincerely,

Mike Dillman

Mike Dillman, Geologist
Division of Mineral Resources Management

mjd

Enclosure

cc: The American Energy Corporation
file

342 High St., Box 471
Flushing, OH 43977
Ph: (740) 968-4947
: (740) 968-4225
ail: hamilton@1st.net
www.hamiltonandassoc.com

Jack A. HAMILTON & Associates, Inc.

Civil Engineerin
Land Surveyin
Mine Permittin
GIS Data Service
Land Developmen
Global Positioning System

May 1, 2008
Revised: October 2, 2008

RECEIVED
OCT 6 2008
Division of Mineral Resources Management

Chief
Ohio Department of Natural Resources
Division of Mineral Resources Management
2045 Morse Road, Bldg. H-2
Columbus, Ohio 43229-6693

Dear Sir:

The American Energy Corporation is preparing an adjacent area permit application for underground mining in the Pittsburgh No. 8 coal seam, and hereby requests a variance from rule OAC 1501:13-4-13 (C)(2)(e)(ii).The proposed permit is located in Sections 3, 4, 9, 10, 13, 14, 15, 19, 20, 21, 25, 26, and 27, Washington Township, T-5N R-4W, Belmont County, Ohio. The method of mining will be conventional entry/pillar for the development of mains and gate entries, and full recovery. The proposed underground works ( permit area) of 2189.1 acres will be adjacent to Permit D-0425.

The Pittsburgh No. 8 coal seam ranges in elevation from 637 feet (Test Hole AEC-2008-09) to 672 feet (Test Hole CLC-2002-18) msl, with overburden thicknesses ranging from 82 feet at Test Hole AEC-2008-03 located in the northwest quarter of Section 3, to 657 feet at Test Hole AEC-2008-04 located in the southeast quarter of Section 21. Gravity discharge of water from this mine will be non-existent because of the coal elevation and thickness of overburden present within the limits of this proposed permit area. The surface elevation at the slope entance to Century Mine is 954.8 msl. The regional dip of the Pittsburgh No. 8 coal seam to the southeast, local dip being to the northeast, also lends itself to the prevention of gravity discharge. Water which may be encountered during the mining process will be used in the mine for dust control or pumped to the surface into treatment ponds before being discharged into the stream system.

Pursuant to OAC 1501:13-4-13(C)(2)(e)(ii), fourteen (14) test holes with geologic data and acid/base accounting for the Pittsburgh No. 8 coal seam is required for the 2189.1 acres of mining proposed for this adjacent area permit. A total of ninety seven (97) test holes are being submitted with this test hole variance request. All ninety seven (97) test holes show the geologic data throughout the depth of drilling. Thirty (30) test holes have complete acid/base accounting for the roof, coal seam, and floor. Eight (8) test holes have acid/base accounting for the roof and floor only. The remaining fifty five (55) test holes have geologic data only. Summarizing, twelve (12) of the

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Jack A. HAMILTON & Associates, Inc.

Civil Engineer
Land Survey
Mine Permitt
GIS Data Servi
Land Developm
Global Positioning Syste

May 1, 2008
Revised: October 2, 2008

Chief
Ohio Department of Natural Resources
Division of Mineral Resources Management
2045 Morse Road, Bldg. H-2
Columbus, Ohio 43229-6693

Dear Sir:

The American Energy Corporation is preparing an adjacent area permit application for underground mining in the Pittsburgh No. 8 coal seam, and hereby requests a variance from rule OAC 1501:13-4-13 (C)(2)(e)(ii).The proposed permit is located in Sections 3, 4, 9, 10, 13, 14, 15, 19, 20, 21, 25, 26, and 27, Washington Township, T-5N R-4W, Belmont County, Ohio. The method of mining will be conventional entry/pillar for the development of mains and gate entries, and full recovery. The proposed underground works ( permit area) of 2189.1 acres will be adjacent to Permit D-0425.

The Pittsburgh No. 8 coal seam ranges in elevation from 637 feet (Test Hole AEC-2008-09) to 672 feet (Test Hole CLC-2002-18) msl, with overburden thicknesses ranging from 82 feet at Test Hole AEC-2008-03 located in the northwest quarter of Section 3, to 657 feet at Test Hole AEC-2008-04 located in the southeast quarter of Section 21. Gravity discharge of water from this mine will be non-existent because of the coal elevation and thickness of overburden present within the limits of this proposed permit area. The surface elevation at the slope entance to Century Mine is 954.8 msl. The regional dip of the Pittsburgh No. 8 coal seam to the southeast, local dip being to the northeast, also lends itself to the prevention of gravity discharge. Water which may be encountered during the mining process will be used in the mine for dust control or pumped to the surface into treatment ponds before being discharged into the stream system.

Pursuant to OAC 1501:13-4-13(C)(2)(e)(ii), fourteen (14) test holes with geologic data and acid/base accounting for the Pittsburgh No. 8 coal seam is required for the 2189.1 acres of mining proposed for this adjacent area permit. A total of ninety seven (97) test holes are being submitted with this test hole variance request. All ninety seven (97) test holes show the geologic data throughout the depth of drilling. Thirty (30) test holes have complete acid/base accounting for the roof, coal seam, and floor. Eight (8) test holes have acid/base accounting for the roof and floor only. The remaining fifty five (55) test holes have geologic data only. Summarizing, twelve (12) of the

test holes are located within the proposed permit limits; seven (7) of the these test holes have complete acid/base accounting. Pursuant to the aforementioned rule, seven (7) test holes are lacking for this proposed permit.

The following addenda are being submitted with this Test Hole Variance Request to support the preceding narrative and to justify approval of this request:

1.) A Test Hole Variance Request map showing the location of the above referenced test holes and also showing Pittsburgh No. 8 coal seam base contours at five (5) foot intervals. The map also depicts the proposed mining plan consisting of main and gate entry development, and the location of Geologic Cross Sections A-A' and D-D' taken along the approximate strike of the Pittsburgh No. 8 coal seam, and B-B' and C-C' taken along the approximate dip of the Pittsburgh No. 8 coal seam.

2.) Test hole data listed on Attachment 13's and drill logs compiled from extensive drilling within the proposed and existing mine workings of Permit D-0425.

3.) Four (4) geologic cross sections, A-A', B-B', C-C', and D-D' depicting the strata from the surface to and immediately below the Pittsburgh No. 8 coal seam.

4.) Listing of all ninety seven (97) test holes with location, surface elevations, base of coal elevations, overburden thickness, and whether or not acid/base accounting is present.

We believe that all data submitted herein and data previously submitted for Permit D-0425 and subsequent adjacent area permits adequately represents the structure and stratigraphy of this proposed underground mine permit and the geology of the proposed mining area.

Your prompt review and approval of this Test Hole Variance Request will be appreciated. The approved Test Hole Variance Request and addenda will be made part of the permit application upon submittal to the Division of Mineral Resources Management.

Please call if you have any questions or comments.

APPROVED ■
DISAPPROVED □
DATE: 11-18-08
SIGNED

Sincerely,

JACK A. HAMILTON & ASSOCIATES, INC.
Consultants for American Energy Corporation

Jim Chuckery
Permitting

# ADDENDUM TO TEST HOLE VARIANCE REQUEST
# AMERICAN ENERGY CORPORATION

| Test Hole | Location | Surf. Elev. | Base of #8 Coal Elev. | Overburden Thickness (ft.) (To top of #8 coal) | Attachment 13 | Drill Log | Acid/Base Account. |
|---|---|---|---|---|---|---|---|
| AEC-2000-01 | NE1/4 SEC 36 | 1023 | 681 | 336 | X | | X |
| AEC-2000-02 | NE1/4 SEC 30 | 1264 | 664 | 592 | X | | X |
| AEC-2000-03 | NE1/4 SEC 31 | 976 | 675 | 294 | X | | X |
| AEC-2000-04 | NE1/4 SEC 19 | 1267 | 671 | 589 | X | | X |
| AEC-2001-02 | NE1/4 SEC 25 | 1239 | 678 | 555 | X | | X |
| AEC-2001-04 | NW1/4 SEC 31 | 1004 | 677 | 320 | X | | X |
| AEC-2001-09 | NE1/4 SEC 35 | 1244 | 657 | 581 | X | | X |
| AEC-2001-10 | NW1/4 SEC 36 | 1267 | 686 | 574 | X | | X |
| AEC-2001-11 | NW1/4 SEC 29 | 1087 | 640 | 441 | X | | X |
| AEC-2001-12 | SE1/4 SEC 5 | 1075 | 663 | 400 | X | | X |
| AEC-2001-14 | SE1/4 SEC 30 | 1314 | 640 | 667 | X | | X |
| AEC-2001-15 | NE1/4 SEC 23 | 1220 | 627 | 586 | X | | X |
| AEC-2001-16 | SW1/4 SEC 31 | 1225 | 688 | 531 | X | | X |
| AEC-2001-24 | SE1/4 SEC 7 | 1140 | 710 | 423 | X | | X |
| AEC-2001-25 | SW1/4 SEC 1 | 1220 | 707 | 506 | X | | X |
| AEC-2001-26 | SW1/4 SEC 6 | 1230 | 695 | 529 | X | | X |
| AEC-2001-29 | NW1/4 SEC 5 | 1110 | 677 | 424 | X | | |
| AEC-2001-30 | NW1/4 SEC 34 | 1080 | 666 | 409 | X | | |
| AEC-2001-32 | NW1/4 SEC 34 | 1100 | 651 | 441 | X | | |
| AEC-2008-03 | NE1/4 SEC 3 | 746 | 658 | 82 | X | | X |
| AEC-2008-04 | SE1/4 SEC 21 | 1332 | 668 | 657 | X | | X |
| AEC-2008-05 | SE1/4 SEC 20 | 986 | 667 | 312 | X | | X |
| AEC-2008-06 | SE1/4 SEC 27 | 1270 | 663 | 602 | X | | X |
| AEC-2008-07 | SW1/4 SEC 9 | 849 | 655 | 186 | X | | X |
| AEC-2008-08 | NW1/4 SEC 20 | 1291 | 656 | 628 | X | | X |

# ADDENDUM TO TEST HOLE VARIANCE REQUEST
# AMERICAN ENERGY CORPORATION

| Test Hole | Location | Surf. Elev. | Base of #8 Coal Elev. | Overburden Thickness (ft.) (To top of #8 coal) | Attachment 13 | Drill Log | Acid/Base Account. |
|---|---|---|---|---|---|---|---|
| AEC-2008-09 | NW1/4 SEC 9 | 1267 | 637 | 622 | X | | X |
| CLC-2001-27 | NE1/4 SEC 28 | 1014 | 620 | 387 | X | | |
| CLC-2001-29 | SE1/4 SEC 29 | 1210 | 688 | 515 | X | | |
| CLC-2001-32 | SW1/4 SEC 4 | 1273 | 689 | 580 | X | | |
| CLC-2001-33 | SE1/4 SEC 11 | 1205 | 710 | 491 | X | | |
| CLC-2002-01 | NE1/4 SEC 11 | 1230 | 680 | 546 | X | | |
| CLC-2002-04 | NW1/4 SEC 19 | 1245 | 680 | 558 | X | | X |
| CLC-2002-06 | SE1/4 SEC 25 | 1250 | 676 | 569 | X | | Roof/Floor |
| CLC-2002-08 | SE1/4 SEC 30 | 1250 | 659 | 584 | X | | |
| CLC-2002-11 | SW1/4 SEC 23 | 1230 | 611 | 613 | X | | X |
| CLC-2002-13 | SE1/4 SEC 29 | 1035 | 624 | 406 | X | | |
| CLC-2002-18 | SW1/4 SEC 21 | 1320 | 672 | 641 | X | | Roof/Floor |
| CLC-2002-20 | NE1/4 SEC 26 | 1325 | 670 | 647 | X | | Roof/Floor |
| CLC-2002-23 | NE1/4 SEC 19 | 1260 | 664 | 589 | X | | Roof/Floor |
| CLC-2002-31 | NW1/4 SEC 23 | 1310 | 631 | 673 | X | | |
| CLC-2002-32 | NW1/4 SEC 30 | 1230 | 675 | 549 | X | | |
| CLC-2002-33 | SW1/4 SEC 19 | 1250 | 671 | 570 | X | | Roof/Floor |
| CLC-2002-34 | NW1/4 SEC 24 | 1230 | 645 | 580 | X | | |
| CLC-2002-35 | SW1/4 SEC 36 | 1160 | 683 | 471 | X | | |
| CLC-2002-36 | NW1/4 SEC 4 | 1175 | 674 | 497 | X | | X |
| CLC-2002-38 | NE1/4 SEC 34 | 1310 | 640 | 664 | X | | |
| CLC-2002-39 | SW1/4 SEC 4 | 1225 | 675 | 545 | X | | X |
| CLC-2002-40 | NW1/4 SEC 28 | 1225 | 627 | 590 | X | | |

# ADDENDUM TO TEST HOLE VARIANCE REQUEST
# AMERICAN ENERGY CORPORATION

| Test Hole | Location | Surf. Elev. | Base of #8 Coal Elev. | Overburden Thickness (ft.) (To top of #8 coal) | Attachment 13 | Drill Log | Acid/Base Account. |
|---|---|---|---|---|---|---|---|
| CLC-2002-41 | NW1/4 SEC 29 | 1105 | 640 | 458 | X | | |
| CLC-2002-43 | SW1/4 SEC 24 | 1330 | 650 | 673 | X | | |
| N94-14 | SW1/4 SEC 7 | 1095 | 731 | 360 | X | | X |
| N94-15 | SE1/4 SEC 36 | 1199 | 652 | 542 | X | | |
| N94-16 | SE1/4 SEC 25 | 1279 | 677 | 594 | X | | |
| N94-17 | NW1/4 SEC 6 | 1183 | 706 | 470 | X | | |
| N94-18 | NE1/4 SEC 20 | 1243 | 797 | 442 | X | | |
| CLC-2002-27 | SE1/4 SEC 21 | 1315 | 662 | 646 | X | | Roof/Floor |
| CLC-2002-30 | SE1/4 SEC 15 | 1260 | 649 | 605 | X | | Roof/Floor |
| Y&O-04 | SE1/4 SEC 20 | 980 | 663 | 310 | X | | Roof/Floor |
| CLC-2002-37 | SE1/4 SEC 34 | 1250 | 646 | 599 | X | | X |
| N94-41 | NE1/4 SEC 5 | 1149 | 676 | 465 | X | | X |
| C-98-04 | SE1/4 SEC 32 | 965 | 673 | 285 | X | | X |
| M-17 | SW1/4 SEC 20 | 1215 | 828 | 383 | | X | X |
| M-14 | NW1/4 SEC 15 | 895 | 796 | 99 | | X | X |
| B&O-1 | SW1/4 SEC 4 | 856 | 750 | 103 | | X | X |
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# ADDENDUM TO TEST HOLE VARIANCE REQUEST
# AMERICAN ENERGY CORPORATION

| Test Hole | Location | Surf. Elev. | Base of #8 Coal Elev. | Overburden Thickness (ft.) (To top of #8 coal) | Attachment 13 | Drill Log | Acid/Base Account. |
|---|---|---|---|---|---|---|---|
| **N-94-19** | | **1122** | **810** | **309** | X | | |
| **N94-41** | **NE1/4 SEC 5** | **1149** | **676** | **465** | X | | X |
| **M-14** | **NW1/4 SEC 15** | **895** | **796** | **95** | | X | X |
| **M-17** | **SW1/4 SEC 20** | **1215** | **828** | **383** | | X | X |
| **C-98-04** | **SE1/4 SEC 32** | **965** | **673** | **285** | X | | X |
| **B&O 1** | **SW1/4 SEC 4** | **856** | **750** | **100** | | X | X |
| **C98-1** | **NE1/4 SEC 1** | **1229** | **687** | **535** | X | | |
| **C98-2** | **NE1/4 SEC 19** | **1260** | **781** | **475** | X | | |
| **C98-3** | **NE1/4 SEC 8** | **1246** | **722** | **516** | X | | |
| **C98-5** | **SW1/4 SEC 33** | **1258** | **686** | **564** | X | | |
| **NA-87-06** | **NE1/4 SEC 28** | **979** | **619** | **355** | X | | |
| **NA-87-07** | **NE1/4 SEC 22** | **1301** | **608** | **689** | X | | |
| **NA-87-08** | **NE1/4 SEC 16** | **1333** | **625** | **701** | X | | |
| **NA-87-09** | **SW1/4 SEC 23** | **1329** | **620** | **703** | X | | |
| **NA-87-10** | **SE1/4 SEC 30** | **1332** | **656** | **669** | X | | |
| **Y&O-1 (DDH-1)** | **NW1/4 SEC 2** | **980** | **719** | **254** | | X | |
| **Y&0-02** | **NW1/4 SEC 26** | **936** | **676** | **253** | X | | |
| **Y&O-3 (DDH-3)** | **SW1/4 SEC 9** | **1020** | **746** | **267** | | X | |
| **Y&O-5(DDH-5)** | **SW1/4 SEC 3** | **953** | **704** | **242** | | X | |
| **Y&O-6(DDH-6)** | **SE1/4 SEC 3** | **944** | **700** | **238** | | X | |
| **Y&O-7(DDH-7)** | **SE1/4 SEC 1** | **1060** | **701** | **352** | | X | |
| **M-16** | **NE1/4 SEC 14** | **1080** | **746** | **330** | X | | |
| **M-20** | **SW1/4 SEC 8** | **1140** | **721** | **415** | X | | |
| **O-1** | **NE1/4 SEC 15** | **1221** | **789** | **428** | X | | |
| **O-5** | | **929** | **806** | **119** | | X | |

**Note: Items in bold print are test holes located within the proposed adjacent area permit limits.**

# ADDENDUM TO TEST HOLE VARIANCE REQUEST
# AMERICAN ENERGY CORPORATION

| Test Hole | Location | Surf. Elev. | Base of #8 Coal Elev. | Overburden Thickness (ft.) (To top of #8 coal) | Attachment 13 | Drill Log | Acid/Base Account. |
|---|---|---|---|---|---|---|---|
| **NMC-11** | **SE1/4 SEC 28** | **820** | **709** | **105** | X | | |
| **NMC-20** | **SE1/4 SEC 28** | **819** | **701** | **111** | X | | |
| **NMC-21** | **SE1/4 SEC 28** | **828** | **699** | **122** | X | | |
| **NMC-22** | **SE1/4 SEC 28** | **820** | **699** | **115** | X | | |
| **NMC-23** | **SE1/4 SEC 28** | **814** | **702** | **104** | X | | |
| **NMC-24** | **NE1/4 SEC 27** | **861** | **690** | **164** | X | | |
| **ON-1** | **NE1/4 SEC 3** | **716** | **664** | **45** | X | | |
| **ON-2** | **NE1/4 SEC 3** | **744** | **663** | **73** | X | | |
| **ON-3** | **NE1/4 SEC 3** | **745** | **659** | **79** | X | | |
| **AEC-2001-31** | **SW1/4 SEC 28** | **1310** | **634** | **671** | X | | |
| **CLC-2002-37** | **SE1/4 SEC 34** | **1250** | **646** | **599** | X | | X |
| **NA-87-02** | **SE1/4 SEC 16** | **1259** | **626** | **627** | X | | |
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**Note: Items in bold print are test holes located within the proposed adjacent area permit limits.**

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: AEC 2000-01**

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,023.19
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 678,882
**Easting:** 2,420,954
**Drilling Company:** LJ Hughes and Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 23.00 | 0.00 | 23.00 | Casing | | | | 0.00 |
| 16.40 | 23.00 | 39.40 | Shale, blk | YES | cm, em | | 0.00 |
| 1.30 | 39.40 | 40.70 | Claystone, dk gy | YES | cv, ev | | 0.00 |
| 0.70 | 40.70 | 41.40 | Claystone, gy | YES | cv, ev | | 0.00 |
| 3.10 | 41.40 | 44.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 11.90 | 44.50 | 56.40 | Sandstone, gy w/ sh stks | | cs, es | y | 11.90 |
| 0.60 | 56.40 | 57.00 | Claystone, grn | | cv, ev | | 0.00 |
| 12.00 | 57.00 | 69.00 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 69.00 | 69.80 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 2.60 | 69.80 | 72.40 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 72.40 | 72.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 72.70 | 73.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.70 | 73.20 | 76.90 | Shale, dk gy | | cm, em | | 0.00 |
| 21.80 | 76.90 | 98.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 98.70 | 98.90 | **Bone w/ coal, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 1.30 | 98.90 | 100.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.60 | 100.20 | 100.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 26.80 | 100.80 | 127.60 | Claystone, dk gy w/ ss stks | | ak, cv, ev | | 0.00 |
| 2.90 | 127.60 | 130.50 | Shale, gy | | cm, em | | 0.00 |
| 7.40 | 130.50 | 137.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 7.50 | 137.90 | 145.40 | Limestone | | ak, cs, es | y | 7.50 |
| 8.10 | 145.40 | 153.50 | Claystone, grn | | cv, ev | | 0.00 |
| 12.70 | 153.50 | 166.20 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 166.20 | 167.40 | Claystone, grn | | cv, ev | | 0.00 |
| 21.50 | 167.40 | 188.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.90 | 188.90 | 192.80 | Shale, grn | | cm, em | | 0.00 |
| 3.60 | 192.80 | 196.40 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 196.40 | 196.75 | Claystone, grn | | cv, ev | | 0.00 |
| 0.55 | 196.75 | 197.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 19.00 | 197.30 | 216.30 | Limestone, shaley, layered | | ak, cs, es | y | 19.00 |
| 1.80 | 216.30 | 218.10 | Claystone, grn | | cv, ev | | 0.00 |
| 5.70 | 218.10 | 223.80 | Limestone | | ak, cs, es | y | 5.70 |
| 0.90 | 223.80 | 224.70 | Flintclay, layered | | ak, cs, es | | 0.00 |
| 2.30 | 224.70 | 227.00 | Claystone, gy | | cv, ev | | 0.00 |
| 5.50 | 227.00 | 232.50 | Claystone, grn | | cv, ev | | 0.00 |
| 0.90 | 232.50 | 233.40 | Claystone, gy | | cv, ev | | 0.00 |
| 8.90 | 233.40 | 242.30 | Limestone | | ak, cs, es | y | 8.90 |
| 1.40 | 242.30 | 243.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.50 | 243.70 | 245.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.10 | 245.20 | 249.30 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 6.00 | 249.30 | 255.30 | Shale, gy/ grn | | cm, em | | 0.00 |
| 9.80 | 255.30 | 265.10 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 2.10 | 265.10 | 267.20 | Shale, dk gy | | cm, em | | 0.00 |
| 4.50 | 267.20 | 271.70 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.00 | 271.70 | 272.70 | Shale, gy/ grn | | cm, em | | 0.00 |
| 17.00 | 272.70 | 289.70 | Limestone | | ak, cs, es | y | 17.00 |
| 0.30 | 289.70 | 290.00 | Claystone, grn | | cv, ev | | 0.00 |
| 21.80 | 290.00 | 311.80 | Claystone, gy | | cv, ev | | 0.00 |
| 4.10 | 311.80 | 315.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 10.90 | 315.90 | 326.80 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 1.90 | 326.80 | 328.70 | Limestone, massive | | ak, cs, es | y | 1.90 |
| 2.10 | 328.70 | 330.80 | Shale, dk gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 330.80 | 332.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 1.60 | 332.60 | 334.20 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 334.20 | 336.00 | Claystone, dk gy w/ ss stks | | cm, em | | 0.00 |
| 0.30 | 336.00 | 336.30 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-01

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.10 | 336.30 | 336.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.10 | 336.40 | 336.50 | **Coal w/ bone stks, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.50 | 336.50 | 337.00 | Shale, gy, soft | | cm, em | | 0.00 |
| 0.35 | 337.00 | 337.35 | Shale w/bone | | cm, em | | 0.00 |
| 3.61 | 337.35 | 340.96 | **Coal w/ bone stks, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 1.49 | 340.96 | 342.45 | **Coal w/ bone, pyritic** | | ac, cv, ev | | 0.00 |
| 1.00 | 342.45 | 343.45 | Shale, dk | | cm, em | | 0.00 |
| 3.40 | 343.45 | 346.85 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 346.85 | 350.35 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 350.35 | 353.35 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.20 | 353.35 | 355.55 | Shale, gy | | cm, em | | 0.00 |
| 2.70 | 355.55 | 358.25 | Sandstone w/sh stks | | cs, es | y | 2.70 |
| 6.40 | 358.25 | 364.65 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 364.65 | | | | | 76.40 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 76.40

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 21%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 76.40 | 21% |
| Soft Rock: | 288.25 | 79% |
| | 364.65 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 203.49 | 1.91 | 1.65 | 59.7 | -143.8 |
| Coal | 2.96 | 4.71 | 1.68 | 147.00 | 144.0 |
| Bottom, 10 ft. | 320.60 | 3.64 | 3.62 | 113.55 | -207.1 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2000-02

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,264
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 678,055
**Easting:** 2,426,386
**Drilling Company:** LJ Huges and Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 21.00 | 0.00 | 21.00 | Casing | | | | 0.00 |
| 5.00 | 21.00 | 26.00 | Shale, grn | YES | cm, em | | 0.00 |
| 7.00 | 26.00 | 33.00 | Sandstone, gy | YES | cs, es | y | 7.00 |
| 4.70 | 33.00 | 37.70 | Shale, grn | | cm, em | | 0.00 |
| 4.20 | 37.70 | 41.90 | Shale, red/grn | YES | cm, em | | 0.00 |
| 5.00 | 41.90 | 46.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.10 | 46.90 | 48.00 | Shale, gy | YES | cm, em | | 0.00 |
| 7.00 | 48.00 | 55.00 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 11.00 | 55.00 | 66.00 | Shale, red/grn | | cm, em | | 0.00 |
| 7.00 | 66.00 | 73.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 73.00 | 75.90 | Sandstone, gy | | cs, es | y | 2.90 |
| 2.10 | 75.90 | 78.00 | Shale, grn | | cm, em | | 0.00 |
| 5.00 | 78.00 | 83.00 | Claystone, red | | cv, ev | | 0.00 |
| 14.00 | 83.00 | 97.00 | Shale, grn | | cm, em | | 0.00 |
| 21.00 | 97.00 | 118.00 | Shale, red | | cm, em | | 0.00 |
| 11.90 | 118.00 | 129.90 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 16.10 | 129.90 | 146.00 | Claystone, red/grn | | cv, ev | | 0.00 |
| 7.00 | 146.00 | 153.00 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 15.00 | 153.00 | 168.00 | Shale, grn | | cm, em | | 0.00 |
| 5.80 | 168.00 | 173.80 | Claystone, red/grn | | cv, ev | | 0.00 |
| 2.50 | 173.80 | 176.30 | Limestone, nodular | | ak, cs, es | y | 2.50 |
| 1.30 | 176.30 | 177.60 | Claystone, red/grn | | cv, ev | | 0.00 |
| 5.40 | 177.60 | 183.00 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 2.00 | 183.00 | 185.00 | Shale, grn | | cm, em | | 0.00 |
| 3.90 | 185.00 | 188.90 | Sandstone, gy | | cs, es | y | 3.90 |
| 6.50 | 188.90 | 195.40 | Shale, grn | | cm, em | | 0.00 |
| 2.60 | 195.40 | 198.00 | Shale, red | | cm, em | | 0.00 |
| 25.00 | 198.00 | 223.00 | Shale, grn | | cm, em | | 0.00 |
| 10.00 | 223.00 | 233.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.10 | 233.00 | 235.10 | **Coal w/ sh layers, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.50 | 235.10 | 235.60 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 235.60 | 236.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 2.90 | 236.60 | 239.50 | Claystone, gy | | cv, ev | | 0.00 |
| 10.30 | 239.50 | 249.80 | Claystone, grn | | cv, ev | | 0.00 |
| 6.60 | 249.80 | 256.40 | Claystone, red | | cv, ev | | 0.00 |
| 5.60 | 256.40 | 262.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 16.60 | 262.00 | 278.60 | Shale, gy, sandy | | cs, es | | 0.00 |
| 8.60 | 278.60 | 287.20 | Shale, grn | | cm, em | | 0.00 |
| 0.55 | 287.20 | 287.75 | **Coal, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.45 | 287.75 | 288.20 | **Shale, gy, pyrite** | | ac, cm, em | | 0.00 |
| 0.20 | 288.20 | 288.40 | **Coal w/ bone** | | ac, cv, ev | | 0.00 |
| 0.30 | 288.40 | 288.70 | **Coal w/ sh stks** | | ac, cv, ev | | 0.00 |
| 0.80 | 288.70 | 289.50 | Shale, gy | | cm, em | | 0.00 |
| 3.00 | 289.50 | 292.50 | Limestone, nodular | | ak, cs, es | y | 3.00 |
| 8.50 | 292.50 | 301.00 | Limestone, shaley | | ak, cs, es | y | 8.50 |
| 6.50 | 301.00 | 307.50 | Sandstone, gy | | cs, es | y | 6.50 |
| 3.80 | 307.50 | 311.30 | Shale, grn | | cm, em | | 0.00 |
| 1.30 | 311.30 | 312.60 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 1.50 | 312.60 | 314.10 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 5.60 | 314.10 | 319.70 | Sandstone, gy | | cs, es | y | 5.60 |
| 4.90 | 319.70 | 324.60 | Shale, grn | | cm, em | | 0.00 |
| 4.50 | 324.60 | 329.10 | Limestone | | ak, cs, es | y | 4.50 |
| 3.10 | 329.10 | 332.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 332.20 | 332.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.95 | 332.70 | 333.65 | Shale, dk gy | | cm, em | | 0.00 |
| 4.20 | 333.65 | 337.85 | Shale, gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-02

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 13.20 | 337.85 | 351.05 | Sandstone, gy w/sh stks | | cs, es | y | 13.20 |
| 0.50 | 351.05 | 351.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 351.55 | 351.85 | **Coal, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.50 | 351.85 | 352.35 | Shale, gy | | cm, em | | 0.00 |
| 3.50 | 352.35 | 355.85 | Claystone, gy | | cv, ev | | 0.00 |
| 20.30 | 355.85 | 376.15 | Limestone, shaley | | ak, cs, es | y | 20.30 |
| 7.50 | 376.15 | 383.65 | Claystone, grn | | cv, ev | | 0.00 |
| 2.20 | 383.65 | 385.85 | Claystone, gy | | cv, ev | | 0.00 |
| 1.60 | 385.85 | 387.45 | Claystone, grn | | cv, ev | | 0.00 |
| 3.40 | 387.45 | 390.85 | Shale, red/grn | | cm, em | | 0.00 |
| 24.20 | 390.85 | 415.05 | Limestone w/ sh layers | | ak, cs, es | y | 24.20 |
| 2.00 | 415.05 | 417.05 | Claystone, gy | | cv, ev | | 0.00 |
| 5.20 | 417.05 | 422.25 | Limestone w/ sh layers | | ak, cs, es | y | 5.20 |
| 4.10 | 422.25 | 426.35 | Claystone, grn | | cv, ev | | 0.00 |
| 10.30 | 426.35 | 436.65 | Limestone | | ak, cs, es | y | 10.30 |
| 3.60 | 436.65 | 440.25 | Shale, grn | | cm, em | | 0.00 |
| 43.60 | 440.25 | 483.85 | Limestone w/ sh layers | | ak, cs, es | y | 43.60 |
| 2.40 | 483.85 | 486.25 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 486.25 | 486.55 | Shale, gy | | cm, em | | 0.00 |
| 1.85 | 486.55 | 488.40 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 3.00 | 488.40 | 491.40 | Shale, gy | | cm, em | | 0.00 |
| 10.10 | 491.40 | 501.50 | Shale, grn, sandy | | cs, es | | 0.00 |
| 17.00 | 501.50 | 518.50 | Sandstone, gy | | cs, es | y | 17.00 |
| 3.00 | 518.50 | 521.50 | Shale, gy, sandy | | cs, es | | 0.00 |
| 6.45 | 521.50 | 527.95 | Shale, gy | | cm, em | | 0.00 |
| 1.30 | 527.95 | 529.25 | Sandstone, gy w/ coal stks | | cs, es | | 0.00 |
| 0.40 | 529.25 | 529.65 | Claystone, gy | | cv, ev | | 0.00 |
| 1.25 | 529.65 | 530.90 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 530.90 | 531.15 | Shale, gy | | cm, em | | 0.00 |
| 1.30 | 531.15 | 532.45 | **Coal** | | ac, cv, ev | | 0.00 |
| 19.85 | 532.45 | 552.30 | Limestone w/ sh layers | | ak, cs, es | y | 19.85 |
| 2.40 | 552.30 | 554.70 | Shale, grn | | cm, em | | 0.00 |
| 3.20 | 554.70 | 557.90 | Shale, gy | | cm, em | | 0.00 |
| 9.70 | 557.90 | 567.60 | Limestone, nodular | | ak, cs, es | y | 9.70 |
| 1.10 | 567.60 | 568.70 | **Coal, bony** | | ac, cv, ev | | 0.00 |
| 2.50 | 568.70 | 571.20 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 571.20 | 573.85 | Limestone | | ak, cs, es | y | 2.65 |
| 14.00 | 573.85 | 587.85 | Limestone w/ claystone stks | | ak, cs, es | y | 14.00 |
| 3.90 | 587.85 | 591.75 | Claystone, grn | | cv, ev | | 0.00 |
| 0.50 | 591.75 | 592.25 | Shale, gy | | cm, em | | 0.00 |
| 1.43 | 592.25 | 593.68 | **Coal w/ bone, pyritic, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.82 | 593.68 | 594.50 | Shale, gy | | cm, em | | 0.00 |
| 5.15 | 594.50 | 599.65 | **Coal, PITTSBURGH NO. 8** | | ac, cv, ev | | 0.00 |
| 0.17 | 599.65 | 599.82 | **Bone w/ coal stks** | | ac, cv, ev | | 0.00 |
| 1.35 | 599.82 | 601.17 | Shale, gy | | cm, em | | 0.00 |
| 10.10 | 601.17 | 611.27 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 611.27 | | | | | 225.70 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 225.70

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 37%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 225.70 | 37% |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-02

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Soft Rock: | 385.57 | 63% | | | | | |
| | 611.27 | | | | | | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 183.08 | 2.40 | 1.42 | 74.9 | -108.4 |
| Coal | 3.88 | 5.91 | 3.04 | 185.00 | 181.0 |
| Bottom, 10 ft. | 28.40 | 5.08 | 4.21 | 159.00 | 130.0 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2000-03

**Field Engineer:** Kim Cecil
**Surface Elevation:** 976.43
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 682,637
**Easting:** 2,421,552
**Drilling Company:** LJ Hughes & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 23.00 | 0.00 | 23.00 | Casing | | | | 0.00 |
| 2.00 | 23.00 | 25.00 | Shale, gy | YES | cm, em | | 0.00 |
| 3.30 | 25.00 | 28.30 | Claystone, gy w/ ls nods | YES | ak, cv, ev | | 0.00 |
| 0.60 | 28.30 | 28.90 | Limestone | | ak, cs, es | y | 0.60 |
| 0.30 | 28.90 | 29.20 | Claystone, gy, soft | YES | cv, ev | | 0.00 |
| 0.50 | 29.20 | 29.70 | Shale, dk gy, limey | | ak, cm, em | | 0.00 |
| 0.80 | 29.70 | 30.50 | Limestone | | ak, cs, es | y | 0.80 |
| 0.30 | 30.50 | 30.80 | Claystone, gy, soft | | cv, ev | | 0.00 |
| 3.20 | 30.80 | 34.00 | Core loss | | | | 0.00 |
| 0.50 | 34.00 | 34.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.50 | 34.50 | 36.00 | Shale, gy, sandy | YES | cs, es | | 0.00 |
| 2.00 | 36.00 | 38.00 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 38.00 | 38.50 | Shale, gy, sandy | | cs, es | | 0.00 |
| 0.60 | 38.50 | 39.10 | Clay, soft | | cv, ev | | 0.00 |
| 1.60 | 39.10 | 40.70 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.20 | 40.70 | 41.90 | Shale, gy | | cm, em | | 0.00 |
| 15.10 | 41.90 | 57.00 | Sandstone, gy w/sh stks | | cs, es | y | 15.10 |
| 0.40 | 57.00 | 57.40 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 57.40 | 57.70 | **Bone w/ coal stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 2.10 | 57.70 | 59.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 59.80 | 62.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.00 |
| 3.50 | 62.80 | 66.30 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 66.30 | 67.10 | Limestone | | ak, cs, es | y | 0.80 |
| 1.60 | 67.10 | 68.70 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 68.70 | 72.70 | Limestone, massive | | ak, cs, es | y | 4.00 |
| 2.80 | 72.70 | 75.50 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 8.50 | 75.50 | 84.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.00 | 84.00 | 86.00 | Limestone, nodular | | ak, cs, es | y | 2.00 |
| 9.00 | 86.00 | 95.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 95.00 | 95.40 | Claystone, red | | cv, ev | | 0.00 |
| 2.60 | 95.40 | 98.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 98.00 | 98.70 | Limestone | | ak, cs, es | y | 0.70 |
| 11.50 | 98.70 | 110.20 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 12.80 | 110.20 | 123.00 | Limestone w/ sh layers | | ak, cs, es | y | 12.80 |
| 0.60 | 123.00 | 123.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 14.90 | 123.60 | 138.50 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 4.00 | 138.50 | 142.50 | Limestone, nodular | | ak, cs, es | y | 4.00 |
| 0.50 | 142.50 | 143.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 143.00 | 147.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.30 | 147.90 | 150.20 | Limestone, shaley | | ak, cs, es | y | 2.30 |
| 2.30 | 150.20 | 152.50 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 16.00 | 152.50 | 168.50 | Limestone, layered | | ak, cs, es | y | 16.00 |
| 2.40 | 168.50 | 170.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 170.90 | 175.90 | Limestone | | ak, cs, es | y | 5.00 |
| 7.10 | 175.90 | 183.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 11.60 | 183.00 | 194.60 | Limestone, nodular | | ak, cs, es | y | 11.60 |
| 4.40 | 194.60 | 199.00 | Shale, dk gy, limey | | ak, cm, em | | 0.00 |
| 1.40 | 199.00 | 200.40 | Shale, dk gy, broken | | cv, ev | | 0.00 |
| 0.20 | 200.40 | 200.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 200.60 | 201.90 | **Coal w/ sh stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 1.20 | 201.90 | 203.10 | Shale, dk gy | | cm, em | | 0.00 |
| 4.30 | 203.10 | 207.40 | Shale, gy, sandy | | cs, es | | 0.00 |
| 6.40 | 207.40 | 213.80 | Sandstone w/ sh stks | | cs, es | y | 6.40 |
| 12.40 | 213.80 | 226.20 | Shale, gy | | cm, em | | 0.00 |
| 0.15 | 226.20 | 226.35 | Shale, blk | | ac, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2000-03

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.75 | 226.35 | 228.10 | **Coal w/ sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.25 | 228.10 | 228.35 | **Shale w/ coal, carbonated** | | ac, cv, ev | | 0.00 |
| 0.70 | 228.35 | 229.05 | **Coal, pyritic** | | ac, cv, ev | | 0.00 |
| 0.50 | 229.05 | 229.55 | **Coal, bony** | | ac, cv, ev | | 0.00 |
| 0.85 | 229.55 | 230.40 | Shale, dk gy | | cm, em | | 0.00 |
| 17.10 | 230.40 | 247.50 | Limestone, nodular | | ak, cs, es | y | 17.10 |
| 0.40 | 247.50 | 247.90 | Claystone, gm | | cv, ev | | 0.00 |
| 1.90 | 247.90 | 249.80 | Limestone, shaley | | ak, cs, es | y | 1.90 |
| 0.60 | 249.80 | 250.40 | Claystone, gm | | cv, ev | | 0.00 |
| 1.30 | 250.40 | 251.70 | Shale, gy | | cm, em | | 0.00 |
| 3.70 | 251.70 | 255.40 | Sandstone w/sh stks | | cs, es | y | 3.70 |
| 1.10 | 255.40 | 256.50 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.60 | 256.50 | 260.10 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 260.10 | 261.50 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 261.50 | 263.00 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 4.10 | 263.00 | 267.10 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 267.10 | 268.30 | Limestone, shaley | | ak, cs, es | y | 1.20 |
| 1.50 | 268.30 | 269.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 269.80 | 271.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 1.40 | 271.50 | 272.90 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 13.40 | 272.90 | 286.30 | Limestone, nodular | | ak, cs, es | y | 13.40 |
| 4.50 | 286.30 | 290.80 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 290.80 | 293.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 293.30 | 293.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.66 | 293.70 | 294.36 | **Coal, pyrite, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.25 | 294.36 | 294.61 | **Coal, bony w/ sh** | | ac, cv, ev | | 0.00 |
| 0.97 | 294.61 | 295.58 | Shale, dk gy | | cm, em | | 0.00 |
| 3.84 | 295.58 | 299.42 | **Coal, bony w/ sh stks PITTSBURGH NO.8** | | ac, cv, ev | | 0.00 |
| 0.95 | 299.42 | 300.37 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.21 | 300.37 | 300.58 | **Coal w/ sh stks** | | ac, cv, ev | | 0.00 |
| 0.50 | 300.58 | 301.08 | Shale, dk gy | | cm, em | | 0.00 |
| 1.95 | 301.08 | 303.03 | Limestone, shaley, nodular | | ak, cs, es | y | 1.95 |
| 5.20 | 303.03 | 308.23 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.50 | 308.23 | 313.73 | Shale, gy | | cm, em | | 0.00 |
| 8.00 | 313.73 | 321.73 | Sandstone w/ sh stks | | cs, es | y | 8.00 |
| 1.30 | 321.73 | 323.03 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| | Total Depth | 323.03 | | | | | 137.45 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 137.45

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 43%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 137.45 | 43% |
| Soft Rock: | 185.58 | 57% |
| | 323.03 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Neutralization | Potential Acidity, tons /1000 tons as | CaCO3 Deficiency, tons/1000 |
|---|---|---|

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-03

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| | Potential, tons/1000 | Total | Pyritic | $CaCO_3$ | tons as $CaCO_3$ | | |
| Stratum | tons as CaCO3 | Sulphur % | Sulphur % | (Total Sul.) | (Total Sul.) | | |
| Roof, 10 ft. | 164.06 | 2.90 | 2.14 | 90.7 | -73.4 | | |
| Coal | 7.63 | 5.62 | 3.02 | 176.0 | 168.0 | | |
| Bottom, 10 ft. | 308.00 | 3.00 | 2.58 | 93.6 | -214.0 | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2000-04

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,267.00
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 682,440
**Easting:** 2,430,373
**Drilling Company:** LJ Hughes and Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 23.00 | 0.00 | 23.00 | Casing | | | | 0.00 |
| 14.00 | 23.00 | 37.00 | Claystone, red/gy | YES | cv, ev | | 0.00 |
| 1.00 | 37.00 | 38.00 | Core loss | | | | 0.00 |
| 2.30 | 38.00 | 40.30 | Claystone, gy | YES | cv, ev | | 0.00 |
| 3.30 | 40.30 | 43.60 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 43.60 | 45.40 | Shale, gy, broken | | cv, ev | | 0.00 |
| 5.20 | 45.40 | 50.60 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 50.60 | 53.00 | Claystone, red | YES | cv, ev | | 0.00 |
| 6.60 | 53.00 | 59.60 | Claystone, red/gy | YES | cv, ev | | 0.00 |
| 5.40 | 59.60 | 65.00 | Sandstone, gy w/ sh stks | | cs, es | y | 5.40 |
| 14.60 | 65.00 | 79.60 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 11.00 | 79.60 | 90.60 | Claystone, red | YES | cv, ev | | 0.00 |
| 0.40 | 90.60 | 91.00 | Core loss | | | | 0.00 |
| 11.50 | 91.00 | 102.50 | Shale, red/gy | | cm, em | | 0.00 |
| 0.50 | 102.50 | 103.00 | Core loss | | | | 0.00 |
| 16.00 | 103.00 | 119.00 | Shale, gy | | cv, ev | | 0.00 |
| 0.20 | 119.00 | 119.20 | **Bone, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 3.80 | 119.20 | 123.00 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 54.00 | 123.00 | 177.00 | Shale, red/ gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 177.00 | 179.60 | Limestone, nodular | | ak, cs, es | y | 2.60 |
| 7.40 | 179.60 | 187.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 187.00 | 190.30 | Shale, red | | cm, em | | 0.00 |
| 18.30 | 190.30 | 208.60 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 208.60 | 208.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 5.60 | 208.80 | 214.40 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 25.55 | 214.40 | 239.95 | Sandstone, gy w/ ss stks | | cs, es | y | 25.55 |
| 0.10 | 239.95 | 240.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.10 | 240.05 | 243.15 | **Coal w/ shale stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 2.70 | 243.15 | 245.85 | Claystone, gy | | cv, ev | | 0.00 |
| 0.25 | 245.85 | 246.10 | Core loss | | | | 0.00 |
| 16.30 | 246.10 | 262.40 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 262.40 | 263.00 | Core loss | | | | 0.00 |
| 10.90 | 263.00 | 273.90 | Shale, gy | | cm, em | | 0.00 |
| 9.10 | 273.90 | 283.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.35 | 283.00 | 285.35 | Shale, gy | | cm, em | | 0.00 |
| 5.75 | 285.35 | 291.10 | **Coal, bony w/ sh stks WAYNESBURGH "A"** | | ac, cv, ev | | 0.00 |
| 0.65 | 291.10 | 291.75 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 291.75 | 292.75 | Shale, blk, carb. | | ac, cm, em | | 0.00 |
| 10.25 | 292.75 | 303.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 303.00 | 304.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 10.90 | 304.00 | 314.90 | Shale, gy | | cm, em | | 0.00 |
| 5.50 | 314.90 | 320.40 | Sandstone, gy | | cs, es | y | 5.50 |
| 2.90 | 320.40 | 323.30 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.50 | 323.30 | 326.80 | Sandstone w/ sh stks | | cs, es | y | 3.50 |
| 0.80 | 326.80 | 327.60 | Claystone, gy | | cv, ev | | 0.00 |
| 3.70 | 327.60 | 331.30 | Limestone, nodular | | ak, cs, es | y | 3.70 |
| 1.40 | 331.30 | 332.70 | Claystone, gy, soft | | cv, ev | | 0.00 |
| 0.50 | 332.70 | 333.20 | Shale, dk gy, soft | | cm, em | | 0.00 |
| 2.30 | 333.20 | 335.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.60 | 335.50 | 341.10 | Sandstone, gy | | cs, es | y | 5.60 |
| 4.90 | 341.10 | 346.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.30 | 346.00 | 351.30 | Sandstone w/ sh stks | | cs, es | y | 5.30 |
| 1.30 | 351.30 | 352.60 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 4.60 | 352.60 | 357.20 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 357.20 | 357.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.00 | 357.50 | 358.50 | Claystone, gy | | cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.50 | 358.50 | 363.00 | Limestone, massive | | ak, cs, es | y | 4.50 |
| 3.80 | 363.00 | 366.80 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 10.60 | 366.80 | 377.40 | Limestone | | ak, cs, es | y | 10.60 |
| 12.30 | 377.40 | 389.70 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 5.20 | 389.70 | 394.90 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.60 | 394.90 | 400.50 | Shale, red/gy | | cm, em | | 0.00 |
| 2.50 | 400.50 | 403.00 | Limestone, nodular | | ak, cs, es | y | 2.50 |
| 20.00 | 403.00 | 423.00 | Limestone w/ claystone parting | | ak, cs, es | y | 20.00 |
| 2.30 | 423.00 | 425.30 | Limestone | | ak, cs, es | y | 2.30 |
| 11.80 | 425.30 | 437.10 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.90 | 437.10 | 443.00 | Limestone, shaley | | ak, cs, es | y | 5.90 |
| 35.00 | 443.00 | 478.00 | Limestone w/ sh layers | | ak, cs, es | y | 35.00 |
| 10.50 | 478.00 | 488.50 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 8.90 | 488.50 | 497.40 | Limestone, shaley | | ak, cs, es | y | 8.90 |
| 3.00 | 497.40 | 500.40 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 500.40 | 502.45 | **Coal, bone, pyrite, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 22.35 | 502.45 | 524.80 | Shale, gy | | cm, em | | 0.00 |
| 1.60 | 524.80 | 526.40 | Shale, dk gy, soft | | cm, em | | 0.00 |
| 0.80 | 526.40 | 527.20 | Claystone, gy | | cv, ev | | 0.00 |
| 1.10 | 527.20 | 528.30 | **Coal w/ sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.90 | 528.30 | 529.20 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 19.90 | 529.20 | 549.10 | Limestone, nodular | | ak, cs, es | y | 19.90 |
| 8.60 | 549.10 | 557.70 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 3.90 | 557.70 | 561.60 | Limestone, shaley | | ak, cs, es | y | 3.90 |
| 2.20 | 561.60 | 563.80 | Claystone, gy | | cv, ev | | 0.00 |
| 0.60 | 563.80 | 564.40 | Shale, blk w/ coal | | ac, cm, em | | 0.00 |
| 0.80 | 564.40 | 565.20 | **Coal, bone, REDSTONE** | | ac, cv, ev | | 0.00 |
| 2.50 | 565.20 | 567.70 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 13.20 | 567.70 | 580.90 | Limestone, nodular | | ak, cs, es | y | 13.20 |
| 6.20 | 580.90 | 587.10 | Claystone, gy | | cv, ev | | 0.00 |
| 1.60 | 587.10 | 588.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.60 | 588.70 | 589.30 | Shale, blk, carb. | | ac, cm, em | | 0.00 |
| 0.97 | 589.30 | 590.27 | **Coal w/ bone, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.92 | 590.27 | 591.19 | Shale, dk gy, soft | | cm, em | | 0.00 |
| 3.97 | 591.19 | 595.16 | **Coal w/ sh stks, pyrite, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 0.90 | 595.16 | 596.06 | **Bone w/ coal layers** | | ac, cv, ev | | 0.00 |
| 0.33 | 596.06 | 596.39 | **Coal w/ pyrite** | | ac, cv, ev | | |
| 4.20 | 596.39 | 600.59 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.40 | 600.59 | 605.99 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.60 | 605.99 | 608.59 | Claystone, gy | | cv, ev | | 0.00 |
| 2.00 | 608.59 | 610.59 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 610.59 | | | | | 183.85 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 183.85

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 30%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 183.85 | 30% |
| Soft Rock: | 426.74 | 70% |
| | 610.59 | |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2000-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 278.84 | 2.94 | 2.64 | 91.92 | -186.80 |
| Coal | 5.01 | 5.95 | 2.85 | 186.0 | 181.0 |
| Bottom, 10 ft. | 164.00 | 3.32 | 3.17 | 103.85 | -60.1 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2001-02

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,238.55
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 684,949
**Easting:** 2,425,410
**Drilling Company:** LJ Hughes and Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 22.00 | 0.00 | 22.00 | Casing | | | | 0.00 |
| 1.30 | 22.00 | 23.30 | Shale, gy | YES | cm, em | | 0.00 |
| 1.30 | 23.30 | 24.60 | Claystone, gy, soft | YES | cv, ev | | 0.00 |
| 0.60 | 24.60 | 25.20 | Shale, gy | | cm, em | | 0.00 |
| 3.20 | 25.20 | 28.40 | Limestone, massive | YES | ak, cs, es | y | 3.20 |
| 16.10 | 28.40 | 44.50 | Shale, red/gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 44.50 | 46.90 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 4.60 | 46.90 | 51.50 | Sandstone, gy | YES | cs, es | y | 4.60 |
| 3.80 | 51.50 | 55.30 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 7.70 | 55.30 | 63.00 | Claystone, red | | cv, ev | | 0.00 |
| 33.50 | 63.00 | 96.50 | Shale, red/gy | YES | cm, em | | 0.00 |
| 6.50 | 96.50 | 103.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 20.00 | 103.00 | 123.00 | Claystone, red/gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 20.00 | 123.00 | 143.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 143.00 | 147.10 | Claystone, red/gy | | cv, ev | | 0.00 |
| 3.30 | 147.10 | 150.40 | Limestone, nodular | | ak, cs, es | y | 3.30 |
| 1.00 | 150.40 | 151.40 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 151.40 | 151.80 | Limestone | | ak, cs, es | y | 0.40 |
| 5.80 | 151.80 | 157.60 | Claystone, gy | | cv, ev | | 0.00 |
| 3.90 | 157.60 | 161.50 | Shale, red/gy | | cm, em | | 0.00 |
| 1.50 | 161.50 | 163.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 15.50 | 163.00 | 178.50 | Shale, gy | | cm, em | | 0.00 |
| 4.50 | 178.50 | 183.00 | Claystone, gy | | cv, ev | | 0.00 |
| 20.00 | 183.00 | 203.00 | Shale, gy | | cm, em | | 0.00 |
| 4.90 | 203.00 | 207.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 207.90 | 208.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 208.90 | 209.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.65 | 209.80 | 212.45 | **Coal w/ pyrite, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.55 | 212.45 | 213.00 | **Shale, gy w/ coal stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 213.00 | 213.20 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.30 | 213.20 | 213.50 | **Shale, dk gy w/ coal stks** | | ac, cv, ev | | 0.00 |
| 0.95 | 213.50 | 214.45 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 214.45 | 214.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 14.00 | 214.75 | 228.75 | Claystone, gy | | cv, ev | | 0.00 |
| 12.00 | 228.75 | 240.75 | Shale, gy | | cm, em | | 0.00 |
| 4.50 | 240.75 | 245.25 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.20 | 245.25 | 246.45 | Shale, gy | | cm, em | | 0.00 |
| 6.10 | 246.45 | 252.55 | Shale, dk gy | | cm, em | | 0.00 |
| 7.00 | 252.55 | 259.55 | **Coal w/ pyrite and sh stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.40 | 259.55 | 259.95 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.35 | 259.95 | 260.30 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 260.30 | 261.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.80 | 261.05 | 261.85 | Limestone | | ak, cs, es | y | 0.80 |
| 0.70 | 261.85 | 262.55 | Claystone, gy | | cv, ev | | 0.00 |
| 0.70 | 262.55 | 263.25 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 6.30 | 263.25 | 269.55 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.20 | 269.55 | 274.75 | Sandstone, gy, massive | | cs, es | y | 5.20 |
| 5.50 | 274.75 | 280.25 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.20 | 280.25 | 283.45 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 283.45 | 285.15 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 4.10 | 285.15 | 289.25 | Sandstone, gy | | cs, es | y | 4.10 |
| 4.00 | 289.25 | 293.25 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.30 | 293.25 | 294.55 | Shale, gy | | cm, em | | 0.00 |
| 1.50 | 294.55 | 296.05 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 296.05 | 296.95 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.70 | 296.95 | 301.65 | Claystone, dk gy | | cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2001-02

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.70 | 301.65 | 302.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.20 | 302.35 | 302.55 | Shale, dk gy | | ac, cm, em | | 0.00 |
| 7.80 | 302.55 | 310.35 | Shale, gy | | cm, em | | 0.00 |
| 6.10 | 310.35 | 316.45 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.10 | 316.45 | 321.55 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 321.55 | 321.75 | **Coal w/ pyrite, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 0.60 | 321.75 | 322.35 | Shale, gy | | cm, em | | 0.00 |
| 1.80 | 322.35 | 324.15 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 324.15 | 326.45 | Limestone, nodular | | ak, cs, es | y | 2.30 |
| 3.80 | 326.45 | 330.25 | Claystone, gy, w/ ls nods | | ak, cv, ev | | 0.00 |
| 12.10 | 330.25 | 342.35 | Limestone w/ sh layers | | ak, cs, es | y | 12.10 |
| 16.00 | 342.35 | 358.35 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.20 | 358.35 | 361.55 | Shale, red/gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 361.55 | 362.75 | Limestone | | ak, cs, es | y | 1.20 |
| 3.60 | 362.75 | 366.35 | Claystone, gy | | cv, ev | | 0.00 |
| 1.20 | 366.35 | 367.55 | Limestone, shaley | | ak, cs, es | y | 1.20 |
| 2.00 | 367.55 | 369.55 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 369.55 | 370.05 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 2.00 | 370.05 | 372.05 | Shale, gy | | cm, em | | 0.00 |
| 1.20 | 372.05 | 373.25 | Core loss | | | | 0.00 |
| 41.10 | 373.25 | 414.35 | Limestone w/ sh layers | | ak, cs, es | y | 41.10 |
| 21.10 | 414.35 | 435.45 | Limestone, shale, nodular | | ak, cs, es | y | 21.10 |
| 19.00 | 435.45 | 454.45 | Limestone w/ sh layers | | ak, cs, es | y | 19.00 |
| 2.70 | 454.45 | 457.15 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 0.60 | 457.15 | 457.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 457.75 | 457.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.90 | 457.95 | 458.85 | **Coal, SEWICKELY No. 9** | | ac, cv, ev | | 0.00 |
| 0.70 | 458.85 | 459.55 | Shale, dk gy w/ coal | | ac, cm, em | | 0.00 |
| 8.50 | 459.55 | 468.05 | Shale, gy | | cm, em | | 0.00 |
| 5.40 | 468.05 | 473.45 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.70 | 473.45 | 479.15 | Shale, gy | | cm, em | | 0.00 |
| 10.40 | 479.15 | 489.55 | Sandstone w/ sh stks | | cs, es | y | 10.40 |
| 1.40 | 489.55 | 490.95 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 490.95 | 491.95 | **Coal w/ bone layers, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.35 | 491.95 | 492.30 | **Coal / shale layers** | | ac, cv, ev | | 0.00 |
| 0.90 | 492.30 | 493.20 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 19.65 | 493.20 | 512.85 | Limestone, nodular | | ak, cs, es | y | 19.65 |
| 6.50 | 512.85 | 519.35 | Shale, gy, sandy | | cs, es | | 0.00 |
| 4.90 | 519.35 | 524.25 | Shale, gy | | cm, em | | 0.00 |
| 3.20 | 524.25 | 527.45 | Limestone, massive | | ak, cs, es | y | 3.20 |
| 1.50 | 527.45 | 528.95 | Claystone, gy | | cv, ev | | 0.00 |
| 1.50 | 528.95 | 530.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.40 | 530.45 | 533.85 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 13.70 | 533.85 | 547.55 | Limestone, nodular | | ak, cs, es | y | 13.70 |
| 5.40 | 547.55 | 552.95 | Claystone, gy | | cv, ev | | 0.00 |
| 0.25 | 552.95 | 553.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 553.20 | 553.70 | Claystone, gy, soft | | cv, ev | | 0.00 |
| 0.95 | 553.70 | 554.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.64 | 554.65 | 555.29 | **Coal w/ bone and sh stks, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.70 | 555.29 | 555.99 | Claystone, gy | | cv, ev | | 0.00 |
| 2.06 | 555.99 | 558.05 | **Coal w/ pyrite, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 1.21 | 558.05 | 559.26 | **Coal w/ bone** | | ac, cv, ev | | 0.00 |
| 2.08 | 559.26 | 561.34 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 1.87 | 561.34 | 563.21 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.60 | 563.21 | 565.81 | Claystone, gy | | cv, ev | | 0.00 |
| 5.50 | 565.81 | 571.31 | Shale, gy, sandy | | cs, es | | 0.00 |
| 9.80 | 571.31 | 581.11 | Sandstone w/ sh stks | | cs, es | y | 9.80 |
| | Total Depth | 581.11 | | | | | 177.95 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC 2001-02

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Total Thickness of Hard Rock Overlying Mining Unit | | | | | | | 177.95 |
| Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit | | | | | | | 31% |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 177.95 | 31% |
| Soft Rock: | 403.16 | 69% |
| | 581.11 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 148.21 | 2.44 | 2.22 | 76.26 | -71.95 |
| Coal | 4.74 | 5.44 | 2.92 | 170.0 | 165.3 |
| Bottom, 10 ft. | 156.50 | 3.64 | 3.40 | 113.55 | -43.0 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2001-04

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,003.59
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 684,675
**Easting:** 2,418,410
**Drilling Company:** Jay Little Drilling Company

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 18.00 | 0.00 | 18.00 | Casing | | | | 0.00 |
| 1.42 | 18.00 | 19.42 | Sandstone, gy | YES | cs, es | y | 1.42 |
| 1.75 | 19.42 | 21.17 | Shale, dk gy w/ coal | YES | cv, ev | | 0.00 |
| 1.00 | 21.17 | 22.17 | Limestone | YES | ak, cs, es | y | 1.00 |
| 0.58 | 22.17 | 22.75 | Claystone, gy | | cv, ev | | 0.00 |
| 1.45 | 22.75 | 24.20 | **Coal w/ sh stks, WAYNESBURGH "A"** | YES | ac, cv, ev | | 0.00 |
| 1.08 | 24.20 | 25.28 | Limestone | | ak, cs, es | y | 1.08 |
| 0.50 | 25.28 | 25.78 | Claystone, gy | YES | cv, ev | | 0.00 |
| 9.67 | 25.78 | 35.45 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.34 | 35.45 | 39.79 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 9.25 | 39.79 | 49.04 | Claystone, red/gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 49.04 | 51.54 | Limestone, shaley | | ak, cs, es | y | 2.50 |
| 2.16 | 51.54 | 53.70 | Sandstone, gy | | cs, es | y | 2.16 |
| 4.25 | 53.70 | 57.95 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.58 | 57.95 | 59.53 | Claystone, gy | | cv, ev | | 0.00 |
| 3.75 | 59.53 | 63.28 | Limestone w/ clay stks | | ak, cs, es | y | 3.75 |
| 3.92 | 63.28 | 67.20 | Claystone, dk gy/ gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 18.16 | 67.20 | 85.36 | Shale, gy, sandy | | cs, es | | 0.00 |
| 30.00 | 85.36 | 115.36 | Limestone w/ claystone | | ak, cs, es | y | 30.00 |
| 4.42 | 115.36 | 119.78 | Shale, gy, sandy | | cs, es | | 0.00 |
| 11.42 | 119.78 | 131.20 | Limestone w/ sh layers | | ak, cs, es | y | 11.42 |
| 5.92 | 131.20 | 137.12 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 0.50 | 137.12 | 137.62 | Sandstone, gy | | cs, es | y | 0.50 |
| 0.83 | 137.62 | 138.45 | Shale, grn, sandy | | cs, es | | 0.00 |
| 12.50 | 138.45 | 150.95 | Limestone, w/ claystone | | ak, cs, es | y | 12.50 |
| 16.92 | 150.95 | 167.87 | Shale, gy/grn, sandy, limey | | ak, cs, es | | 0.00 |
| 9.16 | 167.87 | 177.03 | Claystone, gy/grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 20.34 | 177.03 | 197.37 | Limestone, shaley | | ak, cs, es | y | 20.34 |
| 3.50 | 197.37 | 200.87 | Shale, grn, sandy, limey | | ak, cs, es | | 0.00 |
| 14.00 | 200.87 | 214.87 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.25 | 214.87 | 218.12 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 9.58 | 218.12 | 227.70 | Limestone, shaley, nodular | | ak, cs, es | y | 9.58 |
| 3.58 | 227.70 | 231.28 | Claystone, gy | | cv, ev | | 0.00 |
| 2.00 | 231.28 | 233.28 | **Coal, bony w/ sh. Layers, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 1.50 | 233.28 | 234.78 | Shale, dk gy | | cm, em | | 0.00 |
| 7.75 | 234.78 | 242.53 | Sandstone, gy | | cs, es | y | 7.75 |
| 6.00 | 242.53 | 248.53 | Shale, gy | | cm, em | | 0.00 |
| 5.00 | 248.53 | 253.53 | Claystone, gy | | cv, ev | | 0.00 |
| 2.55 | 253.53 | 256.08 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.71 | 256.08 | 256.79 | Shale, dk gy, sandy | | cs, es | | 0.00 |
| 16.16 | 256.79 | 272.95 | Limestone, shaley | | ak, cs, es | y | 16.16 |
| 5.58 | 272.95 | 278.53 | Claystone, gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.58 | 278.53 | 283.11 | Sandstone, gy | | cs, es | y | 4.58 |
| 4.42 | 283.11 | 287.53 | Shale, gy | | cm, em | | 0.00 |
| 2.16 | 287.53 | 289.69 | Limestone, nodular | | ak, cs, es | y | 2.16 |
| 3.16 | 289.69 | 292.85 | Claystone, gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 292.85 | 293.35 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 293.35 | 294.60 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 12.25 | 294.60 | 306.85 | Limestone, shaley, nodular | | ak, cs, es | y | 12.25 |
| 3.25 | 306.85 | 310.10 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 310.10 | 313.10 | Claystone, gy/grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.42 | 313.10 | 313.52 | Limestone | | ak, cs, es | y | 0.42 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC 2001-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.92 | 313.52 | 316.44 | Claystone, gy/grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.16 | 316.44 | 319.60 | Claystone, gy | | cv, ev | | 0.00 |
| 0.95 | 319.60 | 320.55 | **Coal w/ sh layers, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 1.02 | 320.55 | 321.57 | Shale, dk gy | | cm, em | | 0.00 |
| 4.03 | 321.57 | 325.60 | **Coal, bony, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 1.27 | 325.60 | 326.87 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 3.81 | 326.87 | 330.68 | Limestone, shaley | | ak, cs, es | y | 3.81 |
| 4.00 | 330.68 | 334.68 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 7.83 | 334.68 | 342.51 | Sandstone, gy | | cs, es | y | 7.83 |
| 0.84 | 342.51 | 343.35 | Shale, gy, sandy | | cs, es | | 0.00 |
| | Total Depth | 343.35 | | | | | 151.21 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 151.21

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 44%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 151.21 | 44% |
| Soft Rock: | 192.14 | 56% |
| | 343.35 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft | 175.05 | 2.07 | 1.25 | 64.7 | -110.4 |
| Coal | 4.61 | 5.05 | 2.79 | 158.00 | 153.4 |
| Bottom, 10 ft | 401.00 | 2.01 | 1.51 | 62.81 | -338.19 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-09

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1244.4
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 673725.0
**Easting:** 2418712.2
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 97.00 | 0.00 | 97.00 | Casing/ surface material | | | | 0.00 |
| 7.00 | 97.00 | 104.00 | Claystone, gy, sandy, ls nods | | ak, csv, ev | | 0.00 |
| 19.00 | 104.00 | 123.00 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 8.50 | 123.00 | 131.50 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 0.60 | 131.50 | 132.10 | Sandstone, gy, massive | | cs, es | y | 0.60 |
| 3.90 | 132.10 | 136.00 | Sandstone, gy, sh stks | | cs, es | y | 3.90 |
| 10.10 | 136.00 | 146.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 146.10 | 147.00 | Limestone, shaley | | ak, cs, es | y | 0.90 |
| 6.40 | 147.00 | 153.40 | Claystone, red/ gy, ls nods | | ak, csv, ev | | 0.00 |
| 7.20 | 153.40 | 160.60 | Shale, gy | | cm, em | | 0.00 |
| 2.50 | 160.60 | 163.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 5.90 | 163.10 | 169.00 | Sandstone, gy, sh stks | | cs, es | y | 5.90 |
| 0.60 | 169.00 | 169.60 | Claystone, gy | | cv, ev | | 0.00 |
| 4.20 | 169.60 | 173.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.90 | 173.80 | 174.70 | Shale, gy | | cm, em | | 0.00 |
| 5.30 | 174.70 | 180.00 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 2.80 | 180.00 | 182.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.50 | 182.80 | 184.30 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 1.40 | 184.30 | 185.70 | Claystone, gy, sandy, ls nods | | ak, csv, ev | | 0.00 |
| 13.20 | 185.70 | 198.90 | Sandstone, gy, sh stks | | cs, es | y | 13.20 |
| 5.70 | 198.90 | 204.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.00 | 204.60 | 205.60 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.10 | 205.60 | 205.70 | **Bone, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.25 | 205.70 | 205.95 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.10 | 205.95 | 206.05 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.45 | 206.05 | 206.50 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 206.50 | 206.60 | **Claystone, gy** | | cv, ev | | 0.00 |
| 0.15 | 206.60 | 206.75 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.65 | 206.75 | 208.40 | Claystone, gy | | cv, ev | | 0.00 |
| 7.20 | 208.40 | 215.60 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 4.70 | 215.60 | 220.30 | Claystone, red/ gy, ls nods | | ak, csv, ev | | 0.00 |
| 0.80 | 220.30 | 221.10 | Claystone, gy, sandy | | cv, ev | | 0.00 |
| 1.20 | 221.10 | 222.30 | Sandstone, gy, sh stks | | cs, es | y | 1.20 |
| 7.70 | 222.30 | 230.00 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 53.60 | 230.00 | 283.60 | Sandstone, gy, massive | | cs, es | y | 53.60 |
| 0.70 | 283.60 | 284.30 | Sandstone, gy, coal spars | | cs, es | y | 0.70 |
| 0.05 | 284.30 | 284.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.45 | 284.35 | 284.80 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 0.20 | 284.80 | 285.00 | **Bone, coal layers, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.75 | 285.00 | 285.75 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 285.75 | 286.00 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.70 | 286.00 | 287.70 | Limestone, shaley, layered | | ak, cs, es | y | 1.70 |
| 1.00 | 287.70 | 288.70 | Claystone, dk gy, ls nods | | ak, csv, ev | | 0.00 |
| 5.30 | 288.70 | 294.00 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 2.40 | 294.00 | 296.40 | Claystone, gy, sandy, ls nods | | ak, csv, ev | | 0.00 |
| 2.20 | 296.40 | 298.60 | Sandstone, gy, massive | | cs, es | y | 2.20 |
| 1.80 | 298.60 | 300.40 | Sandstone, gy, sh stks | | cs, es | y | 1.80 |
| 5.80 | 300.40 | 306.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.55 | 306.20 | 307.75 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 307.75 | 308.25 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 308.25 | 309.70 | Limestone, shaley, layered | | ak, cs, es | y | 1.45 |
| 1.70 | 309.70 | 311.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 311.40 | 311.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.70 | 311.70 | 313.40 | Sandstone, gy, massive | | cs, es | y | 1.70 |
| 4.10 | 313.40 | 317.50 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 2.50 | 317.50 | 320.00 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 320.00 | 320.80 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-09

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.70 | 320.80 | 321.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.50 | 321.50 | 326.00 | Limestone, shaley, layered | | ak, cs, es | y | 4.50 |
| 2.00 | 326.00 | 328.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.80 | 328.00 | 328.80 | Claystone, blk | | cv, ev | | 0.00 |
| 0.65 | 328.80 | 329.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 329.45 | 329.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 329.70 | 329.85 | **Coal, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.05 | 329.85 | 329.90 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.20 | 329.90 | 330.10 | **Coal** | | ac, cv, ev | | 0.00 |
| 4.10 | 330.10 | 334.20 | Claystone, gy | | cv, ev | | 0.00 |
| 7.40 | 334.20 | 341.60 | Sandstone, gy, sh stks | | cs, es | y | 7.40 |
| 1.90 | 341.60 | 343.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.40 | 343.50 | 343.90 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.10 | 343.90 | 344.00 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.90 | 344.00 | 344.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 344.90 | 345.10 | **Coal, pyrite, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 5.70 | 345.10 | 350.80 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 19.50 | 350.80 | 370.30 | Limestone, shaley, layered | | ak, cs, es | y | 19.50 |
| 1.70 | 370.30 | 372.00 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 372.00 | 372.80 | Limestone, shaley, layered | | ak, cs, es | y | 0.80 |
| 3.70 | 372.80 | 376.50 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 2.10 | 376.50 | 378.60 | Limestone, layered | | ak, cs, es | y | 2.10 |
| 0.50 | 378.60 | 379.10 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.40 | 379.10 | 380.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.90 | 380.50 | 382.40 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 3.90 | 382.40 | 386.30 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 386.30 | 388.20 | Shale, red/ gy | | cm, em | | 0.00 |
| 7.00 | 388.20 | 395.20 | Limestone, shaley, layered | | ak, cs, es | y | 7.00 |
| 4.80 | 395.20 | 400.00 | Claystone, gm, ls nods | | ak, csv, ev | | 0.00 |
| 0.20 | 400.00 | 400.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.30 | 400.20 | 403.50 | Sandstone, gy, sh stks | | cs, es | y | 3.30 |
| 1.10 | 403.50 | 404.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 10.10 | 404.60 | 414.70 | Limestone, shaley, layered | | ak, cs, es | y | 10.10 |
| 1.20 | 414.70 | 415.90 | Limestone, massive | | ak, cs, es | y | 1.20 |
| 6.60 | 415.90 | 422.50 | Claystone, gm, ls nods | | ak, csv, ev | | 0.00 |
| 5.20 | 422.50 | 427.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.30 | 427.70 | 435.00 | Limestone, shaley, layered | | ak, cs, es | y | 7.30 |
| 6.30 | 435.00 | 441.30 | Claystone, gm, ls nods | | ak, csv, ev | | 0.00 |
| 19.70 | 441.30 | 461.00 | Limestone, shaley, layered | | ak, cs, es | y | 19.70 |
| 2.80 | 461.00 | 463.80 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 4.80 | 463.80 | 468.60 | Limestone, massive | | ak, cs, es | y | 4.80 |
| 6.40 | 468.60 | 475.00 | Limestone, shaley, layered | | ak, cs, es | y | 6.40 |
| 2.20 | 475.00 | 477.20 | Claystone, gy/ gm | | cv, ev | | 0.00 |
| 12.80 | 477.20 | 490.00 | Limestone, shaley, layered | | ak, cs, es | y | 12.80 |
| 1.30 | 490.00 | 491.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 491.30 | 491.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 491.50 | 492.80 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.60 | 492.80 | 493.40 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.20 | 493.40 | 493.60 | **Limestone** | | ak, cs, es | y | 0.20 |
| 0.45 | 493.60 | 494.05 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 494.05 | 494.30 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 494.30 | 494.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.80 | 494.50 | 499.30 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 2.70 | 499.30 | 502.00 | Sandstone, gy, massive | | cs, es | y | 2.70 |
| 3.60 | 502.00 | 505.60 | Sandstone, gy, sh stks | | cs, es | y | 3.60 |
| 4.20 | 505.60 | 509.80 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.60 | 509.80 | 514.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 514.40 | 514.45 | **Coal, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.10 | 514.45 | 514.55 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.25 | 514.55 | 514.80 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 514.80 | 514.95 | **Bone,** | | ac, cv, ev | | 0.00 |
| 0.45 | 514.95 | 515.40 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 515.40 | 515.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 515.55 | 515.70 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.30 | 515.70 | 517.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.60 | 517.00 | 517.60 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.60 | 517.60 | 518.20 | Limestone | | ak, cs, es | y | 0.60 |
| 16.80 | 518.20 | 535.00 | Limestone, shaley, layered | | ak, cs, es | y | 16.80 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-09

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 6.20 | 535.00 | 541.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 541.20 | 542.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.20 | 542.20 | 544.40 | Sandstone, gy, slumped | | cs, es | y | 2.20 |
| 0.60 | 544.40 | 545.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.90 | 545.00 | 546.90 | Shale, dk gy | | cm, em | | 0.00 |
| 4.10 | 546.90 | 551.00 | Limestone, shaley, layered | | ak, cs, es | y | 4.10 |
| 3.00 | 551.00 | 554.00 | Claystone, gm | | cv, ev | | 0.00 |
| 0.30 | 554.00 | 554.30 | **Bone, coal stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.35 | 554.30 | 554.65 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 554.65 | 554.95 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 554.95 | 555.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.90 | 555.00 | 556.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 556.90 | 557.70 | Shale, gy | | cm, em | | 0.00 |
| 2.20 | 557.70 | 559.90 | Limestone, shaley, layered | | ak, cs, es | y | 2.20 |
| 11.80 | 559.90 | 571.70 | Limestone, massive | | ak, cs, es | y | 11.80 |
| 1.90 | 571.70 | 573.60 | Limestone, shaley, layered | | ak, cs, es | y | 1.90 |
| 6.00 | 573.60 | 579.60 | Claystone, dk gy, ls nods | | ak, csv, ev | | 0.00 |
| 0.10 | 579.60 | 579.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.50 | 579.70 | 581.20 | Shale, gy | | cm, em | | 0.00 |
| 0.05 | 581.20 | 581.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.29 | 581.25 | 581.54 | **Coal, bone stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.11 | 581.54 | 581.65 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.15 | 581.65 | 581.80 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.93 | 581.80 | 582.73 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.27 | 582.73 | 584.00 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.04 | 584.00 | 584.04 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 2.16 | 584.04 | 586.20 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 586.20 | 586.23 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.12 | 586.23 | 587.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.40 | 587.35 | 587.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 587.75 | 587.95 | Claystone, gy | | cv, ev | | 0.00 |
| 5.10 | 587.95 | 593.05 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 1.00 | 593.05 | 594.05 | Sandstone, gy, massive | | cs, es | y | 1.00 |
| 2.65 | 594.05 | 596.70 | Sandstone, gy, sh stks | | cs, es | y | 2.65 |
| 1.00 | 596.70 | 597.70 | Claystone, gy, ls nods | | ak, csv, ev | | 0.00 |
| 4.30 | 597.70 | 602.00 | Claystone, gy, sandy, ls nods | | ak, csv, ev | | 0.00 |
| 7.20 | 602.00 | 609.20 | Sandstone, gy, sh stks | | cs, es | y | 7.20 |
| 0.80 | 609.20 | 610.00 | Claystone, gy | | cv, ev | | 0.00 |
| | Total Depth | 610.00 | | | | | 253.15 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **253.15**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **42%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 253.15 | 42% |
| Soft Rock: | 356.85 | 59% |
| | 610.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 131.65 | 1.97 | 1.63 | 61.7 | -70.1 |
| Coal | 5.37 | 4.58 | 2.13 | 143.0 | 138.0 |
| Bottom, 10 ft. | 276.50 | 1.42 | 1.39 | 44.2 | -232.5 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-10

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,266.50
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 678,002
**Easting:** 2,417,321
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 67.00 | 0.00 | 67.00 | Casing | | | | 0.00 |
| 3.00 | 67.00 | 70.00 | Claystone, gy | YES | cv, ev | | 0.00 |
| 10.00 | 70.00 | 80.00 | Claystone, red/ grn | YES | cv, ev | | 0.00 |
| 9.00 | 80.00 | 89.00 | Shale, gy, sandy | YES | cm, em | | 0.00 |
| 3.80 | 89.00 | 92.80 | Shale, red | | cm, em | | 0.00 |
| 12.10 | 92.80 | 104.90 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 104.90 | 108.60 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 2.10 | 108.60 | 110.70 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 110.70 | 112.90 | Shale, grn, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 5.80 | 112.90 | 118.70 | Shale, red/ grn, sandy | | cs, es | | 0.00 |
| 0.90 | 118.70 | 119.60 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 16.80 | 119.60 | 136.40 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.30 | 136.40 | 138.70 | Shale, gy, sandy | | cs, es | | 0.00 |
| 0.80 | 138.70 | 139.50 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 10.50 | 139.50 | 150.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.60 | 150.00 | 153.60 | Claystone, red/ grn, limey | | ak, cv, ev | | 0.00 |
| 3.70 | 153.60 | 157.30 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 6.40 | 157.30 | 163.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 38.00 | 163.70 | 201.70 | Sandstone, gy w/ sh stks | | cs, es | y | 38.00 |
| 0.60 | 201.70 | 202.30 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 12.70 | 202.30 | 215.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 63.00 | 215.00 | 278.00 | Sandstone, gy w/ sh stks | | cs, es | y | 63.00 |
| 1.80 | 278.00 | 279.80 | Sandstone, gy w/ coal stks | | cs, es | y | 1.80 |
| 8.20 | 279.80 | 288.00 | Sandstone, gy, massive | | cs, es | y | 8.20 |
| 0.40 | 288.00 | 288.40 | Sandstone, gy w/ coal stks | | cs, es | y | 0.40 |
| 15.50 | 288.40 | 303.90 | Sandstone, gy, massive | | cs, es | y | 15.50 |
| 1.60 | 303.90 | 305.50 | Claystone, gy | | cv, ev | | 0.00 |
| 2.10 | 305.50 | 307.60 | Limestone, shaley | | ak, cs, es | y | 2.10 |
| 2.40 | 307.60 | 310.00 | Shale, gy w/ interbedded ss | | cs, es | | 0.00 |
| 4.60 | 310.00 | 314.60 | Sandstone, gy w/ sh stks | | cs, es | y | 4.60 |
| 2.10 | 314.60 | 316.70 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 316.70 | 318.80 | Shale, dk gy | | cm, em | | 0.00 |
| 5.50 | 318.80 | 324.30 | Limestone, shaley, layered | | ak, cs, es | y | 5.50 |
| 2.60 | 324.30 | 326.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 326.90 | 327.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.65 | 327.25 | 327.90 | **Coal w/ bone stks, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 5.10 | 327.90 | 333.00 | Shale, gy | | cm, em | | 0.00 |
| 2.20 | 333.00 | 335.20 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 5.80 | 335.20 | 341.00 | Sandstone, gy w/ sh stks | | cs, es | y | 5.80 |
| 0.90 | 341.00 | 341.90 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 341.90 | 342.20 | **Bone w/ coal, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 0.80 | 342.20 | 343.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 27.00 | 343.00 | 370.00 | Limestone, shaley, layered | | ak, cs, es | y | 27.00 |
| 2.80 | 370.00 | 372.80 | Claystone, gy | | cv, ev | | 0.00 |
| 4.50 | 372.80 | 377.30 | Sandstone, gy, churned | | cs, es | y | 4.50 |
| 4.60 | 377.30 | 381.90 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.00 | 381.90 | 382.90 | Limestone, shaley, massive | | ak, cs, es | y | 1.00 |
| 5.20 | 382.90 | 388.10 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 388.10 | 389.10 | Shale, gy, sandy | | cs, es | | 0.00 |
| 7.90 | 389.10 | 397.00 | Sandstone, gy w/ sh stks | | cs, es | y | 7.90 |
| 10.80 | 397.00 | 407.80 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 2.20 | 407.80 | 410.00 | Limestone, massive | | ak, cs, es | y | 2.20 |
| 1.00 | 410.00 | 411.00 | Claystone, gy | | cv, ev | | 0.00 |
| 5.20 | 411.00 | 416.20 | Limestone, massive | | ak, cs, es | y | 5.20 |
| 2.00 | 416.20 | 418.20 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.00 | 418.20 | 421.20 | Sandstone, gy w/ sh stks | | cs, es | y | 3.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-10

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.80 | 421.20 | 422.00 | Claystone, gy | | cv, ev | | 0.00 |
| 33.60 | 422.00 | 455.60 | Limestone, shaley, layered | | ak, cs, es | y | 33.60 |
| 3.30 | 455.60 | 458.90 | Shale, grn | | cm, em | | 0.00 |
| 5.40 | 458.90 | 464.30 | Limestone, massive | | ak, cs, es | y | 5.40 |
| 17.40 | 464.30 | 481.70 | Limestone, shaley, layered | | ak, cs, es | y | 17.40 |
| 2.30 | 481.70 | 484.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 484.00 | 486.00 | Shale, dk gy | | cm, em | | 0.00 |
| 3.15 | 486.00 | 489.15 | **Coal w/ bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.10 | 489.15 | 489.25 | Pyrite | | ac, cs, es | y | 0.10 |
| 1.35 | 489.25 | 490.60 | Claystone, gy w/ ls nods | | ak cv, ev | | 0.00 |
| 2.50 | 490.60 | 493.10 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.90 | 493.10 | 495.00 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 8.70 | 495.00 | 503.70 | Shale, gy | | cm, em | | 0.00 |
| 3.50 | 503.70 | 507.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 507.20 | 508.05 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.40 | 508.05 | 508.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.00 | 508.45 | 509.45 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 509.45 | 509.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.55 | 509.75 | 510.30 | **Coal w/ sh stks** | | ac, cv, ev | | 0.00 |
| 1.50 | 510.30 | 511.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 14.30 | 511.80 | 526.10 | Limestone, shaley, layered | | ak, cs, es | y | 14.30 |
| 3.40 | 526.10 | 529.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.50 | 529.50 | 534.00 | Sandstone, gy | | cs, es | y | 4.50 |
| 7.00 | 534.00 | 541.00 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 2.80 | 541.00 | 543.80 | Limestone, shaley, layered | | ak, cs, es | y | 2.80 |
| 3.75 | 543.80 | 547.55 | Claystone, gy | | cv, ev | | 0.00 |
| 0.65 | 547.55 | 548.20 | **Coal, shaley, bony, pyritic** | | ac, cv, ev | | 0.00 |
| 16.30 | 548.20 | 564.50 | Limestone, shaley, layered | | ak, cs, es | y | 16.30 |
| 3.20 | 564.50 | 567.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 567.70 | 568.40 | Limestone, shaley, layered | | ak, cs, es | y | 0.70 |
| 1.60 | 568.40 | 570.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 570.00 | 571.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.32 | 571.80 | 574.12 | Shale, dk gy | | cm, em | | 0.00 |
| 0.28 | 574.12 | 574.40 | **Coal w/ pyrite, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.90 | 574.40 | 575.30 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 5.05 | 575.30 | 580.35 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.15 | 580.35 | 580.50 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 1.85 | 580.50 | 582.35 | Shale, gy | | cm, em | | 0.00 |
| 1.35 | 582.35 | 583.70 | Limestone, shaley | | ak, cs, es | y | 1.35 |
| 2.70 | 583.70 | 586.40 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 586.40 | 588.50 | Claystone, gy | | cv, ev | | 0.00 |
| 1.10 | 588.50 | 589.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 589.60 | 590.10 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.40 | 590.10 | 593.50 | Sandstone, gy w/ sh stks | | cs, es | y | 3.40 |
| 0.80 | 593.50 | 594.30 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.90 | 594.30 | 596.20 | Sandstone, gy w/ sh stks | | cs, es | y | 1.90 |
| 1.70 | 596.20 | 597.90 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 2.10 | 597.90 | 600.00 | Sandstone, gy, churned | | cs, es | y | 2.10 |
| | Total Depth | 600.00 | | | | | 299.55 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 299.55

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 50%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 299.55 | 50% |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-10

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Soft Rock: | 300.45 | 50% | | | | | |
| | 600.00 | | | | | | |

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 158.20 | 1.60 | 1.51 | 50.1 | -108.1 |
| Coal | 4.35 | 5.24 | 2.61 | 165.00 | 160.7 |
| Bottom, 10 ft. | 188.60 | 2.28 | 2.01 | 71.10 | -117.5 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-11

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1087.1
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 672198.6
**Easting:** 2421410.7
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 30.00 | 0.00 | 30.00 | Casing | | | | 0.00 |
| 2.40 | 30.00 | 32.40 | Claystone, gy | | cv, ev | | 0.00 |
| 4.00 | 32.40 | 36.40 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 8.60 | 36.40 | 45.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 45.00 | 46.00 | Core Loss | | | | 0.00 |
| 4.60 | 46.00 | 50.60 | Sandstone, gy, massive | | cs, es | y | 4.60 |
| 5.00 | 50.60 | 55.60 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 55.60 | 56.60 | **Bone, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.40 | 56.60 | 58.00 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.70 | 58.00 | 58.70 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.70 | 58.70 | 59.40 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 59.40 | 59.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 7.00 | 59.60 | 66.60 | Claystone, gy | | cv, ev | | 0.00 |
| 4.40 | 66.60 | 71.00 | Claystone, gy, sandy | | cv, ev | | 0.00 |
| 58.30 | 71.00 | 129.30 | Sandstone, gy, sh stks | | cs, es | y | 58.30 |
| 0.20 | 129.30 | 129.50 | Claystone, gy | | cv, ev | | 0.00 |
| 0.70 | 129.50 | 130.20 | Sandstone, gy, slumped | | cs, es | y | 0.70 |
| 0.80 | 130.20 | 131.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 131.00 | 131.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.00 | 131.90 | 135.90 | Sandstone, gy, sh stks | | cs, es | y | 4.00 |
| 0.30 | 135.90 | 136.20 | **Coal, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.20 | 136.20 | 136.40 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.90 | 136.40 | 137.30 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 137.30 | 137.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.85 | 137.55 | 138.40 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.30 | 138.40 | 139.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.10 | 139.70 | 141.80 | Limestone, shaley | | ak, cs, es | y | 2.10 |
| 17.90 | 141.80 | 159.70 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 10.70 | 159.70 | 170.40 | Sandstone, gy, sh stks | | cs, es | y | 10.70 |
| 2.70 | 170.40 | 173.10 | Claystone, gm, sandy | | cv, ev | | 0.00 |
| 1.40 | 173.10 | 174.50 | Shale, dk gy | | cm, em | | 0.00 |
| 4.00 | 174.50 | 178.50 | Limestone, shaley, layered | | ak, cs, es | y | 4.00 |
| 2.20 | 178.50 | 180.70 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 180.70 | 181.00 | **Bone, sh stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 1.30 | 181.00 | 182.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 182.30 | 182.50 | **Bone, sh stks** | | ac, cv, ev | | 0.00 |
| 0.60 | 182.50 | 183.10 | Claystone, gy | | cv, ev | | 0.00 |
| 4.70 | 183.10 | 187.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 6.00 | 187.80 | 193.80 | Sandstone, gy, sh stks | | cs, es | y | 6.00 |
| 0.60 | 193.80 | 194.40 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.90 | 194.40 | 196.30 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.10 | 196.30 | 196.40 | **Coal, pyrite, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 2.90 | 196.40 | 199.30 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 7.10 | 199.30 | 206.40 | Shale, gy | | cm, em | | 0.00 |
| 0.35 | 206.40 | 206.75 | **Coal, sh stks,** | | ac, cv, ev | | 0.00 |
| 0.15 | 206.75 | 206.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.10 | 206.90 | 208.00 | Claystone, gy | | cv, ev | | 0.00 |
| 30.00 | 208.00 | 238.00 | Limestone, shaley, layered | | ak, cs, es | y | 30.00 |
| 1.40 | 238.00 | 239.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.20 | 239.40 | 243.60 | Claystone, gm | | cv, ev | | 0.00 |
| 2.00 | 243.60 | 245.60 | Shale, red/ gy | | cm, em | | 0.00 |
| 9.20 | 245.60 | 254.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 254.80 | 255.10 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 255.10 | 255.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 6.90 | 255.30 | 262.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 11.40 | 262.20 | 273.60 | Limestone, shaley, layered | | ak, cs, es | y | 11.40 |
| 12.40 | 273.60 | 286.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-11

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 45.20 | 286.00 | 331.20 | Limestone, shaley, layered | | ak, cs, es | y | 45.20 |
| 1.00 | 331.20 | 332.20 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 332.20 | 333.20 | Shale, grn | | cm, em | | 0.00 |
| 3.70 | 333.20 | 336.90 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 12.10 | 336.90 | 349.00 | Limestone, shaley, layered | | ak, cs, es | y | 12.10 |
| 1.40 | 349.00 | 350.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 350.40 | 351.25 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 351.25 | 351.60 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.90 | 351.60 | 352.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.75 | 352.50 | 353.25 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.05 | 353.25 | 353.30 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.70 | 353.30 | 355.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 355.00 | 355.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 355.30 | 356.00 | Claystone, gy | | cv, ev | | 0.00 |
| 17.50 | 356.00 | 373.50 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 373.50 | 373.90 | **Coal, pyrite, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.30 | 373.90 | 374.20 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.80 | 374.20 | 375.00 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.25 | 375.00 | 375.25 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.20 | 375.25 | 375.45 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 375.45 | 375.50 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.45 | 375.50 | 375.95 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.65 | 375.95 | 376.60 | Claystone, gy | | cv, ev | | 0.00 |
| 17.40 | 376.60 | 394.00 | Limestone, shaley, layered | | ak, cs, es | y | 17.40 |
| 6.30 | 394.00 | 400.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 400.30 | 401.00 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 0.70 | 401.00 | 401.70 | Shale, gy | | cm, em | | 0.00 |
| 2.30 | 401.70 | 404.00 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 2.50 | 404.00 | 406.50 | Shale, gy | | cm, em | | 0.00 |
| 3.90 | 406.50 | 410.40 | Limestone, shaley, layered | | ak, cs, es | y | 3.90 |
| 2.70 | 410.40 | 413.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 413.10 | 413.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 7.30 | 413.50 | 420.80 | Limestone, shaley, layered | | ak, cs, es | y | 7.30 |
| 1.00 | 420.80 | 421.80 | Limestone, layered | | ak, cs, es | y | 1.00 |
| 0.50 | 421.80 | 422.30 | Limestone, mosaic | | ak, cs, es | y | 0.50 |
| 8.50 | 422.30 | 430.80 | Limestone, nodular | | ak, cs, es | y | 8.50 |
| 0.50 | 430.80 | 431.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 2.00 | 431.30 | 433.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 433.30 | 434.40 | Limestone, layered | | ak, cs, es | y | 1.10 |
| 1.00 | 434.40 | 435.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 435.40 | 437.60 | Shale, gy | | cm, em | | 0.00 |
| 3.20 | 437.60 | 440.80 | Shale, gy/ grn | | cm, em | | 0.00 |
| 0.82 | 440.80 | 441.62 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.30 | 441.62 | 441.92 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.23 | 441.92 | 442.15 | Shale, gy/ grn | | cm, em | | 0.00 |
| 0.25 | 442.15 | 442.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.50 | 442.40 | 443.90 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.02 | 443.90 | 443.92 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.48 | 443.92 | 444.40 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 2.67 | 444.40 | 447.07 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 447.07 | 447.32 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.10 | 447.32 | 447.42 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.23 | 447.42 | 448.65 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 448.65 | 449.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 2.25 | 449.35 | 451.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 451.60 | 453.80 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.60 | 453.80 | 457.40 | Sandstone, gy, sh stks | | cs, es | y | 3.60 |
| 0.60 | 457.40 | 458.00 | Claystone, gy | | cv, ev | | 0.00 |
| 5.40 | 458.00 | 463.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 463.40 | 463.90 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 2.00 | 463.90 | 465.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.50 | 465.90 | 467.40 | Claystone, gy | | cv, ev | | 0.00 |
| | Total Depth | 467.40 | | | | | 234.80 |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: AEC-2001-11**

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **234.80**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **50%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 234.80 | 50% |
| Soft Rock: | 232.60 | 50% |
| | 467.40 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 2.50 | 2.28 | 1.82 | 71.4 | 68.9 |
| Coal | 3.93 | 5.16 | 2.51 | 161.00 | 157.0 |
| Bottom, 10 ft. | 104.00 | 2.25 | 2.09 | 70.30 | -33.7 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-12

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1075
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 670753
**Easting:** 2415305
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing | | | | 0.00 |
| 2.00 | 16.00 | 18.00 | Claystone, gy | Yes | cv, ev | | 0.00 |
| 5.00 | 18.00 | 23.00 | Claystone, gy, sandy | Yes | cv, ev | | 0.00 |
| 61.00 | 23.00 | 84.00 | Sandstone, gy, sh stks | Yes | cs, es | y | 61.00 |
| 2.40 | 84.00 | 86.40 | Shale, gy, slumped | | cm, em | | 0.00 |
| 2.60 | 86.40 | 89.00 | Sandstone, gy, slumped | | cs, es | y | 2.60 |
| 2.25 | 89.00 | 91.25 | Sandstone, gy, sh stks | | cs, es | y | 2.25 |
| 0.10 | 91.25 | 91.35 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.75 | 91.35 | 92.10 | **Coal, pyrite, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.30 | 92.10 | 92.40 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.90 | 92.40 | 95.30 | Limestone, shaley, layered | | ak, cs, es | y | 2.90 |
| 9.40 | 95.30 | 104.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.80 | 104.70 | 108.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 108.50 | 111.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 6.40 | 111.80 | 118.20 | Shale, gy | | cm, em | | 0.00 |
| 2.40 | 118.20 | 120.60 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 120.60 | 122.20 | Sandstone, gy, massive | | cs, es | y | 1.60 |
| 6.00 | 122.20 | 128.20 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 128.20 | 128.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 128.90 | 129.05 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 5.15 | 129.05 | 134.20 | Limestone, shaley, layered | | ak, cs, es | y | 5.15 |
| 3.80 | 134.20 | 138.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 138.00 | 138.40 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 5.70 | 138.40 | 144.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 144.10 | 145.40 | Claystone, gy | | cv, ev | | 0.00 |
| 4.10 | 145.40 | 149.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 6.60 | 149.50 | 156.10 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 156.10 | 159.00 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 159.00 | 159.10 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.40 | 159.10 | 159.50 | **Coal, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.25 | 159.50 | 159.75 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 28.45 | 159.75 | 188.20 | Limestone, shaley, layered | | ak, cs, es | y | 28.45 |
| 2.60 | 188.20 | 190.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 190.80 | 192.50 | Core Loss | | | | 0.00 |
| 0.15 | 192.50 | 192.65 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 192.65 | 192.90 | Limestone, shaley | | ak, cs, es | y | 0.25 |
| 1.00 | 192.90 | 193.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.90 | 193.90 | 197.80 | Claystone, gm | | cv, ev | | 0.00 |
| 2.10 | 197.80 | 199.90 | Shale, red/ gy | | cm, em | | 0.00 |
| 7.10 | 199.90 | 207.00 | Limestone, shaley, layered | | ak, cs, es | y | 7.10 |
| 5.00 | 207.00 | 212.00 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 212.00 | 215.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.40 | 215.00 | 216.40 | Shale, gy | | cm, em | | 0.00 |
| 30.60 | 216.40 | 247.00 | Limestone, shaley, layered | | ak, cs, es | y | 30.60 |
| 6.40 | 247.00 | 253.40 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 17.80 | 253.40 | 271.20 | Limestone, shaley, layered | | ak, cs, es | y | 17.80 |
| 3.40 | 271.20 | 274.60 | Claystone, gy | | cv, ev | | 0.00 |
| 12.40 | 274.60 | 287.00 | Limestone, shaley, layered | | ak, cs, es | y | 12.40 |
| 2.80 | 287.00 | 289.80 | Claystone, gy/ gm | | cv, ev | | 0.00 |
| 1.20 | 289.80 | 291.00 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 7.70 | 291.00 | 298.70 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 1.40 | 298.70 | 300.10 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.20 | 300.10 | 300.30 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.30 | 300.30 | 301.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.60 | 301.60 | 306.20 | Shale, gy, sandy | | cm, em | | 0.00 |
| 7.00 | 306.20 | 313.20 | Sandstone, gy, crossbeds | | cs, es | y | 7.00 |
| 21.70 | 313.20 | 334.90 | Sandstone, gy, sh stks | | cs, es | y | 21.70 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-12

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.60 | 334.90 | 335.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.50 | 335.50 | 340.00 | Sandstone, gy, sh stks | | cs, es | y | 4.50 |
| 1.70 | 340.00 | 341.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 341.70 | 342.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 342.90 | 343.20 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 343.20 | 343.40 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.25 | 343.40 | 343.65 | **Coal, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.15 | 343.65 | 343.80 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.60 | 343.80 | 344.40 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.15 | 344.40 | 344.55 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.25 | 344.55 | 345.80 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 345.80 | 345.90 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.60 | 345.90 | 346.50 | **Coal sh stks** | | ac, cv, ev | | 0.00 |
| 1.00 | 346.50 | 347.50 | Claystone, gy | | cv, ev | | 0.00 |
| 5.50 | 347.50 | 353.00 | Limestone, shaley, layered | | ak, cs, es | y | 5.50 |
| 2.70 | 353.00 | 355.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 355.70 | 356.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 356.90 | 358.10 | Sandstone, gy, sh stks | | cs, es | y | 1.20 |
| 3.20 | 358.10 | 361.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.00 | 361.30 | 362.30 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 362.30 | 364.20 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 2.90 | 364.20 | 367.10 | Limestone, shaley, layered | | ak, cs, es | y | 2.90 |
| 2.10 | 367.10 | 369.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 369.20 | 369.50 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 4.60 | 369.50 | 374.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.40 | 374.10 | 381.50 | Limestone, shaley, layered | | ak, cs, es | y | 7.40 |
| 5.35 | 381.50 | 386.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 386.85 | 387.85 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 3.50 | 387.85 | 391.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 391.35 | 391.90 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 1.95 | 391.90 | 393.85 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 393.85 | 394.30 | Claystone, grn | | cv, ev | | 0.00 |
| 0.85 | 394.30 | 395.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 395.15 | 395.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.65 | 395.65 | 396.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 396.30 | 396.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 396.75 | 396.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 396.90 | 397.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.50 | 397.10 | 397.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 397.60 | 397.90 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 0.20 | 397.90 | 398.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.20 |
| 0.60 | 398.10 | 398.70 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 398.70 | 400.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.95 | 400.10 | 402.05 | **Coal, sh stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.15 | 402.05 | 402.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.45 | 402.20 | 402.65 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 2.60 | 402.65 | 405.25 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.10 | 405.25 | 405.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 405.35 | 405.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.15 | 405.50 | 405.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 405.65 | 406.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 406.15 | 406.85 | Shale, blk, layered | | ac, cm, em | | 0.00 |
| 0.57 | 406.85 | 407.42 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.03 | 407.42 | 407.45 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.66 | 407.45 | 408.11 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.10 | 408.11 | 409.21 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 409.21 | 409.41 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.38 | 409.41 | 410.79 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 410.79 | 410.87 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.35 | 410.87 | 412.22 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 412.22 | 412.30 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.50 | 412.30 | 412.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 412.80 | 413.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 1.80 | 413.60 | 415.40 | Claystone, grn | | cv, ev | | 0.00 |
| 0.35 | 415.40 | 415.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.95 | 415.75 | 416.70 | Limestone, mosaic | | ak, cs, es | y | 0.95 |
| 0.50 | 416.70 | 417.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 417.20 | 417.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-12

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.60 | 417.90 | 419.50 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 1.60 |
| 0.30 | 419.50 | 419.80 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 419.80 | 421.15 | Shale, gy | | cm, em | | 0.00 |
| 0.75 | 421.15 | 421.90 | Shale, gy, layered | | cm, em | | 0.00 |
| | Total Depth | 421.90 | | | | | 228.05 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **228.05**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **54%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 228.05 | 54% |
| Soft Rock: | 193.85 | 46% |
| | 421.90 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 4.99 | 2.66 | 2.19 | 83.2 | 73.0 |
| Coal | 3.28 | 4.95 | 1.98 | 155.0 | 151.0 |
| Bottom, 10 ft. | 233.45 | 2.47 | 1.65 | 77.2 | -156.5 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-14

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,314.97
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 674,806
**Easting:** 2,425,948
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 15.00 | 0.00 | 15.00 | Casing | | | | 0.00 |
| 4.90 | 15.00 | 19.90 | Sandstone, gy / sh stks | Yes | cs, es | y | 4.90 |
| 5.10 | 19.90 | 25.00 | Shale, gy | Yes | cm, em | | 0.00 |
| 8.70 | 25.00 | 33.70 | Shale,dk gy | Yes | cm, em | | 0.00 |
| 1.40 | 33.70 | 35.10 | Limestone | | ak, cs, es | y | 1.40 |
| 2.55 | 35.10 | 37.65 | Shale,dk gy | | cm, em | | 0.00 |
| 0.25 | 37.65 | 37.90 | Coal | | ac, cv, ev | | 0.00 |
| 0.20 | 37.90 | 38.10 | Shale, blk | | ac, cv, ev | | 0.00 |
| 7.50 | 38.10 | 45.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 11.40 | 45.60 | 57.00 | Claystone, red w/ ls nods | Yes | ak, cv, ev | | 0.00 |
| 3.70 | 57.00 | 60.70 | Claystone, gy, sandy, limey | | ak, cm, em | | 0.00 |
| 4.80 | 60.70 | 65.50 | Sandstone, gy / sh stks | Yes | cs, es | y | 4.80 |
| 33.50 | 65.50 | 99.00 | Claystone, red w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.60 | 99.00 | 101.60 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 6.80 | 101.60 | 108.40 | Sandstone, gy / sh stks | | cs, es | y | 6.80 |
| 3.20 | 108.40 | 111.60 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 6.40 | 111.60 | 118.00 | Shale, red/ grn w/ ls nods | Yes | ak, cm, em | | 0.00 |
| 1.00 | 118.00 | 119.00 | Claystone, gy | | cv, ev | | 0.00 |
| 4.30 | 119.00 | 123.30 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.20 | 123.30 | 128.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 7.50 | 128.50 | 136.00 | Claystone, red | | cv, ev | | 0.00 |
| 4.00 | 136.00 | 140.00 | Claystone, red/ grn, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 140.00 | 141.90 | Sandstone, gy / sh stks | | cs, es | y | 1.90 |
| 6.10 | 141.90 | 148.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.10 | 148.00 | 149.10 | Sandstone, gy, churned | | cs, es | y | 1.10 |
| 4.90 | 149.10 | 154.00 | Sandstone, gy / sh stks | | cs, es | y | 4.90 |
| 7.60 | 154.00 | 161.60 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.40 | 161.60 | 167.00 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 167.00 | 169.10 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 169.10 | 171.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.90 | 171.10 | 173.00 | Shale, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 12.40 | 173.00 | 185.40 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 8.80 | 185.40 | 194.20 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 194.20 | 194.50 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 8.00 | 194.50 | 202.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 27.20 | 202.50 | 229.70 | Claystone, red/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 12.70 | 229.70 | 242.40 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 242.40 | 242.85 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 5.15 | 242.85 | 248.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 4.00 | 248.00 | 252.00 | Limestone, shaley, layered | | ak, cs, es | y | 4.00 |
| 8.30 | 252.00 | 260.30 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 2.30 | 260.30 | 262.60 | Claystone, gy | | cv, ev | | 0.00 |
| 1.40 | 262.60 | 264.00 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 5.60 | 264.00 | 269.60 | Sandstone, gy / sh stks | | cs, es | y | 5.60 |
| 0.40 | 269.60 | 270.00 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 7.00 | 270.00 | 277.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.60 | 277.00 | 279.60 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 4.20 | 279.60 | 283.80 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 283.80 | 284.80 | Sandstone, gy, churned | | cs, es | y | 1.00 |
| 3.30 | 284.80 | 288.10 | Sandstone, gy / sh stks | | cs, es | y | 3.30 |
| 2.10 | 288.10 | 290.20 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 290.20 | 292.70 | Sandstone, gy / sh stks | | cs, es | y | 2.50 |
| 3.70 | 292.70 | 296.40 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 3.00 | 296.40 | 299.40 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 299.40 | 299.50 | Limestone, shaley, layered | | ak, cs, es | y | 0.10 |
| 4.40 | 299.50 | 303.90 | Claystone, gy | | cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-14

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.40 | 303.90 | 305.30 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 1.45 | 305.30 | 306.75 | **Coal w/ bone stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.50 | 306.75 | 307.25 | Shale, dk gy | | ac, cv, ev | | 0.00 |
| 1.25 | 307.25 | 308.50 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 14.50 | 308.50 | 323.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 8.30 | 323.00 | 331.30 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 16.30 | 331.30 | 347.60 | Sandstone, gy w/ crossbeds | | cs, es | y | 16.30 |
| 4.50 | 347.60 | 352.10 | Shale, gy w/ ss stks and ls nods | | ak, cs, es | | 0.00 |
| 2.90 | 352.10 | 355.00 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 0.35 | 355.00 | 355.35 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 1.95 | 355.35 | 357.30 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 357.30 | 357.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 357.50 | 358.90 | **Coal w/ bone stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.10 | 358.90 | 359.00 | Shale, blk | | ac, cv, ev | | 0.00 |
| 3.50 | 359.00 | 362.50 | **Coal w/ sh layers, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.20 | 362.50 | 362.70 | Shale, blk | | ac, cv, ev | | 0.00 |
| 1.40 | 362.70 | 364.10 | **Coal w/ bone stks, pyritic** | | ac, cv, ev | | 0.00 |
| 0.90 | 364.10 | 365.00 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 2.20 | 365.00 | 367.20 | Limestone, shaley, layered | | ak, cs, es | y | 2.20 |
| 9.90 | 367.20 | 377.10 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.20 | 377.10 | 382.30 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 2.20 | 382.30 | 384.50 | Shale, gy | | cm, em | | 0.00 |
| 0.90 | 384.50 | 385.40 | Claystone, gy | | cv, ev | | 0.00 |
| 1.60 | 385.40 | 387.00 | Limestone, shaley, layered | | ak, cs, es | y | 1.60 |
| 7.70 | 387.00 | 394.70 | Sandstone, gy | | cs, es | y | 7.70 |
| 2.50 | 394.70 | 397.20 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.60 | 397.20 | 398.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 398.80 | 399.50 | Shale, blk | | ac, cv, ev | | 0.00 |
| 1.05 | 399.50 | 400.55 | Shale, dk gy | | cm, em | | 0.00 |
| 5.05 | 400.55 | 405.60 | Limestone, shaley, layered | | ak, cs, es | y | 5.05 |
| 0.30 | 405.60 | 405.90 | Sandstone, gy w/ sh stks | | cs, es | y | 0.30 |
| 3.30 | 405.90 | 409.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.90 | 409.20 | 410.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.75 | 410.10 | 410.85 | Shale, blk w/ coal stks | | ac, cm, em | | 0.00 |
| 1.35 | 410.85 | 412.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.60 | 412.20 | 412.80 | Shale, gy | | cm, em | | 0.00 |
| 8.50 | 412.80 | 421.30 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 0.70 | 421.30 | 422.00 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.38 | 422.00 | 422.38 | Shale, dk gy w/ coal stks | | cm, em | | 0.00 |
| 0.22 | 422.38 | 422.60 | **Coal w/ bone stks, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 1.10 | 422.60 | 423.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.50 | 423.70 | 428.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 428.20 | 428.60 | Shale, dk gy w/ ss stks | | cs, es | | 0.00 |
| 19.00 | 428.60 | 447.60 | Limestone, shaley, layered | | ak, cs, es | y | 19.00 |
| 8.10 | 447.60 | 455.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 455.70 | 457.50 | Limestone, shaley, layered | | ak, cs, es | y | 1.80 |
| 1.10 | 457.50 | 458.60 | Claystone, grn | | cv, ev | | 0.00 |
| 0.70 | 458.60 | 459.30 | Shale, blk w/ coal stks | | cm, em | | 0.00 |
| 0.40 | 459.30 | 459.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.70 | 459.70 | 462.40 | Claystone, gy w/ ss stks | | cm, em | | 0.00 |
| 1.60 | 462.40 | 464.00 | Sandstone, gy, churned | | cs, es | y | 1.60 |
| 0.60 | 464.00 | 464.60 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 4.60 | 464.60 | 469.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 10.40 | 469.20 | 479.60 | Limestone, shaley, layered | | ak, cs, es | y | 10.40 |
| 0.50 | 479.60 | 480.10 | Claystone, gy | | cv, ev | | 0.00 |
| 2.00 | 480.10 | 482.10 | Shale, gy, sandy | | cs, es | | 0.00 |
| 19.60 | 482.10 | 501.70 | Limestone, shaley, layered | | ak, cs, es | y | 19.60 |
| 2.70 | 501.70 | 504.40 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.30 | 504.40 | 505.70 | Claystone, gy | | cv, ev | | 0.00 |
| 10.00 | 505.70 | 515.70 | Limestone, shaley, layered | | ak, cs, es | y | 10.00 |
| 3.30 | 515.70 | 519.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 17.70 | 519.00 | 536.70 | Limestone, shaley, layered | | ak, cs, es | y | 17.70 |
| 2.70 | 536.70 | 539.40 | Claystone, gy | | cv, ev | | 0.00 |
| 5.10 | 539.40 | 544.50 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 11.40 | 544.50 | 555.90 | Limestone, shaley, layered | | ak, cs, es | y | 11.40 |
| 4.60 | 555.90 | 560.50 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 9.50 | 560.50 | 570.00 | Limestone, shaley, layered | | ak, cs, es | y | 9.50 |
| 1.00 | 570.00 | 571.00 | Claystone, dk gy | | cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-14

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.00 | 571.00 | 572.00 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 0.45 | 572.00 | 572.45 | Sandstone, gy, churned | | cs, es | y | 0.45 |
| 0.45 | 572.45 | 572.90 | Shale, blk/ dk gy | | cm, em | | 0.00 |
| 5.10 | 572.90 | 578.00 | Claystone, gy, sandy, w/ ls nods | | al, cm, em | | 0.00 |
| 16.00 | 578.00 | 594.00 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.70 | 594.00 | 595.70 | Sandstone, gy w/ sh stks | | cs, es | y | 1.70 |
| 2.00 | 595.70 | 597.70 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 3.30 | 597.70 | 601.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 601.00 | 601.40 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.60 | 601.40 | 602.00 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 0.75 | 602.00 | 602.75 | **Coal w/ bone stks, pyritic, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.55 | 602.75 | 603.30 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 1.40 | 603.30 | 604.70 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 18.90 | 604.70 | 623.60 | Limestone, shaley, layered | | ak, cs, es | y | 18.90 |
| 2.80 | 623.60 | 626.40 | Sandstone, gy w/ sh stks | | cs, es | y | 2.80 |
| 6.80 | 626.40 | 633.20 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 633.20 | 633.70 | Sandstone, gy w/ sh stks | | cs, es | y | 0.50 |
| 2.00 | 633.70 | 635.70 | Shale, dk gy | | cm, em | | 0.00 |
| 3.10 | 635.70 | 638.80 | Limestone, shaley, layered | | ak, cs, es | y | 3.10 |
| 0.40 | 638.80 | 639.20 | Shale, dk gy | | cm, em | | 0.00 |
| 1.00 | 639.20 | 640.20 | Claystone, gm | | cv, ev | | 0.00 |
| 1.80 | 640.20 | 642.00 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 1.20 | 642.00 | 643.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.60 | 643.20 | 643.80 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 5.55 | 643.80 | 649.35 | Limestone, shaley, massive | | ak, cs, es | y | 5.55 |
| 0.60 | 649.35 | 649.95 | Claystone, dk gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 649.95 | 654.55 | Limestone, nodular | | ak, cs, es | y | 4.60 |
| 0.70 | 654.55 | 655.25 | Shale, dk gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 655.25 | 657.80 | Limestone, nodular | | ak, cs, es | y | 2.55 |
| 3.10 | 657.80 | 660.90 | Claystone, dk gy/ gy | | cv, ev | | 0.00 |
| 0.25 | 660.90 | 661.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 1.05 | 661.15 | 662.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.70 | 662.20 | 662.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 662.90 | 663.30 | Limestone, shaley, mosaic | | ak, cs, es | y | 0.40 |
| 1.65 | 663.30 | 664.95 | Claystone, gm | | cv, ev | | 0.00 |
| 1.95 | 664.95 | 666.90 | Claystone, brn/ blk | | cv, ev | | 0.00 |
| 0.25 | 666.90 | 667.15 | Shale, blk w/ coal stks | | ac, cv, ev | | 0.00 |
| 1.05 | 667.15 | 668.20 | **Coal w/ bone, pyritic, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.49 | 668.20 | 668.69 | Shale, blk/ dk gy | | ac, cv, ev | | 0.00 |
| 0.25 | 668.69 | 668.94 | Shale, brn/ blk | | cm, em | | 0.00 |
| 0.15 | 668.94 | 669.09 | Limestone, shaley, layered | | ak, cs, es | y | 0.15 |
| 4.88 | 669.09 | 673.97 | **Coal w/ bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.68 | 673.97 | 674.65 | **Coal, pyritic** | | ac, cv, ev | | 0.00 |
| 0.10 | 674.65 | 674.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 674.75 | 675.15 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 675.15 | 675.65 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 675.65 | 677.20 | Limestone, nodular | | ak, cs, es | y | 0.00 |
| 2.30 | 677.20 | 679.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 679.50 | 680.70 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 2.30 | 680.70 | 683.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 683.00 | 685.80 | Sandstone, gy | | cs, es | y | 2.80 |
| | Total Depth | 685.80 | | | | | 220.20 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 220.20

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 32%

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-14

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 220.20 | 32% |
| Soft Rock: | 465.60 | 68% |
| | 685.80 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 193.31 | 1.90 | 1.62 | 59.4 | -133.9 |
| Coal | 6.13 | 5.11 | 2.21 | 160.00 | 153.9 |
| Bottom, 10 ft. | 146.10 | 3.37 | 2.53 | 105.05 | -41.1 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-15

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1220
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 673102
**Easting:** 2429453
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 15.00 | 0.00 | 15.00 | Casing | | | | 0.00 |
| 2.50 | 15.00 | 17.50 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 1.50 | 17.50 | 19.00 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.40 | 19.00 | 21.40 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 11.50 | 21.40 | 32.90 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.80 | 32.90 | 36.70 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.30 | 36.70 | 39.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.00 | 39.00 | 42.00 | Limestone, shaley, layered | | ak, cs, es | y | 3.00 |
| 6.50 | 42.00 | 48.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.50 | 48.50 | 53.00 | Claystone, red | | cv, ev | | 0.00 |
| 2.40 | 53.00 | 55.40 | Claystone, gy | | cv, ev | | 0.00 |
| 3.90 | 55.40 | 59.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.90 | 59.30 | 64.20 | Shale, red/ gy | | cm, em | | 0.00 |
| 22.80 | 64.20 | 87.00 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.20 | 87.00 | 88.20 | Sandstone, gy, sh stks | | cs, es | y | 1.20 |
| 19.80 | 88.20 | 108.00 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.20 | 108.00 | 111.20 | Shale, gy | | cm, em | | 0.00 |
| 0.15 | 111.20 | 111.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 111.35 | 111.50 | **Coal, sh stks, JOLLYTOWN "A"** | | ac, cv, ev | | 0.00 |
| 0.10 | 111.50 | 111.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 14.20 | 111.60 | 125.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 10.90 | 125.80 | 136.70 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 12.30 | 136.70 | 149.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.40 | 149.00 | 151.40 | Sandstone, gy, sh stks | | cs, es | y | 2.40 |
| 4.90 | 151.40 | 156.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.40 | 156.30 | 159.70 | Shale, gy | | cm, em | | 0.00 |
| 2.10 | 159.70 | 161.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 10.30 | 161.80 | 172.10 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 172.10 | 175.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.20 | 175.80 | 180.00 | Sandstone, gy, sh stks | | cs, es | y | 4.20 |
| 0.50 | 180.00 | 180.50 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 14.40 | 180.50 | 194.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 194.90 | 195.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.00 | 195.20 | 198.20 | Limestone, shaley, layered | | ak, cs, es | y | 3.00 |
| 1.00 | 198.20 | 199.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 199.20 | 199.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 7.60 | 199.40 | 207.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 207.00 | 209.00 | Sandstone, gy, sh stks | | cs, es | y | 2.00 |
| 4.60 | 209.00 | 213.60 | Sandstone, gy, massive | | cs, es | y | 4.60 |
| 4.10 | 213.60 | 217.70 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 217.70 | 218.50 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 4.70 | 218.50 | 223.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 223.20 | 223.45 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 4.15 | 223.45 | 227.60 | **Coal, bone layers, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 13.00 | 227.60 | 240.60 | Claystone, gy | | cv, ev | | 0.00 |
| 16.30 | 240.60 | 256.90 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 8.10 | 256.90 | 265.00 | Sandstone, gy, sh stks | | cs, es | y | 8.10 |
| 6.10 | 265.00 | 271.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.50 | 271.10 | 273.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.40 | 273.60 | 277.00 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 277.00 | 277.10 | Pyrite | | ac, cs, es | | 0.00 |
| 6.40 | 277.10 | 283.50 | **Coal, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.30 | 283.50 | 283.80 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 283.80 | 284.10 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 3.00 | 284.10 | 287.10 | Limestone, shaley, layered | | ak, cs, es | y | 3.00 |
| 8.80 | 287.10 | 295.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 295.90 | 297.20 | Sandstone, gy, slumped | | cs, es | y | 1.30 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-15

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.50 | 297.20 | 298.70 | Sandstone, gy, churned | | cs, es | y | 1.50 |
| 0.50 | 298.70 | 299.20 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 2.70 | 299.20 | 301.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.40 | 301.90 | 304.30 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.10 | 304.30 | 305.40 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 305.40 | 305.90 | Limestone, shaley | | ak, cs, es | y | 0.50 |
| 2.90 | 305.90 | 308.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 308.80 | 310.10 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| 3.50 | 310.10 | 313.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.90 | 313.60 | 316.50 | Shale, gy | | cm, em | | 0.00 |
| 6.40 | 316.50 | 322.90 | Limestone, shaley, layered | | ak, cs, es | y | 6.40 |
| 3.20 | 322.90 | 326.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.00 | 326.10 | 327.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 327.10 | 327.70 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 327.70 | 328.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.40 | 328.10 | 328.50 | **Coal, pyrite, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 2.90 | 328.50 | 331.40 | Claystone, gy | | cv, ev | | 0.00 |
| 3.90 | 331.40 | 335.30 | Sandstone, gy, sh stks | | cs, es | y | 3.90 |
| 3.80 | 335.30 | 339.10 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.70 | 339.10 | 340.80 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 340.80 | 341.05 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.20 | 341.05 | 341.25 | **Coal, sh stks, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 5.55 | 341.25 | 346.80 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 346.80 | 348.70 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 348.70 | 348.90 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 19.70 | 348.90 | 368.60 | Limestone, shaley, layered | | ak, cs, es | y | 19.70 |
| 1.20 | 368.60 | 369.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 369.80 | 370.60 | Limestone, shaley, layered | | ak, cs, es | y | 0.80 |
| 6.60 | 370.60 | 377.20 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 377.20 | 378.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 378.70 | 379.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.30 | 379.50 | 380.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 380.80 | 385.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 385.80 | 389.40 | Shale, red/ gy | | cm, em | | 0.00 |
| 6.10 | 389.40 | 395.50 | Limestone, shaley, layered | | ak, cs, es | y | 6.10 |
| 1.25 | 395.50 | 396.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 396.75 | 401.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 401.75 | 403.25 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.60 | 403.25 | 403.85 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 15.90 | 403.85 | 419.75 | Limestone, shaley, layered | | ak, cs, es | y | 15.90 |
| 3.00 | 419.75 | 422.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 422.75 | 426.15 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 426.15 | 427.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 427.15 | 427.55 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.40 | 427.55 | 427.95 | Claystone, gy | | cv, ev | | 0.00 |
| 0.60 | 427.95 | 428.55 | Limestone, shaley | | ak, cs, es | y | 0.60 |
| 1.20 | 428.55 | 429.75 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 429.75 | 431.15 | Claystone, grn | | cv, ev | | 0.00 |
| 3.10 | 431.15 | 434.25 | Limestone, shaley, layered | | ak, cs, es | y | 3.10 |
| 2.30 | 434.25 | 436.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 436.55 | 437.25 | Limestone, massive | | ak, cs, es | y | 0.70 |
| 3.90 | 437.25 | 441.15 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 9.50 | 441.15 | 450.65 | Limestone, shaley, layered | | ak, cs, es | y | 9.50 |
| 11.10 | 450.65 | 461.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.70 | 461.75 | 467.45 | Limestone, massive | | ak, cs, es | y | 5.70 |
| 5.00 | 467.45 | 472.45 | Limestone, shaley, layered | | ak, cs, es | y | 5.00 |
| 1.50 | 472.45 | 473.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.80 | 473.95 | 478.75 | Limestone, shaley, layered | | ak, cs, es | y | 4.80 |
| 4.90 | 478.75 | 483.65 | Limestone, massive | | ak, cs, es | y | 4.90 |
| 4.60 | 483.65 | 488.25 | Limestone, shaley, layered | | ak, cs, es | y | 4.60 |
| 0.60 | 488.25 | 488.85 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.90 | 488.85 | 491.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 491.75 | 492.00 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.90 | 492.00 | 492.90 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 2.75 | 492.90 | 495.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.80 | 495.65 | 498.45 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.00 | 498.45 | 499.45 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 2.00 | 499.45 | 501.45 | Shale, gy, interbedded ss | | cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-15

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.40 | 501.45 | 504.85 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.30 | 504.85 | 508.15 | Sandstone, gy, sh stks | | cs, es | y | 3.30 |
| 2.75 | 508.15 | 510.90 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 510.90 | 511.40 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 3.70 | 511.40 | 515.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 515.10 | 515.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.40 | 515.90 | 519.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 519.30 | 520.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 520.00 | 520.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.40 | 520.90 | 526.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.95 | 526.30 | 528.25 | **Coal, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.10 | 528.25 | 528.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 528.35 | 529.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 10.70 | 529.10 | 539.80 | Limestone, shaley, layered | | ak, cs, es | y | 10.70 |
| 5.10 | 539.80 | 544.90 | Limestone, layered | | ak, cs, es | y | 5.10 |
| 1.10 | 544.90 | 546.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 546.00 | 548.20 | Limestone | | ak, cs, es | y | 2.20 |
| 0.75 | 548.20 | 548.95 | Shale, dk gy | | cm, em | | 0.00 |
| 5.70 | 548.95 | 554.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 554.65 | 558.15 | Shale, dk gy | | cm, em | | 0.00 |
| 2.50 | 558.15 | 560.65 | Limestone, shaley, layered | | ak, cs, es | y | 2.50 |
| 2.57 | 560.65 | 563.22 | Claystone, gy | | cv, ev | | 0.00 |
| 0.38 | 563.22 | 563.60 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.15 | 563.60 | 564.75 | **Coal, bone stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.60 | 564.75 | 565.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 0.10 | 565.35 | 565.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 565.45 | 566.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 0.20 | 566.00 | 566.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 566.20 | 567.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 0.75 | 567.95 | 568.70 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 2.65 | 568.70 | 571.35 | Limestone, massive | | ak, cs, es | y | 2.65 |
| 3.35 | 571.35 | 574.70 | Limestone, shaley, nodular | | ak, cs, es | y | 3.35 |
| 0.40 | 574.70 | 575.10 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 1.15 | 575.10 | 576.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 0.15 | 576.25 | 576.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 576.40 | 577.55 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 1.35 | 577.55 | 578.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 578.90 | 580.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 580.00 | 580.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 2.20 | 580.45 | 582.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 582.65 | 584.45 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 1.70 | 584.45 | 586.15 | Shale, gy, brecciated | | cm, em | | 0.00 |
| 0.15 | 586.15 | 586.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.02 | 586.30 | 587.32 | **Coal, bone stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.45 | 587.32 | 587.77 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.45 | 587.77 | 588.22 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.95 | 588.22 | 593.17 | **Coal, bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.05 | 593.17 | 593.22 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 593.22 | 593.97 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 593.97 | 594.37 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 594.37 | 595.07 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.30 | 595.07 | 596.37 | Claystone, grn | | cv, ev | | 0.00 |
| 2.80 | 596.37 | 599.17 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 599.17 | 599.87 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 599.87 | 600.97 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 3.00 | 600.97 | 603.97 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 603.97 | | | | | 167.10 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-15

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **167.10** |
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **28%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 167.10 | 28% |
| Soft Rock: | 436.87 | 72% |
| | 603.97 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 180.45 | 2.31 | 1.75 | 72.2 | -108.2 |
| Coal | -0.09 | 6.61 | 3.88 | 207.00 | 207.0 |
| Bottom, 10 ft. | 135.50 | 1.47 | 1.31 | 45.45 | -91.1 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-16

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,224.59
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 681,538
**Easting:** 2,416,392
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing | | | | 0.00 |
| 1.10 | 16.00 | 17.10 | Sandstone, gy, massive | YES | cs, es | y | 1.10 |
| 13.20 | 17.10 | 30.30 | Claystone, red | YES | cv, ev | | 0.00 |
| 5.50 | 30.30 | 35.80 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 2.40 | 35.80 | 38.20 | Sandstone, gy w/ sh stks | YES | cs, es | y | 2.40 |
| 9.90 | 38.20 | 48.10 | Claystone, red | YES | cv, ev | | 0.00 |
| 5.90 | 48.10 | 54.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.00 | 54.00 | 56.00 | Shale, red/ grn | YES | cm, em | | 0.00 |
| 3.00 | 56.00 | 59.00 | Core loss | | | | 0.00 |
| 12.40 | 59.00 | 71.40 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 6.90 | 71.40 | 78.30 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.40 | 78.30 | 80.70 | Claystone, red/ ren, sandy | | cs, es | | 0.00 |
| 28.80 | 80.70 | 109.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.70 | 109.50 | 114.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 7.80 | 114.20 | 122.00 | Shale, red/ grn, sandy | | cs, es | | 0.00 |
| 3.50 | 122.00 | 125.50 | Shale, red | | cm, em | | 0.00 |
| 2.35 | 125.50 | 127.85 | Shale, blk/ dk gy, layered | | ac, cm, em | | 0.00 |
| 0.10 | 127.85 | 127.95 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.85 | 127.95 | 129.80 | Limestone | | cak, cs, es | y | 1.85 |
| 2.00 | 129.80 | 131.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 131.80 | 132.20 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 13.80 | 132.20 | 146.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.70 | 146.00 | 148.70 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.80 | 148.70 | 149.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.20 | 149.50 | 151.70 | **Coal w/ Sh, pyritic, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.75 | 151.70 | 152.45 | Shale, dk gy | | cm, em | | 0.00 |
| 15.15 | 152.45 | 167.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 6.20 | 167.60 | 173.80 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 3.20 | 173.80 | 177.00 | Claystone, gy | | cv, ev | | 0.00 |
| 43.30 | 177.00 | 220.30 | Sandstone, gy w/ sh stks | | cs, es | y | 43.30 |
| 5.60 | 220.30 | 225.90 | Shale, gy, conglomerate w/ iron nods | | cs, es | | 0.00 |
| 0.80 | 225.90 | 226.70 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 1.10 | 226.70 | 227.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.40 | 227.80 | 229.20 | Limestone | | cak, cs, es | y | 1.40 |
| 0.70 | 229.20 | 229.90 | Claystone, grn | | cv, ev | | 0.00 |
| 9.10 | 229.90 | 239.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 239.00 | 240.50 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 240.50 | 242.20 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.80 | 242.20 | 244.00 | Sandstone, gy w/ sh stks | | cs, es | y | 1.80 |
| 9.50 | 244.00 | 253.50 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.10 | 253.50 | 254.60 | Limestone, nodular | | cak, cs, es | y | 1.10 |
| 7.70 | 254.60 | 262.30 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 262.30 | 264.00 | Limestone, shaley, layered | | cak, cs, es | y | 1.70 |
| 4.70 | 264.00 | 268.70 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 268.70 | 269.50 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 10.20 | 269.50 | 279.70 | Shale, gy, sandy | | cs, es | | 0.00 |
| 8.60 | 279.70 | 288.30 | Sandstone, gy w/ sh stks | | cs, es | y | 8.60 |
| 0.70 | 288.30 | 289.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.00 | 289.00 | 292.00 | Shale, gy | | cm, em | | 0.00 |
| 0.60 | 292.00 | 292.60 | **Coal w/ sh stks, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 2.10 | 292.60 | 294.70 | Claystone, gy | | cv, ev | | 0.00 |
| 1.80 | 294.70 | 296.50 | Limestone | | cak, cs, es | y | 1.80 |
| 5.10 | 296.50 | 301.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.20 | 301.60 | 305.80 | Limestone, shaley, layered | | cak, cs, es | y | 4.20 |
| 1.00 | 305.80 | 306.80 | Shale, gy | | cm, em | | 0.00 |
| 2.00 | 306.80 | 308.80 | Limestone, mosaic | | cak, cs, es | y | 2.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-16

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.20 | 308.80 | 311.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.10 | 311.00 | 313.10 | Limestone, shaley, layered | | cak, cs, es | y | 2.10 |
| 3.50 | 313.10 | 316.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.40 | 316.60 | 321.00 | Limestone, nodular | | cak, cs, es | y | 4.40 |
| 1.60 | 321.00 | 322.60 | Shale, gy/ grn | | cm, em | | 0.00 |
| 3.40 | 322.60 | 326.00 | Claystone, gy | | cv, ev | | 0.00 |
| 3.60 | 326.00 | 329.60 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.30 | 329.60 | 331.90 | Shale, red/ grn | | cm, em | | 0.00 |
| 6.90 | 331.90 | 338.80 | Limestone, layered | | cak, cs, es | y | 6.90 |
| 0.90 | 338.80 | 339.70 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 6.40 | 339.70 | 346.10 | Sandstone, gy w/ sh stks | | cs, es | y | 6.40 |
| 1.50 | 346.10 | 347.60 | Shale, grn | | cm, em | | 0.00 |
| 10.70 | 347.60 | 358.30 | Limestone, shaley, layered | | cak, cs, es | y | 10.70 |
| 7.10 | 358.30 | 365.40 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 10.80 | 365.40 | 376.20 | Claystone, grn | | cv, ev | | 0.00 |
| 2.20 | 376.20 | 378.40 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.70 | 378.40 | 384.10 | Limestone, shaley, layered | | cak, cs, es | y | 5.70 |
| 5.10 | 384.10 | 389.20 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 389.20 | 391.10 | Claystone, grn | | cv, ev | | 0.00 |
| 13.70 | 391.10 | 404.80 | Limestone, nodular | | cak, cs, es | y | 13.70 |
| 2.90 | 404.80 | 407.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.90 | 407.70 | 410.60 | Claystone, grn | | cv, ev | | 0.00 |
| 5.50 | 410.60 | 416.10 | Limestone, massive | | cak, cs, es | y | 5.50 |
| 4.10 | 416.10 | 420.20 | Limestone, shaley, layered | | cak, cs, es | y | 4.10 |
| 2.50 | 420.20 | 422.70 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 422.70 | 424.90 | Limestone, mosaic | | cak, cs, es | y | 2.20 |
| 0.90 | 424.90 | 425.80 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 12.50 | 425.80 | 438.30 | Limestone, nodular | | cak, cs, es | y | 12.50 |
| 2.00 | 438.30 | 440.30 | Claystone, brn/ blk | | ac, cv, ev | | 0.00 |
| 1.40 | 440.30 | 441.70 | **Coal w/ bone, pyritic, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.20 | 441.70 | 441.90 | **Shale, blk w/ coal stks** | | ac, cm, em | | 0.00 |
| 1.40 | 441.90 | 443.30 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 1.00 | 443.30 | 444.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.00 | 444.30 | 446.30 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 446.30 | 449.70 | Limestone, shaley, layered | | cak, cs, es | y | 3.40 |
| 11.10 | 449.70 | 460.80 | Claystone, gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 460.80 | 461.40 | **Coal w/ sh stks** | | ac, cv, ev | | 0.00 |
| 0.50 | 461.40 | 461.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 11.40 | 461.90 | 473.30 | Limestone, nodular | | cak, cs, es | y | 11.40 |
| 0.30 | 473.30 | 473.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 6.90 | 473.60 | 480.50 | Limestone, nodular | | cak, cs, es | y | 6.90 |
| 2.30 | 480.50 | 482.80 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 482.80 | 484.60 | Limestone, shaley, layered | | cak, cs, es | y | 1.80 |
| 11.40 | 484.60 | 496.00 | Shale, gy/ grn w/ ls nods | | ak, cm, em | | 0.00 |
| 4.40 | 496.00 | 500.40 | Limestone, shaley, layered | | ak, cs, es | | 0.00 |
| 2.10 | 500.40 | 502.50 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 502.50 | 503.20 | Claystone, blk/ dk gy | | ac, cv, ev | | 0.00 |
| 1.40 | 503.20 | 504.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.10 | 504.60 | 507.70 | Limestone, massive | | cak, cs, es | y | 3.10 |
| 3.20 | 507.70 | 510.90 | Claystone, gy | | cv, ev | | 0.00 |
| 11.90 | 510.90 | 522.80 | Limestone, shaley, layered | | cak, cs, es | y | 11.90 |
| 2.30 | 522.80 | 525.10 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 525.10 | 525.60 | Limestone | | cak, cs, es | y | 0.50 |
| 5.00 | 525.60 | 530.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.10 | 530.60 | 530.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 530.70 | 531.25 | **Coal w/ bone layers, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.80 | 531.25 | 532.05 | Shale, dk gy | | cm, em | | 0.00 |
| 3.24 | 532.05 | 535.29 | **Coal, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 1.61 | 535.29 | 536.90 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.60 | 536.90 | 537.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 5.20 | 537.50 | 542.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 542.70 | 544.20 | Sandstone, gy, churned | | cs, es | y | 1.50 |
| 1.70 | 544.20 | 545.90 | Shale, gy, conglomerate w/ iron nods | | cs, es | | 0.00 |
| 0.60 | 545.90 | 546.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 546.50 | 547.80 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 547.80 | 548.60 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.40 | 548.60 | 549.00 | Claystone, gy | | cv, ev | | 0.00 |
| 4.50 | 549.00 | 553.50 | Shale, gy w/ ss stks | | cs, es | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-16

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| | Total Depth | 553.50 | | | | | 185.95 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 185.95

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 34%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 185.95 | 34% |
| Soft Rock: | 367.55 | 66% |
| | 553.50 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 339.11 | 1.50 | 1.24 | 46.8 | -292.3 |
| Coal | 1.45 | 6.61 | 3.88 | 207.00 | 205.6 |
| Bottom, 10 ft. | 252.00 | 1.14 | 0.92 | 35.60 | -216.4 |

# DIAMOND DRILL HOLE: AEC-2001-24

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,140.00
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 682,935
**Easting:** 2,410,742
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 22.00 | 0.00 | 22.00 | Casing | | | | 0.00 |
| 2.65 | 22.00 | 24.65 | Shale, dk gy/ gy | YES | cm, em | | 0.00 |
| 0.55 | 24.65 | 25.20 | Limestone, shaley | YES | ak, cs, es | y | 0.55 |
| 0.30 | 25.20 | 25.50 | Claystone, gy | YES | cv, ev | | 0.00 |
| 0.30 | 25.50 | 25.80 | Limestone, shaley | YES | ak, cs, es | y | 0.30 |
| 9.90 | 25.80 | 35.70 | Claystone, gy | YES | cv, ev | | 0.00 |
| 1.60 | 35.70 | 37.30 | Shale, blk w/ coal stks | YES | ac, cm, em | | 0.00 |
| 0.55 | 37.30 | 37.85 | **Coal, WASHINGTON No. 12** | YES | ac, cv, ev | | 0.00 |
| 11.70 | 37.85 | 49.55 | Claystone, gy | YES | cv, ev | | 0.00 |
| 2.80 | 49.55 | 52.35 | Shale, gy w/ ss stks | YES | cs, es | | 0.00 |
| 52.85 | 52.35 | 105.20 | Sandstone, gy | | cs, es | y | 52.85 |
| 0.50 | 105.20 | 105.70 | Shale, gy, sandy | | cs, es | | 0.00 |
| 6.20 | 105.70 | 111.90 | Sandstone, gy | | cs, es | y | 6.20 |
| 6.60 | 111.90 | 118.50 | Sandstone, gy w/ coal stks | | cs, es | y | 6.60 |
| 1.10 | 118.50 | 119.60 | Shale, dk gy w/ coal stks | | ac, cm, em | | 0.00 |
| 2.10 | 119.60 | 121.70 | Sandstone, gy w/ coal stks | | cs, es | y | 2.10 |
| 19.40 | 121.70 | 141.10 | Sandstone, gy w/ crossbeds | | cs, es | y | 19.40 |
| 1.40 | 141.10 | 142.50 | Shale, gy w/ interbedded ss | | cs, es | | 0.00 |
| 0.80 | 142.50 | 143.30 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 0.45 | 143.30 | 143.75 | Sandstone, gy w/ sh stks | | cs, es | y | 0.45 |
| 2.15 | 143.75 | 145.90 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.95 | 145.90 | 148.85 | Shale, gy, sandy w/ ls nods | | ak, cs, es | | 0.00 |
| 7.15 | 148.85 | 156.00 | Shale, blk/ dk gy | | ac, cm, em | | 0.00 |
| 2.00 | 156.00 | 158.00 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 158.00 | 160.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.25 | 160.45 | 163.70 | Limestone, shaley, nodular | | ak, cs, es | y | 3.25 |
| 1.00 | 163.70 | 164.70 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 164.70 | 167.00 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 0.45 | 167.00 | 167.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.05 | 167.45 | 170.50 | Shale, gy | | cm, em | | 0.00 |
| 2.40 | 170.50 | 172.90 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.10 | 172.90 | 174.00 | Sandstone, gy w/ sh stks | | cs, es | y | 1.10 |
| 3.10 | 174.00 | 177.10 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 177.10 | 178.50 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 5.70 | 178.50 | 184.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.37 | 184.20 | 184.57 | **Coal, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 0.43 | 184.57 | 185.00 | Claystone, gy | | cv, ev | | 0.00 |
| 1.20 | 185.00 | 186.20 | Claystone, dk gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 186.20 | 187.00 | Claystone, gy | | cv, ev | | 0.00 |
| 8.05 | 187.00 | 195.05 | Limestone, nodular | | ak, cs, es | y | 8.05 |
| 6.45 | 195.05 | 201.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.10 | 201.50 | 206.60 | Claystone, gy | | cv, ev | | 0.00 |
| 1.05 | 206.60 | 207.65 | Shale, grn, sandy | | cs, es | | 0.00 |
| 4.95 | 207.65 | 212.60 | Limestone, shaley | | ak, cs, es | y | 4.95 |
| 3.75 | 212.60 | 216.35 | Shale, dk gy/ gy/ grn | | cm, em | | 0.00 |
| 2.80 | 216.35 | 219.15 | Sandstone, gy w/ sh stks | | cs, es | y | 2.80 |
| 3.85 | 219.15 | 223.00 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 5.70 | 223.00 | 228.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 228.70 | 232.20 | Shale, gy/ grn | | cm, em | | 0.00 |
| 5.80 | 232.20 | 238.00 | Shale, grn w/ ss stks | | cs, es | | 0.00 |
| 8.30 | 238.00 | 246.30 | Limestone, shaley, nodular | | ak, cs, es | y | 8.30 |
| 2.50 | 246.30 | 248.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 248.80 | 249.40 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 9.75 | 249.40 | 259.15 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 6.85 | 259.15 | 266.00 | Limestone, shaley, layered | | ak, cs, es | y | 6.85 |
| 2.80 | 266.00 | 268.80 | Shale, gy/ grn | | cm, em | | 0.00 |

## DIAMOND DRILL HOLE: AEC-2001-24

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.15 | 268.80 | 270.95 | Sandstone, gy w/ sh stks | | cs, es | y | 2.15 |
| 2.35 | 270.95 | 273.30 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.20 | 273.30 | 274.50 | Shale, grn, sandy, limey | | ak, cs, es | | 0.00 |
| 1.50 | 274.50 | 276.00 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 4.70 | 276.00 | 280.70 | Limestone, shaley, layered | | ak, cs, es | y | 4.70 |
| 4.50 | 280.70 | 285.20 | Shale, grn w/ ls nods | | ak, cm, em | | 0.00 |
| 12.30 | 285.20 | 297.50 | Limestone | | ak, cs, es | y | 12.30 |
| 1.35 | 297.50 | 298.85 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 10.30 | 298.85 | 309.15 | Limestone, nodular | | ak, cs, es | y | 10.30 |
| 2.35 | 309.15 | 311.50 | Shale, gy/ grn | | cm, em | | 0.00 |
| 3.15 | 311.50 | 314.65 | Limestone, mosaic | | ak, cs, es | y | 3.15 |
| 1.65 | 314.65 | 316.30 | Shale, gy | | cm, em | | 0.00 |
| 7.70 | 316.30 | 324.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.45 | 324.00 | 328.45 | Shale, dk gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 328.45 | 329.15 | Claystone, blk w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 329.15 | 329.45 | Shale, blk w/ coal stks | | ac, cm, em | | 0.00 |
| 3.10 | 329.45 | 332.55 | **Coal w/ bone/ shale, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 4.00 | 332.55 | 336.55 | Shale, dk gy | | cm, em | | 0.00 |
| 2.65 | 336.55 | 339.20 | Shale, gy w/ interbedded ss | | cs, es | | 0.00 |
| 4.65 | 339.20 | 343.85 | Shale, gy | | cm, em | | 0.00 |
| 3.90 | 343.85 | 347.75 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 8.00 | 347.75 | 355.75 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 0.70 | 355.75 | 356.45 | Limestone, massive | | ak, cs, es | y | 0.70 |
| 1.43 | 356.45 | 357.88 | **Coal, shaley, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.62 | 357.88 | 358.50 | Shale, blk/ dk gy | | cm, em | | 0.00 |
| 15.00 | 358.50 | 373.50 | Limestone, nodular | | ak, cs, es | y | 15.00 |
| 9.15 | 373.50 | 382.65 | Shale, gy/ grn w/ ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 382.65 | 382.85 | Shale, gy w/ interbedded ss | | cs, es | | 0.00 |
| 1.05 | 382.85 | 383.90 | Shale, dk gy | | cm, em | | 0.00 |
| 4.75 | 383.90 | 388.65 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.50 | 388.65 | 393.15 | Claystone, dk gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 393.15 | 393.75 | Shale, blk w/ coal stks | | ac, cm, em | | 0.00 |
| 0.65 | 393.75 | 394.40 | Shale, dk gy | | cm, em | | 0.00 |
| 1.10 | 394.40 | 395.50 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 0.85 | 395.50 | 396.35 | Shale, dk gy, limey | | ak, cm, em | | 0.00 |
| 6.30 | 396.35 | 402.65 | Limestone, nodular | | ak, cs, es | y | 6.30 |
| 0.60 | 402.65 | 403.25 | Claystone, gy | | cv, ev | | 0.00 |
| 8.60 | 403.25 | 411.85 | Limestone, shaley | | ak, cs, es | y | 8.60 |
| 4.62 | 411.85 | 416.47 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 416.47 | 417.62 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 2.77 | 417.62 | 420.39 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.25 | 420.39 | 421.64 | Claystone, gy | | cv, ev | | 0.00 |
| 1.40 | 421.64 | 423.04 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 0.39 | 423.04 | 423.43 | **Bone w/ coal, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.72 | 423.43 | 424.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.65 | 424.15 | 424.80 | Shale, blk w/ coal stks | | ac, cm, em | | 0.00 |
| 3.71 | 424.80 | 428.51 | **Coal, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 1.14 | 428.51 | 429.65 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 0.10 | 429.65 | 429.75 | Shale, blk w/ coal stks | | ac, cm, em | | 0.00 |
| 1.69 | 429.75 | 431.44 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 431.44 | 433.74 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 3.51 | 433.74 | 437.25 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.05 | 437.25 | 440.30 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.40 | 440.30 | 441.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 441.70 | 442.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 3.95 | 442.65 | 446.60 | Shale, gy, sandy | | cs, es | | 0.00 |
| | Total Depth | 446.60 | | | | | 191.35 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

## DIAMOND DRILL HOLE: AEC-2001-24

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Total Thickness of Hard Rock Overlying Mining Unit 191.35

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 43%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 191.35 | 43% |
| Soft Rock: | 255.25 | 57% |
| | 446.60 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 155.69 | 1.29 | 1.11 | 40.2 | -115.5 |
| Coal | 1.25 | 5.26 | 2.10 | 164.00 | 162.8 |
| Bottom, 10 ft. | 443.50 | 1.16 | 1.12 | 36.25 | -407.3 |

# DIAMOND DRILL HOLE: AEC-2001-25

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,220.00
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 682,930
**Easting:** 2,413,433
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 28.00 | 0.00 | 28.00 | Casing | | | | 0.00 |
| 1.90 | 28.00 | 29.90 | Claystone, gy w/ ls nods | YES | ak, cv, ev | | 0.00 |
| 19.25 | 29.90 | 49.15 | Claystone, red/ gy w/ ls nods | YES | ak, cv, ev | | 0.00 |
| 4.90 | 49.15 | 54.05 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 54.05 | 58.15 | Shale, gy, sandy, limey | | ak, cm, em | | 0.00 |
| 7.40 | 58.15 | 65.55 | Sandstone, gy w/ crossbeds | | cs, es | y | 7.40 |
| 1.30 | 65.55 | 66.85 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 66.85 | 67.65 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 67.65 | 68.65 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 10.10 | 68.65 | 78.75 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 2.90 | 78.75 | 81.65 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 8.95 | 81.65 | 90.60 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.60 | 90.60 | 94.20 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 9.45 | 94.20 | 103.65 | Shale, gy, sandy, limey | | ak, cs, es | | 0.00 |
| 1.75 | 103.65 | 105.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.93 | 105.40 | 106.33 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.53 | 106.33 | 106.86 | Shale, dk gy | | cm, em | | 0.00 |
| 1.15 | 106.86 | 108.01 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 108.01 | 108.81 | Claystone, gy | | cv, ev | | 0.00 |
| 2.00 | 108.81 | 110.81 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.05 | 110.81 | 114.86 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.85 | 114.86 | 116.71 | Shale, gy, sandy, limey | | ak, cs, es | | 0.00 |
| 6.50 | 116.71 | 123.21 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 1.00 | 123.21 | 124.21 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.71 | 124.21 | 125.92 | **Coal w/ bone and sh layers, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.00 | 125.92 | 126.92 | Shale, blk/ dk gy | | ac, cm, em | | 0.00 |
| 8.90 | 126.92 | 135.82 | Claystone, gy | | cv, ev | | 0.00 |
| 5.00 | 135.82 | 140.82 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 47.90 | 140.82 | 188.72 | Sandstone, gy w/ sh stks | | cs, es | y | 47.90 |
| 1.50 | 188.72 | 190.22 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 7.65 | 190.22 | 197.87 | Sandstone, gy w/ sh stks | | cs, es | y | 7.65 |
| 0.60 | 197.87 | 198.47 | **Coal w/ bone, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.95 | 198.47 | 199.42 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 7.05 | 199.42 | 206.47 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 206.47 | 210.07 | Shale, gy | | cm, em | | 0.00 |
| 11.55 | 210.07 | 221.62 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 7.10 | 221.62 | 228.72 | Sandstone, gy w/ crossbeds | | cs, es | y | 7.10 |
| 2.55 | 228.72 | 231.27 | Shale, gy | | cm, em | | 0.00 |
| 3.75 | 231.27 | 235.02 | Shale, dk gy w/ ss stks | | cs, es | | 0.00 |
| 7.90 | 235.02 | 242.92 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 6.25 | 242.92 | 249.17 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 249.17 | 250.02 | Limestone, shaley, layered | | ak, cs, es | y | 0.85 |
| 1.05 | 250.02 | 251.07 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 3.45 | 251.07 | 254.52 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 254.52 | 255.67 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.65 | 255.67 | 256.32 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 8.15 | 256.32 | 264.47 | Shale, gy | | cm, em | | 0.00 |
| 4.00 | 264.47 | 268.47 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 4.25 | 268.47 | 272.72 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 0.40 | 272.72 | 273.12 | **Coal w/ bone, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 3.80 | 273.12 | 276.92 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 276.92 | 278.42 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 5.90 | 278.42 | 284.32 | Shale, dk gy/ gy w/ ls nods | | ak, cm, em | | 0.00 |
| 4.05 | 284.32 | 288.37 | Limestone, nodular | | ak, cs, es | y | 4.05 |
| 11.65 | 288.37 | 300.02 | Claystone, dk gy/ gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 300.02 | 302.12 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |

## DIAMOND DRILL HOLE: AEC-2001-25

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.60 | 302.12 | 304.72 | Claystone, gy, limey | | ak, cv, ev | | 0.00 |
| 1.35 | 304.72 | 306.07 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.85 | 306.07 | 307.92 | Sandstone, gy, massive | | ak, cs, es | y | 1.85 |
| 4.25 | 307.92 | 312.17 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 10.45 | 312.17 | 322.62 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 322.62 | 324.62 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.65 | 324.62 | 330.27 | Sandstone, gy w/ sh stks | | cs, es | y | 5.65 |
| 1.35 | 330.27 | 331.62 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 6.40 | 331.62 | 338.02 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 7.20 | 338.02 | 345.22 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 5.75 | 345.22 | 350.97 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 350.97 | 352.57 | Claystone, gy, sandy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.75 | 352.57 | 357.32 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.15 | 357.32 | 358.47 | Shale, gy, sandy, limey | | ak, cs, es | | 0.00 |
| 2.70 | 358.47 | 361.17 | Shale, gy | | cm, em | | 0.00 |
| 12.00 | 361.17 | 373.17 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 30.10 | 373.17 | 403.27 | Limestone, layered | | ak, cs, es | y | 30.10 |
| 2.75 | 403.27 | 406.02 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 12.10 | 406.02 | 418.12 | Limestone, Shaley, nodular | | ak, cs, es | y | 12.10 |
| 4.90 | 418.12 | 423.02 | Shale, dk gy/ gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 423.02 | 424.67 | Shale, dk gy w/ coal stks | | ac, cm, em | | 0.00 |
| 3.65 | 424.67 | 428.32 | **Coal w/ bone layers, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 4.10 | 428.32 | 432.42 | Shale, gy/ gm | | cm, em | | 0.00 |
| 8.05 | 432.42 | 440.47 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 11.15 | 440.47 | 451.62 | Claystone, dk gy/ gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.57 | 451.62 | 452.19 | **Coal w/ bone stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 1.00 | 452.19 | 453.19 | Shale, blk/ dk gy, limey | | ak, cm, em | | 0.00 |
| 19.90 | 453.19 | 473.09 | Limestone, nodular | | ak, cs, es | y | 19.90 |
| 1.65 | 473.09 | 474.74 | Claystone, gm w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.60 | 474.74 | 477.34 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.20 | 477.34 | 479.54 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 479.54 | 481.64 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 2.90 | 481.64 | 484.54 | Claystone, gy/ gm | | cv, ev | | 0.00 |
| 0.45 | 484.54 | 484.99 | Shale, gy/ gm w/ ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 484.99 | 485.29 | Shale, dk gy | | cm, em | | 0.00 |
| 0.55 | 485.29 | 485.84 | **Coal w/ sh layers, RED STONE** | | ac, cv, ev | | 0.00 |
| 0.40 | 485.84 | 486.24 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 486.24 | 487.49 | Shale, gy, limey, sandy | | ak, cs, es | | 0.00 |
| 6.00 | 487.49 | 493.49 | Limestone, nodular | | ak, cs, es | y | 6.00 |
| 0.45 | 493.49 | 493.94 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 7.75 | 493.94 | 501.69 | Limestone, shaley, nodular | | ak, cs, es | y | 7.75 |
| 1.55 | 501.69 | 503.24 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 503.24 | 505.74 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 505.74 | 506.24 | Claystone, brn/ blk | | ac, cv, ev | | 0.00 |
| 0.15 | 506.24 | 506.39 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.80 | 506.39 | 507.19 | **Coal w/ sh layers, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 1.10 | 507.19 | 508.29 | Shale, blk/ dk gy | | ac, cm, em | | 0.00 |
| 2.10 | 508.29 | 510.39 | **Bone w/ coal stks, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 2.74 | 510.39 | 513.13 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.18 | 513.13 | 513.31 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 513.31 | 513.41 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 513.41 | 514.01 | Shale, dk gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 514.01 | 514.91 | Limestone, shaley | | ak, cs, es | y | 0.90 |
| 2.20 | 514.91 | 517.11 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 517.11 | 517.61 | Limestone, shaley | | ak, cs, es | y | 0.50 |
| 0.70 | 517.61 | 518.31 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 518.31 | 519.96 | Limestone, shaley | | ak, cs, es | y | 1.65 |
| 3.60 | 519.96 | 523.56 | Shale, gy, sandy, limey | | ak, cs, es | | 0.00 |
| | Total Depth | 523.56 | | | | | 169.05 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

## DIAMOND DRILL HOLE: AEC-2001-25

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Total Thickness of Hard Rock Overlying Mining Unit | | | | | | | 169.05 |
| Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit | | | | | | | 32% |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 169.05 | 32% |
| Soft Rock: | 354.51 | 68% |
| | 523.56 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 175.45 | 1.99 | 1.63 | 62.1 | -113.4 |
| Coal | 4.33 | 5.46 | 2.57 | 171.00 | 166.7 |
| Bottom, 10 ft. | 493.50 | 1.72 | 1.48 | 53.75 | -439.8 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-26

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1230
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 678390
**Easting:** 2412070
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 24.00 | 0.00 | 24.00 | Casing | | | | 0.00 |
| 2.35 | 24.00 | 26.35 | Claystone, red/ grn | Y | cv, ev | | 0.00 |
| 2.35 | 26.35 | 28.70 | Claystone, gy, sandy, ls nods | Y | ak, cm, em | | 0.00 |
| 3.70 | 28.70 | 32.40 | Sandstone, gy, calcite cemented | Y | ak, cs, es | y | 3.70 |
| 1.15 | 32.40 | 33.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 33.55 | 35.45 | Shale, gy | Y | cm, em | | 0.00 |
| 0.15 | 35.45 | 35.60 | Shale, blk | Y | ac, cm, em | | 0.00 |
| 0.25 | 35.60 | 35.85 | Shale, dk gy | Y | cm, em | | 0.00 |
| 0.70 | 35.85 | 36.55 | Claystone, red/ grn | Y | cv, ev | | 0.00 |
| 0.70 | 36.55 | 37.25 | Claystone, gy, sandy, ls nods | Y | ak, cv, ev | | 0.00 |
| 0.30 | 37.25 | 37.55 | Shale, blk | Y | ac, cm, em | | 0.00 |
| 0.30 | 37.55 | 37.85 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 37.85 | 38.20 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.25 | 38.20 | 39.45 | Claystone, gy | | cv, ev | | 0.00 |
| 1.05 | 39.45 | 40.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.20 | 40.50 | 41.70 | Claystone, gy | | cv, ev | | 0.00 |
| 3.65 | 41.70 | 45.35 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 45.35 | 45.85 | Claystone, gy | | cv, ev | | 0.00 |
| 1.10 | 45.85 | 46.95 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.80 | 46.95 | 48.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 48.75 | 49.30 | Shale, gy | Y | cm, em | | 0.00 |
| 0.15 | 49.30 | 49.45 | Claystone, gy | Y | cv, ev | | 0.00 |
| 0.45 | 49.45 | 49.90 | Claystone, dk gy | Y | cv, ev | | 0.00 |
| 0.85 | 49.90 | 50.75 | Claystone, gy | Y | cv, ev | | 0.00 |
| 0.15 | 50.75 | 50.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.50 | 50.90 | 55.40 | Claystone, gy, ls nods | Y | ak, cv, ev | | 0.00 |
| 3.65 | 55.40 | 59.05 | Claystone, red/ grn, ls nods | Y | ak, cv, ev | | 0.00 |
| 7.95 | 59.05 | 67.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.10 | 67.00 | 69.10 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 69.10 | 70.75 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 70.75 | 72.95 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.50 | 72.95 | 75.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 75.45 | 79.15 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 2.45 | 79.15 | 81.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.15 | 81.60 | 84.75 | Sandstone, gy, crossbeds | | cs, es | y | 3.15 |
| 1.15 | 84.75 | 85.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.60 | 85.90 | 87.50 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 87.50 | 87.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 87.60 | 87.70 | Claystone, red | | cv, ev | | 0.00 |
| 0.20 | 87.70 | 87.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 87.90 | 88.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.50 | 88.40 | 89.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 89.90 | 91.10 | Sandstone, gy, crossbeds | | cs, es | y | 1.20 |
| 3.20 | 91.10 | 94.30 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 94.30 | 95.95 | Claystone, gy | | cv, ev | | 0.00 |
| 1.15 | 95.95 | 97.10 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 97.10 | 97.80 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.40 | 97.80 | 98.20 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 98.20 | 99.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 99.20 | 101.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 9.10 | 101.05 | 110.15 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 110.15 | 111.00 | Claystone, red | | cv, ev | | 0.00 |
| 0.95 | 111.00 | 111.95 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 111.95 | 113.40 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 113.40 | 114.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 114.15 | 114.40 | Shale, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-26

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.00 | 114.40 | 115.40 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 115.40 | 115.75 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 115.75 | 116.75 | Claystone, red | | cv, ev | | 0.00 |
| 4.00 | 116.75 | 120.75 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 120.75 | 121.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 121.25 | 121.45 | Shale, gy | | cm, em | | 0.00 |
| 0.06 | 121.45 | 121.51 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.14 | 121.51 | 121.65 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 121.65 | 122.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 122.45 | 122.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 122.60 | 123.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.55 | 123.30 | 123.85 | Shale, gy | | cm, em | | 0.00 |
| 3.35 | 123.85 | 127.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 127.20 | 128.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 128.40 | 129.40 | Shale, gy | | cm, em | | 0.00 |
| 0.12 | 129.40 | 129.52 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.08 | 129.52 | 129.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 129.60 | 130.50 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.20 | 130.50 | 130.70 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 130.70 | 132.00 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 132.00 | 132.45 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 132.45 | 133.20 | Claystone, gy | | cv, ev | | 0.00 |
| 1.90 | 133.20 | 135.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 135.10 | 135.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 135.85 | 136.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.70 | 136.60 | 141.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 141.30 | 141.95 | Sandstone, gy, sh stks | | cs, es | y | 0.65 |
| 0.70 | 141.95 | 142.65 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.25 | 142.65 | 143.90 | Shale, gy | | cm, em | | 0.00 |
| 0.05 | 143.90 | 143.95 | Claystone, gy | | cv, ev | | 0.00 |
| 0.05 | 143.95 | 144.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.05 | 144.00 | 144.05 | Shale, gy | | cm, em | | 0.00 |
| 0.05 | 144.05 | 144.10 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.95 | 144.10 | 145.05 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 145.05 | 145.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.65 | 145.60 | 147.25 | Claystone, blk, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 147.25 | 147.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 147.55 | 147.75 | Claystone, blk, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 147.75 | 148.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 148.15 | 148.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 148.55 | 148.85 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.15 | 148.85 | 149.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 149.00 | 149.30 | **Bone, coal layers, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 0.35 | 149.30 | 149.65 | **Claystone, blk** | | ac, cv, ev | | 0.00 |
| 0.13 | 149.65 | 149.78 | **Bone** | | ac, cv, ev | | 0.00 |
| 0.87 | 149.78 | 150.65 | **Coal** | | ac, cv, ev | | 0.00 |
| 3.35 | 150.65 | 154.00 | Claystone, gy | | cv, ev | | 0.00 |
| 14.85 | 154.00 | 168.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 168.85 | 169.75 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 169.75 | 171.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.45 | 171.10 | 176.55 | Sandstone, gy, massive | | cs, es | y | 5.45 |
| 2.70 | 176.55 | 179.25 | Sandstone, gy, sh stks | | cs, es | y | 2.70 |
| 21.40 | 179.25 | 200.65 | Sandstone, gy, crossbedded | | cs, es | y | 21.40 |
| 4.60 | 200.65 | 205.25 | Sandstone, gy, sh stks | | cs, es | y | 4.60 |
| 0.30 | 205.25 | 205.55 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 2.65 | 205.55 | 208.20 | Sandstone, gy, sh stks | | cs, es | y | 2.65 |
| 0.10 | 208.20 | 208.30 | Claystone, gy, sandy | | ccv, ev | | 0.00 |
| 2.75 | 208.30 | 211.05 | Sandstone, gy, massive | | cs, es | y | 2.75 |
| 16.45 | 211.05 | 227.50 | Sandstone, gy, sh stks | | cs, es | y | 16.45 |
| 0.23 | 227.50 | 227.73 | **Bone, coal stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.02 | 227.73 | 227.75 | **Coal, dull** | | ac, cv, ev | | 0.00 |
| 0.17 | 227.75 | 227.92 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 227.92 | 227.94 | **Pyrite** | | ac, cm, em | | 0.00 |
| 0.37 | 227.94 | 228.31 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.13 | 228.31 | 228.44 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.46 | 228.44 | 228.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 228.90 | 229.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 229.85 | 230.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-26

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 5.80 | 230.85 | 236.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 236.65 | 238.25 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 238.25 | 239.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.15 | 239.90 | 241.05 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.45 | 241.05 | 241.50 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 1.60 | 241.50 | 243.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 243.10 | 243.30 | Sandstone, gy, sh stks | | cs, es | y | 0.20 |
| 1.25 | 243.30 | 244.55 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.10 | 244.55 | 245.65 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.40 | 245.65 | 246.05 | Sandstone, gy, sh stks | | cs, es | y | 0.40 |
| 0.20 | 246.05 | 246.25 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.20 | 246.25 | 250.45 | Shale, dk gy | | cm, em | | 0.00 |
| 2.00 | 250.45 | 252.45 | Sandstone, gy, sh stks | | cs, es | y | 2.00 |
| 0.50 | 252.45 | 252.95 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.60 | 252.95 | 253.55 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.65 | 253.55 | 254.20 | Sandstone, gy, sh stks | | cs, es | y | 0.65 |
| 0.15 | 254.20 | 254.35 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.40 | 254.35 | 254.75 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.40 | 254.75 | 256.15 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 256.15 | 257.85 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 257.85 | 258.65 | Shale, gy | | cm, em | | 0.00 |
| 1.65 | 258.65 | 260.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 260.30 | 261.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 261.70 | 262.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.80 | 262.50 | 263.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 263.30 | 265.45 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 265.45 | 266.75 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 266.75 | 267.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.70 | 267.90 | 268.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 268.60 | 269.10 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 269.10 | 270.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 270.10 | 270.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.15 | 270.55 | 271.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 1.10 | 271.70 | 272.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 272.80 | 273.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.75 | 273.75 | 274.50 | Claystone, gy | | cv, ev | | 0.00 |
| 1.75 | 274.50 | 276.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.95 | 276.25 | 277.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 277.20 | 277.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.25 | 277.50 | 281.75 | Shale, gy, sandy | | cm, em | | 0.00 |
| 9.20 | 281.75 | 290.95 | Sandstone, gy, sh stks | | cs, es | y | 9.20 |
| 0.50 | 290.95 | 291.45 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.50 |
| 0.90 | 291.45 | 292.35 | Sandstone, gy, sh stks | | cs, es | y | 0.90 |
| 0.35 | 292.35 | 292.70 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.35 |
| 0.80 | 292.70 | 293.50 | Sandstone, gy, sh stks | | cs, es | y | 0.80 |
| 1.65 | 293.50 | 295.15 | Sandstone, gy, coal spars | | ac, cs, es | y | 1.65 |
| 1.65 | 295.15 | 296.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 296.80 | 297.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 297.65 | 298.00 | **Bone, coal layers, Little Waynesburg** | | ac, cv, ev | | 0.00 |
| 0.25 | 298.00 | 298.25 | Shale, gy | | cm, em | | 0.00 |
| 1.15 | 298.25 | 299.40 | Claystone, gy | | cv, ev | | 0.00 |
| 1.70 | 299.40 | 301.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 301.10 | 301.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 4.55 | 301.90 | 306.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 306.45 | 306.95 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 2.45 | 306.95 | 309.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 309.40 | 310.55 | Limestone, massive | | ak, cs, es | y | 1.15 |
| 1.30 | 310.55 | 311.85 | Limestone, shaley, layered | | ak, cs, es | y | 1.30 |
| 1.20 | 311.85 | 313.05 | Limestone, massive | | ak, cs, es | y | 1.20 |
| 0.40 | 313.05 | 313.45 | Limestone, shaley, mosaic | | ak, cs, es | y | 0.40 |
| 0.25 | 313.45 | 313.70 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 313.70 | 315.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 315.10 | 316.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 0.65 | 316.70 | 317.35 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 317.35 | 318.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 0.95 | 318.05 | 319.00 | Claystone, grn | | cv, ev | | 0.00 |
| 5.30 | 319.00 | 324.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.05 | 324.30 | 326.35 | Limestone, shaley, layered | | ak, cs, es | y | 2.05 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-26

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.35 | 326.35 | 327.70 | Claystone, grn | | cv, ev | | 0.00 |
| 0.20 | 327.70 | 327.90 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.40 | 327.90 | 328.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.10 | 328.30 | 328.40 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.45 | 328.40 | 328.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 328.85 | 329.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.20 |
| 0.35 | 329.05 | 329.40 | Claystone, grn | | cv, ev | | 0.00 |
| 0.10 | 329.40 | 329.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.10 |
| 1.75 | 329.50 | 331.25 | Shale, grn, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 331.25 | 335.00 | Claystone, grn | | cv, ev | | 0.00 |
| 6.05 | 335.00 | 341.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 341.05 | 341.35 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 341.35 | 342.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 342.90 | 343.65 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 343.65 | 343.90 | Shale, grn, ss stks | | cm, em | | 0.00 |
| 1.80 | 343.90 | 345.70 | Shale, grn, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 345.70 | 350.05 | Shale, grn, sandy | | cm, em | | 0.00 |
| 0.50 | 350.05 | 350.55 | Shale, grn, ss stks | | cm, em | | 0.00 |
| 0.65 | 350.55 | 351.20 | Shale, grn, sandy | | cm, em | | 0.00 |
| 1.65 | 351.20 | 352.85 | Limestone, massive | | ak, cs, es | y | 1.65 |
| 0.35 | 352.85 | 353.20 | Limestone, shaley, layered | | ak, cs, es | y | 0.35 |
| 1.60 | 353.20 | 354.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 0.95 | 354.80 | 355.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 355.75 | 358.90 | Limestone, shaley, nodular | | ak, cs, es | y | 3.15 |
| 3.35 | 358.90 | 362.25 | Limestone, shaley, layered | | ak, cs, es | y | 3.35 |
| 0.20 | 362.25 | 362.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 362.45 | 363.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.65 | 363.20 | 369.85 | Limestone, shaley, layered | | ak, cs, es | y | 6.65 |
| 1.65 | 369.85 | 371.50 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 371.50 | 374.00 | Shale, grn, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 374.00 | 374.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 374.75 | 375.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.30 | 375.80 | 376.10 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.80 | 376.10 | 379.90 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 379.90 | 380.95 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 3.60 | 380.95 | 384.55 | Limestone, shaley, nodular | | ak, cs, es | y | 3.60 |
| 3.50 | 384.55 | 388.05 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 388.05 | 390.55 | Limestone, shaley, nodular | | ak, cs, es | y | 2.50 |
| 0.20 | 390.55 | 390.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 390.75 | 391.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.05 | 391.40 | 392.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.45 | 392.45 | 395.90 | Limestone, shaley, nodular | | ak, cs, es | y | 3.45 |
| 1.05 | 395.90 | 396.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 396.95 | 397.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 0.80 | 397.65 | 398.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 398.45 | 400.95 | Limestone, shaley, nodular | | ak, cs, es | y | 2.50 |
| 0.45 | 400.95 | 401.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 401.40 | 402.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 1.45 | 402.50 | 403.95 | Limestone, massive | | ak, cs, es | y | 1.45 |
| 0.10 | 403.95 | 404.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 404.05 | 404.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 404.40 | 406.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.35 |
| 0.75 | 406.75 | 407.50 | Shale, grn | | cm, em | | 0.00 |
| 6.10 | 407.50 | 413.60 | Limestone, shaley, nodular | | ak, cs, es | y | 6.10 |
| 0.40 | 413.60 | 414.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 414.00 | 417.20 | Limestone, shaley, nodular | | ak, cs, es | y | 3.20 |
| 0.70 | 417.20 | 417.90 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 417.90 | 418.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 2.60 | 418.40 | 421.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 10.50 | 421.00 | 431.50 | Limestone, shaley, nodular | | ak, cs, es | y | 10.50 |
| 0.50 | 431.50 | 432.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 432.00 | 432.45 | Claystone, gy | | cv, ev | | 0.00 |
| 3.35 | 432.45 | 435.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.17 | 435.80 | 435.97 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.23 | 435.97 | 436.20 | **Coal, Sewickley No 9** | | ac, cv, ev | | 0.00 |
| 0.04 | 436.20 | 436.24 | **Bone** | | ac, cv, ev | | 0.00 |
| 0.81 | 436.24 | 437.05 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 437.05 | 437.10 | **Bone** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-26

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.17 | 437.10 | 437.27 | Coal | | ac, cv, ev | | 0.00 |
| 0.04 | 437.27 | 437.31 | Bone | | ac, cv, ev | | 0.00 |
| 1.73 | 437.31 | 439.04 | Coal | | ac, cv, ev | | 0.00 |
| 0.13 | 439.04 | 439.17 | Bone, sh stks | | ac, cv, ev | | 0.00 |
| 0.13 | 439.17 | 439.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 439.30 | 440.05 | Shale, dk gy | | cm, em | | 0.00 |
| 1.85 | 440.05 | 441.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.00 | 441.90 | 443.90 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.45 | 443.90 | 444.35 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 0.08 | 444.35 | 444.43 | Claystone, gy | | cv, ev | | 0.00 |
| 8.67 | 444.43 | 453.10 | Sandstone, gy, sh stks | | cs, es | y | 8.67 |
| 0.55 | 453.10 | 453.65 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.00 | 453.65 | 454.65 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 1.10 | 454.65 | 455.75 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 3.95 | 455.75 | 459.70 | Sandstone, gy, sh stks | | cs, es | y | 3.95 |
| 0.45 | 459.70 | 460.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 460.15 | 460.70 | Shale, gy | | cm, em | | 0.00 |
| 0.65 | 460.70 | 461.35 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.15 | 461.35 | 461.50 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.15 | 461.50 | 461.65 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.10 | 461.65 | 461.75 | Coal, Fishpot | | ac, cv, ev | | 0.00 |
| 0.08 | 461.75 | 461.83 | Coal, bone stks | | ac, cv, ev | | 0.00 |
| 0.03 | 461.83 | 461.86 | Bone | | ac, cv, ev | | 0.00 |
| 0.46 | 461.86 | 462.32 | Coal | | ac, cv, ev | | 0.00 |
| 0.03 | 462.32 | 462.35 | Bone, sh stks | | ac, cv, ev | | 0.00 |
| 0.51 | 462.35 | 462.86 | Coal | | ac, cv, ev | | 0.00 |
| 0.83 | 462.86 | 463.69 | Bone, coal layers | | ac, cv, ev | | 0.00 |
| 0.16 | 463.69 | 463.85 | Coal | | ac, cv, ev | | 0.00 |
| 0.30 | 463.85 | 464.15 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.16 | 464.15 | 464.31 | Coal | | ac, cv, ev | | 0.00 |
| 0.08 | 464.31 | 464.39 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.31 | 464.39 | 464.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 464.70 | 465.20 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 465.20 | 467.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 1.50 | 467.90 | 469.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 469.40 | 471.20 | Limestone, shaley, layered | | ak, cs, es | y | 1.80 |
| 2.55 | 471.20 | 473.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 0.35 | 473.75 | 474.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 474.10 | 475.05 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 0.95 | 475.05 | 476.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 1.90 | 476.00 | 477.90 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.90 |
| 3.00 | 477.90 | 480.90 | Limestone, shaley, nodular | | ak, cs, es | y | 3.00 |
| 2.05 | 480.90 | 482.95 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 4.30 | 482.95 | 487.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 487.25 | 487.55 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 487.55 | 489.10 | Shale, gy | | cm, em | | 0.00 |
| 0.75 | 489.10 | 489.85 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 489.85 | 490.65 | Shale, dk gy | | cm, em | | 0.00 |
| 3.05 | 490.65 | 493.70 | Limestone, shaley, layered | | ak, cs, es | y | 3.05 |
| 0.80 | 493.70 | 494.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 494.50 | 497.35 | Limestone, shaley, layered | | ak, cs, es | y | 2.85 |
| 1.45 | 497.35 | 498.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 498.80 | 499.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.10 | 499.10 | 499.20 | Shale, blk | | cm, em | | 0.00 |
| 0.85 | 499.20 | 500.05 | Shale, dk gy | | cm, em | | 0.00 |
| 2.55 | 500.05 | 502.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.35 | 502.60 | 502.95 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 502.95 | 504.40 | Limestone, shaley, nodular | | ak, cs, es | y | 1.45 |
| 2.25 | 504.40 | 506.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 506.65 | 507.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.85 | 507.70 | 508.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.88 | 508.55 | 511.43 | Limestone, shaley, nodular | | ak, cs, es | y | 2.88 |
| 0.10 | 511.43 | 511.53 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.70 | 511.53 | 514.23 | Limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 2.45 | 514.23 | 516.68 | Limestone, nodular | | ak, cs, es | y | 2.45 |
| 0.40 | 516.68 | 517.08 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.05 | 517.08 | 522.13 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.10 | 522.13 | 522.23 | Limestone, shaley, nodular | | ak, cs, es | y | 0.10 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-26

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.40 | 522.23 | 522.63 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 522.63 | 522.98 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 1.05 | 522.98 | 524.03 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 524.03 | 524.33 | Claystone, grn | | cv, ev | | 0.00 |
| 0.75 | 524.33 | 525.08 | Claystone, gy | | cv, ev | | 0.00 |
| 1.30 | 525.08 | 526.38 | Claystone, blk/ tan, mottled | | ac, cv, ev | | 0.00 |
| 0.20 | 526.38 | 526.58 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 526.58 | 527.28 | Shale, blk/ tan, layered | | ac, cm, em | | 0.00 |
| 0.75 | 527.28 | 528.03 | Claystone, blk/ tan, mottled | | ac, cv, ev | | 0.00 |
| 0.16 | 528.03 | 528.19 | Claystone, tan | | cv, ev | | 0.00 |
| 0.10 | 528.19 | 528.29 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.09 | 528.29 | 528.38 | Shale, blk/ tan, layered | | ac, cm, em | | 0.00 |
| 0.05 | 528.38 | 528.43 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.21 | 528.43 | 528.64 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.43 | 528.64 | 529.07 | **Coal, bone layers, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 529.07 | 529.17 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 529.17 | 529.67 | Shale, dk gy | | cm, em | | 0.00 |
| 0.03 | 529.67 | 529.70 | Pyrite | | ac, cm, em | | 0.00 |
| 0.38 | 529.70 | 530.08 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.49 | 530.08 | 531.57 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.05 | 531.57 | 531.62 | **Coal, dull** | | ac, cv, ev | | 0.00 |
| 0.54 | 531.62 | 532.16 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 532.16 | 532.19 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.78 | 532.19 | 533.97 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 533.97 | 534.01 | **Coal, dull** | | ac, cv, ev | | 0.00 |
| 1.39 | 534.01 | 535.40 | **Coal** | | ac, cv, ev | | 0.00 |
| 2.00 | 535.40 | 537.40 | Shale, dk gy | | cm, em | | 0.00 |
| 1.85 | 537.40 | 539.25 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 539.25 | 540.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.62 | 540.00 | 540.62 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 540.62 | 540.72 | Claystone, gy | | cv, ev | | 0.00 |
| 1.40 | 540.72 | 542.12 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 542.12 | 542.52 | Shale, gy | | cm, em | | 0.00 |
| 0.90 | 542.52 | 543.42 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 543.42 | 544.97 | Shale, gy | | cm, em | | 0.00 |
| 0.55 | 544.97 | 545.52 | Shale, blk/ tan, layered | | ac, cm, em | | 0.00 |
| | Total Depth | 545.52 | | | | | 197.00 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 197.00

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 36%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 197.00 | 36% |
| Soft Rock: | 348.52 | 64% |
| | 545.52 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 78.60 | 2.62 | 2.33 | 81.8 | 3.3 |
| Coal | 4.11 | 5.60 | 3.26 | 175.00 | 171.0 |
| Bottom, 10 ft. | 302.50 | 2.15 | 1.82 | 57.05 | -234.4 |

ATTACHMENT 13

**Field Engineer: Jon Murray**
**Surface Elevation: 746.49** **AEC - 2008 - 03**
**Drill Hole Coordinates (State Plane 1983 NA Datum)**
**Northing: 693091.332**
**Easting: 2414548.312**
**Drilling Company: West Virginia Resources, Inc.**

Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 9.00 | 0.00 | 9.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 0.50 | 9.00 | 9.50 | Nodular Limestone | | ak, cs, es | Y | 0.50 | 906 |
| 1.50 | 9.50 | 11.00 | Light Gray/Green Shale & Interbedded Sandstone | Y | cm, em | Y | 1.50 | 332 |
| 3.10 | 11.00 | 14.10 | Light Gray/Green Shale & Int. Sandstone with Limestone Nodules | Y | ak, cm, em | Y | 3.10 | 432 |
| 3.50 | 14.10 | 17.60 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 1.50 | 17.60 | 19.10 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.20 | 19.10 | 21.30 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 0.35 | 21.30 | 21.65 | Coal with shale streaks | | ac, cm, em | | 0.00 | 28 |
| 0.25 | 21.65 | 21.90 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.70 | 21.90 | 22.60 | Coal with shale streaks | | ac, cm, em | | 0.00 | 28 |
| 1.60 | 22.60 | 24.20 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 7.60 | 24.20 | 31.80 | Shaley Nodular Limestone | | ak, cs, es | Y | 7.60 | 806 |
| 0.70 | 31.80 | 32.50 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.80 | 32.50 | 36.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.80 | 806 |
| 2.00 | 36.30 | 38.30 | Shaley Layered Limestone | | ak, cs, es | Y | 2.00 | 802 |
| 2.00 | 38.30 | 40.30 | Nodular Limestone | | ak, cs, es | Y | 2.00 | 906 |
| 2.40 | 40.30 | 42.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.40 | 806 |
| 0.60 | 42.70 | 43.30 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.50 | 43.30 | 44.80 | Gray Calcite Cemented Sandstone w/ Shale Streaks | | ak, cs, es | Y | 1.50 | 643 |
| 2.40 | 44.80 | 47.20 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 4.00 | 47.20 | 51.20 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.10 | 51.20 | 52.30 | Shaley Layered Limestone | | ak, cs, es | Y | 1.10 | 802 |
| 1.30 | 52.30 | 53.60 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.30 | 806 |
| 1.10 | 53.60 | 54.70 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.10 | 54.70 | 56.80 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 0.50 | 56.80 | 57.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.65 | 57.30 | 58.95 | Coal, common banded | | ac, cm, em | | 0.00 | 21 |
| 80 | 58.95 | 59.75 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 60 | 59.75 | 61.35 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 90 | 61.35 | 63.25 | Shaley Layered Limestone | | ak, cs, es | Y | 1.90 | 802 |
| 1.40 | 63.25 | 64.65 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 4.50 | 64.65 | 69.15 | Shaley Nodular Limestone | | ak, cs, es | Y | 4.50 | 806 |
| 3.00 | 69.15 | 72.15 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.60 | 72.15 | 74.75 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.80 | 74.75 | 76.55 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 1.00 | 76.55 | 77.55 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.10 | 77.55 | 79.65 | Black/ Tan Layered Shale | | ac, cm, em | | 0.00 | 172 |
| 0.45 | 79.65 | 80.10 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.50 | 80.10 | 80.60 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| 0.20 | 80.60 | 80.80 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.30 | 80.80 | 82.10 | Coal, common banded | | ac, cm, em | | 0.00 | 21 |
| 0.40 | 82.10 | 82.50 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 5.90 | 82.50 | 88.40 | Coal, common banded | | ac, cm, em | | 0.00 | 21 |
| 0.40 | 88.40 | 88.80 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.90 | 88.80 | 89.70 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.50 | 89.70 | 90.20 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.50 | 806 |
| 0.80 | 90.20 | 91.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 3.10 | 91.00 | 94.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 8.20 | 94.10 | 102.30 | Light Gray Green Churned Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 435 |
| | Total Depth | 102.30 | | | | | 33.70 | |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 33.70

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 33%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 33.70 | 33% |
| Soft Rock: | 68.60 | 67% |
| | 102.30 | |

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 216.80 | 1.66 | 51.85 |
| Coal | 4.02 | 5.40 | 169.00 |
| Bottom, 10 ft. | 102.15 | 2.10 | 65.45 |

Field Engineer: Jon Murray
Surface Elevation: 1332.43 ATTACHMENT 13
Drill Hole Coordinates (State Plane 1983 NA Datum)
Northing: 691846.73 AEC - 2008-04
Easting: 2400501.69
Drilling Company: West Virginia Resources, Inc.



Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 30.00 | 0.00 | 30.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 0.40 | 30.00 | 30.40 | Gray Sandstone w/ Shale Streaks | Y | cs, es | Y | 0.40 | 543 |
| 2.00 | 30.40 | 32.40 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.40 | 32.40 | 33.80 | Nodular Limestone | | ak, cs, es | Y | 1.40 | 906 |
| 0.60 | 33.80 | 34.40 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.50 | 34.40 | 35.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.50 | 806 |
| 6.80 | 35.90 | 42.70 | Core Loss | | | | 0.00 | 4 |
| 0.90 | 42.70 | 43.60 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 2.70 | 43.60 | 46.30 | Shaley Layered Limestone | | ak, cs, es | Y | 2.70 | 802 |
| 0.50 | 46.30 | 46.80 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 5.00 | 46.80 | 51.80 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 3.20 | 51.80 | 55.00 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 5.80 | 55.00 | 60.80 | Red Claystone | | cv, ev | | 0.00 | 167 |
| 2.70 | 60.80 | 63.50 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 3.00 | 63.50 | 66.50 | Light Gray Green Churned Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 435 |
| 4.30 | 66.50 | 70.80 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 2.70 | 70.80 | 73.50 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 5.40 | 73.50 | 78.90 | Gray Sandstone w/ Shale Streaks | | cs, es | Y | 5.40 | 543 |
| 12.00 | 78.90 | 90.90 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 2.00 | 90.90 | 92.90 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 0.80 | 92.90 | 93.70 | Nodular Limestone | | ak, cs, es | Y | 0.80 | 906 |
| 3.30 | 93.70 | 97.00 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.70 | 97.00 | 99.70 | Core Loss | | | | 0.00 | 4 |
| 2.00 | 99.70 | 101.70 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.40 | 101.70 | 104.10 | Light Gray/Green Shale & Interbedded Sandstone | | cm, em | Y | 2.40 | 332 |
| 4.50 | 104.10 | 108.60 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 3.70 | 108.60 | 112.30 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 4.50 | 112.30 | 116.80 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 1.90 | 116.80 | 118.70 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| [illegible] | 118.70 | 121.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.20 | 806 |
| [illegible] | 121.90 | 125.60 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible] | 125.60 | 129.40 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 1.80 | 129.40 | 131.20 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 6.40 | 131.20 | 137.60 | Light Gray/Green Shale & Int. Sandstone with Limestone Nodules | | ak, cm, em | Y | 6.40 | 432 |
| 6.50 | 137.60 | 144.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.90 | 144.10 | 147.00 | Gray Sandstone w/ Shale Streaks | | cs, es | Y | 2.90 | 543 |
| 4.70 | 147.00 | 151.70 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 3.30 | 151.70 | 155.00 | Red & Green Shale | | cm, em | | 0.00 | 154 |
| 2.20 | 155.00 | 157.20 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 5.80 | 157.20 | 163.00 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 3.00 | 163.00 | 166.00 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 6.40 | 166.00 | 172.40 | Light Gray/Green Shale & Int. Sandstone with Limestone Nodules | | ak, cm, em | Y | 6.40 | 432 |
| 2.90 | 172.40 | 175.30 | Light Gray/Green Shale & Interbedded Sandstone | | cm, em | Y | 2.90 | 332 |
| 7.30 | 175.30 | 182.60 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 4.00 | 182.60 | 186.60 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 3.70 | 186.60 | 190.30 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 7.70 | 190.30 | 198.00 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.70 | 198.00 | 199.70 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.20 | 199.70 | 201.90 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 4.10 | 201.90 | 206.00 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.40 | 206.00 | 207.40 | Shaley Layered Limestone | | ak, cs, es | Y | 1.40 | 802 |
| 2.00 | 207.40 | 209.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 9.30 | 209.40 | 218.70 | Red Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 265 |
| 6.70 | 218.70 | 225.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 6.00 | 225.40 | 231.40 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 7.40 | 231.40 | 238.80 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 5.00 | 238.80 | 243.80 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 2.50 | 243.80 | 246.30 | Red & Green Shale | | cm, em | | 0.00 | 154 |
| 6.10 | 246.30 | 252.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.20 | 252.40 | 253.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 0.70 | 253.60 | 254.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.70 | 806 |
| 1.00 | 254.30 | 255.30 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.80 | 255.30 | 257.10 | Shaley Layered Limestone | | ak, cs, es | Y | 1.80 | 802 |
| 1.00 | 257.10 | 258.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.20 | 258.10 | 260.30 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.80 | 260.30 | 263.10 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 3.90 | 263.10 | 267.00 | Red Churned Shale | | cm, em | | 0.00 | 165 |
| [illegible] | 267.00 | 273.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible] | 273.40 | 275.40 | Light Gray/Green Shale & Int. Sandstone with Limestone Nodules | | ak, cm, em | Y | 2.00 | 432 |
| [illegible] | 275.40 | 279.60 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 2.00 | 279.60 | 281.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 9.30 | 281.60 | 290.90 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.10 | 290.90 | 292.00 | Black Churned Shale with Limestone Nods | | ak, cm, em | | 0.00 | 215 |
| 1.30 | 292.00 | 293.30 | Nodular Limestone | | ak, cs, es | Y | 1.30 | 906 |
| 7.10 | 293.30 | 300.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.90 | 300.40 | 302.30 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.40 | 302.30 | 303.70 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Harmful (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 2.50 | 303.70 | 306.20 | Coal with shale streaks | | ac, cm, em | | 0.00 | 28 |
| 0.80 | 306.20 | 307.00 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| 0.50 | 307.00 | 307.50 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| [illegible]10 | 307.50 | 308.60 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| [illegible]90 | 308.60 | 313.50 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| [illegible]10 | 313.50 | 316.60 | Shaley Layered Limestone | | ak, cs, es | Y | 3.10 | 802 |
| 17.50 | 316.60 | 334.10 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 11.00 | 334.10 | 345.10 | Gray Sandstone w/ Shale Streaks | | cs, es | Y | 11.00 | 543 |
| 10.00 | 345.10 | 355.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.20 | 355.10 | 358.30 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.50 | 358.30 | 358.80 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 0.40 | 358.80 | 359.20 | Coal with shale layers | | ac, cm, em | | 0.00 | 27 |
| 0.70 | 359.20 | 359.90 | Coal with shale streaks | | ac, cm, em | | 0.00 | 28 |
| 1.70 | 359.90 | 361.60 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| 1.80 | 361.60 | 363.40 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.80 | 363.40 | 368.20 | Shaley Layered Limestone | | ak, cs, es | Y | 4.80 | 802 |
| 1.80 | 368.20 | 370.00 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.70 | 370.00 | 372.70 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 4.20 | 372.70 | 376.90 | Gray Calcite Cemented Sandstone w/ Shale Streaks | | ak, cs, es | Y | 4.20 | 643 |
| 10.30 | 376.90 | 387.20 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 1.30 | 387.20 | 388.50 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.30 | 806 |
| 5.80 | 388.50 | 394.30 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 3.90 | 394.30 | 398.20 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.70 | 398.20 | 399.90 | Light Gray/Green Shale & Int. Sandstone with Limestone Nodules | | ak, cm, em | Y | 1.70 | 432 |
| 1.40 | 399.90 | 401.30 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 2.70 | 401.30 | 404.00 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| 1.00 | 404.00 | 405.00 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 3.20 | 405.00 | 408.20 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 3.20 | 322 |
| 3.40 | 408.20 | 411.60 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 1.20 | 411.60 | 412.80 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 9.60 | 412.80 | 422.40 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 434 |
| 0.70 | 422.40 | 423.10 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.30 | 423.10 | 423.40 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| 1.00 | 423.40 | 424.40 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.20 | 424.40 | 426.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.50 | 426.60 | 429.10 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.50 | 806 |
| 5.00 | 429.10 | 434.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.00 | 434.10 | 438.10 | Shaley Mosaic Limestone | | ak, cs, es | Y | 4.00 | 805 |
| 2.80 | 438.10 | 440.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.90 | 440.90 | 444.80 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible]90 | 444.80 | 446.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.90 | 806 |
| [illegible]00 | 446.70 | 451.70 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible]20 | 451.70 | 457.90 | Light Gray/Green Shale & Interbedded Sandstone | | cm, em | Y | 6.20 | 332 |
| [illegible]50 | 457.90 | 461.40 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 1.70 | 461.40 | 463.10 | Red & Green Shale | | cm, em | | 0.00 | 154 |
| 14.80 | 463.10 | 477.90 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 1.40 | 477.90 | 479.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.40 | 806 |
| 5.80 | 479.30 | 485.10 | Shaley Layered Limestone | | ak, cs, es | Y | 5.80 | 802 |
| 4.00 | 485.10 | 489.10 | Shaley Nodular Limestone | | ak, cs, es | Y | 4.00 | 806 |
| 4.30 | 489.10 | 493.40 | Shaley Layered Limestone | | ak, cs, es | Y | 4.30 | 802 |
| 2.50 | 493.40 | 495.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.50 | 495.90 | 499.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.30 | 499.40 | 502.70 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.70 | 502.70 | 505.40 | Shaley Layered Limestone | | ak, cs, es | Y | 2.70 | 802 |
| 8.10 | 505.40 | 513.50 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 4.30 | 513.50 | 517.80 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.90 | 517.80 | 520.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.90 | 806 |
| 7.00 | 520.70 | 527.70 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.40 | 527.70 | 532.10 | Shaley Layered Limestone | | ak, cs, es | Y | 4.40 | 802 |
| 4.00 | 532.10 | 536.10 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 6.80 | 536.10 | 542.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 6.80 | 806 |
| 2.00 | 542.90 | 544.90 | Shaley Layered Limestone | | ak, cs, es | Y | 2.00 | 802 |
| 6.80 | 544.90 | 551.70 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 3.50 | 551.70 | 555.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.00 | 555.20 | 557.20 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.00 | 806 |
| 0.80 | 557.20 | 558.00 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.80 | 558.00 | 563.80 | Shaley Layered Limestone | | ak, cs, es | Y | 5.80 | 802 |
| 2.40 | 563.80 | 566.20 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.30 | 566.20 | 568.50 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| 2.00 | 568.50 | 570.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.90 | 570.50 | 573.40 | Light Gray/Green Massive Churned Sandy Shale | | cm, em | | 0.00 | 335 |
| 6.50 | 573.40 | 579.90 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 10.80 | 579.90 | 590.70 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 2.90 | 590.70 | 593.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.40 | 593.60 | 595.00 | Coal with shale streaks | | ac, cm, em | | 0.00 | 28 |
| 1.10 | 595.00 | 596.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 9.70 | 596.10 | 605.80 | Shaley Nodular Limestone | | ak, cs, es | Y | 9.70 | 806 |
| [illegible]2.90 | 605.80 | 608.70 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| [illegible]90 | 608.70 | 612.60 | Nodular Limestone | | ak, cs, es | Y | 3.90 | 906 |
| [illegible]80 | 612.60 | 615.40 | Shaley Layered Limestone | | ak, cs, es | Y | 2.80 | 802 |
| [illegible]70 | 615.40 | 618.10 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| [illegible]80 | 618.10 | 621.90 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 2.00 | 621.90 | 623.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.70 | 623.90 | 626.60 | Nodular Limestone | | ak, cs, es | Y | 2.70 | 906 |
| 2.90 | 626.60 | 629.50 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.90 | 806 |
| 2.80 | 629.50 | 632.30 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 2.90 | AEC-2008-04 632.30 | 635.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 9.90 | 635.20 | 645.10 | Shaley Nodular Limestone | | ak, cs, es | Y | 9.90 | 806 |
| 3.20 | 645.10 | 648.30 | Shaley Layered Limestone | | ak, cs, es | Y | 3.20 | 802 |

OHIO M3/19/2008

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 2.50 | 648.30 | 650.80 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 2.00 | 650.80 | 652.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.70 | 652.80 | 655.50 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 1.90 | 655.50 | 657.40 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| .55 | 657.40 | 657.95 | Coal with bone streaks | | ac, cm, em | | 0.00 | 23 |
| .20 | 657.95 | 658.15 | Coal with shale streaks | | ac, cm, em | | 0.00 | 28 |
| 1.00 | 658.15 | 659.15 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 5.15 | 659.15 | 664.30 | Coal, common banded | | ac, cm, em | | 0.00 | 21 |
| 1.20 | 664.30 | 665.50 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 2.50 | 665.50 | 668.00 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.70 | 668.00 | 668.70 | Shaley Layered Limestone | | ak, cs, es | Y | 0.70 | 802 |
| 4.90 | 668.70 | 673.60 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 434 |
| 1.50 | 673.60 | 675.10 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 1.50 | 322 |
| 8.25 | 675.10 | 683.35 | Gray Crossbedded Sandstone | | cs, es | Y | 8.25 | 541 |
| 2.80 | 683.35 | 686.15 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| | Total Depth | 686.15 | | | | | 175.15 | |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **175.15**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **26%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 175.15 | 26% |
| Soft Rock: | 511.00 | 74% |
| | 686.15 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 189.36 | 1.82 | 56.78 |
| Coal | 1.96 | 4.29 | 134.00 |
| Bottom, 10 ft. | 171.70 | 2.05 | 64.05 |

Field Engineer: Jon Murray
Surface Elevation: 986.341 ATTACHMENT 13
Drill Hole Coordinates (State Plane 1983 NA Datum)
Northing: 685524.00 AEC - 2008-05
Easting: 2400495.456
Drilling Company: West Virginia Resources, Inc.



Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 9.00 | 0.00 | 9.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 2.70 | 9.00 | 11.70 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 0.30 | 11.70 | 12.00 | Gray Sandstone w/ Shale Streaks | Y | cs, es | Y | 0.30 | 543 |
| 2.60 | 12.00 | 14.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.60 | 14.60 | 15.20 | Shaley Layered Limestone | | ak, cs, es | Y | 0.60 | 802 |
| 2.90 | 15.20 | 18.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.90 | 18.10 | 20.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 1.40 | 20.00 | 21.40 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.70 | 21.40 | 24.10 | Sandstone | | cs, es | Y | 2.70 | 540 |
| 5.40 | 24.10 | 29.50 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 2.50 | 29.50 | 32.00 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 4.70 | 32.00 | 36.70 | Light Gray Green Churned Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 435 |
| 5.50 | 36.70 | 42.20 | Light Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 5.50 | 432 |
| 2.50 | 42.20 | 44.70 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.40 | 44.70 | 46.10 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.20 | 46.10 | 47.30 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 3.90 | 47.30 | 51.20 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 5.60 | 51.20 | 56.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 17.00 | 56.80 | 73.80 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.10 | 73.80 | 76.90 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.25 | 76.90 | 77.15 | Coal with Bone streaks | | ac, cm, em | | 0.00 | 23 |
| 0.80 | 77.15 | 77.95 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 1.20 | 77.95 | 79.15 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.50 | 79.15 | 82.65 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.50 | 806 |
| 3.50 | 82.65 | 86.15 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.70 | 86.15 | 86.85 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.70 | 806 |
| 2.00 | 86.85 | 88.85 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.50 | 88.85 | 90.35 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.50 | 806 |
| 1.10 | 90.35 | 91.45 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.50 | 91.45 | 92.95 | Shaley Mosaic Limestone | | ak, cs, es | Y | 1.50 | 805 |
| 2.80 | 92.95 | 95.75 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.20 | 95.75 | 96.95 | Shaley Layered Limestone | | ak, cs, es | Y | 1.20 | 802 |
| 3.30 | 96.95 | 100.25 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.00 | 100.25 | 103.25 | Shaley Layered Limestone | | ak, cs, es | Y | 3.00 | 802 |
| 2.40 | 103.25 | 105.65 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 9.90 | 105.65 | 115.55 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 434 |
| 2.30 | 115.55 | 117.85 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 2.50 | 117.85 | 120.35 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.20 | 120.35 | 121.55 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.20 | 806 |
| 4.10 | 121.55 | 125.65 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.10 | 125.65 | 126.75 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.10 | 806 |
| 6.80 | 126.75 | 133.55 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.00 | 133.55 | 135.55 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.00 | 806 |
| 6.10 | 135.55 | 141.65 | Shaley Layered Limestone | | ak, cs, es | Y | 6.10 | 802 |
| 3.00 | 141.65 | 144.65 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.00 | 806 |
| 6.20 | 144.65 | 150.85 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 4.20 | 150.85 | 155.05 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 0.70 | 155.05 | 155.75 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.70 | 806 |
| 3.50 | 155.75 | 159.25 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 3.70 | 159.25 | 162.95 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.70 | 806 |
| 0.60 | 162.95 | 163.55 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 0.90 | 163.55 | 164.45 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.90 | 806 |
| 4.10 | 164.45 | 168.55 | Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 245 |
| 5.30 | 168.55 | 173.85 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.10 | 173.85 | 176.95 | Shaley Layered Limestone | | ak, cs, es | Y | 3.10 | 802 |
| 2.20 | 176.95 | 179.15 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 8.60 | 179.15 | 187.75 | Shaley Layered Limestone | | ak, cs, es | Y | 8.60 | 802 |
| 3.80 | 187.75 | 191.55 | Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 245 |
| 5.30 | 191.55 | 196.85 | Nodular Limestone | | ak, cs, es | Y | 5.30 | 906 |
| 6.10 | 196.85 | 202.95 | Shaley Layered Limestone | | ak, cs, es | Y | 6.10 | 802 |
| 1.30 | 202.95 | 204.25 | Green Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 244 |
| 3.10 | 204.25 | 207.35 | Shaley Layered Limestone | | ak, cs, es | Y | 3.10 | 802 |
| 2.30 | 207.35 | 209.65 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.50 | 209.65 | 215.15 | Shaley Nodular Limestone | | ak, cs, es | Y | 5.50 | 806 |
| 4.90 | 215.15 | 220.05 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.40 | 220.05 | 222.45 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.20 | 222.45 | 224.65 | Coal with Bone streaks | | ac, cm, em | | 0.00 | 23 |
| 5.00 | 224.65 | 229.65 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 8.70 | 229.65 | 238.35 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 434 |
| 3.80 | 238.35 | 242.15 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 4.60 | 242.15 | 246.75 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 4.60 | 322 |
| 0.80 | 246.75 | 247.55 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.75 | 247.55 | 248.30 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 1.10 | 248.30 | 249.40 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.90 | 249.40 | 251.30 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 0.80 | 251.30 | 252.10 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 16.40 | 252.10 | 268.50 | Shaley Nodular Limestone | | ak, cs, es | Y | 16.40 | 806 |

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata ATTACHMENT 13 | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 2.90 | 268.50 | 271.40 | Shaley Layered Limestone | | ak, cs, es | Y | 2.90 | 802 |
| 13.90 | 271.40 | 285.30 | Dark Gray Shale w/ Limestone Nods AEC - 2008-05 | | ak, cm, em | | 0.00 | 224 |
| 2.90 | 285.30 | 288.20 | Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 245 |
| 0.60 | 288.20 | 288.80 | Bone with Coal streaks | | ac, cm, em | | 0.00 | 33 |
| 2.00 | 288.80 | 290.80 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.50 | 290.80 | 292.30 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 6.00 | 292.30 | 298.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 6.00 | 806 |
| 2.70 | 298.30 | 301.00 | Nodular Limestone | | ak, cs, es | Y | 2.70 | 906 |
| 0.90 | 301.00 | 301.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.90 | 806 |
| 1.60 | 301.90 | 303.50 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.90 | 303.50 | 305.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.90 | 305.40 | 307.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.00 | 307.30 | 309.30 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 1.90 | 309.30 | 311.20 | Black/ Tan Layered Shale | | ac, cm, em | | 0.00 | 172 |
| 0.50 | 311.20 | 311.70 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| 1.15 | 311.70 | 312.85 | Pyritic Coal | | ac, cm, em | | 0.00 | 29 |
| 0.25 | 312.85 | 313.10 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 0.75 | 313.10 | 313.85 | Black/ Brown Churned Shale | | ac, cm, em | | 0.00 | 175 |
| 3.95 | 313.85 | 317.80 | **Coal, Common Banded** | | ac, cm, em | | 0.00 | 21 |
| 0.10 | 317.80 | 317.90 | **Pyrite Band** | | ac, cm, em | | 0.00 | 84 |
| 1.15 | 317.90 | 319.05 | **Coal, Common Banded** | | ac, cm, em | | 0.00 | 21 |
| 0.15 | 319.05 | 319.20 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.60 | 319.20 | 320.80 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 2.25 | 320.80 | 323.05 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.20 | 323.05 | 326.25 | Light Gray Green Churned Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 435 |
| 3.10 | 326.25 | 329.35 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 423 |
| 5.40 | 329.35 | 334.75 | Light Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 5.40 | 432 |
| 7.40 | 334.75 | 342.15 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 1.20 | 342.15 | 343.35 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.25 | 343.35 | 344.60 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| | Total Depth | 344.60 | | | | | 109.80 | |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 109.80

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 32%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 109.80 | 32% |
| Soft Rock: | 234.80 | 68% |
| | 344.60 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 132.28 | 2.35 | 73.50 |
| Coal | 2.20 | 5.93 | 185.00 |
| Bottom, 10 ft. | 107.05 | 2.26 | 70.60 |

Field Engineer: Jon Murray
Surface Elevation: 1269.761 ATTACHMENT 13
Drill Hole Coordinates (State Plane 1983 NA Datum)
Northing: 691119.868 AEC - 2008-06
Easting: 2394530.661
Drilling Company: McKee Drilling



Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 21.00 | 0.00 | 21.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 0.60 | 21.00 | 21.60 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 3.40 | 21.60 | 25.00 | Red & Green Shale | | cm, em | | 0.00 | 154 |
| 5.60 | 25.00 | 30.60 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 11.10 | 30.60 | 41.70 | Light Gray Green Shale w/ SS Stks and Limestone Nods | Y | ak, cm, em | | 0.00 | 433 |
| 3.10 | 41.70 | 44.80 | Gray Sandstone w/ Shale Streaks | Y | cs, es | Y | 3.10 | 543 |
| 2.90 | 44.80 | 47.70 | Light Gray Green Massive Shale | Y | cm, em | | 0.00 | 135 |
| 2.00 | 47.70 | 49.70 | Red & Green Churned Shale | Y | cm, em | | 0.00 | 155 |
| 9.30 | 49.70 | 59.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 4.40 | 59.00 | 63.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.70 | 63.40 | 66.10 | Light Gray/Green Shale & Interbedded Sandstone | | cm, em | Y | 2.70 | 332 |
| 7.40 | 66.10 | 73.50 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 2.40 | 73.50 | 75.90 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.20 | 75.90 | 79.10 | Light Gray Green Shale w/ SS Stks and Limestone Nods | Y | ak, cm, em | | 0.00 | 433 |
| 2.50 | 79.10 | 81.60 | Sandstone | Y | cs, es | Y | 2.50 | 540 |
| 8.00 | 81.60 | 89.60 | Light Gray Green Shale | | cm, em | | 0.00 | 134 |
| 9.10 | 89.60 | 98.70 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 5.00 | 98.70 | 103.70 | Light Gray/Green Shale & Interbedded Sandstone | | cm, em | Y | 5.00 | 332 |
| 5.10 | 103.70 | 108.80 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 2.30 | 108.80 | 111.10 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 2.80 | 111.10 | 113.90 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 11.60 | 113.90 | 125.50 | Red & Green Shale | | cm, em | | 0.00 | 154 |
| 2.40 | 125.50 | 127.90 | Red Churned Shale | | cm, em | | 0.00 | 165 |
| 0.80 | 127.90 | 128.70 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 7.10 | 128.70 | 135.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 5.10 | 135.80 | 140.90 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 1.70 | 140.90 | 142.60 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.40 | 142.60 | 144.00 | Shaley Layered Limestone | | ak, cs, es | Y | 1.40 | 802 |
| 3.10 | 144.00 | 147.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible]10 | 147.10 | 156.20 | Red Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 265 |
| [illegible]70 | 156.20 | 161.90 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| [illegible]70 | 161.90 | 165.60 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible]60 | 165.60 | 167.20 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 12.90 | 167.20 | 180.10 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 4.70 | 180.10 | 184.80 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 2.90 | 184.80 | 187.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.90 | 806 |
| 7.10 | 187.70 | 194.80 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 3.80 | 194.80 | 198.60 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 7.10 | 198.60 | 205.70 | Dark Gray Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 7.40 | 205.70 | 213.10 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 7.40 | 422 |
| 1.50 | 213.10 | 214.60 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.80 | 214.60 | 215.40 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 0.70 | 215.40 | 216.10 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 2.50 | 216.10 | 218.60 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 434 |
| 2.10 | 218.60 | 220.70 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.30 | 220.70 | 224.00 | Dark Gray Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 424 |
| 7.70 | 224.00 | 231.70 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 7.70 | 422 |
| 3.10 | 231.70 | 234.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 5.70 | 234.80 | 240.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.60 | 240.50 | 242.10 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 1.60 | 242.10 | 243.70 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 0.90 | 243.70 | 244.60 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.40 | 244.60 | 245.00 | Black Layered Shale | | ac, cm, em | | 0.00 | 112 |
| 0.80 | 245.00 | 245.80 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 2.70 | 245.80 | 248.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 5.80 | 248.50 | 254.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.90 | 254.30 | 256.20 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 24.70 | 256.20 | 280.90 | Light Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 24.70 | 432 |
| 1.60 | 280.90 | 282.50 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 8.50 | 282.50 | 291.00 | Gray Crossbedded Sandstone | | cs, es | Y | 8.50 | 541 |
| 5.00 | 291.00 | 296.00 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 6.30 | 296.00 | 302.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.50 | 302.30 | 302.80 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.90 | 302.80 | 304.70 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 1.00 | 304.70 | 305.70 | Shaley Layered Limestone | | ak, cs, es | Y | 1.00 | 802 |
| 0.70 | 305.70 | 306.40 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| [illegible]70 | 306.40 | 309.10 | Shaley Layered Limestone | | ak, cs, es | Y | 2.70 | 802 |
| [illegible]60 | 309.10 | 313.70 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| [illegible]40 | 313.70 | 316.10 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.40 | 806 |
| [illegible] | 316.10 | 319.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| [illegible]0 | 319.90 | 324.80 | Light Gray/Green Shale & Interbedded Sandstone | | cm, em | Y | 4.90 | 332 |
| 4.00 | 324.80 | 328.80 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 0.50 | 328.80 | 329.30 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.00 | 329.30 | 330.30 | Nodular Limestone | | ak, cs, es | Y | 1.00 | 906 |
| 4.60 | 330.30 | 334.90 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 4.60 | 334.90 | 339.50 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 5.00 | 339.50 | 344.50 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata ATTACHMENT 13 | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Page No. 2 of Ferm |
|---|---|---|---|---|---|---|---|---|
| 0.50 | 344.50 | 345.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.50 | 345.00 | 346.50 | Coal with Bone Streaks AEC - 2008-06 | | ac, cm, em | | 0.00 | 23 |
| 2.00 | 346.50 | 348.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.60 | 348.50 | 358.10 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 1.60 | 358.10 | 359.70 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.30 | 359.70 | 360.00 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 1.00 | 360.00 | 361.00 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 1.50 | 361.00 | 362.50 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.90 | 362.50 | 365.40 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.90 | 806 |
| 5.50 | 365.40 | 370.90 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.70 | 370.90 | 372.60 | Nodular Limestone | | ak, cs, es | Y | 1.70 | 906 |
| 2.00 | 372.60 | 374.60 | Shaley Mosaic Limestone | | ak, cs, es | Y | 2.00 | 805 |
| 3.50 | 374.60 | 378.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.60 | 378.10 | 383.70 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.60 | 383.70 | 384.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.60 | 806 |
| 3.00 | 384.30 | 387.30 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 5.50 | 387.30 | 392.80 | Light Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 5.50 | 432 |
| 4.50 | 392.80 | 397.30 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 2.80 | 397.30 | 400.10 | Red & Green Shale | | cm, em | | 0.00 | 154 |
| 5.50 | 400.10 | 405.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.00 | 405.60 | 406.60 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.00 | 806 |
| 7.00 | 406.60 | 413.60 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.00 | 413.60 | 416.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.10 | 416.60 | 419.70 | Shaley Layered Limestone | | ak, cs, es | Y | 3.10 | 802 |
| 5.40 | 419.70 | 425.10 | Nodular Limestone | | ak, cs, es | Y | 5.40 | 906 |
| 3.00 | 425.10 | 428.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.30 | 428.10 | 430.40 | Shaley Layered Limestone | | ak, cs, es | Y | 2.30 | 802 |
| 3.50 | 430.40 | 433.90 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.70 | 433.90 | 437.60 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 2.50 | 437.60 | 440.10 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.30 | 440.10 | 443.40 | Nodular Limestone | | ak, cs, es | Y | 3.30 | 906 |
| 3.10 | 443.40 | 446.50 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 3.60 | 446.50 | 450.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 6.70 | 450.10 | 456.80 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.40 | 456.80 | 459.20 | Shaley Layered Limestone | | ak, cs, es | Y | 2.40 | 802 |
| 6.40 | 459.20 | 465.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.50 | 465.60 | 468.10 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.50 | 806 |
| 3.50 | 468.10 | 471.60 | Shaley Layered Limestone | | ak, cs, es | Y | 3.50 | 802 |
| 2.50 | 471.60 | 474.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 5.70 | 474.10 | 479.80 | Nodular Limestone | | ak, cs, es | Y | 5.70 | 906 |
| 9.80 | 479.80 | 489.60 | Shaley Layered Limestone | | ak, cs, es | Y | 9.80 | 802 |
| 2.40 | 489.60 | 492.00 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.90 | 492.00 | 495.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.90 | 806 |
| 5.00 | 495.90 | 500.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.50 | 500.90 | 503.40 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.00 | 503.40 | 505.40 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 1.20 | 505.40 | 506.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 5.20 | 506.60 | 511.80 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 8.80 | 511.80 | 520.60 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 11.50 | 520.60 | 532.10 | Dark Gray Shale and Interbedded Sandstone | | cm, em | | 0.00 | 322 |
| 1.20 | 532.10 | 533.30 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.00 | 533.30 | 534.30 | Black Layered Shale | | ac, cm, em | | 0.00 | 112 |
| 0.30 | 534.30 | 534.60 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.70 | 534.60 | 535.30 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 0.40 | 535.30 | 535.70 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.80 | 535.70 | 536.50 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.10 | 536.50 | 538.60 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.10 | 806 |
| 3.10 | 538.60 | 541.70 | Shaley Mosaic Limestone | | ak, cs, es | Y | 3.10 | 805 |
| 4.00 | 541.70 | 545.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 4.00 | 806 |
| 2.80 | 545.70 | 548.50 | Shaley Mosaic Limestone | | ak, cs, es | Y | 2.80 | 805 |
| 3.00 | 548.50 | 551.50 | Nodular Limestone | | ak, cs, es | Y | 3.00 | 906 |
| 11.20 | 551.50 | 562.70 | Dark Gray Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 0.80 | 562.70 | 563.50 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 0.80 | 422 |
| 2.50 | 563.50 | 566.00 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.50 | 566.00 | 568.50 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.50 | 806 |
| 2.60 | 568.50 | 571.10 | Shaley Layered Limestone | | ak, cs, es | Y | 2.60 | 802 |
| 2.30 | 571.10 | 573.40 | Green Claystone w/Limestone Nods | | ak, cv, ev | | 0.00 | 247 |
| 1.30 | 573.40 | 574.70 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.30 | 574.70 | 575.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.80 | 575.00 | 575.80 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 2.00 | 575.80 | 577.80 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.90 | 577.80 | 580.70 | Shaley Layered Limestone | | ak, cs, es | Y | 2.90 | 802 |
| 1.60 | 580.70 | 582.30 | Shaley Mosaic Limestone | | ak, cs, es | Y | 1.60 | 805 |
| 1.90 | 582.30 | 584.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 7.20 | 584.20 | 591.40 | Shaley Nodular Limestone | | ak, cs, es | Y | 7.20 | 806 |
| 4.80 | 591.40 | 596.20 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.90 | 596.20 | 600.10 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 0.50 | 600.10 | 600.60 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| 0.90 | 600.60 | 601.50 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 5.15 | 601.50 | 606.65 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 0.30 | 606.65 | 606.95 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 1.60 | 606.95 | 608.55 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.70 | 608.55 | 610.25 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.40 | 610.25 | 612.65 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 2.50 | 612.65 | 615.15 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 4.10 | 615.15 | 619.25 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 4.10 | 422 |
| 10.40 | AEC-2008-06 619.25 | 629.65 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 329 |
| 0.70 | 629.65 | 630.35 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 0.90 | 630.35 | 631.25 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.90 | 806 |

9:44 AM 3/18/2008

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 5.30 | 631.25 | 636.55 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 6.60 | 636.55 | 643.15 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 6.60 | 322 |
| | Total Depth | 643.15 | | | | | 177.70 | |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 177.70

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 28%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 177.70 | 28% |
| Soft Rock: | 465.45 | 72% |
| | 643.15 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 130.10 | 1.81 | 56.55 |
| Coal | 4.68 | 4.73 | 148.00 |
| Bottom, 10 ft. | 210.40 | 1.85 | 57.65 |

Field Engineer: Jon Murray
Surface Elevation: 848.862 ATTACHMENT 13
Drill Hole Coordinates (State Plane 1983 NA Datum)
Northing: 690477.27 AEC - 2008-07
Easting: 2408890.88
Drilling Company: West Virginia Resources, Inc.



Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 7.00 | 0.00 | 7.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 7.70 | 7.00 | 14.70 | Shaley Layered Limestone | | ak, cs, es | Y | 7.70 | 802 |
| 5.60 | 14.70 | 20.30 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.30 | 20.30 | 22.60 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 3.20 | 22.60 | 25.80 | Core Loss | | | | 0.00 | 4 |
| 2.20 | 25.80 | 28.00 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.60 | 28.00 | 30.60 | Shaley Layered Limestone | | ak, cs, es | Y | 2.60 | 802 |
| 3.50 | 30.60 | 34.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.20 | 34.10 | 37.30 | Green Claystone | | cv, ev | | 0.00 | 147 |
| 2.00 | 37.30 | 39.30 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.00 | 39.30 | 41.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.60 | 41.30 | 44.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.20 | 44.90 | 46.10 | Shaley Layered Limestone | | ak, cs, es | Y | 1.20 | 802 |
| 1.10 | 46.10 | 47.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.70 | 47.20 | 50.90 | Shaley Layered Limestone | | ak, cs, es | Y | 3.70 | 802 |
| 2.00 | 50.90 | 52.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.40 | 52.90 | 54.30 | Shaley Layered Limestone | | ak, cs, es | Y | 1.40 | 802 |
| 1.10 | 54.30 | 55.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 4.20 | 55.40 | 59.60 | Shaley Layered Limestone | | ak, cs, es | Y | 4.20 | 802 |
| 2.80 | 59.60 | 62.40 | Green Claystone | | cv, ev | | 0.00 | 147 |
| 1.70 | 62.40 | 64.10 | Shaley Layered Limestone | | ak, cs, es | Y | 1.70 | 802 |
| 5.00 | 64.10 | 69.10 | Mosaic Limestone | | ak, cs, es | Y | 5.00 | 905 |
| 1.90 | 69.10 | 71.00 | Shaley Layered Limestone | | ak, cs, es | Y | 1.90 | 802 |
| 1.20 | 71.00 | 72.20 | Shaley Mosaic Limestone | | ak, cs, es | Y | 1.20 | 805 |
| 2.30 | 72.20 | 74.50 | Shaley Layered Limestone | | ak, cs, es | Y | 2.30 | 802 |
| 1.40 | 74.50 | 75.90 | Green Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 244 |
| 1.40 | 75.90 | 77.30 | Black Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 214 |
| 2.10 | 77.30 | 79.40 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.70 | 79.40 | 81.10 | Black Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 214 |
| 5.00 | 81.10 | 86.10 | Shaley Layered Limestone | | ak, cs, es | Y | 5.00 | 802 |
| 2.40 | 86.10 | 88.50 | Black Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 214 |
| 3.50 | 88.50 | 92.00 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 2.40 | 92.00 | 94.40 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 1.70 | 94.40 | 96.10 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.60 | 96.10 | 98.70 | Shaley Layered Limestone | | ak, cs, es | Y | 2.60 | 802 |
| 3.10 | 98.70 | 101.80 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.10 | 806 |
| 1.50 | 101.80 | 103.30 | Dark Gray Shale and Interbedded Sandstone | Y | cm, em | | 0.00 | 322 |
| 14.80 | 103.30 | 118.10 | Gray Sandstone w/ Shale Streaks | Y | cs, es | Y | 14.80 | 543 |
| 4.00 | 118.10 | 122.10 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.00 | 122.10 | 123.10 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 0.40 | 123.10 | 123.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.60 | 123.50 | 124.10 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 0.90 | 124.10 | 125.00 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 8.60 | 125.00 | 133.60 | Shaley Mosaic Limestone | | ak, cs, es | Y | 8.60 | 805 |
| 6.00 | 133.60 | 139.60 | Shaley Nodular Limestone | | ak, cs, es | Y | 6.00 | 806 |
| 2.20 | 139.60 | 141.80 | Nodular Limestone | | ak, cs, es | Y | 2.20 | 906 |
| 1.90 | 141.80 | 143.70 | Shaley Layered Limestone | | ak, cs, es | Y | 1.90 | 802 |
| 0.80 | 143.70 | 144.50 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.70 | 144.50 | 146.20 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.70 | 806 |
| 8.20 | 146.20 | 154.40 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 4.00 | 154.40 | 158.40 | Shaley Nodular Limestone | | ak, cs, es | Y | 4.00 | 806 |
| 2.00 | 158.40 | 160.40 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 0.50 | 160.40 | 160.90 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 1.00 | 160.90 | 161.90 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 2.00 | 161.90 | 163.90 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 8.70 | 163.90 | 172.60 | Shaley Layered Limestone | | ak, cs, es | Y | 8.70 | 802 |
| 3.20 | 172.60 | 175.80 | Nodular Limestone | | ak, cs, es | Y | 3.20 | 906 |
| 4.20 | 175.80 | 180.00 | Shaley Layered Limestone | | ak, cs, es | Y | 4.20 | 802 |
| 4.70 | 180.00 | 184.70 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 0.80 | 184.70 | 185.50 | Black/ Brown Churned Shale | | cm, em | | 0.00 | 175 |
| 0.70 | 185.50 | 186.20 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 0.20 | 186.20 | 186.40 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 1.10 | 186.40 | 187.50 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 0.80 | 187.50 | 188.30 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 6.00 | 188.30 | 194.30 | **Coal, Common Banded** | | ac, cm, em | | 0.00 | 21 |
| 2.20 | 194.30 | 196.50 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.60 | 196.50 | 199.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.90 | 199.10 | 205.00 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 10.40 | 205.00 | 215.40 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 3.00 | 215.40 | 218.40 | Red/ Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 353 |
| 1.80 | 218.40 | 220.20 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 1.90 | 220.20 | 222.10 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 5.80 | 222.10 | 227.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.00 | 227.90 | 232.90 | Red/ Gray Shale w/ Sandstone Streaks and Limestone Nods | | ak, cm, em | | 0.00 | 455 |
| 13.00 | 232.90 | 245.90 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| | Total Depth | 245.90 | | | | | 98.90 | |

AEC-2008-07.WB 9:46 AM 3/19/2008

AEC - 2008-07

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **98.90**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **40%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 98.90 | 40% |
| Soft Rock: | 147.00 | 60% |
| | 245.90 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 366.24 | 1.76 | 55.09 |
| Coal | 8.14 | 4.74 | 148.00 |
| Bottom, 10 ft. | 264.50 | 2.74 | 85.40 |

Field Engineer: Jon Murray
Surface Elevation: 1291.226 ATTACHMENT 13
Drill Hole Coordinates (State Plane 1983 NA Datum)
Northing: 687910.651 AEC - 2008-08
Easting: 2396655.896
Drilling Company: McKee Drilling



Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 21.00 | 0.00 | 21.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 4.00 | 21.00 | 25.00 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 7.30 | 25.00 | 32.30 | Light Gray Green Churned Sandy Shale w/ Limestone Nods | Y | ak, cm, em | | 0.00 | 435 |
| 16.50 | 32.30 | 48.80 | Light Gray/Green Shale w/Sandstone Streaks | Y | cm, em | | 0.00 | 333 |
| 26.70 | 48.80 | 75.50 | Gray Sandstone w/ Shale Streaks | Y | cs, es | Y | 26.70 | 543 |
| 5.00 | 75.50 | 80.50 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 2.10 | 80.50 | 82.60 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.50 | 82.60 | 83.10 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| 1.60 | 83.10 | 84.70 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 5.30 | 84.70 | 90.00 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 7.40 | 90.00 | 97.40 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 5.30 | 97.40 | 102.70 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.00 | 102.70 | 105.70 | Light Gray/ Green Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 3.00 | 432 |
| 4.00 | 105.70 | 109.70 | Light Gray/Green Shale w/Sandstone Streaks | | cm, em | | 0.00 | 333 |
| 3.50 | 109.70 | 113.20 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 8.10 | 113.20 | 121.30 | Red Claystone | | cv, ev | | 0.00 | 167 |
| 6.40 | 121.30 | 127.70 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 3.30 | 127.70 | 131.00 | Light Gray/Green Massive Churned Sandy Shale | | cm, em | | 0.00 | 335 |
| 1.70 | 131.00 | 132.70 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 11.00 | 132.70 | 143.70 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 7.70 | 143.70 | 151.40 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 7.50 | 151.40 | 158.90 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.90 | 158.90 | 162.80 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 2.60 | 162.80 | 165.40 | Shaley Layered Limestone | | ak, cs, es | Y | 2.60 | 802 |
| 1.20 | 165.40 | 166.60 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.20 | 806 |
| 2.60 | 166.60 | 169.20 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 8.00 | 169.20 | 177.20 | Red Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 265 |
| 20.20 | 177.20 | 197.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible]20 | 197.40 | 204.60 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| [illegible]80 | 204.60 | 218.40 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| [illegible]40 | 218.40 | 222.80 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| [illegible].30 | 222.80 | 237.10 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| [illegible].60 | 237.10 | 238.70 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.30 | 238.70 | 239.00 | Bone with Coal Layers | | ac, cm, em | | 0.00 | 32 |
| 0.90 | 239.00 | 239.90 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 5.60 | 239.90 | 245.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.20 | 245.50 | 247.70 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.00 | 247.70 | 251.70 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 8.50 | 251.70 | 260.20 | Gray Crossbedded Sandstone | | cs, es | Y | 8.50 | 541 |
| 5.80 | 260.20 | 266.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.70 | 266.00 | 266.70 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 2.50 | 266.70 | 269.20 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 1.00 | 269.20 | 270.20 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 0.90 | 270.20 | 271.10 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 8.80 | 271.10 | 279.90 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.60 | 279.90 | 282.50 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 31.20 | 282.50 | 313.70 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 7.60 | 313.70 | 321.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.20 | 321.30 | 323.50 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.80 | 323.50 | 324.30 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| 3.20 | 324.30 | 327.50 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 7.80 | 327.50 | 335.30 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.30 | 335.30 | 337.60 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.60 | 337.60 | 340.20 | Light Gray/ Green Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 2.60 | 432 |
| 2.40 | 340.20 | 342.60 | Light Gray Massive Sandstone with Limestone Nodules | | ak, cm, em | | 0.00 | 640 |
| 15.40 | 342.60 | 358.00 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 9.90 | 358.00 | 367.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 0.70 | 367.90 | 368.60 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 0.40 | 368.60 | 369.00 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 3.30 | 369.00 | 372.30 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 16.20 | 372.30 | 388.50 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 2.80 | 388.50 | 391.30 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.40 | 391.30 | 393.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.40 | 806 |
| 6.10 | 393.70 | 399.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 1.70 | 399.80 | 401.50 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.70 | 806 |
| 5.00 | 401.50 | 406.50 | Shaley Layered Limestone | | ak, cs, es | Y | 5.00 | 802 |
| [illegible]00 | 406.50 | 409.50 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| [illegible]0 | 409.50 | 412.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| [illegible]70 | 412.20 | 427.90 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| [illegible]0 | 427.90 | 431.50 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| [illegible]00 | 431.50 | 437.50 | Shaley Layered Limestone | | ak, cs, es | Y | 6.00 | 802 |
| 6.40 | 437.50 | 443.90 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.60 | 443.90 | 446.50 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.80 | 446.50 | 448.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.80 | 806 |
| 3.00 | 448.30 | 451.30 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.50 | 451.30 | 455.80 | Nodular Limestone | | ak, cs, es | Y | 4.50 | 806 |
| 14.90 | 455.80 | 470.70 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata ATTACHMENT 13 | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Page No. 2 of Ferm |
|---|---|---|---|---|---|---|---|---|
| 5.10 | 470.70 | 475.80 | Mosaic Limestone | | ak, cs, es | Y | 5.10 | 905 |
| 11.30 | 475.80 | 487.10 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 3.90 | 487.10 | 501.00 | Shaley Layered Limestone | | ak, cs, es | Y | 13.90 | 802 |
| 3.10 | 501.00 | 504.10 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 4.60 | 504.10 | 508.70 | Nodular Limestone | | ak, cs, es | Y | 4.60 | 906 |
| 8.50 | 508.70 | 517.20 | Light Gray/ Green Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 8.50 | 432 |
| 3.90 | 517.20 | 521.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.30 | 521.10 | 526.40 | Shaley Nodular Limestone | | ak, cs, es | Y | 5.30 | 806 |
| 4.40 | 526.40 | 530.80 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.50 | 530.80 | 532.30 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 0.50 | 532.30 | 532.80 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 2.00 | 532.80 | 534.80 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 0.90 | 534.80 | 535.70 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 4.10 | 535.70 | 539.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 7.20 | 539.80 | 547.00 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 7.20 | 422 |
| 8.00 | 547.00 | 555.00 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.60 | 555.00 | 558.60 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | ak, cm, em | Y | 3.60 | 422 |
| 3.90 | 558.60 | 562.50 | Black Shale w/ Sandstone Streaks | | ac, cm, em | | 0.00 | 313 |
| 0.90 | 562.50 | 563.40 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 1.00 | 563.40 | 564.40 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 0.20 | 564.40 | 564.60 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 0.30 | 564.60 | 564.90 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.20 | 564.90 | 565.10 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 0.40 | 565.10 | 565.50 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 1.00 | 565.50 | 566.50 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 6.50 | 566.50 | 573.00 | Shaley Layered Limestone | | ak, cs, es | Y | 6.50 | 802 |
| 8.40 | 573.00 | 581.40 | Shaley Nodular Limestone | | ak, cs, es | Y | 8.40 | 806 |
| 3.50 | 581.40 | 584.90 | Shaley Layered Limestone | | ak, cs, es | Y | 3.50 | 802 |
| 6.50 | 584.90 | 591.40 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.60 | 591.40 | 594.00 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.80 | 594.00 | 599.80 | Shaley Nodular Limestone | | ak, cs, es | Y | 5.80 | 806 |
| 3.10 | 599.80 | 602.90 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 4.40 | 602.90 | 607.30 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 7.10 | 607.30 | 614.40 | Shaley Layered Limestone | | ak, cs, es | Y | 7.10 | 802 |
| 4.30 | 614.40 | 618.70 | Shaley Nodular Limestone | | ak, cs, es | Y | 4.30 | 806 |
| 3.70 | 618.70 | 622.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 2.40 | 622.40 | 624.80 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 1.00 | 624.80 | 625.80 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 1.40 | 625.80 | 627.20 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.50 | 627.20 | 627.70 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| 1.30 | 627.70 | 629.00 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 1.00 | 629.00 | 630.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 5.35 | 630.00 | 635.35 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 1.70 | 635.35 | 637.05 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.50 | 637.05 | 637.55 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.50 | 806 |
| 4.00 | 637.55 | 641.55 | Light Gray/Green Massive Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 425 |
| 4.40 | 641.55 | 645.95 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.00 | 645.95 | 646.95 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 1.00 | 646.95 | 647.95 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 1.00 | 322 |
| 27.90 | 647.95 | 675.85 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| | Total Depth | 675.85 | | | | | 151.30 | |

AEC - 2008-08

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 151.30

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 22%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 151.30 | 22% |
| Soft Rock: | 524.55 | 78% |
| | 675.85 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 204.63 | 2.26 | 70.59 |
| Coal | 2.38 | 5.06 | 158.00 |
| Bottom, 10 ft. | 165.30 | 2.64 | 82.50 |

Field Engineer: Jon Murray
Surface Elevation: 1267.05 ATTACHMENT 13
Drill Hole Coordinates (State Plane 1983 NA Datum)
Northing: 694711.62 AEC - 2008-09
Easting: 2409079.00
Drilling Company: West Virginia Resources, Inc.



Ferm to Strata

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 15.00 | 0.00 | 15.00 | Casing or Surface Material | | | | 0.00 | 001 |
| 0.60 | 15.00 | 15.60 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 1.60 | 15.60 | 17.20 | Sandstone | Y | cs, es | Y | 1.60 | 540 |
| 4.60 | 17.20 | 21.80 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 1.00 | 21.80 | 22.80 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 14.40 | 22.80 | 37.20 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 2.10 | 37.20 | 39.30 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 5.10 | 39.30 | 44.40 | Light Gray Green Massive Shale | Y | cm, em | | 0.00 | 135 |
| 3.30 | 44.40 | 47.70 | Light Gray/Green Massive Churned Sandy Shale | Y | cm, em | | 0.00 | 335 |
| 5.50 | 47.70 | 53.20 | Gray Sandstone w/ Shale Streaks | Y | cs, es | Y | 5.50 | 543 |
| 10.00 | 53.20 | 63.20 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 2.00 | 63.20 | 65.20 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.80 | 65.20 | 67.00 | Dark Gray Fireclay | | cv, ev | | 0.00 | 127 |
| 3.70 | 67.00 | 70.70 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 0.90 | 70.70 | 71.60 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 0.60 | 71.60 | 72.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.20 | 72.20 | 74.40 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.80 | 74.40 | 77.20 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 3.40 | 77.20 | 80.60 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 13.70 | 80.60 | 94.30 | Light Gray Green Churned Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 435 |
| 7.00 | 94.30 | 101.30 | Light Gray Green Shale w/ SS Stks and Limestone Nods | | ak, cm, em | | 0.00 | 433 |
| 2.00 | 101.30 | 103.30 | Light Gray Green Massive Shale | | cm, em | | 0.00 | 135 |
| 7.00 | 103.30 | 110.30 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 4.40 | 110.30 | 114.70 | Red & Green Claystone | | cv, ev | | 0.00 | 157 |
| 10.00 | 114.70 | 124.70 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 11.70 | 124.70 | 136.40 | Red/ Gray Shale with Sandstone Streaks | | cm, em | | 0.00 | 353 |
| 4.70 | 136.40 | 141.10 | Red Shale | | cm, em | | 0.00 | 164 |
| 8.80 | 141.10 | 149.90 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 4.00 | 149.90 | 153.90 | Red Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 265 |
| 7.90 | 153.90 | 161.80 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 8.80 | 161.80 | 170.60 | Red Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 265 |
| 4.60 | 170.60 | 175.20 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 7.00 | 175.20 | 182.20 | Gray Crossbedded Sandstone | | cs, es | Y | 7.00 | 541 |
| 18.30 | 182.20 | 200.50 | Red & Green Churned Shale | | cm, em | | 0.00 | 155 |
| 2.20 | 200.50 | 202.70 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.70 | 202.70 | 203.40 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.70 | 806 |
| 3.20 | 203.40 | 206.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.20 | 206.60 | 208.80 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.50 | 208.80 | 211.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.50 | 806 |
| 4.30 | 211.30 | 215.60 | Red Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 265 |
| 5.20 | 215.60 | 220.80 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.20 | 220.80 | 222.00 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 2.40 | 222.00 | 224.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 14.70 | 224.40 | 239.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.50 | 239.10 | 241.60 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 5.40 | 241.60 | 247.00 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.40 | 247.00 | 251.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 5.00 | 251.40 | 256.40 | Dark Gray Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 227 |
| 0.60 | 256.40 | 257.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.70 | 257.00 | 257.70 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 0.80 | 257.70 | 258.50 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 3.10 | 258.50 | 261.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.00 | 261.60 | 262.60 | Black Shale w/ Sandstone Streaks | | ac, cm, em | | 0.00 | 313 |
| 0.90 | 262.60 | 263.50 | Black Sandstone with Shale Streaks | | ac, cm, em | | 0.00 | 513 |
| 0.70 | 263.50 | 264.20 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 6.10 | 264.20 | 270.30 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 8.20 | 270.30 | 278.50 | Light Gray Green Sandy Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 434 |
| 7.20 | 278.50 | 285.70 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 7.20 | 322 |
| 16.00 | 285.70 | 301.70 | Gray Sandstone w/ Shale Streaks | | cs, es | Y | 16.00 | 543 |
| 7.70 | 301.70 | 309.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.70 | 309.40 | 312.10 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.60 | 312.10 | 312.70 | Black/ Brown Churned Shale | | ac, cm, em | | 0.00 | 175 |
| 0.60 | 312.70 | 313.30 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 1.40 | 313.30 | 314.70 | Coal with Bone Streaks | | ac, cm, em | | 0.00 | 23 |
| 2.90 | 314.70 | 317.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 6.60 | 317.60 | 324.20 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 22.30 | 324.20 | 346.50 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 5.90 | 346.50 | 352.40 | Gray Sandstone w/ Shale Streaks | | cs, es | Y | 5.90 | 543 |
| 4.20 | 352.40 | 356.60 | Dark Gray Massive Sandy Shale | | cm, em | | 0.00 | 324 |
| 8.60 | 356.60 | 365.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 3.00 | 365.20 | 368.20 | Black Massive Shale | | ac, cm, em | | 0.00 | 115 |
| 1.60 | 368.20 | 369.80 | Black/ Tan Layered Shale | | ac, cm, em | | 0.00 | 172 |
| 16.90 | 369.80 | 386.70 | Dark Gray Shale w/ Sandstone Streaks | | cm, em | | 0.00 | 323 |
| 0.90 | 386.70 | 387.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.50 | 387.60 | 388.10 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 0.70 | 388.10 | 388.80 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 1.50 | 388.80 | 390.30 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata ATTACHMENT 13 AEC - 2008-09 | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| 3.80 | 390.30 | 394.10 | Nodular Limestone | | ak, cs, es | Y | 3.80 | 906 |
| 6.70 | 394.10 | 400.80 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| .50 | 400.80 | 404.30 | Shaley Mosaic Limestone | | ak, cs, es | Y | 3.50 | 805 |
| .30 | 404.30 | 409.60 | Shaley Layered Limestone | | ak, cs, es | Y | 5.30 | 802 |
| .60 | 409.60 | 411.20 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.60 | 806 |
| 3.40 | 411.20 | 414.60 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 4.10 | 414.60 | 418.70 | Shaley Layered Limestone | | ak, cs, es | Y | 4.10 | 802 |
| 9.60 | 418.70 | 428.30 | Red & Green Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 255 |
| 1.90 | 428.30 | 430.20 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.90 | 806 |
| 3.00 | 430.20 | 433.20 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 1.00 | 433.20 | 434.20 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.00 | 806 |
| 7.60 | 434.20 | 441.80 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.60 | 441.80 | 443.40 | Shaley Layered Limestone | | ak, cs, es | Y | 1.60 | 802 |
| 1.60 | 443.40 | 445.00 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.60 | 806 |
| 4.10 | 445.00 | 449.10 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.60 | 449.10 | 451.70 | Shaley Layered Limestone | | ak, cs, es | Y | 2.60 | 802 |
| 2.70 | 451.70 | 454.40 | Nodular Limestone | | ak, cs, es | Y | 2.70 | 906 |
| 3.50 | 454.40 | 457.90 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 2.70 | 457.90 | 460.60 | Shaley Layered Limestone | | ak, cs, es | Y | 2.70 | 802 |
| 3.00 | 460.60 | 463.60 | Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 245 |
| 4.00 | 463.60 | 467.60 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 4.10 | 467.60 | 471.70 | Nodular Limestone | | ak, cs, es | Y | 4.10 | 906 |
| 4.70 | 471.70 | 476.40 | Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 245 |
| 19.80 | 476.40 | 496.20 | Shaley Layered Limestone | | ak, cs, es | Y | 19.80 | 802 |
| 2.80 | 496.20 | 499.00 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.00 | 499.00 | 501.00 | Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 245 |
| 2.80 | 501.00 | 503.80 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.80 | 806 |
| 3.60 | 503.80 | 507.40 | Nodular Limestone | | ak, cs, es | Y | 3.60 | 906 |
| 6.20 | 507.40 | 513.60 | Shaley Layered Limestone | | ak, cs, es | Y | 6.20 | 802 |
| 7.80 | 513.60 | 521.40 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 5.50 | 521.40 | 526.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 5.50 | 806 |
| 2.60 | 526.90 | 529.50 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.10 | 529.50 | 531.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.30 | 531.60 | 531.90 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 1.80 | 531.90 | 533.70 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 0.30 | 533.70 | 534.00 | Coal with Shale Layers | | ac, cm, em | | 0.00 | 27 |
| 0.80 | 534.00 | 534.80 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 1.10 | 534.80 | 535.90 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 4.00 | 535.90 | 539.90 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 1.00 | 539.90 | 540.90 | Shaley Nodular Limestone | | ak, cs, es | Y | 1.00 | 806 |
| .30 | 540.90 | 542.20 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| .80 | 542.20 | 552.00 | Dark Gray Shale and Interbedded Sandstone | | cm, em | Y | 9.80 | 322 |
| 4.40 | 552.00 | 556.40 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| 1.00 | 556.40 | 557.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.80 | 557.40 | 560.20 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 0.70 | 560.20 | 560.90 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 1.00 | 560.90 | 561.90 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 9.90 | 561.90 | 571.80 | Shaley Nodular Limestone | | ak, cs, es | Y | 9.90 | 806 |
| 3.50 | 571.80 | 575.30 | Shaley Layered Limestone | | ak, cs, es | Y | 3.50 | 802 |
| 1.10 | 575.30 | 576.40 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 4.10 | 576.40 | 580.50 | Nodular Limestone | | ak, cs, es | Y | 4.10 | 906 |
| 3.50 | 580.50 | 584.00 | Layered Limestone | | ak, cs, es | Y | 3.50 | 902 |
| 8.40 | 584.00 | 592.40 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 2.60 | 592.40 | 595.00 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.60 | 806 |
| 1.70 | 595.00 | 596.70 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 0.60 | 596.70 | 597.30 | Black Shale | | ac, cm, em | | 0.00 | 114 |
| 0.40 | 597.30 | 597.70 | Bone with Coal Layers | | ac, cm, em | | 0.00 | 32 |
| 0.20 | 597.70 | 597.90 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 | 113 |
| 1.10 | 597.90 | 599.00 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 2.10 | 599.00 | 601.10 | Dark Gray Massive Churned Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 225 |
| 2.00 | 601.10 | 603.10 | Shaley Nodular Limestone | | ak, cs, es | Y | 2.00 | 806 |
| 5.70 | 603.10 | 608.80 | Dark Gray Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 224 |
| 0.60 | 608.80 | 609.40 | Shaley Layered Limestone | | ak, cs, es | Y | 0.60 | 802 |
| 3.90 | 609.40 | 613.30 | Shaley Nodular Limestone | | ak, cs, es | Y | 3.90 | 806 |
| 4.10 | 613.30 | 617.40 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 0.70 | 617.40 | 618.10 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 1.40 | 618.10 | 619.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 | 137 |
| 1.90 | 619.50 | 621.40 | Black/ Tan Layered Shale | | ac, cm, em | | 0.00 | 172 |
| 0.50 | 621.40 | 621.90 | Black/ Brown Churned Shale | | ac, cm, em | | 0.00 | 175 |
| 0.60 | 621.90 | 622.50 | Coal with Shale Streaks | | ac, cm, em | | 0.00 | 28 |
| 1.10 | 622.50 | 623.60 | Dark Gray Massive Shale | | cm, em | | 0.00 | 125 |
| 6.00 | 623.60 | 629.60 | Coal, Common Banded | | ac, cm, em | | 0.00 | 21 |
| 0.90 | 629.60 | 630.50 | Dark Gray Shale | | cm, em | | 0.00 | 124 |
| 3.70 | 630.50 | 634.20 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 | 235 |
| 1.50 | 634.20 | 635.70 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 | 237 |
| 1.30 | 635.70 | 637.00 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 | 234 |
| 7.60 | 637.00 | 644.60 | Dark Gray Layered Sandy Shale w/ Limestone Nods | | cm, em | | 0.00 | 423 |
| | Total Depth | 644.60 | | | | | 161.70 | |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata ATTACHMENT 13 | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | Ferm |
|---|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | **AEC - 2008-09** | | | | **161.70** | |
| **ss and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **25%** | |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 161.70 | 25% |
| Soft Rock: | 482.90 | 75% |
| | 644.60 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|
| Roof, 10 ft. | 30.47 | 2.02 | 63.14 |
| Coal | 4.90 | 3.68 | 115.00 |
| Bottom, 10 ft. | 181.95 | 1.96 | 61.10 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-04

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,245
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 684,270
**Easting:** 2,427,520
**Drilling Company:** Kerogen Resources, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing | | | | 0.00 |
| 0.30 | 16.00 | 16.30 | Limestone, shaley, nodular | yes | ak, cs, es | y | 0.30 |
| 0.60 | 16.30 | 16.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 16.90 | 17.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 3.10 | 17.40 | 20.50 | Claystone, gy | yes | cv, ev | | 0.00 |
| 1.90 | 20.50 | 22.40 | Shale, gy | yes | cm, em | | 0.00 |
| 0.65 | 22.40 | 23.05 | Claystone, gy | | cv, ev | | 0.00 |
| 2.55 | 23.05 | 25.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 1.25 | 25.60 | 26.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 26.85 | 28.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.90 | 28.80 | 31.70 | Shale, red/ gy/ gn, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 31.70 | 33.00 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 33.00 | 35.50 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 35.50 | 36.60 | Shale, gn, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 4.50 | 36.60 | 41.10 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 41.10 | 44.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.00 | 44.00 | 51.00 | Sandstone, gy, sh stks | | cs, es | | 0.00 |
| 2.90 | 51.00 | 53.90 | Shale, gy, sandy, massive | | ak, cs, es | | 0.00 |
| 2.40 | 53.90 | 56.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.75 | 56.30 | 59.05 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 4.25 | 59.05 | 63.30 | Claystone, red | | cv, ev | | 0.00 |
| 1.80 | 63.30 | 65.10 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 2.80 | 65.10 | 67.90 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 67.90 | 70.90 | Claystone, gn, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 4.85 | 70.90 | 75.75 | Shale, gy, sandy, massive, ls nods | | ak, cs, es | | 0.00 |
| 0.35 | 75.75 | 76.10 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 4.25 | 76.10 | 80.35 | Shale, gy, sandy, massive, ls nods | | ak, cs, es | | 0.00 |
| 1.45 | 80.35 | 81.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 81.80 | 84.50 | Shale,gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 84.50 | 85.25 | Shale, red, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 85.25 | 86.40 | Shale, red/ gy/ gn, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 86.40 | 88.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 88.20 | 89.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 89.65 | 90.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 90.20 | 94.30 | Shale, red, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 94.30 | 96.75 | Shale, red | | cm, em | | 0.00 |
| 3.80 | 96.75 | 100.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 100.55 | 100.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 1.15 | 100.90 | 102.05 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 0.95 | 102.05 | 103.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 0.60 | 103.00 | 103.60 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 103.60 | 105.40 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 105.40 | 106.80 | Shale, red | | cm, em | | 0.00 |
| 1.10 | 106.80 | 107.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 107.90 | 108.40 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 3.85 | 108.40 | 112.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 112.25 | 113.00 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 7.10 | 113.00 | 120.10 | Claystone, red | | cv, ev | | 0.00 |
| 0.50 | 120.10 | 120.60 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 2.85 | 120.60 | 123.45 | Sandstone, gy, massive, ls nods | | ak, cs, es | y | 2.85 |
| 1.90 | 123.45 | 125.35 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 125.35 | 126.10 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 126.10 | 127.45 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 127.45 | 128.75 | Shale, gy, sandy, massive, ls nods | | ak, cs, es | | 0.00 |
| 0.60 | 128.75 | 129.35 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 129.35 | 131.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 131.10 | 131.90 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 131.90 | 133.10 | Shale, gn | | cm, em | | 0.00 |
| 2.55 | 133.10 | 135.65 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 1.95 | 135.65 | 137.60 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 137.60 | 139.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 139.50 | 140.80 | Claystone, red | | cv, ev | | 0.00 |
| 1.00 | 140.80 | 141.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.10 | 141.80 | 142.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 142.90 | 145.40 | Shale, gy, sandy, massive | | ak, cs, es | | 0.00 |
| 1.90 | 145.40 | 147.30 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 0.20 | 147.30 | 147.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.20 |
| 3.35 | 147.50 | 150.85 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 150.85 | 151.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.20 | 151.70 | 152.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 152.90 | 155.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.90 |
| 3.05 | 155.80 | 158.85 | Limestone, massive | | ak, cs, es | y | 3.05 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.55 | 158.85 | 159.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.90 | 159.40 | 164.30 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.45 | 164.30 | 164.75 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 164.75 | 165.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 165.40 | 166.25 | Shale, red | | cm, em | | 0.00 |
| 1.35 | 166.25 | 167.60 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 6.70 | 167.60 | 174.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 174.30 | 174.90 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.80 | 174.90 | 176.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 176.70 | 177.05 | Sandstone, gy, massive | | cs, es | y | 0.35 |
| 2.15 | 177.05 | 179.20 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.90 | 179.20 | 180.10 | Sandstone, gy, xbed | | cs, es | | 0.00 |
| 2.25 | 180.10 | 182.35 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.30 | 182.35 | 183.65 | Sandstone, gy, sh stks, ls nods | | ak, cs, es | | 0.00 |
| 1.75 | 183.65 | 185.40 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 6.85 | 185.40 | 192.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.25 | 192.25 | 196.50 | Limestone, shaley, nodular | | ak, cs, es | y | 4.25 |
| 0.50 | 196.50 | 197.00 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 4.15 | 197.00 | 201.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.55 | 201.15 | 205.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 205.70 | 209.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.23 | 209.50 | 209.73 | **Coal w/ sh layers, Washington No.12** | | ac, cv, ev | | 0.00 |
| 0.19 | 209.73 | 209.92 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 209.92 | 209.98 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.08 | 209.98 | 210.06 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.04 | 210.06 | 210.10 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 210.10 | 210.38 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.37 | 210.38 | 210.75 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.39 | 210.75 | 211.14 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.85 | 211.14 | 211.99 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.26 | 211.99 | 212.25 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.21 | 212.25 | 212.46 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.29 | 212.46 | 212.75 | **Shale, dk gy** | | ac, cm, em | | 0.00 |
| 0.28 | 212.75 | 213.03 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 213.03 | 213.06 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.64 | 213.06 | 213.70 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 213.70 | 213.74 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 28.96 | 213.74 | 242.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 242.70 | 243.90 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 4.45 | 243.90 | 248.35 | Sandstone, gy, xbed | | cs, es | y | 4.45 |
| 0.40 | 248.35 | 248.75 | Sandstone, gy, sh stks | | cs, es | y | 0.40 |
| 1.40 | 248.75 | 250.15 | Sandstone, gy, sh stks, ls nods | | ak, cs, es | y | 1.40 |
| 2.95 | 250.15 | 253.10 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 0.45 | 253.10 | 253.55 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 1.85 | 253.55 | 255.40 | Shale, gy, ss stks, ls nods | | ak, cs, es | y | 1.85 |
| 2.55 | 255.40 | 257.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.11 | 257.95 | 258.06 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.73 | 258.06 | 258.79 | **Coal w/ bone stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.12 | 258.79 | 258.91 | **Bone w/ coal stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 258.91 | 259.05 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 259.05 | 259.16 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.21 | 259.16 | 259.37 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.30 | 259.37 | 259.67 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.61 | 259.67 | 260.28 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 260.28 | 260.36 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.33 | 260.36 | 260.69 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.21 | 260.69 | 260.90 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 260.90 | 261.06 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.33 | 261.06 | 261.39 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 261.39 | 261.50 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.50 | 261.50 | 262.00 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.89 | 262.00 | 262.89 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 262.89 | 263.05 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.75 | 263.05 | 263.80 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.34 | 263.80 | 264.14 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.09 | 264.14 | 264.23 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.67 | 264.23 | 264.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.47 | 264.90 | 265.37 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.53 | 265.37 | 265.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 7.20 | 265.90 | 273.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.20 | 273.10 | 279.30 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 279.30 | 280.00 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.95 | 280.00 | 280.95 | Sandstone, gy, sh stks, ls nods | | ak, cs, es | y | 0.95 |
| 1.30 | 280.95 | 282.25 | Shale, gy, ss layers, ls nods | | ak, cs, es | | 0.00 |
| 1.05 | 282.25 | 283.30 | Sandstone, gy, sh stks | | cs, es | y | 1.05 |
| 0.90 | 283.30 | 284.20 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 2.80 | 284.20 | 287.00 | Sandstone, gy, massive | | cs, es | y | 2.80 |
| 2.15 | 287.00 | 289.15 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 289.15 | 290.70 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 2.65 | 290.70 | 293.35 | Sandstone, gy, sh stks | | cs, es | y | 2.65 |
| 2.20 | 293.35 | 295.55 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 1.40 | 295.55 | 296.95 | Shale, gy, ss stks | | cs, es | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.80 | 296.95 | 299.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 299.75 | 300.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 2.55 | 300.05 | 302.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.80 | 302.60 | 305.40 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.35 | 305.40 | 305.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.59 | 305.75 | 306.34 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.10 | 306.34 | 306.44 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.21 | 306.44 | 306.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 306.65 | 307.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.30 | 307.20 | 309.50 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 3.40 | 309.50 | 312.90 | Shale, gy, ss layers, ls nods | | ak, cs, es | | 0.00 |
| 2.20 | 312.90 | 315.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 315.10 | 315.30 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 0.90 | 315.30 | 316.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 316.20 | 316.80 | Shale, dk gy, ss layers | | cs, es | | 0.00 |
| 2.45 | 316.80 | 319.25 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 1.00 | 319.25 | 320.25 | Shale, dk gy | | cm, em | | 0.00 |
| 6.00 | 320.25 | 326.25 | Shale, dk gy, ss layers | | cs, es | | 0.00 |
| 2.10 | 326.25 | 328.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.19 | 328.35 | 328.54 | **Bone w/ coat layers, Waynesburg No.11** | | ac, cv, ev | | 0.00 |
| 0.10 | 328.54 | 328.64 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 328.64 | 328.72 | Shale, dk gy | | cm, em | | 0.00 |
| 2.18 | 328.72 | 330.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 330.90 | 333.60 | Limestone, nodular | | ak, cs, es | y | 2.70 |
| 4.20 | 333.60 | 337.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 337.80 | 339.10 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 1.90 | 339.10 | 341.00 | Limestone, mosaic | | ak, cs, es | y | 1.90 |
| 2.55 | 341.00 | 343.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 343.55 | 344.75 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 5.35 | 344.75 | 350.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 350.10 | 351.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 1.45 | 351.20 | 352.65 | Limestone, nodular | | ak, cs, es | y | 1.45 |
| 0.80 | 352.65 | 353.45 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 353.45 | 354.05 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 354.05 | 354.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 354.40 | 354.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 354.90 | 356.50 | Claystone, gy | | cv, ev | | 0.00 |
| 1.60 | 356.50 | 358.10 | Sandstone, gy, massive | | cs, es | y | 1.60 |
| 1.10 | 358.10 | 359.20 | Sandstone, gy, sh stks | | cs, es | y | 1.10 |
| 0.90 | 359.20 | 360.10 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.85 | 360.10 | 360.95 | Sandstone, gy, sh stks | | cs, es | y | 0.85 |
| 1.65 | 360.95 | 362.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 362.60 | 363.00 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 1.45 | 363.00 | 364.45 | Shale, red | | cm, em | | 0.00 |
| 0.50 | 364.45 | 364.95 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 0.45 | 364.95 | 365.40 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 0.90 | 365.40 | 366.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 366.30 | 367.45 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 4.05 | 367.45 | 371.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 371.50 | 372.60 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 2.60 | 372.60 | 375.20 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 375.20 | 377.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 377.30 | 379.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 1.90 | 379.60 | 381.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 381.50 | 382.20 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 2.35 | 382.20 | 384.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.35 | 384.55 | 387.90 | Limestone, nodular | | ak, cs, es | y | 3.35 |
| 1.80 | 387.90 | 389.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 0.95 | 389.70 | 390.65 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 1.75 | 390.65 | 392.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 392.40 | 393.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.60 | 393.30 | 393.90 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 1.50 | 393.90 | 395.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 395.40 | 397.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 8.70 | 397.10 | 405.80 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 2.15 | 405.80 | 407.95 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 0.45 | 407.95 | 408.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 408.40 | 409.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.50 | 409.10 | 410.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 410.60 | 412.50 | Limestone, shaley, nodular | | ak, cs, es | | 0.00 |
| 1.95 | 412.50 | 414.45 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 414.45 | 415.50 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 4.50 | 415.50 | 420.00 | Limestone, shaley, nodular | | ak, cs, es | y | 4.50 |
| 2.40 | 420.00 | 422.40 | Limestone, massive | | ak, cs, es | y | 2.40 |
| 10.50 | 422.40 | 432.90 | Limestone, shaley, nodular | | ak, cs, es | y | 10.50 |
| 3.60 | 432.90 | 436.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.80 | 436.50 | 442.30 | Limestone, massive | | ak, cs, es | y | 5.80 |
| 2.00 | 442.30 | 444.30 | Limestone, sh layers | | ak, cs, es | y | 2.00 |
| 1.15 | 444.30 | 445.45 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 0.90 | 445.45 | 446.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 446.35 | 448.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 0.95 | 448.05 | 449.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |

## DIAMOND DRILL HOLE:CLC-2002-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.10 | 449.00 | 450.10 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 2.70 | 450.10 | 452.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 2.50 | 452.80 | 455.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 455.30 | 456.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 0.95 | 456.00 | 456.95 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.21 | 456.95 | 457.16 | **Shale, blk, coal stks, Sewickley No.9** | | ac, cm, em | | 0.00 |
| 0.18 | 457.16 | 457.34 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 0.20 | 457.34 | 457.54 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 457.54 | 457.58 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.06 | 457.58 | 457.64 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 2.31 | 457.64 | 459.95 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.80 | 459.95 | 466.75 | Shale, dk gy | | cm, em | | 0.00 |
| 4.75 | 466.75 | 471.50 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 3.10 | 471.50 | 474.60 | Sandstone, gy, sh stks | | cs, es | y | 3.10 |
| 1.80 | 474.60 | 476.40 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 11.40 | 476.40 | 487.80 | Sandstone, gy, sh stks | | cs, es | y | 11.40 |
| 0.95 | 487.80 | 488.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.09 | 488.75 | 488.84 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.56 | 488.84 | 489.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.47 | 489.40 | 490.87 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 1.23 | 490.87 | 492.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.16 | 492.10 | 492.26 | **Coal w/ bone stks, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.08 | 492.26 | 492.34 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.47 | 492.34 | 492.81 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 492.81 | 492.85 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.03 | 492.85 | 492.88 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.05 | 492.88 | 492.93 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.10 | 492.93 | 493.03 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.11 | 493.03 | 493.14 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 493.14 | 493.19 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.19 | 493.19 | 493.38 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.46 | 493.38 | 493.84 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.38 | 493.84 | 494.22 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.78 | 494.22 | 495.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 495.00 | 495.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.10 | 495.70 | 496.80 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 0.80 | 496.80 | 497.60 | Limestone, mosaic | | ak, cs, es | y | 0.80 |
| 0.50 | 497.60 | 498.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 1.45 | 498.10 | 499.55 | Limestone, mosaic | | ak, cs, es | y | 1.45 |
| 0.60 | 499.55 | 500.15 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 1.00 | 500.15 | 501.15 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 2.35 | 501.15 | 503.50 | Limestone, shaley, nodular | | ak, cs, es | y | 2.35 |
| 1.55 | 503.50 | 505.05 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 3.10 | 505.05 | 508.15 | Limestone, mosaic | | ak, cs, es | y | 3.10 |
| 2.35 | 508.15 | 510.50 | Limestone, massive | | ak, cs, es | y | 2.35 |
| 0.95 | 510.50 | 511.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 1.20 | 511.45 | 512.65 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 512.65 | 514.10 | Limestone, sh layers | | ak, cs, es | y | 1.45 |
| 0.70 | 514.10 | 514.80 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 514.80 | 515.80 | Shale, gn, ss stks | | cs, es | | 0.00 |
| 1.60 | 515.80 | 517.40 | Sandstone, gy, xbed | | cs, es | y | 1.60 |
| 2.80 | 517.40 | 520.20 | Sandstone, gy, sh stks | | cs, es | y | 2.80 |
| 0.85 | 520.20 | 521.05 | Shale, dk gy, ss layers | | cs, es | | 0.00 |
| 1.30 | 521.05 | 522.35 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| 3.10 | 522.35 | 525.45 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 1.90 | 525.45 | 527.35 | Limestone, nodular | | ak, cs, es | y | 1.90 |
| 2.25 | 527.35 | 529.60 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 529.60 | 530.35 | Claystone, bwn/ blk | | ac, cv, ev | | 0.00 |
| 0.52 | 530.35 | 530.87 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.33 | 530.87 | 531.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 531.20 | 531.55 | Claystone, gy | | cv, ev | | 0.00 |
| 1.74 | 531.55 | 533.29 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 533.29 | 533.94 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.40 | 533.94 | 534.34 | Sandstone, gy, xbed | | cs, es | y | 0.40 |
| 0.90 | 534.34 | 535.24 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 535.24 | 536.94 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 0.70 | 536.94 | 537.64 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 537.64 | 541.64 | Limestone, massive | | ak, cs, es | y | 4.00 |
| 0.40 | 541.64 | 542.04 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 542.04 | 542.54 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 0.30 | 542.54 | 542.84 | Claystone, gn | | cv, ev | | 0.00 |
| 0.45 | 542.84 | 543.29 | Claystone, gy | | cv, ev | | 0.00 |
| 0.65 | 543.29 | 543.94 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.50 | 543.94 | 549.44 | Limestone, massive | | ak, cs, es | y | 5.50 |
| 0.65 | 549.44 | 550.09 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 550.09 | 551.14 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 1.90 | 551.14 | 553.04 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 553.04 | 554.04 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.10 | 554.04 | 555.14 | Claystone, gn | | cv, ev | | 0.00 |
| 0.65 | 555.14 | 555.79 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 555.79 | 556.24 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 556.24 | 556.79 | Claystone, bwn/ blk, layered | | ac, cv, ev | | 0.00 |

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ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.90 | 556.79 | 557.69 | Claystone, bwn/ blk, churned | | ac, cv, ev | | 0.00 |
| 0.30 | 557.69 | 557.99 | Claystone, bwn/ blk, layered | | ac, cv, ev | | 0.00 |
| 0.08 | 557.99 | 558.07 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.31 | 558.07 | 558.38 | **Coal, bone stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.03 | 558.38 | 558.41 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.40 | 558.41 | 558.81 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 558.81 | 558.96 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.09 | 558.96 | 559.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 559.05 | 559.80 | Claystone, gy | | cv, ev | | 0.00 |
| 0.04 | 559.80 | 559.84 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.25 | 559.84 | 561.09 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.73 | 561.09 | 561.82 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.37 | 561.82 | 562.19 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.20 | 562.19 | 563.39 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 563.39 | 563.42 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.16 | 563.42 | 564.58 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.34 | 564.58 | 564.92 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.26 | 564.92 | 565.18 | Shale, dk gy | | cm, em | | 0.00 |
| 4.00 | 565.18 | 569.18 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.50 | 569.18 | 574.68 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 574.95 | | | | | 158.55 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 158.55

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 28%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 158.55 | 28% |
| Soft Rock: | 416.40 | 72% |
| | 574.95 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 265.82 | 2.19 | 1.59 | 68.5 | -197.1 |
| Coal | 8.73 | 6.00 | 3.16 | 188.00 | 179.0 |
| Bottom, 10 ft. | 71.00 | 2.03 | 1.58 | 63.40 | -7.6 |

ATTACHMENT 13

## DIAMOND DRILL HOLE:CLC-2002-11

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,230
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 670130
**Easting:** 2426610
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 32.00 | Casing | | | | 0.00 |
| 2.90 | 32.00 | 34.90 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 34.90 | 35.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.80 | 35.10 | 35.90 | Shale, dk gy | | cm, em | | 0.00 |
| 2.50 | 35.90 | 38.40 | Claystone, red/ gy | yes | cv, ev | | 0.00 |
| 2.90 | 38.40 | 41.30 | Shale, gy | | cm, em | | 0.00 |
| 1.15 | 41.30 | 42.45 | Shale, gy, ss stks | yes | cm, em | | 0.00 |
| 1.40 | 42.45 | 43.85 | Sandstone, gy, sh stks | yes | cs,es | y | 1.40 |
| 0.30 | 43.85 | 44.15 | Shale, gy | | cm, em | | 0.00 |
| 1.35 | 44.15 | 45.50 | Sandstone, gy, sh stks | | cs,es | y | 1.35 |
| 2.60 | 45.50 | 48.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.25 | 48.10 | 48.35 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 48.35 | 48.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 48.75 | 49.20 | Sandstone, gy, sh stks | | cs,es | y | 0.45 |
| 0.65 | 49.20 | 49.85 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 49.85 | 50.30 | Claystone, red | | cv, ev | | 0.00 |
| 0.35 | 50.30 | 50.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 50.65 | 51.00 | Claystone, red | | cv, ev | | 0.00 |
| 2.40 | 51.00 | 53.40 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.40 | 53.40 | 55.80 | Claystone, gy | | cv, ev | | 0.00 |
| 4.35 | 55.80 | 60.15 | Shale, gy, sandy, massive | | cm, em | | 0.00 |
| 2.55 | 60.15 | 62.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 62.70 | 62.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 62.95 | 63.30 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.40 | 63.30 | 65.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 65.70 | 69.00 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.45 | 69.00 | 76.45 | Claystone, red | | cv, ev | | 0.00 |
| 1.90 | 76.45 | 78.35 | core loss | | | | 0.00 |
| 0.55 | 78.35 | 78.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.50 | 78.90 | 80.40 | Claystone, red | | cv, ev | | 0.00 |
| 1.50 | 80.40 | 81.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.60 | 81.90 | 86.50 | Shale, gy, ss layers | | cm, em | | 0.00 |
| 1.40 | 86.50 | 87.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.90 | 87.90 | 88.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.10 | 88.80 | 91.90 | Claystone, red | | cv, ev | | 0.00 |
| 0.50 | 91.90 | 92.40 | Limestone, shaley | | ak, cs, es | y | 0.50 |
| 0.70 | 92.40 | 93.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.15 | 93.10 | 100.25 | Claystone, red | | cv, ev | | 0.00 |
| 4.75 | 100.25 | 105.00 | Shale, gy, sandy, massive, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 105.00 | 105.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 105.50 | 105.60 | Claystone, red | | cv, ev | | 0.00 |
| 2.05 | 105.60 | 107.65 | Shale, dk gy | | cm, em | | 0.00 |
| 1.15 | 107.65 | 108.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.10 | 108.80 | 111.90 | Shale, gy, sandy, massive, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 111.90 | 112.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.25 | 112.90 | 113.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.15 | 113.15 | 114.30 | Shale, gy | | cm, em | | 0.00 |
| 0.65 | 114.30 | 114.95 | Shale, gy, sandy, massive | | cm, em | | 0.00 |
| 2.75 | 114.95 | 117.70 | Sandstone, gy, sh stks | | cs,es | y | 2.75 |
| 1.50 | 117.70 | 119.20 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.65 | 119.20 | 119.85 | Shale, gy | | cm, em | | 0.00 |
| 0.65 | 119.85 | 120.50 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.30 | 120.50 | 120.80 | Shale, gy | | cm, em | | 0.00 |
| 2.70 | 120.80 | 123.50 | Shale, red | | cm, em | | 0.00 |
| 1.00 | 123.50 | 124.50 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 124.50 | 126.20 | Shale, red/ gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-11

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.50 | 126.20 | 128.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 128.70 | 131.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 131.25 | 131.50 | Limestone, shaley | | ak, cs, es | y | 0.25 |
| 3.20 | 131.50 | 134.70 | Shale, dk gy | | cm, em | | 0.00 |
| 11.40 | 134.70 | 146.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 146.10 | 149.20 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 149.20 | 149.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.75 | 149.75 | 154.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 5.00 | 154.50 | 159.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 159.50 | 162.00 | Shale, gy, sandy, massive, ls nods | | ak, cm, em | | 0.00 |
| 7.30 | 162.00 | 169.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 169.30 | 172.60 | Sandstone, gy, massive, ls nods | | cs,es | y | 3.30 |
| 5.90 | 172.60 | 178.50 | Sandstone, gy, sh stks | | cs,es | y | 5.90 |
| 4.15 | 178.50 | 182.65 | Sandstone, gy, crossbedded | | cs,es | y | 4.15 |
| 1.70 | 182.65 | 184.35 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.15 | 184.35 | 185.50 | Shale, gy | | cm, em | | 0.00 |
| 1.30 | 185.50 | 186.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 186.80 | 187.50 | Shale, gy, ls layers | | ak, cm, em | | 0.00 |
| 0.70 | 187.50 | 188.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 188.20 | 190.90 | Shale, gy | | cm, em | | 0.00 |
| 5.20 | 190.90 | 196.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 196.10 | 196.65 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 5.05 | 196.65 | 201.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 201.70 | 202.30 | Shale, gy | | cm, em | | 0.00 |
| 7.10 | 202.30 | 209.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 209.40 | 209.85 | Shale, dk gy | | cm, em | | 0.00 |
| 1.35 | 209.85 | 211.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.60 | 211.20 | 213.80 | Shale, gy | | cm, em | | 0.00 |
| 2.70 | 213.80 | 216.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 216.50 | 217.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.15 | 217.95 | 220.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 220.10 | 221.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.40 | 221.50 | 228.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 228.90 | 231.50 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 231.50 | 232.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.10 | 232.90 | 235.00 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 235.00 | 236.00 | Shale, dk gy | | cm, em | | 0.00 |
| 5.90 | 236.00 | 241.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.90 | 241.90 | 242.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.27 | 242.80 | 243.07 | **Coal w/ sh layers, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.41 | 243.07 | 243.48 | **Bone w/ coal stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 243.48 | 243.76 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.32 | 243.76 | 244.08 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.19 | 244.08 | 244.27 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.32 | 244.27 | 244.59 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.31 | 244.59 | 244.90 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.07 | 244.90 | 244.97 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.05 | 244.97 | 245.02 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.44 | 245.02 | 245.46 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.53 | 245.46 | 245.99 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 245.99 | 246.01 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.32 | 246.01 | 246.33 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.97 | 246.33 | 247.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.90 | 247.30 | 252.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 252.20 | 252.40 | Limestone | | ak, cs, es | y | 0.20 |
| 5.40 | 252.40 | 257.80 | Shale, gy | | cm, em | | 0.00 |
| 4.30 | 257.80 | 262.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 262.10 | 264.50 | Shale, gy, sandy, massive, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 264.50 | 265.80 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 265.80 | 266.10 | Sandstone, gy, sh stks | | cm, em | y | 0.30 |
| 1.15 | 266.10 | 267.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 267.25 | 271.60 | Sandstone, gy, sh stks | | cs,es | y | 4.35 |
| 30.00 | 271.60 | 301.60 | Sandstone, gy, crossbedded | | cs,es | y | 30.00 |
| 1.35 | 301.60 | 302.95 | Sandstone, gy massive | | cs,es | y | 1.35 |
| 2.00 | 302.95 | 304.95 | Sandstone, gy, sh stks | | cs,es | y | 2.00 |
| 0.95 | 304.95 | 305.90 | Shale, gy | | cm, em | | 0.00 |
| 0.52 | 305.90 | 306.42 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.24 | 306.42 | 307.66 | Shale, blk | | ac, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-11

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.60 | 307.66 | 308.26 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.23 | 308.26 | 308.49 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.06 | 308.49 | 308.55 | **Coal w/ pyrite, WAYNESBURG "A"** | | ac, cm, em | | 0.00 |
| 0.37 | 308.55 | 308.92 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 308.92 | 309.04 | **Claystone, gy** | | cv, ev | | 0.00 |
| 0.54 | 309.04 | 309.58 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.45 | 309.58 | 310.03 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.03 | 310.03 | 310.06 | Shale, dk gy | | cm, em | | 0.00 |
| 0.22 | 310.06 | 310.28 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.42 | 310.28 | 310.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.42 |
| 0.60 | 310.70 | 311.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 311.30 | 311.40 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.50 | 311.40 | 311.90 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 311.90 | 313.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 1.25 | 313.60 | 314.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.30 | 314.85 | 315.15 | Shale, dk gy, ls layers | | ak, cm, em | | 0.00 |
| 0.70 | 315.15 | 315.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 315.85 | 316.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 7.00 | 316.30 | 323.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 323.30 | 323.90 | Sandstone, gy, massive | | cs,es | y | 0.60 |
| 4.10 | 323.90 | 328.00 | Sandstone, gy, sh stks | | cs,es | y | 4.10 |
| 0.65 | 328.00 | 328.65 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.70 | 328.65 | 331.35 | Shale, gy | | cm, em | | 0.00 |
| 2.45 | 331.35 | 333.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 333.80 | 335.70 | Limestone, nodular | | ak, cs, es | y | 1.90 |
| 5.80 | 335.70 | 341.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 341.50 | 343.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 343.00 | 344.55 | Shale, dk gy | | cm, em | | 0.00 |
| 2.20 | 344.55 | 346.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.20 |
| 3.75 | 346.75 | 350.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 350.50 | 350.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 350.90 | 351.45 | Claystone, bwn/ blk, churned | | cv, ev | | 0.00 |
| 0.45 | 351.45 | 351.90 | Claystone, blk | | cv, ev | | 0.00 |
| 0.75 | 351.90 | 352.65 | Claystone, bwn/ blk, layered | | cv, ev | | 0.00 |
| 0.50 | 352.65 | 353.15 | Claystone, bwn/ blk, churned | | cv, ev | | 0.00 |
| 0.37 | 353.15 | 353.52 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.38 | 353.52 | 353.90 | **Coal w/ pyrite, WAYNESBURG No.11** | | cm, em | | 0.00 |
| 1.95 | 353.90 | 355.85 | Shale, dk gy | | cm, em | | 0.00 |
| 2.80 | 355.85 | 358.65 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.80 |
| 0.90 | 358.65 | 359.55 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 359.55 | 360.85 | Shale, gy, sandy, massive | | cm, em | | 0.00 |
| 0.35 | 360.85 | 361.20 | Sandstone, gy massive | | cs,es | y | 0.35 |
| 1.65 | 361.20 | 362.85 | Shale, gy, sandy, massive | | cm, em | | 0.00 |
| 1.85 | 362.85 | 364.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.05 | 364.70 | 368.75 | Sandstone, gy, sh stks | | cs,es | y | 4.05 |
| 5.07 | 368.75 | 373.82 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.28 | 373.82 | 374.10 | **Coal w/ sh layers, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 1.35 | 374.10 | 375.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 375.45 | 376.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 7.15 | 376.50 | 383.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 383.65 | 384.75 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 1.35 | 384.75 | 386.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 386.10 | 386.60 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 0.90 | 386.60 | 387.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.95 | 387.50 | 388.45 | Limestone, shaley, mosaic | | ak, cs, es | y | 0.95 |
| 0.85 | 388.45 | 389.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 389.30 | 390.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.85 | 390.35 | 391.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 391.20 | 391.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 1.70 | 391.50 | 393.20 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 1.30 | 393.20 | 394.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 394.50 | 395.80 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 395.80 | 397.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 4.30 | 397.00 | 401.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 401.30 | 401.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.40 | 401.70 | 403.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 403.10 | 404.70 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.90 | 404.70 | 405.60 | Shale, gy/ dk gy, layered | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-11

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.95 | 405.60 | 407.55 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 407.55 | 409.10 | Shale, gn, ss stks | | cm, em | | 0.00 |
| 3.90 | 409.10 | 413.00 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 413.00 | 414.20 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.40 | 414.20 | 414.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 414.60 | 415.25 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.60 | 415.25 | 415.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 1.10 | 415.85 | 416.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.65 | 416.95 | 417.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.50 | 417.60 | 419.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 419.10 | 421.10 | Limestone, nodular | | ak, cs, es | y | 2.00 |
| 1.30 | 421.10 | 422.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 422.40 | 423.05 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 423.05 | 423.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 0.30 | 423.80 | 424.10 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 5.10 | 424.10 | 429.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 429.20 | 429.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 1.70 | 429.80 | 431.50 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 1.95 | 431.50 | 433.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 433.45 | 434.35 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 2.35 | 434.35 | 436.70 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.35 |
| 0.50 | 436.70 | 437.20 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 2.55 | 437.20 | 439.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 1.45 | 439.75 | 441.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.05 | 441.20 | 445.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 445.25 | 446.35 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 446.35 | 447.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 447.10 | 448.70 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 448.70 | 450.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 450.50 | 450.90 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 450.90 | 451.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 451.60 | 453.15 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 3.20 | 453.15 | 456.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 456.35 | 457.50 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 1.50 | 457.50 | 459.00 | Limestone, shaley, massive | | ak, cs, es | y | 1.50 |
| 1.85 | 459.00 | 460.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 460.85 | 461.15 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 0.80 | 461.15 | 461.95 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 461.95 | 464.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 464.05 | 464.50 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 464.50 | 465.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 465.20 | 465.85 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 465.85 | 467.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 2.40 | 467.60 | 470.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.95 | 470.00 | 472.95 | Limestone, sh layers | | ak, cs, es | y | 2.95 |
| 2.20 | 472.95 | 475.15 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.20 |
| 2.25 | 475.15 | 477.40 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 1.35 | 477.40 | 478.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 478.75 | 479.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 1.45 | 479.90 | 481.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 481.35 | 482.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 2.30 | 482.90 | 485.20 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 6.00 | 485.20 | 491.20 | Limestone, massive | | ak, cs, es | y | 6.00 |
| 1.90 | 491.20 | 493.10 | Limestone, sh layers | | ak, cs, es | y | 1.90 |
| 4.05 | 493.10 | 497.15 | Limestone, shaley, sh layers | | ak, cs, es | y | 4.05 |
| 4.45 | 497.15 | 501.60 | Limestone, shaley, nodular | | ak, cs, es | y | 4.45 |
| 2.00 | 501.60 | 503.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 503.60 | 506.40 | Limestone, nodular | | ak, cs, es | y | 2.80 |
| 3.90 | 506.40 | 510.30 | Limestone, shaley, nodular | | ak, cs, es | y | 3.90 |
| 1.55 | 510.30 | 511.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 511.85 | 514.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.32 | 514.60 | 515.92 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.19 | 515.92 | 516.11 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.57 | 516.11 | 516.68 | **Coal w/ bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.16 | 516.68 | 516.84 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.15 | 516.84 | 516.99 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 3.16 | 516.99 | 520.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 7.60 | 520.15 | 527.75 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-11

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.60 | 527.75 | 528.35 | Sandstone, gy, sh stks | | cs,es | y | 0.60 |
| 5.70 | 528.35 | 534.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 534.05 | 536.40 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 9.75 | 536.40 | 546.15 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 546.15 | 547.20 | Sandstone, gy, sh stks | | cs,es | y | 1.05 |
| 3.32 | 547.20 | 550.52 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.21 | 550.52 | 550.73 | **Coal w/ bone stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.06 | 550.73 | 550.79 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.45 | 550.79 | 551.24 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 551.24 | 551.27 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.15 | 551.27 | 551.42 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 551.42 | 551.46 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.20 | 551.46 | 551.66 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.09 | 551.66 | 551.75 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.25 | 551.75 | 552.00 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.28 | 552.00 | 552.28 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.12 | 552.28 | 552.40 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.19 | 552.40 | 552.59 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.07 | 552.59 | 552.66 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.54 | 552.66 | 553.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 553.20 | 553.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 553.70 | 556.55 | Limestone, nodular | | ak, cs, es | y | 2.85 |
| 0.40 | 556.55 | 556.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 556.95 | 557.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 4.60 | 557.50 | 562.10 | Limestone, nodular | | ak, cs, es | y | 4.60 |
| 2.50 | 562.10 | 564.60 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.50 |
| 2.40 | 564.60 | 567.00 | Limestone, mosaic | | ak, cs, es | y | 2.40 |
| 1.10 | 567.00 | 568.10 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 1.70 | 568.10 | 569.80 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.70 |
| 0.35 | 569.80 | 570.15 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 570.15 | 572.00 | Limestone, nodular | | ak, cs, es | y | 1.85 |
| 1.00 | 572.00 | 573.00 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 573.00 | 574.20 | Sandstone, gy, sh stks | | cs,es | y | 1.20 |
| 7.50 | 574.20 | 581.70 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 581.70 | 584.85 | Shale, dk gy, ls layers | | ak, cm, em | | 0.00 |
| 1.85 | 584.85 | 586.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 0.90 | 586.70 | 587.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 587.60 | 588.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.78 | 588.30 | 590.08 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.98 | 590.08 | 591.06 | **Coal w/ bone stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.24 | 591.06 | 591.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.90 | 591.30 | 593.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 593.20 | 594.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 1.70 | 594.60 | 596.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 596.30 | 599.10 | Limestone, nodular | | ak, cs, es | y | 2.80 |
| 2.40 | 599.10 | 601.50 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 2.60 | 601.50 | 604.10 | Limestone, massive | | ak, cs, es | y | 2.60 |
| 0.85 | 604.10 | 604.95 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.05 | 604.95 | 606.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 5.05 | 606.00 | 611.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 611.05 | 611.90 | Claystone, bwn/ blk, layered | | cv, ev | | 0.00 |
| 0.55 | 611.90 | 612.45 | Claystone, bwn/ blk, churned | | cv, ev | | 0.00 |
| 0.25 | 612.45 | 612.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.10 | 612.70 | 612.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 612.80 | 612.95 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.05 | 612.95 | 613.00 | **Coal w/ sh layers, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.04 | 613.00 | 613.04 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.11 | 613.04 | 613.15 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.45 | 613.15 | 613.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 613.60 | 613.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.14 | 613.70 | 613.84 | Shale, dk gy | | cm, em | | 0.00 |
| 0.24 | 613.84 | 614.08 | **Coal w/ bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.24 | 614.08 | 614.32 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.41 | 614.32 | 614.73 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.74 | 614.73 | 615.47 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 615.47 | 615.51 | **Shale, dk gy** | | cm, em | | 0.00 |
| 2.47 | 615.51 | 617.98 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 617.98 | 618.00 | **Shale, dk gy** | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-11

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.83 | 618.00 | 618.83 | Coal | | ac, cv, ev | | 0.00 |
| 0.36 | 618.83 | 619.19 | Coal w/ bone stks | | ac, cv, ev | | 0.00 |
| 0.05 | 619.19 | 619.24 | Pyrite | | ac, cs, es | | 0.00 |
| 0.91 | 619.24 | 620.15 | Shale, dk gy | | cm, em | | 0.00 |
| 1.35 | 620.15 | 621.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 621.50 | 623.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.25 | 623.65 | 626.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 626.90 | 627.55 | Sandstone, gy, sh stks | | cs,es | y | 0.65 |
| 0.65 | 627.55 | 628.20 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 628.20 | 628.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 628.80 | 629.35 | Claystone, bwn/ blk, churned | | cv, ev | | 0.00 |
| | Total Depth | 629.35 | | | | | 172.32 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **172.32**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **27%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 172.32 | 27% |
| Soft Rock: | 457.03 | 73% |
| | 629.35 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 206.00 | 1.27 | 1.11 | 39.7 | -166.0 |
| Coal | 7.22 | 5.17 | 2.38 | 162.00 | 154.0 |
| Bottom, 10 ft. | 38.70 | 2.90 | 2.46 | 90.60 | 51.9 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-36

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1175
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 669020
**Easting:** 2412900
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 18.00 | 0.00 | 18.00 | Casing | | | | 0.00 |
| 1.85 | 18.00 | 19.85 | Sandstone, gy, sh stks | Yes | cs, es | y | 1.85 |
| 0.85 | 19.85 | 20.70 | Sandstone, gy, massive | | cs, es | y | 0.85 |
| 2.65 | 20.70 | 23.35 | Sandstone, gy, sh stks | Yes | cs, es | y | 2.65 |
| 3.15 | 23.35 | 26.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 26.50 | 28.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 28.40 | 31.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.70 | 31.65 | 32.35 | Claystone, red | | cv, ev | | 0.00 |
| 1.20 | 32.35 | 33.55 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.45 | 33.55 | 37.00 | Claystone, red | | cv, ev | | 0.00 |
| 0.45 | 37.00 | 37.45 | Claystone, gy | | cv, ev | | 0.00 |
| 5.70 | 37.45 | 43.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 43.15 | 44.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 44.60 | 46.85 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.90 | 46.85 | 48.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.25 | 48.75 | 51.00 | Claystone, red | | cv, ev | | 0.00 |
| 0.30 | 51.00 | 51.30 | Claystone, gy | | cv, ev | | 0.00 |
| 3.35 | 51.30 | 54.65 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.75 | 54.65 | 57.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 57.40 | 60.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.52 | 60.80 | 61.32 | Shale, dk gy | | cm, em | | 0.00 |
| 0.29 | 61.32 | 61.61 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.04 | 61.61 | 61.65 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.45 | 61.65 | 62.10 | Claystone, gy | | cv, ev | | 0.00 |
| 2.95 | 62.10 | 65.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 65.05 | 65.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 65.50 | 69.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 69.70 | 70.05 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 9.10 | 70.05 | 79.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 79.15 | 80.20 | Sandstone, gy, sh stks | | cs, es | y | 1.05 |
| 4.30 | 80.20 | 84.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 84.50 | 85.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.24 | 85.55 | 86.79 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.73 | 86.79 | 87.52 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.14 | 87.52 | 87.66 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.23 | 87.66 | 88.89 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 5.11 | 88.89 | 94.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.20 | 94.00 | 96.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.45 | 96.20 | 100.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 35.90 | 100.65 | 136.55 | Sandstone, gy, sh stks | | cs, es | y | 35.90 |
| 6.35 | 136.55 | 142.90 | Sandstone, gy, crossbeds | | cs, es | y | 6.35 |
| 1.60 | 142.90 | 144.50 | Sandstone, gy, sh stks | | cs, es | y | 1.60 |
| 1.40 | 144.50 | 145.90 | Sandstone, gy, crossbeds | | cs, es | y | 1.40 |
| 12.05 | 145.90 | 157.95 | Sandstone, gy, sh stks | | cs, es | y | 12.05 |
| 0.45 | 157.95 | 158.40 | Sandstone, gy, massive | | cs, es | y | 0.45 |
| 11.15 | 158.40 | 169.55 | Sandstone, gy, sh stks | | cs, es | y | 11.15 |
| 1.37 | 169.55 | 170.92 | Sandstone, gy, coal spars | | cs, es | y | 1.37 |
| 0.59 | 170.92 | 171.51 | **Coal, bone stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.08 | 171.51 | 171.59 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.44 | 171.59 | 172.03 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.17 | 172.03 | 172.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 172.20 | 173.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 173.50 | 174.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 5.25 | 174.50 | 179.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.25 | 179.75 | 186.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.30 | 186.00 | 190.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 190.30 | 191.15 | Shale, gy | | cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-36

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.20 | 191.15 | 192.35 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.25 | 192.35 | 193.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 193.60 | 195.30 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.80 | 195.30 | 199.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.10 | 199.10 | 200.20 | Limestone, massive | | ak, cs, es | y | 1.10 |
| 0.20 | 200.20 | 200.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 200.40 | 201.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.60 | 201.30 | 201.90 | Shale, dk gy | | cm, em | | 0.00 |
| 6.51 | 201.90 | 208.41 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 208.41 | 208.86 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.94 | 208.86 | 209.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.94 |
| 2.15 | 209.80 | 211.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 211.95 | 212.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.25 | 212.45 | 213.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 213.70 | 215.10 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.14 | 215.10 | 215.24 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.86 | 215.24 | 218.10 | Shale, dk gy | | cm, em | | 0.00 |
| 5.15 | 218.10 | 223.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 223.25 | 224.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 224.50 | 228.60 | Sandstone, gy, sh stks | | cs, es | y | 4.10 |
| 4.20 | 228.60 | 232.80 | Sandstone, gy, crossbeds | | cs, es | y | 4.20 |
| 3.50 | 232.80 | 236.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.24 | 236.30 | 237.54 | Shale, dk gy | | cm, em | | 0.00 |
| 0.42 | 237.54 | 237.96 | **Coal, bone stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.20 | 237.96 | 238.16 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 238.16 | 238.30 | Shale, dk gy | | cm, em | | 0.00 |
| 5.20 | 238.30 | 243.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 243.50 | 243.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.00 | 243.90 | 244.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 244.90 | 247.25 | Limestone, nodular | | ak, cs, es | y | 2.35 |
| 0.40 | 247.25 | 247.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 247.65 | 248.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.55 | 248.70 | 249.25 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 0.85 | 249.25 | 250.10 | Limestone, mosaic | | ak, cs, es | y | 0.85 |
| 2.10 | 250.10 | 252.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 252.20 | 253.70 | Limestone, shaley, layered | | ak, cs, es | y | 1.50 |
| 0.85 | 253.70 | 254.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 254.55 | 255.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 1.35 | 255.10 | 256.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 256.45 | 257.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 257.60 | 258.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 258.40 | 259.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.35 | 259.10 | 260.45 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 260.45 | 260.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 260.95 | 261.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.90 | 261.60 | 263.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 263.50 | 264.50 | Limestone, massive | | ak, cs, es | y | 1.00 |
| 1.05 | 264.50 | 265.55 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 265.55 | 266.25 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.85 | 266.25 | 267.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 267.10 | 267.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 267.90 | 268.95 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.90 | 268.95 | 272.85 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.10 | 272.85 | 274.95 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.85 | 274.95 | 277.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 277.80 | 278.45 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.40 | 278.45 | 281.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 281.85 | 285.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 285.65 | 288.00 | Sandstone, gy, sh stks | | cs, es | y | 2.35 |
| 3.60 | 288.00 | 291.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 291.60 | 292.65 | Limestone, shaley, massive | | ak, cs, es | y | 1.05 |
| 1.15 | 292.65 | 293.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.30 | 293.80 | 301.10 | Limestone, shaley, layered | | ak, cs, es | y | 7.30 |
| 1.05 | 301.10 | 302.15 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 1.20 | 302.15 | 303.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 303.35 | 304.00 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 304.00 | 305.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 305.90 | 307.50 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-36

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 5.05 | 307.50 | 312.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 312.55 | 312.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 312.95 | 313.25 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 2.75 | 313.25 | 316.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 316.00 | 317.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 317.50 | 320.25 | Limestone, shaley, nodular | | ak, cs, es | y | 2.75 |
| 2.10 | 320.25 | 322.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 322.35 | 325.35 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 325.35 | 325.80 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 325.80 | 330.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 330.40 | 332.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 8.70 | 332.25 | 340.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 340.95 | 341.55 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 3.25 | 341.55 | 344.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.30 | 344.80 | 350.10 | Limestone, nodular | | ak, cs, es | y | 5.30 |
| 1.65 | 350.10 | 351.75 | Limestone, layered | | ak, cs, es | y | 1.65 |
| 3.05 | 351.75 | 354.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 354.80 | 355.90 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 355.90 | 358.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 1.50 | 358.00 | 359.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 359.50 | 360.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 9.50 | 360.05 | 369.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 369.55 | 371.50 | Shale, breccia | | cm, em | | 0.00 |
| 1.80 | 371.50 | 373.30 | Shale, dk gy | | cm, em | | 0.00 |
| 4.00 | 373.30 | 377.30 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 377.30 | 378.75 | Sandstone, gy, sh stks | | cs, es | y | 1.45 |
| 6.60 | 378.75 | 385.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 385.35 | 387.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.65 | 387.25 | 391.90 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.00 | 391.90 | 394.90 | Sandstone, gy, sh stks | | cs, es | y | 3.00 |
| 1.20 | 394.90 | 396.10 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.28 | 396.10 | 403.38 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.52 | 403.38 | 403.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 403.90 | 404.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.06 | 404.00 | 404.06 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.07 | 404.06 | 404.13 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.67 | 404.13 | 404.80 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.04 | 404.80 | 404.84 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.17 | 404.84 | 405.01 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.08 | 405.01 | 405.09 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.98 | 405.09 | 406.07 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.37 | 406.07 | 406.44 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.52 | 406.44 | 406.96 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 406.96 | 407.02 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.38 | 407.02 | 407.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 407.40 | 408.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 408.00 | 411.20 | Limestone, shaley, nodular | | ak, cs, es | y | 3.20 |
| 3.55 | 411.20 | 414.75 | Limestone, shaley, layered | | ak, cs, es | y | 3.55 |
| 2.55 | 414.75 | 417.30 | Limestone, massive | | ak, cs, es | y | 2.55 |
| 0.40 | 417.30 | 417.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 417.70 | 420.00 | Limestone, shaley, layered | | ak, cs, es | y | 2.30 |
| 2.80 | 420.00 | 422.80 | Limestone, shaley, mosaic | | ak, cs, es | y | 2.80 |
| 0.50 | 422.80 | 423.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 423.30 | 424.75 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 424.75 | 426.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 426.45 | 429.00 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.80 | 429.00 | 434.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 434.80 | 436.20 | Claystone, gy | | cv, ev | | 0.00 |
| 3.80 | 436.20 | 440.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 8.00 | 440.00 | 448.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 448.00 | 451.10 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 3.10 |
| 2.65 | 451.10 | 453.75 | Sandstone, gy, sh stks | | cs, es | y | 2.65 |
| 1.00 | 453.75 | 454.75 | Sandstone, gy, massive | | cs, es | y | 1.00 |
| 0.85 | 454.75 | 455.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.60 | 455.60 | 458.20 | Sandstone, gy, crossbeds | | cs, es | y | 2.60 |
| 2.95 | 458.20 | 461.15 | Sandstone, gy, massive | | cs, es | y | 2.95 |
| 8.10 | 461.15 | 469.25 | Sandstone, gy, crossbeds | | cs, es | y | 8.10 |
| 1.85 | 469.25 | 471.10 | Sandstone, gy, massive | | cs, es | y | 1.85 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-36

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.90 | 471.10 | 476.00 | Sandstone, gy, sh stks | | cs, es | y | 4.90 |
| 3.78 | 476.00 | 479.78 | Sandstone, gy, massive | | cs, es | y | 3.78 |
| 0.85 | 479.78 | 480.63 | Sandstone, gy, crossbeds | | cs, es | y | 0.85 |
| 0.95 | 480.63 | 481.58 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 481.58 | 481.83 | Sandstone, gy, massive | | cs, es | y | 0.25 |
| 0.40 | 481.83 | 482.23 | Sandstone, gy, coal spars | | cs, es | y | 0.40 |
| 5.90 | 482.23 | 488.13 | Sandstone, gy, massive | | cs, es | y | 5.90 |
| 3.60 | 488.13 | 491.73 | Sandstone, gy, crossbeds | | cs, es | y | 3.60 |
| 3.28 | 491.73 | 495.01 | Sandstone, gy, massive | | cs, es | y | 3.28 |
| 0.25 | 495.01 | 495.26 | Sandstone, gy, sh stks | | cs, es | y | 0.25 |
| 1.25 | 495.26 | 496.51 | Sandstone, gy, massive | | cs, es | y | 1.25 |
| 0.21 | 496.51 | 496.72 | Sandstone, gy, pyrite | | cs, es | y | 0.21 |
| 0.66 | 496.72 | 497.38 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.43 | 497.38 | 497.81 | **Coal, pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.52 | 497.81 | 498.33 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 498.33 | 498.38 | **Claystone, blk** | | ac, cv, ev | | 0.00 |
| 0.27 | 498.38 | 498.65 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.52 | 498.65 | 500.17 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 500.17 | 500.19 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.08 | 500.19 | 500.27 | **Fusain** | | ac, cv, ev | | 0.00 |
| 0.88 | 500.27 | 501.15 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.24 | 501.15 | 501.39 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.50 | 501.39 | 501.89 | Shale, dk gy | | cm, em | | 0.00 |
| 2.25 | 501.89 | 504.14 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 504.14 | 505.14 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 2.10 | 505.14 | 507.24 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 507.24 | 508.99 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 508.99 | 509.54 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 509.54 | 509.99 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.45 | 509.99 | 510.44 | Claystone, gy | | cv, ev | | 0.00 |
| 0.95 | 510.44 | 511.39 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.83 | 511.39 | 512.22 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| | Total Depth | 512.22 | | | | | 192.13 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **192.13**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **38%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 192.13 | 38% |
| Soft Rock: | 320.09 | 62% |
| | 512.22 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 4.74 | 0.51 | 0.42 | 15.9 | 11.2 |
| Coal | 12.10 | 5.08 | 2.51 | 159.0 | 147.0 |
| Bottom, 10 ft. | 38.80 | 3.31 | 2.86 | 103.0 | 64.6 |

CLC-2002-36.xls

2:28 PM 11/4/03

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-37

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1250
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 665090
**Easting:** 2418540
**Drilling Company:** L. J. Hughes & Sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 3.00 | 25.00 | 28.00 | Shale, gy ss stks | Y | cm, em | | 0.00 |
| 2.50 | 28.00 | 30.50 | Shale, gy | Y | cm, em | | 0.00 |
| 3.40 | 30.50 | 33.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 33.90 | 37.40 | Shale, red | | cm, em | | 0.00 |
| 1.30 | 37.40 | 38.70 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 38.70 | 41.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 41.70 | 43.00 | Core Loss | | | | 0.00 |
| 1.70 | 43.00 | 44.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.30 | 44.70 | 48.00 | Claystone, red | | cv, ev | | 0.00 |
| 1.00 | 48.00 | 49.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.00 | 49.00 | 54.00 | Claystone, red | | cv, ev | | 0.00 |
| 7.00 | 54.00 | 61.00 | Core Loss | | | | 0.00 |
| 2.70 | 61.00 | 63.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 7.70 | 63.70 | 71.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.30 | 71.40 | 72.70 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.90 | 72.70 | 76.60 | Sandstone, gy, sh stks | | cs, es | y | 3.90 |
| 2.80 | 76.60 | 79.40 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.50 | 79.40 | 81.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 3.80 | 81.90 | 85.70 | Shale, red | | cm, em | | 0.00 |
| 4.10 | 85.70 | 89.80 | Shale, red/ grn | | cm, em | | 0.00 |
| 5.00 | 89.80 | 94.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.20 | 94.80 | 102.00 | Core Loss | | | | 0.00 |
| 5.00 | 102.00 | 107.00 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 7.80 | 107.00 | 114.80 | Shale, red | | cm, em | | 0.00 |
| 2.20 | 114.80 | 117.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.40 | 117.00 | 119.40 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 119.40 | 121.50 | Core Loss | | | | 0.00 |
| 1.50 | 121.50 | 123.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.80 | 123.00 | 125.80 | Shale, dk gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 125.80 | 127.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 127.10 | 129.80 | Sandstone, gy | | cs, es | y | 2.70 |
| 5.30 | 129.80 | 135.10 | Shale, dk gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 135.10 | 137.90 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.25 | 137.90 | 143.15 | Shale, dk gy | | cm, em | | 0.00 |
| 2.45 | 143.15 | 145.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.60 | 145.60 | 146.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.50 | 146.20 | 148.70 | Shale, dk gy | | cm, em | | 0.00 |
| 3.40 | 148.70 | 152.10 | Claystone, red | | cv, ev | | 0.00 |
| 5.90 | 152.10 | 158.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 158.00 | 158.95 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.65 | 158.95 | 162.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 4.20 | 162.60 | 166.80 | Shale, dk gy | | cm, em | | 0.00 |
| 2.40 | 166.80 | 169.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.80 | 169.20 | 171.00 | Claystone, red | | cv, ev | | 0.00 |
| 1.80 | 171.00 | 172.80 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 6.50 | 172.80 | 179.30 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.80 | 179.30 | 181.10 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.50 | 181.10 | 181.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 181.60 | 185.20 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 185.20 | 188.70 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.60 | 188.70 | 191.30 | Sandstone, gy, sh stks | | cs, es | y | 2.60 |
| 2.90 | 191.30 | 194.20 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 4.00 | 194.20 | 198.20 | Sandstone, gy | | cs, es | y | 4.00 |
| 3.60 | 198.20 | 201.80 | Sandstone, gy, sh stks | | cs, es | y | 3.60 |
| 3.85 | 201.80 | 205.65 | Sandstone, gy | | cs, es | y | 3.85 |
| 1.10 | 205.65 | 206.75 | Sandstone, gy, sh stks | | cs, es | y | 1.10 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-37

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.40 | 206.75 | 207.15 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.05 | 207.15 | 211.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.80 | 211.20 | 216.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 216.00 | 219.80 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.30 | 219.80 | 222.10 | Core Loss | | | | 0.00 |
| 1.50 | 222.10 | 223.60 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 11.50 | 223.60 | 235.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 235.10 | 237.00 | Shale, dk gy | | cm, em | | 0.00 |
| 5.60 | 237.00 | 242.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.30 | 242.60 | 244.90 | Shale, dk gy | | cm, em | | 0.00 |
| 2.20 | 244.90 | 247.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.30 | 247.10 | 254.40 | Sandstone, gy, sh stks | | cs, es | y | 7.30 |
| 18.90 | 254.40 | 273.30 | Sandstone, gy | | cs, es | y | 18.90 |
| 0.11 | 273.30 | 273.41 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.31 | 273.41 | 273.72 | Sandstone, gy, coal spars | | ac, cs, es | y | 0.31 |
| 3.68 | 273.72 | 277.40 | Sandstone, gy, sh stks | | cs, es | y | 3.68 |
| 0.12 | 277.40 | 277.52 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.06 | 277.52 | 277.58 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 277.58 | 277.66 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 5.34 | 277.66 | 283.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 283.00 | 283.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 283.90 | 284.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 284.25 | 284.40 | **Coal, sh stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.62 | 284.40 | 285.02 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.48 | 285.02 | 285.50 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.84 | 285.50 | 286.34 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.66 | 286.34 | 288.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.66 |
| 6.70 | 288.00 | 294.70 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 294.70 | 296.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 6.80 | 296.10 | 302.90 | Sandstone, gy, sh stks, calcite cemented | | ak, cs, es | y | 6.80 |
| 6.35 | 302.90 | 309.25 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 309.25 | 309.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.50 | 309.90 | 311.40 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 0.45 | 311.40 | 311.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 8.50 | 311.85 | 320.35 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 320.35 | 321.65 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.75 | 321.65 | 324.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 324.40 | 326.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.44 | 326.45 | 326.89 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 2.60 | 326.89 | 329.49 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 329.49 | 330.89 | Core Loss | | | | 0.00 |
| 2.00 | 330.89 | 332.89 | Shale, dk gy | | cm, em | | 0.00 |
| 1.50 | 332.89 | 334.39 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 334.39 | 335.99 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 6.20 | 335.99 | 342.19 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 342.19 | 343.69 | Sandstone, gy, sh stks | | cs, es | y | 1.50 |
| 4.10 | 343.69 | 347.79 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 347.79 | 350.14 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.05 | 350.14 | 351.19 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 351.19 | 351.44 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.17 | 351.44 | 351.61 | **Coal, bone stks, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 0.08 | 351.61 | 351.69 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 351.69 | 351.81 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 351.81 | 351.96 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.83 | 351.96 | 356.79 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 356.79 | 359.04 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 1.30 | 359.04 | 360.34 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 0.55 | 360.34 | 360.89 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 360.89 | 361.74 | Limestone, massive | | ak, cs, es | y | 0.85 |
| 1.55 | 361.74 | 363.29 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 3.40 | 363.29 | 366.69 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 366.69 | 368.49 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 368.49 | 369.04 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 5.90 | 369.04 | 374.94 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 374.94 | 377.99 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 6.00 | 377.99 | 383.99 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.70 | 383.99 | 385.69 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 385.69 | 388.29 | Shale, dk gy, ss stks | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-37

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.30 | 388.29 | 389.59 | Shale, dk gy | | cm, em | | 0.00 |
| 0.65 | 389.59 | 390.24 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.55 | 390.24 | 391.79 | Shale, dk gy | | cm, em | | 0.00 |
| 4.30 | 391.79 | 396.09 | Limestone, shaley, layered | | ak, cs, es | y | 4.30 |
| 5.10 | 396.09 | 401.19 | Shale, red, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 401.19 | 402.24 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 402.24 | 403.44 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 3.85 | 403.44 | 407.29 | Sandstone, gy, sh stks | | cs, es | y | 3.85 |
| 2.30 | 407.29 | 409.59 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.95 | 409.59 | 410.54 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 410.54 | 411.44 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 3.25 | 411.44 | 414.69 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 414.69 | 415.69 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 5.10 | 415.69 | 420.79 | Limestone, shaley, layered | | ak, cs, es | y | 5.10 |
| 1.20 | 420.79 | 421.99 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 3.45 | 421.99 | 425.44 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 425.44 | 426.99 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 426.99 | 429.09 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 429.09 | 432.19 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.50 | 432.19 | 437.69 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 437.69 | 438.89 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 1.30 | 438.89 | 440.19 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 0.60 | 440.19 | 440.79 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 6.90 | 440.79 | 447.69 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 447.69 | 449.29 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 2.30 | 449.29 | 451.59 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.36 | 451.59 | 452.95 | Limestone, nodular | | ak, cs, es | y | 1.36 |
| 1.15 | 452.95 | 454.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 3.25 | 454.10 | 457.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 457.35 | 459.45 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 1.80 | 459.45 | 461.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 461.25 | 463.50 | Limestone, layered | | ak, cs, es | y | 2.25 |
| 1.30 | 463.50 | 464.80 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 2.20 | 464.80 | 467.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.95 | 467.00 | 472.95 | Limestone, massive | | ak, cs, es | y | 5.95 |
| 1.40 | 472.95 | 474.35 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 6.00 | 474.35 | 480.35 | Limestone, layered | | ak, cs, es | y | 6.00 |
| 4.40 | 480.35 | 484.75 | Limestone, shaley, nodular | | ak, cs, es | y | 4.40 |
| 2.70 | 484.75 | 487.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 487.45 | 491.45 | Limestone, nodular | | ak, cs, es | y | 4.00 |
| 4.40 | 491.45 | 495.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 495.85 | 497.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 497.15 | 497.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.20 | 497.35 | 497.55 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.27 | 497.55 | 497.82 | **Coal, sh stks, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.10 | 497.82 | 497.92 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.46 | 497.92 | 498.38 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 498.38 | 498.48 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.84 | 498.48 | 499.32 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.17 | 499.32 | 499.49 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 499.49 | 499.69 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.36 | 499.69 | 501.05 | Shale, dk gy | | cm, em | | 0.00 |
| 4.10 | 501.05 | 505.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.30 | 505.15 | 509.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 509.45 | 514.35 | Sandstone, gy, sh stks | | cs, es | y | 4.90 |
| 5.30 | 514.35 | 519.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 519.65 | 521.55 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 521.55 | 522.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.09 | 522.35 | 522.44 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.44 | 522.44 | 522.88 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.16 | 522.88 | 523.04 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 523.04 | 523.09 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.16 | 523.09 | 523.25 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.50 | 523.25 | 523.75 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.16 | 523.75 | 523.91 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 523.91 | 524.06 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.50 | 524.06 | 524.56 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 524.56 | 524.61 | **Pyrite** | | ac, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-37

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.15 | 524.61 | 524.76 | Coal, bone stks | | ac, cv, ev | | 0.00 |
| 0.07 | 524.76 | 524.83 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.22 | 524.83 | 525.05 | Coal | | ac, cv, ev | | 0.00 |
| 0.28 | 525.05 | 525.33 | Shale, dk gy | | cm, em | | 0.00 |
| 0.47 | 525.33 | 525.80 | Coal, sh stks | | ac, cv, ev | | 0.00 |
| 1.55 | 525.80 | 527.35 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 527.35 | 530.05 | Limestone, nodular | | ak, cs, es | y | 2.70 |
| 0.80 | 530.05 | 530.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 3.10 | 530.85 | 533.95 | Limestone, nodular | | ak, cs, es | y | 3.10 |
| 1.55 | 533.95 | 535.50 | Limestone, massive | | ak, cs, es | y | 1.55 |
| 0.45 | 535.50 | 535.95 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 0.65 | 535.95 | 536.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.65 | 536.60 | 538.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.65 |
| 3.10 | 538.25 | 541.35 | Limestone, nodular | | ak, cs, es | y | 3.10 |
| 2.80 | 541.35 | 544.15 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 6.50 | 544.15 | 550.65 | Shale, grn, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 550.65 | 552.45 | Shale, blk, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 552.45 | 554.75 | Limestone, nodular | | ak, cs, es | y | 2.30 |
| 0.75 | 554.75 | 555.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 555.50 | 559.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 559.25 | 561.35 | Shale, dk gy | | cm, em | | 0.00 |
| 3.70 | 561.35 | 565.05 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 565.05 | 566.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 1.20 | 566.65 | 567.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.20 | 567.85 | 575.05 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 575.05 | 575.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 1.60 | 575.85 | 577.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 577.45 | 580.55 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 580.55 | 582.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 582.15 | 582.45 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 3.65 | 582.45 | 586.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.15 | 586.10 | 586.25 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.75 | 586.25 | 587.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.72 | 587.00 | 590.72 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 0.29 | 590.72 | 591.01 | Coal, pyrite | | ac, cv, ev | | 0.00 |
| 0.95 | 591.01 | 591.96 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 591.96 | 592.41 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.40 | 592.41 | 592.81 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.70 | 592.81 | 593.51 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 2.59 | 593.51 | 596.10 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.05 | 596.10 | 596.15 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 3.11 | 596.15 | 599.26 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.04 | 599.26 | 599.30 | Coal, pyrite, Pittsburgh No. 8 | | ac, cv, ev | | 0.00 |
| 1.15 | 599.30 | 600.45 | Coal | | ac, cv, ev | | 0.00 |
| 0.23 | 600.45 | 600.68 | Coal, bone stks | | ac, cv, ev | | 0.00 |
| 1.71 | 600.68 | 602.39 | Coal | | ac, cv, ev | | 0.00 |
| 0.03 | 602.39 | 602.42 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.53 | 602.42 | 602.95 | Coal | | ac, cv, ev | | 0.00 |
| 0.13 | 602.95 | 603.08 | Coal, pyrite | | ac, cv, ev | | 0.00 |
| 0.52 | 603.08 | 603.60 | Coal, bone stks | | ac, cv, ev | | 0.00 |
| 0.25 | 603.60 | 603.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 603.85 | 603.95 | Pyrite | | ac, cm, em | | 0.00 |
| 1.55 | 603.95 | 605.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 605.50 | 608.75 | Claystone, dk gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 1.85 | 608.75 | 610.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 610.60 | 611.75 | Sandstone, gy, crossbeds, calcite cement | | ak, cs, es | y | 1.15 |
| 1.50 | 611.75 | 613.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 613.25 | | | | | 147.66 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-37

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | 147.66 |

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 24%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 147.66 | 24% |
| Soft Rock: | 465.59 | 76% |
| | 613.25 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 12.10 | 1.16 | 0.99 | 36.3 | 24.2 |
| Coal | 1.32 | 5.51 | 3.09 | 172.00 | 171.0 |
| Bottom, 10 ft. | 125.00 | 1.13 | 1.00 | 35.30 | -89.7 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-39

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1225
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 665510
**Easting:** 2412530
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 13.50 | 0.00 | 13.50 | Casing | | | | 0.00 |
| 1.10 | 13.50 | 14.60 | Sandstone, gy, sh stks | Y | cs, es | y | 1.10 |
| 0.30 | 14.60 | 14.90 | Shale, gy, ss stks | Y | cm, em | | 0.00 |
| 0.30 | 14.90 | 15.20 | Claystone, gy, ls nods | Y | ak, cv, ev | | 0.00 |
| 15.35 | 15.20 | 30.55 | Sandstone, gy, sh stks | Y | cs, es | y | 15.35 |
| 4.35 | 30.55 | 34.90 | Claystone, gy | | cv, ev | | 0.00 |
| 2.35 | 34.90 | 37.25 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 3.60 | 37.25 | 40.85 | Claystone, gy | | cv, ev | | 0.00 |
| 9.90 | 40.85 | 50.75 | Claystone, red | | cv, ev | | 0.00 |
| 4.25 | 50.75 | 55.00 | Core Loss | | | | 0.00 |
| 7.20 | 55.00 | 62.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 62.20 | 65.95 | Sandstone, gy, sh stks, calcite cement | | ak, cs, es | y | 3.75 |
| 1.60 | 65.95 | 67.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 67.55 | 68.15 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 68.15 | 69.80 | Sandstone, gy, sh stks, calcite cement | | ak, cs, es | y | 1.65 |
| 5.35 | 69.80 | 75.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.00 | 75.15 | 80.15 | Shale, red/ grn | | cm, em | | 0.00 |
| 4.75 | 80.15 | 84.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.10 | 84.90 | 86.00 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.15 | 86.00 | 88.15 | Claystone, red | | cv, ev | | 0.00 |
| 2.85 | 88.15 | 91.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.35 | 91.00 | 94.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 94.35 | 95.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 95.05 | 95.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.60 | 95.30 | 100.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 100.90 | 103.95 | Claystone, red | | cv, ev | | 0.00 |
| 1.35 | 103.95 | 105.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.15 | 105.30 | 106.45 | Claystone, red | | cv, ev | | 0.00 |
| 0.65 | 106.45 | 107.10 | Claystone, gy | | cv, ev | | 0.00 |
| 4.50 | 107.10 | 111.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 9.30 | 111.60 | 120.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 6.60 | 120.90 | 127.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 127.50 | 130.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 130.70 | 132.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.03 | 132.20 | 133.23 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.40 | 133.23 | 133.63 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.06 | 133.63 | 133.69 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 133.69 | 133.84 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.10 | 133.84 | 133.94 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.23 | 133.94 | 135.17 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 3.23 | 135.17 | 138.40 | Claystone, gy | | cv, ev | | 0.00 |
| 6.10 | 138.40 | 144.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.65 | 144.50 | 151.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 151.15 | 153.60 | Sandstone, gy, massive | | cs, es | y | 2.45 |
| 2.15 | 153.60 | 155.75 | Sandstone, gy, crossbeds | | cs, es | y | 2.15 |
| 4.05 | 155.75 | 159.80 | Sandstone, gy, sh stks | | cs, es | y | 4.05 |
| 2.45 | 159.80 | 162.25 | Sandstone, gy, crossbeds, calcite cement | | ak, cs, es | y | 2.45 |
| 15.40 | 162.25 | 177.65 | Sandstone, gy, sh stks | | cs, es | y | 15.40 |
| 3.90 | 177.65 | 181.55 | Sandstone, gy, massive | | cs, es | y | 3.90 |
| 6.75 | 181.55 | 188.30 | Sandstone, gy, massive, calcite cement | | ak, cs, es | y | 6.75 |
| 10.40 | 188.30 | 198.70 | Sandstone, gy, sh stks | | cs, es | y | 10.40 |
| 0.75 | 198.70 | 199.45 | Sandstone, gy, sh pebbles | | cs, es | y | 0.75 |
| 3.50 | 199.45 | 202.95 | Sandstone, gy, sh stks | | cs, es | y | 3.50 |
| 1.50 | 202.95 | 204.45 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.75 | 204.45 | 206.20 | Sandstone, gy, sh stks | | cs, es | y | 1.75 |
| 1.15 | 206.20 | 207.35 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.40 | 207.35 | 209.75 | Sandstone, gy, sh stks | | cs, es | y | 2.40 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-39

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 7.35 | 209.75 | 217.10 | Sandstone, gy, massive | | cs, es | y | 7.35 |
| 1.05 | 217.10 | 218.15 | Sandstone, gy, coal bands | | cs, es | y | 1.05 |
| 1.40 | 218.15 | 219.55 | Sandstone, gy, crossbeds | | cs, es | y | 1.40 |
| 0.55 | 219.55 | 220.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 220.10 | 220.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 4.55 | 220.45 | 225.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 225.00 | 227.75 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 227.75 | 229.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.70 | 229.40 | 234.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 234.10 | 236.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 236.60 | 237.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 237.35 | 238.30 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.25 | 238.30 | 241.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 241.55 | 241.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.30 | 241.65 | 243.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 243.95 | 244.10 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 244.10 | 245.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 245.30 | 246.25 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 0.75 | 246.25 | 247.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.95 | 247.00 | 250.95 | Sandstone, gy, calcite cement | | ak, cs, es | y | 3.95 |
| 1.25 | 250.95 | 252.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.85 | 252.20 | 256.05 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 256.05 | 256.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 256.25 | 257.55 | Limestone, massive | | ak, cs, es | y | 1.30 |
| 3.50 | 257.55 | 261.05 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 261.05 | 261.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 261.50 | 261.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 261.75 | 261.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.05 | 261.95 | 262.00 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.10 | 262.00 | 262.10 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 262.10 | 262.65 | Claystone, gy | | cv, ev | | 0.00 |
| 3.45 | 262.65 | 266.10 | Shale, gy | | cm, em | | 0.00 |
| 1.20 | 266.10 | 267.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.95 | 267.30 | 269.25 | Shale, gy | | cm, em | | 0.00 |
| 1.67 | 269.25 | 270.92 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.12 | 270.92 | 271.04 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.11 | 271.04 | 271.15 | **Coal, pyrite, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.15 | 271.15 | 271.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 271.30 | 274.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 274.00 | 275.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 275.10 | 275.95 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 275.95 | 276.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 276.05 | 276.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 276.65 | 279.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 5.90 | 279.00 | 284.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 284.90 | 285.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 285.90 | 286.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.65 | 286.25 | 286.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 286.90 | 287.10 | Limestone, shaley | | ak, cs, es | y | 0.20 |
| 4.40 | 287.10 | 291.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 291.50 | 293.25 | Limestone, shaley, layered | | ak, cs, es | y | 1.75 |
| 0.85 | 293.25 | 294.10 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 0.50 | 294.10 | 294.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 294.60 | 295.05 | Limestone, massive | | ak, cs, es | y | 0.45 |
| 0.60 | 295.05 | 295.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 295.65 | 296.70 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 6.20 | 296.70 | 302.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 302.90 | 303.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 303.70 | 304.40 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 304.40 | 304.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 304.70 | 305.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.55 | 305.05 | 305.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 305.60 | 306.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 306.10 | 306.60 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.25 | 306.60 | 307.85 | Limestone, massive | | ak, cs, es | y | 1.25 |
| 0.85 | 307.85 | 308.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 308.70 | 309.70 | Limestone, layered | | ak, cs, es | y | 1.00 |
| 0.65 | 309.70 | 310.35 | Limestone, massive | | ak, cs, es | y | 0.65 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-39

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.55 | 310.35 | 312.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.30 | 312.90 | 313.20 | Shale, dk gy | | cm, em | | 0.00 |
| 4.15 | 313.20 | 317.35 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.65 | 317.35 | 318.00 | Sandstone, gy, massive | | cs, es | y | 0.65 |
| 5.00 | 318.00 | 323.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 323.00 | 323.65 | Shale, dk gy | | cm, em | | 0.00 |
| 1.15 | 323.65 | 324.80 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.65 | 324.80 | 325.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 325.45 | 325.85 | Shale, red | | cm, em | | 0.00 |
| 1.70 | 325.85 | 327.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 327.55 | 327.85 | Limestone | | ak, cs, es | y | 0.30 |
| 3.20 | 327.85 | 331.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 331.05 | 332.80 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 332.80 | 334.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 334.10 | 336.55 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 336.55 | 337.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.55 | 337.10 | 339.65 | Sandstone, gy, sh stks | | cs, es | y | 2.55 |
| 2.85 | 339.65 | 342.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.00 | 342.50 | 343.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 0.70 | 343.50 | 344.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 344.20 | 344.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 6.55 | 344.95 | 351.50 | Limestone, shaley, layered | | ak, cs, es | y | 6.55 |
| 0.90 | 351.50 | 352.40 | Limestone, massive | | ak, cs, es | y | 0.90 |
| 0.75 | 352.40 | 353.15 | Claystone, grn | | cv, ev | | 0.00 |
| 1.25 | 353.15 | 354.40 | Claystone, red | | cv, ev | | 0.00 |
| 1.50 | 354.40 | 355.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 355.90 | 357.50 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 357.50 | 358.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 358.65 | 359.30 | Sandstone, gy, sh stks, calcite cement | | ak, cs, es | y | 0.65 |
| 2.75 | 359.30 | 362.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 362.05 | 362.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.20 | 362.30 | 363.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.35 | 363.50 | 363.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 363.85 | 364.20 | Limestone | | ak, cs, es | y | 0.35 |
| 7.10 | 364.20 | 371.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 371.30 | 372.10 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 372.10 | 374.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 374.50 | 376.55 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.65 | 376.55 | 379.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 379.20 | 381.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 381.50 | 383.10 | Limestone, massive | | ak, cs, es | y | 1.60 |
| 0.80 | 383.10 | 383.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 383.90 | 385.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 385.15 | 385.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 4.10 | 385.60 | 389.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 389.70 | 391.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.65 |
| 4.65 | 391.35 | 396.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.10 | 396.00 | 401.10 | Limestone, massive | | ak, cs, es | y | 5.10 |
| 0.55 | 401.10 | 401.65 | Limestone, layered | | ak, cs, es | y | 0.55 |
| 0.35 | 401.65 | 402.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 402.00 | 403.15 | Limestone, layered | | ak, cs, es | y | 1.15 |
| 2.20 | 403.15 | 405.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 405.35 | 406.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 1.30 | 406.10 | 407.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.15 | 407.40 | 413.55 | Limestone, shaley, nodular | | ak, cs, es | y | 6.15 |
| 0.45 | 413.55 | 414.00 | Claystone, grn | | cv, ev | | 0.00 |
| 2.25 | 414.00 | 416.25 | Claystone, gy | | cv, ev | | 0.00 |
| 1.45 | 416.25 | 417.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.15 | 417.70 | 422.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.40 | 422.85 | 426.25 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 426.25 | 426.75 | Sandstone, gy | | cs, es | y | 0.50 |
| 2.80 | 426.75 | 429.55 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.95 | 429.55 | 430.50 | Sandstone, gy, sh stks | | cs, es | y | 0.95 |
| 1.00 | 430.50 | 431.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.35 | 431.50 | 431.85 | Sandstone, gy, sh stks | | cs, es | y | 0.35 |
| 2.95 | 431.85 | 434.80 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.65 | 434.80 | 435.45 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.25 | 435.45 | 438.70 | Shale, gy, sandy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-39

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 11.65 | 438.70 | 450.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 450.35 | 451.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.60 | 451.70 | 454.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 454.30 | 454.55 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.18 | 454.55 | 454.73 | **Coal, bone stks, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.39 | 454.73 | 455.12 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.80 | 455.12 | 455.92 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 455.92 | 456.00 | **Pyrite** | | ac, cm, em | | 0.00 |
| 0.11 | 456.00 | 456.11 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.13 | 456.11 | 456.24 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.14 | 456.24 | 457.38 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 457.38 | 457.66 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.11 | 457.66 | 457.77 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.41 | 457.77 | 458.18 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.82 | 458.18 | 459.00 | Shale, dk gy | | cm, em | | 0.00 |
| 3.65 | 459.00 | 462.65 | Limestone, shaley, nodular | | ak, cs, es | y | 3.65 |
| 0.65 | 462.65 | 463.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.20 | 463.30 | 465.50 | Limestone, nodular | | ak, cs, es | y | 2.20 |
| 0.50 | 465.50 | 466.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 466.00 | 466.70 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 1.70 | 466.70 | 468.40 | Limestone, massive | | ak, cs, es | y | 1.70 |
| 0.30 | 468.40 | 468.70 | Claystone, grn | | cv, ev | | 0.00 |
| 0.20 | 468.70 | 468.90 | Shale, dk gy | | cm, em | | 0.00 |
| 2.30 | 468.90 | 471.20 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 2.75 | 471.20 | 473.95 | Limestone, shaley, mosaic | | ak, cs, es | y | 2.75 |
| 1.00 | 473.95 | 474.95 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 474.95 | 476.40 | Sandstone, gy, sh stks | | cs, es | y | 1.45 |
| 0.55 | 476.40 | 476.95 | Claystone, gy | | cv, ev | | 0.00 |
| 0.25 | 476.95 | 477.20 | Sandstone, gy | | cs, es | y | 0.25 |
| 2.20 | 477.20 | 479.40 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 479.40 | 480.40 | Claystone, grn | | cv, ev | | 0.00 |
| 0.15 | 480.40 | 480.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.40 | 480.55 | 484.95 | Claystone, gy | | cv, ev | | 0.00 |
| 6.95 | 484.95 | 491.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.55 | 491.90 | 492.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 8.10 | 492.45 | 500.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 500.55 | 503.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 12.50 | 503.60 | 516.10 | Sandstone, gy, sh stks | | cs, es | y | 12.50 |
| 10.28 | 516.10 | 526.38 | Sandstone, gy, crossbeds | | cs, es | y | 10.28 |
| 0.70 | 526.38 | 527.08 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 6.00 | 527.08 | 533.08 | Sandstone, gy, sh stks | | cs, es | y | 6.00 |
| 1.60 | 533.08 | 534.68 | Sandstone, gy, massive | | cs, es | y | 1.60 |
| 5.50 | 534.68 | 540.18 | Sandstone, gy, sh stks | | cs, es | y | 5.50 |
| 4.70 | 540.18 | 544.88 | Sandstone, gy, coal spars | | ac, cs, es | y | 4.70 |
| 0.20 | 544.88 | 545.08 | Sandstone, gy, sh stks | | cs, es | y | 0.20 |
| 0.96 | 545.08 | 546.04 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.02 | 546.04 | 546.06 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.61 | 546.06 | 546.67 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 546.67 | 546.69 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.75 | 546.69 | 547.44 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 547.44 | 547.47 | **Coal, fusain** | | ac, cv, ev | | 0.00 |
| 0.86 | 547.47 | 548.33 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 548.33 | 548.41 | **Pyrite** | | ac, cm, em | | 0.00 |
| 0.02 | 548.41 | 548.43 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.95 | 548.43 | 549.38 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.23 | 549.38 | 549.61 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.10 | 549.61 | 549.71 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.65 | 549.71 | 550.36 | Shale, dk gy | | cm, em | | 0.00 |
| 1.20 | 550.36 | 551.56 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 551.56 | 552.46 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 1.07 | 552.46 | 553.53 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.97 | 553.53 | 555.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 555.50 | 557.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 557.80 | 558.95 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 558.95 | 559.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 559.45 | 560.35 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| | Total Depth | 560.35 | | | | | 191.28 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-39

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **191.28**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **34%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 191.28 | 34% |
| Soft Rock: | 369.07 | 66% |
| | 560.35 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 0.16 | 2.21 | 1.68 | 69.1 | 68.9 |
| Coal | 4.48 | 8.98 | 5.58 | 281.00 | 276.0 |
| Bottom, 10 ft. | 478.00 | 1.60 | 1.40 | 50.00 | -428.0 |

# LJ HUGHES & SONS, INC.

DIAMOND CORE DRILLING
Pressure Grouting, Foundation & Soil Borings
320 Turnpike Road, Summersville, West Virginia 26651 (304) 872-1111


DRILL HOLE NO. N-94-14 DRILLER: JOSEPH MILLER

DRILLING FOR: THE OHIO VALLEY COAL COMPANY
ALLEDONIA OHIO

SURFACE ELEVATION: 1094.91 STARTED: SEPTEMBER 29 1994
COMPLETED: SEPTEMBER 30 1994

LOCATION: OHIO BELMONT COUNTY

| FORMATION | STRATA THICKNESS | DEPTH FROM SURFACE |
|---|---|---|
| CASING | 20.00 | 20.00 |
| BROWN SHALY CLAYSTONE | 18.30 | 38.30 |
| GRAY SANDSTONE | 7.20 | 45.50 |
| COAL . . . . . | 0.60 | 46.10 |
| GRAY SHALY CLAYSTONE | 22.10 | 68.20 |
| GRAY SHALE | 12.50 | 80.70 |
| GRAY LIMY SHALY CLAYSTONE | 14.40 | 95.10 |
| GRAY SANDSTONE | 2.00 | 97.10 |
| DARK SHALE | 0.50 | 97.60 |
| GRAY SHALY CLAYSTONE | 1.90 | 99.50 |
| GRAY SANDY SHALE | 4.40 | 103.90 |
| GRAY SANDSTONE WITH SHALE STREAKS | 2.50 | 106.40 |
| GRAY SANDSTONE WITH COAL SPARS | 2.60 | 109.00 |
| DARK GRAY SHALY CLAYSTONE | 3.70 | 112.70 |
| COAL . . . . . | 0.40 | 113.10 |
| DARK GRAY LIMY SHALY CLAYSTONE | 7.00 | 120.10 |
| GRAY SHALY LIMESTONE | 9.80 | 129.90 |
| DARK GRAY LIMY SHALY CLAYSTONE | 10.20 | 140.10 |
| RED AND GRAY SHALY CLAYSTONE | 1.90 | 142.00 |
| GRAY LIMY SHALE | 1.60 | 143.60 |
| GRAY AND GREEN SANDSTONE | 3.10 | 146.70 |
| RED AND GRAY SHALY CLAYSTONE | 2.70 | 149.40 |



AEC 03344

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-14

| FORMATION | STRATA THICKNESS | 149.40<br>DEPTH FROM SURFACE |
|---|---|---|
| GRAY LIMY SANDY SHALE | 3.10 | 152.50 |
| GRAY LIMESTONE | 1.20 | 153.70 |
| GRAY LIMY SHALY CLAYSTONE | 4.10 | 157.80 |
| GRAY SANDSTONE | 3.80 | 161.60 |
| GRAY SHALE | 3.80 | 165.40 |
| GRAY SHALY LIMESTONE | 3.60 | 169.00 |
| GRAY LIMY SHALY CLAYSTONE | 2.00 | 171.00 |
| RED AND GRAY LIMY SHALY CLAYSTONE | 6.00 | 177.00 |
| GRAY LIMY SHALY CLAYSTONE | 7.00 | 184.00 |
| GRAY SANDSTONE | 3.30 | 187.30 |
| GRAY SHALY CLAYSTONE | 1.60 | 188.90 |
| GRAY SANDY SHALE | 0.80 | 189.70 |
| GRAY SHALE | 2.70 | 192.40 |
| GRAY LIMY SHALY CLAYSTONE | 2.80 | 195.20 |
| GRAY LIMESTONE | 2.90 | 198.10 |
| GRAY LIMY SHALY CLAYSTONE | 6.00 | 204.10 |
| GRAY SHALY LIMESTONE | 18.20 | 222.30 |
| GRAY GREEN LIMY CLAYSTONE | 1.90 | 224.20 |
| WHITE LIMESTONE | 6.00 | 230.20 |
| GRAY LIMY SHALY CLAYSTONE | 1.90 | 232.10 |
| WHITE LIMESTONE | 2.50 | 234.60 |
| GRAY LIMY SHALE | 11.20 | 245.80 |
| GRAY LIMESTONE | 1.70 | 247.50 |
| GRAY LIMY SHALY CLAYSTONE | 1.80 | 249.30 |
| DARK GRAY SHALY CLAYSTONE | 3.48 | 252.78 |
| BONY COAL | 0.17 | 252.95 |
| COAL . . . . . | 0.42 | 253.37 |
| PYRITE | 0.02 | 253.39 |
| COAL . . . . . | 0.27 | 253.66 |
| DARK SHALE | 0.05 | 253.71 |
| COAL . . . . . | 0.52 | 254.23 |
| DARK SHALE | 0.05 | 254.28 |
| COAL . . . . . | 1.28 | 255.56 |
| DARK NODULES | 0.07 | 255.63 |
| COAL . . . . . | 0.08 | 255.71 |
| DARK SHALE | 0.25 | 255.96 |
| GRAY SANDSTONE | 1.45 | 257.41 |
| GRAY GREEN SHALY CLAYSTONE | 3.20 | 260.61 |
| GRAY SHALY CLAYSTONE | 6.30 | 266.91 |
| GRAY SANDSTONE WITH SHALE STREAKS | 5.53 | 272.44 |
| GRAY SHALY CLAYSTONE | 1.80 | 274.24 |
| DARK SHALY CLAYSTONE | 0.35 | 274.59 |
| COAL AND PYRITE . . . | 0.07 | 274.66 |
| COAL . . . . . | 0.60 | 275.26 |
| DARK SHALY CLAYSTONE | 0.07 | 275.33 |
| COAL . . . . . | 0.16 | 275.49 |



AEC 03345

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-14

| FORMATION | STRATA THICKNESS | 275.49<br>DEPTH FROM SURFACE |
|---|---|---|
| DARK SHALY CLAYSTONE | 0.12 | 275.61 |
| COAL . . . . . | 0.17 | 275.78 |
| BONY COAL | 0.12 | 275.90 |
| COAL . . . . . | 0.94 | 276.84 |
| GRAY SHALY CLAYSTONE | 0.10 | 276.94 |
| PYRITE | 0.03 | 276.97 |
| COAL . . . . . | 0.25 | 277.22 |
| DARK SHALE WITH PYRITE | 0.04 | 277.26 |
| COAL . . . . . | 0.29 | 277.55 |
| DARK SHALY CLAYSTONE | 0.80 | 278.35 |
| GRAY LIMESTONE | 14.75 | 293.10 |
| GREEN LIMY SHALY CLAYSTONE | 2.09 | 295.19 |
| GRAY SANDSTONE | 1.01 | 296.20 |
| GRAY SHALY CLAYSTONE | 3.20 | 299.40 |
| GRAY LIMESTONE | 1.00 | 300.40 |
| GRAY LIMY SHALY CLAYSTONE | 20.00 | 320.40 |
| GRAY LIMY SANDSTONE | 1.20 | 321.60 |
| GRAY SANDY SHALE | 7.10 | 328.70 |
| GRAY SANDSTONE WITH SHALE STREAKS | 2.30 | 331.00 |
| GRAY SHALE | 4.80 | 335.80 |
| GRAY SANDSTONE | 4.50 | 340.30 |
| GRAY SANDY SHALE | 1.60 | 341.90 |
| GRAY SANDSTONE | 12.10 | 354.00 |
| DARK SHALE WITH COAL SPARS | 0.23 | 354.23 |
| DARK SHALY CLAYSTONE | 5.20 | 359.43 |
| PYRITE | 0.15 | 359.58 |
| BLACK SHALE | 0.13 | 359.71 |
| COAL #8 . . . . . | 4.20 | 363.91 |
| DARK SHALY CLAYSTONE | 0.12 | 364.03 |
| DARK GRAY SHALY CLAYSTONE | 2.26 | 366.29 |
| GRAY LIMESTONE | 0.23 | 366.52 |
| DARK GRAY SHALY CLAYSTONE | 0.95 | 367.47 |
| GRAY LIMESTONE | 1.26 | 368.73 |
| DARK GRAY LIMY SHALY CLAYSTONE | 11.50 | 380.23 |
| GRAY SHALE WITH LIME NODULES | 5.70 | 385.93 |
| RED AND GRAY SHALY CLAYSTONE | 11.27 | 397.20 |
| GRAY SANDY LIMY SHALE | 2.10 | 399.30 |
| GRAY SANDSTONE | 3.50 | 402.80 |
| RED AND GRAY SHALY CLAYSTONE | 0.60 | 403.40 |
| GRAY SANDSTONE | 1.60 | 405.00 |
| RED AND GREEN SANDY SHALY CLAYSTONE | 0.40 | 405.40 |
| GRAY SANDSTONE | 1.60 | 407.00 |



AEC 03346

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-14

| FORMATION | STRATA THICKNESS | 407.00<br>DEPTH FROM SURFACE |
|---|---|---|
| GRAY SANDY SHALE | 0.90 | 407.90 |
| RED SHALY CLAYSTONE | 8.40 | 416.30 |
| GRAY LIMY SHALE | 3.70 | 420.00 |

TOTAL DEPTH OF HOLE = 420.00 FEET

20 BAGS CEMENT PLACED IN HOLE



AEC 03347

CCITT G3:# 2
3045479097→
;10-20-94 12:29PM ;
AEC 03348

**DIAMOND DRILL HOLE NO. 94-14**
Drilled: 0/00/00
Surface Elevation: 0000.00
North 00000.00, East 00000.00
THE OHIO VALLEY COAL COMPANY

**PITTSBURGH NO. 8 - MAIN SEAM**
Lab Processed Depth: 000.00 to 000.00 ft.
Lab Processed Elevation: 000.00 to 000.00 ft.

| SPECIFIC GRAVITY | | DRY BASIS | | | | CUMULATIVE PRODUCT (FLOAT) | | | | CUMULATIVE REJECT (SINK) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sink | Float | % Wt. | % Ash | % Sulf. | BTU | % Wt. | % Ash | % Sulf. | BTU | % Wt. | % Ash | % Sulf. | BTU |
| | | | | | 3/4" x 8-Mesh SQ Fraction = 88.69% of Total Seam | | | | | | | | |
| | 1.40 | 89.18 | 6.92 | 4.33 | 13,769 | 89.18 | 6.92 | 4.33 | 13,769 | 100.00 | 9.19 | 5.10 | 13,381 |
| 1.40 | 1.60 | 6.95 | 20.84 | 8.40 | 11,454 | 96.13 | 7.93 | 4.62 | 13,602 | 10.82 | 27.92 | 11.48 | 10,179 |
| 1.60 | 1.80 | 2.00 | 34.31 | 12.32 | 9,087 | 98.13 | 8.46 | 4.78 | 13,510 | 3.87 | 40.63 | 17.00 | 7,890 |
| 1.80 | | 1.87 | 47.39 | 22.00 | 6,609 | 100.00 | 9.19 | 5.10 | 13,381 | 1.87 | 47.39 | 22.00 | 6,609 |
| | | | | | 8 Mesh x 200-Mesh SQ Fraction = 12.19% of Total Seam | | | | | | | | |
| | 1.40 | 81.95 | 5.55 | 3.82 | 14,008 | 81.95 | 5.55 | 3.82 | 14,008 | 100.00 | 11.09 | 4.77 | 12,828 |
| 1.40 | 1.60 | 8.58 | 18.12 | 7.25 | 11,938 | 90.43 | 6.74 | 4.15 | 13,812 | 18.15 | 36.07 | 9.06 | 7,507 |
| 1.60 | 1.80 | 2.02 | 31.65 | 9.19 | 9,693 | 92.45 | 7.28 | 4.26 | 13,722 | 9.57 | 52.17 | 10.69 | 3,535 |
| 1.80 | | 7.55 | 57.66 | 11.09 | 1,887 | 100.00 | 11.09 | 4.77 | 12,828 | 7.55 | 57.66 | 11.09 | 1,887 |

Minus 200-mesh Fraction = 1.12% of Total Sample

| | |
|---|---|
| % Ash (D/B) | 21.13 |
| % Sulfur (D/B) | 5.04 |
| BTU/lb. (D/B) | 11,504 |
| MAFBTU/lb. | 14,586 |

ATTACHMENT 13

DIAMOND DRILL HOLE: N94-41

**Field Engineer:** William Siplivey
**Surface Elevation:** 1,149.20
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 674,396
**Easting:** 2,413,650
**Drilling Company:** LJ Hughes and Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.00 | 0.00 | 20.00 | Casing | | | | 0.00 |
| 20.00 | 20.00 | 40.00 | Claystone, red/grn | YES | cv, ev | | 0.00 |
| 20.00 | 40.00 | 60.00 | Claystone, gy | YES | cv, ev | | 0.00 |
| 7.80 | 60.00 | 67.80 | Claystone, grn | YES | cv, ev | | 0.00 |
| 0.90 | 67.80 | 68.70 | Sandstone, gy | | cs, es | y | 0.90 |
| 10.00 | 68.70 | 78.70 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 78.70 | 79.70 | **Coal, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 10.30 | 79.70 | 90.00 | Claystone, gy | | cv, ev | | 0.00 |
| 5.00 | 90.00 | 95.00 | Claystone, grn | | cv, ev | | 0.00 |
| 61.25 | 95.00 | 156.25 | Sandstone, gy | | cs, es | y | 61.25 |
| 0.10 | 156.25 | 156.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.60 | 156.35 | 156.95 | Sandstone, gy | | cs, es | y | 0.60 |
| 0.20 | 156.95 | 157.15 | Shale, gy w/ coal stks | | cm, em | | 0.00 |
| 0.70 | 157.15 | 157.85 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.80 | 157.85 | 158.65 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 158.65 | 160.65 | Limestone | | ak, cs, es | y | 2.00 |
| 28.35 | 160.65 | 189.00 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 189.00 | 190.00 | Limestone | | ak, cs, es | y | 1.00 |
| 1.00 | 190.00 | 191.00 | Shale, grn | | cm, em | | 0.00 |
| 8.60 | 191.00 | 199.60 | Sandstone, gy w/ sh stks | | cs, es | y | 8.60 |
| 1.00 | 199.60 | 200.60 | Shale, gy | | cm, em | | 0.00 |
| 5.05 | 200.60 | 205.65 | Limestone w/ sh layers | | ak, cs, es | y | 5.05 |
| 4.35 | 205.65 | 210.00 | Claystone, gy | | cv, ev | | 0.00 |
| 4.50 | 210.00 | 214.50 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.65 | 214.50 | 218.15 | Sandstone, gy | | cs, es | y | 3.65 |
| 1.95 | 218.15 | 220.10 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.70 | 220.10 | 225.80 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 225.80 | 226.10 | **coal, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 3.90 | 226.10 | 230.00 | Claystone, gy | | cv, ev | | 0.00 |
| 20.40 | 230.00 | 250.40 | Limestone w/ claystone stks | | ak, cs, es | y | 20.40 |
| 2.70 | 250.40 | 253.10 | Claystone, grn | | cv, ev | | 0.00 |
| 5.10 | 253.10 | 258.20 | Limestone w/ claystone stks | | ak, cs, es | y | 5.10 |
| 16.35 | 258.20 | 274.55 | Shale, red/grn | | cm, em | | 0.00 |
| 8.75 | 274.55 | 283.30 | Shale, grn | | cm, em | | 0.00 |
| 11.50 | 283.30 | 294.80 | Limestone | | ak, cs, es | y | 11.50 |
| 10.00 | 294.80 | 304.80 | Claystone, grn, limey | | ak, cv, ev | | 0.00 |
| 2.20 | 304.80 | 307.00 | Sandstone, gy w/ sh stks | | cs, es | y | 2.20 |
| 8.10 | 307.00 | 315.10 | Limestone w/ claystone stks | | ak, cs, es | y | 8.10 |
| 5.40 | 315.10 | 320.50 | Claystone, grn, limey | | ak, cv, ev | | 0.00 |
| 9.50 | 320.50 | 330.00 | Limestone w/ claystone stks | | ak, cs, es | y | 9.50 |
| 10.00 | 330.00 | 340.00 | Limestone | | ak, cs, es | y | 10.00 |
| 2.00 | 340.00 | 342.00 | Claystone, grn | | cv, ev | | 0.00 |
| 14.70 | 342.00 | 356.70 | Limestone, nodular | | ak, cs, es | y | 14.70 |
| 10.00 | 356.70 | 366.70 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.55 | 366.70 | 370.25 | Claystone, gy | | cv, ev | | 0.00 |
| 1.80 | 370.25 | 372.05 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 3.40 | 372.05 | 375.45 | Claystone, gy | | cv, ev | | 0.00 |
| 14.55 | 375.45 | 390.00 | Shale, grn w/ ss bands | | cs, es | | 0.00 |
| 3.30 | 390.00 | 393.30 | Shale, gy, sandy | | cs, es | | 0.00 |
| 3.70 | 393.30 | 397.00 | Shale, gy | | cm, em | | 0.00 |
| 1.15 | 397.00 | 398.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.10 | 398.15 | 398.25 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.33 | 398.25 | 398.58 | Shale, gy | | cm, em | | 0.00 |
| 0.85 | 398.58 | 399.43 | **Coal, bony w/ pyrite** | | ac, cv, ev | | 0.00 |
| 0.17 | 399.43 | 399.60 | Shale, gy | | cm, em | | 0.00 |
| 1.30 | 399.60 | 400.90 | **Coal, bony** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: N94-41

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.30 | 400.90 | 401.20 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 401.20 | 401.65 | **Coal, bony** | | ac, cv, ev | | 0.00 |
| 0.50 | 401.65 | 402.15 | Shale, gy | | cm, em | | 0.00 |
| 15.85 | 402.15 | 418.00 | Limestone | | ak, cs, es | y | 15.85 |
| 2.00 | 418.00 | 420.00 | Claystone, grn, limey | | ak, cv, ev | | 0.00 |
| 4.00 | 420.00 | 424.00 | Claystone, grn w/ ss bands | | cm, em | | 0.00 |
| 3.00 | 424.00 | 427.00 | Claystone, grn | | cv, ev | | 0.00 |
| 4.20 | 427.00 | 431.20 | Limestone | | ak, cs, es | y | 4.20 |
| 4.20 | 431.20 | 435.40 | Claystone, grn | | cv, ev | | 0.00 |
| 19.05 | 435.40 | 454.45 | Limestone, nodular | | ak, cs, es | y | 19.05 |
| 8.65 | 454.45 | 463.10 | Claystone, grn w/ ls stks | | cm, em | | 0.00 |
| 1.85 | 463.10 | 464.95 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 464.95 | 465.45 | **Coal, bony, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 1.20 | 465.45 | 466.65 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 466.65 | 467.45 | Shale, dk gy w/ coal stks | | cm, em | | 0.00 |
| 0.55 | 467.45 | 468.00 | Shale, gy | | cm, em | | 0.00 |
| 2.87 | 468.00 | 470.87 | **Coal, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 0.13 | 470.87 | 471.00 | Pyrite | | ac, cs, es | | 0.00 |
| 2.10 | 471.00 | 473.10 | **Coal** | | ac, cv, ev | | 0.00 |
| 6.00 | 473.10 | 479.10 | Claystone, gy, limey | | ak, cv, ev | | 0.00 |
| 12.00 | 479.10 | 491.10 | Sandstone, gy | | cs, es | y | 12.00 |
| 4.00 | 491.10 | 495.10 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.00 | 495.10 | 497.10 | Limestone, nodular | | ak, cs, es | y | 2.00 |
| 2.90 | 497.10 | 500.00 | Claystone, gy | | cv, ev | | 0.00 |
| | Total Depth | 500.00 | | | | | 217.65 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 217.65

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 44%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 217.65 | 44% |
| Soft Rock: | 282.35 | 56% |
| | 500.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 1.43 | 3.32 | 2.95 | 104.0 | 102.6 |
| Coal | 2.30 | 6.40 | 4.42 | 200.00 | 197.7 |
| Bottom, 10 ft. | 23.70 | 4.14 | 3.60 | 129.00 | 105.3 |

Drill No. C

Hole No. 1 B&O

Driller [illegible]

# L. J. HUGHES & SONS

Contractors, Diamond Core Drilling

INDIANA, PA.

RICHWOOD, W. VA.

Date Started Oct. 18, 1950

Date Finished Oct. 20, 1950

FOR WHOM DRILLING: Baltimore & Ohio Railroad Company

ADDRESS [illegible]

Property Description: Ohio, Belmont County, Wayne Township. Located on Captina Creek one quarter mile east of Mike's Run near mouth of a small drain on North side Captina Creek. On farm of Judson Moore.

Surface elevation: 855.93

| No. of Strata | FORMATION | Thickness of Strata | | Depth from Surface | |
|---|---|---|---|---|---|
| | | Feet | Inches | Feet | Inches |
| | Surface Slag, [illegible] | 15 | 0 | 15 | 0 |
| | Shaley Fire Clay | 15 | 7 | 30 | 7 |
| | Limestone | 3 | 9 | 33 | 4 |
| | Gray Shale | 1 | 6 | 34 | 10 |
| | Dark Shale | 0 | 4 | 35 | 2 |
| | Coal Boney | 1 | 11 | 37 | 1 |
| | Fire Clay | 0 | 4 | 37 | 5 |
| | Limestone | 11 | 5 | 48 | 10 |
| | Light Gray Shale | 0 | 8 | 4 | 6 |
| | Limestone | 6 | 7 | 56 | 1 |
| | Gray Shale | 0 | 9 | 56 | 10 |
| | Shaley Fire Clay | 10 | 1 | 66 | 11 |
| | Limestone | 1 | 9 | 68 | 8 |
| | Gray Shale | 2 | 0 | 71 | 5 |
| | Dark Shale | 1 | 10 | 73 | 3 |
| | Fire Clay | 1 | 9 | 75 | 0 |
| | Limestone | 0 | 9 | 75 | 9 |
| | Dark Shale | 2 | 5 | 78 | 2 |
| | Limestone | 3 | 0 | 81 | 2 |
| | Dark Shale | 0 | 3 | 81 | 5 |
| | Limestone | 9 | 4 | 80 | 9 |
| | Shaley Fire Clay | 8 | 1 | 98 | 10 |
| | Dark Shale | 0 | 2 | 99 | 0 |
| | Boney Coal with [illegible] Shale Cominations | 0 | 9 | 99 | 9 |
| | Gray Shale | 0 | 11 | 100 | 8 |
| | Bone Coal | 0 | 2 | 100 | 10 |
| | Coal | 1 | 4 | 102 | 3 |
| | Fire Clay Binder | 0 | 0 | 102 | 5 |
| | Coal | 0 | 4 | 102 | 7 |
| | Slate binder | 0 | 0 | 102 | 9 |
| | Boney Coal | 0 | 1 | 102 | 10 |
| | Slate binder | 0 | 0 | 102 | 10 |
| | Coal | 1 | 11 | 104 | 10 |
| | Boney Coal | 0 | 0 | 104 | 10 |
| | Coal | 1 | 0 | 105 | 11 |
| | Gray Shale | 1 | 0 | 107 | 0 |
| | Total Depth | | | | |

AEC 03351

MORGANTOWN COAL TESTING LABORATORY

401 University Ave.
Morgantown, W. Va.

Laboratory No. 50-3618 Date Nov. 6, 1950

Report No. 50-3795

---

Company Bernard G. Sampson Co. Address Fairmont, W.Va.

Date Received 10/28/50 Sent By

---

THIS SAMPLE IS (REPRESENTED TO US TO BE)

Taken at Mine B & O Coal Location Diamond Drill Hole # 1

Seam # 8 Type Sample # 1 - Wild coal

---

ANALYSIS

| | Moisture | Volatile Matter | Fixed Carbon | Ash | Sulfur | Ash Softng. Temp. | B.T.U. |
|---|---|---|---|---|---|---|---|
| As Received | 1.8 | 30.8 | 36.3 | 30.9 | 9.71 | 2520 | 9,450 |
| Dry Basis | --- | 31.4 | 37.1 | 31.5 | 9.89 | 2520 | 9,620 |

---

WE DO NOT CERTIFY SAMPLING

REMARKS:

(signed) Paul N. Brown
Chief Chemist



AEC 03352

MORGANTOWN COAL TESTING LABORATORY

401 University Ave.
Morgantown, W. Va.

Laboratory No. 50-3619 Date Nov. 6, 1950

Report No. 50-3796

---

Company Bernard C. Sampson Co. Address Fairmont, W.Va.

Date Received 10/28/50 Sent By

---

THIS SAMPLE IS (REPRESENTED TO US TO BE)

Taken at Mine B & O Coal Location Diamond Drill Hole # 1

Seam #8 Type Sample # 2 - Top 6"

---

ANALYSIS

| | Moisture | Volatile Matter | Fixed Carbon | Ash | Sulfur | Ash Softng. Temp. | B.T.U. |
|---|---|---|---|---|---|---|---|
| As Received | 1.7 | 40.8 | 41.0 | 16.5 | 7.34 | 2420 | 11,620 |
| Dry Basis | --- | 41.5 | 41.7 | 16.8 | 7.47 | 2420 | 11,820 |

---

WE DO NOT CERTIFY SAMPLING

REMARKS:

(signed) Paul N. Brown
Chief Chemist



AEC 03353

MORGANTOWN COAL TESTING LABORATORY

401 University Ave.
Morgantown, W. Va.

| | | | |
|---|---|---|---|
| Laboratory No. | 50-3620 | Date | Nov. 6, 1950 |
| Report No. | 50-3828 | | |

| | | | |
|---|---|---|---|
| Company | Bernard G. Sampson Co. | Address | Fairmont, W.Va. |
| Date Received | 10/28/50 | Sent By | |

THIS SAMPLE IS (REPRESENTED TO US TO BE)

| | | | |
|---|---|---|---|
| Taken at Mine | B & O Coal | Location | D.D.Hole # 1 |
| Seam | #8 | Type | Sample #3 main seam with top 6" & bottom 6" & biniers removed |

ANALYSIS

| | Moisture | Volatile Matter | Fixed Carbon | Ash | Sulfur | Ash Softng. Temp. | B.T.U. |
|---|---|---|---|---|---|---|---|
| As Received | 1.7 | 41.8 | 46.3 | 10.2 | 5.29 | 2210 | 12,850 |
| Dry Basis | --- | 42.5 | 47.1 | 10.4 | 5.38 | 2210 | 13,070 |

WE DO NOT CERTIFY SAMPLING

REMARKS:

(signed) Paul N. Brown
Chief Chemist



AEC 03354

MORGANTOWN COAL TESTING LABORATORY

401 University Ave.
Morgantown, W. Va.

| | | | |
|---|---|---|---|
| Laboratory No. | 50-3621 | Date | Nov. 6, 1950 |
| Report No. | 50-3829 | | |

| | | | |
|---|---|---|---|
| Company | Bernard G. Sampson Co. | Address | Fairmont, W.Va. |
| Date Received | 10/28/50 | Sent By | |

THIS SAMPLE IS (REPRESENTED TO US TO BE)

| | | | |
|---|---|---|---|
| Taken at Mine | B & O Coal | Location | D.D.Hole #1 |
| Seam | #8 | Type | Sample #4 - bottom 6" |

ANALYSIS

| | Moisture | Volatile Matter | Fixed Carbon | Ash | Sulfur | Ash Softng. Temp. | B.T.U. |
|---|---|---|---|---|---|---|---|
| As Received | 2.0 | 40.5 | 42.8 | 14.7 | 6.63 | 2180 | 12,010 |
| Dry Basis | --- | 41.3 | 43.7 | 15.0 | 6.77 | 2180 | 12,250 |

WE DO NOT CERTIFY SAMPLING

REMARKS:

(signed) Paul N. Brown
Chief Chemist



AEC 03355

PENNSYLVANIA DRILLING COMPANY
MAIN ADDRESS
1201-1215 CHARTIERS AVENUE
PITTSBURGH 20, PA.
PHONE WALNUT 1-5816

For MANOR REAL ESTATE CO.

Record of Hole No. 14 M M-14

Location YOCOSFIELD, OHIO

NW ¼ Sect. 15, WAYNE Twp.

Surface Elevation 895 Bar.

Date Started 6-9-56

Driller BYRON DOYLE

Date Completed 6-13-56

| STRATA | FEET | INCHES | TOTAL |
|---|---|---|---|
| CLAY & SAND | 6 | 0 | 6' 0" |
| GRAY SHALE | 7 | 0 | 13' 0" |
| COAL, SLATE & BLACK SHALE | 2 | 0 | 15' 0" |
| BROWN LIMESTONE | 14 | 6 | 20' 6" |
| GREEN SHALE | 5 | 6 | 35' 0" |
| BROWN LIMESTONE | 4 | 0 | 39' 0" |
| BROKEN GREEN & GRAY SHALE | 25 | 0 | 64' 0" |
| GRAY SANDY SHALE | 9 | 0 | 73' 0" |
| GRAY SANDSTONE | 17 | 0 | 90' 0" |
| DARK SHALE | 5 | 0 | 95' 0" |
| COAL No. 8 | 4 | 3½ | 99' 3½" |
| HARD GRAY SHALE | 2 | 1 | 101' 4½" |

A Duplicate of this Record may be obtained by writing to the Above Address

AEC 0335

Form 407

# PITTSBURGH TESTING LABORATORY

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ORDER No. PG-6307 LABORATORY No. 481700

CLIENT'S No. FILE No.

## REPORT

July 10, 1956

Analysis of: COAL

Marked:- M-14

Submitted by: Manor Real Estate Co.

Reported to: Manor Real Estate Co.
Buck Hill Bottom
Industrial Site Development
C/O Richard D. Snouffer
1520 Farmers Bank Bldg.
Pittsburgh 22, Penna.

| | As Received | Dry Basis |
|---|---|---|
| MOISTURE | 1.76% | -----% |
| VOLATILE MATTER | 41.50 | 42.24 |
| FIXED CARBON | 44.59 | 45.39 |
| ASH | 12.15 | 12.37 |
| SULPHUR | 5.89 | 6.00 |
| BTU PER POUND | 12,696 | 12,923 |
| FUSION TEMPERATURE OF ASH | 1970°F | |
| ASTM FREE SWELLING INDEX | ----- | |

PITTSBURGH TESTING LABORATORY

Lawrence K. Jones,
Manager, Chemical Division

3 Copies: Manor Real Estate Co.

cn

"WE LOOK INTO THE EARTH"

# PENNSYLVANIA DRILLING COMPANY

MAIN ADDRESS
1201-1215 CHARTIERS AVENUE
PITTSBURGH 20, PA.
PHONE WALNUT 1-5816

For MANOR REAL ESTATE CO.

Record of Hole No. M-17

Location MOORSFIELD, OHIO

SE ¼ Sect. 20, WAYNE Twp.

Surface Elevation 1215 BAR.
W. WILSON

Driller B. DOYLE

Date Started 5-3-56

Date Completed 5-23-56

| STRATA | FEET | INCHES | TOTAL |
|---|---|---|---|
| OVERBURDEN | 10 | 0 | 10' 0" |
| YELLOW SANDY SHALE | 8 | 0 | 18' 0" |
| GRAY SANDSTONE | 40 | 0 | 58' 0" |
| DARK SHALE | 3 | 0 | 61' 0" |
| COAL ✓ | | 8 | 61' 8" |
| DARK SHALE | 1 | 4 | 63' 0" |
| GRAY SHALE | 11 | 0 | 77' 0" |
| DO. | 22 | 0 | 99' 0" |
| GRAY SANDY SHALE | 14 | 0 | 113' 0" |
| COAL / | 1 | 0 | #11 114'0" |
| DARK SHALE | 21 | 0 | 135' 0" |
| LIMESTONE | 10 | 0 | 145' 0" |
| GREEN SHALE | 1 | 0 | 146' 0" |
| GRAY SHALE | 17 | 0 | 163' 0" |
| COAL - SHALE PARTINGS / | 1 | 6 | #10 164' 6" |
| GRAY SHALE | 21 | 6 | 186' 0" |
| LIME SHALE | 20 | 0 | 206' 0" |
| G[illegible] & GREEN SHALE | 7 | 6 | 213' 6" |
| GRAY SANDSTONE | 2 | 6 | 216' 0" |
| GRAY SHALE | 12 | 0 | 228' 0" |

"WE LOOK INTO THE EARTH"

# PENNSYLVANIA DRILLING COMPANY

MAIN ADDRESS
1201-1215 CHARTIERS AVENUE
PITTSBURGH 20, PA.
PHONE WALNUT 1-5816

For MANOR REAL ESTATE CO.

Record of Hole No. 17 (CONTINUED)

Location WOODSFIELD, OHIO

Surface Elevation

Date Started

Driller

Date Completed

| STRATA | FEET | INCHES | TOTAL |
|---|---|---|---|
| BROWN LIMESTONE | 6 | 0 | 241' 0" |
| GRAY SHALE WITH LIME | 21 | 0 | 262' 0" |
| BROWN LIMESTONE | 4 | 0 | 266' 0" |
| GRAY & BLACK SHALE | 6 | 0 | 272' 0" |
| SLATE & COAL | 1 | 0 | GR 273' 0" |
| GRAY SHALE | 17 | 0 | 290' 0" |
| GRAY SANDSTONE & SHALE | 6 | 0 | 296' 0" |
| VERY DARK SHALE | 9 | 0 | 305' 0" |
| SLATE & COAL | 2 | 6 | SG 307' 6" |
| BROWN LIMY SHALE | 15 | 0 | 322' 6" |
| GRAY SANDSTONE | 3 | 6 | 326' 0" |
| GRAY & GREEN SHALE WITH LIMESTREAKS | 38 | 0 | 364' 0" |
| GRAY SANDSTONE | 6 | 0 | 370' 0" |
| DARK SHALE | 2 | 0 | 372' 0" |
| GRAY SANDSTONE | 5 | 6 | 377' 6" |
| DARK SHALE | 5 | | 382' 6" |

A Duplicate of this Record may be obtained by writing to the Above Address

AEC 03359

"WE LOOK INTO THE EARTH"

FORM 0-104 [illegible]

# PENNSYLVANIA DRILLING COMPANY

MAIN ADDRESS
1201-1215 CHARTIERS AVENUE
PITTSBURGH 20, PA.
PHONE WALNUT 1-5816

For MANOR REAL ESTATE CO.

Record of Hole No. 17 (CONTINUED)

Location WOODSFIELD, OHIO

Surface Elevation

Date Started

Driller B. DOYLE

Date Completed 5-23-56

| STRATA | FEET | INCHES | TOTAL 382' 6" |
|---|---|---|---|
| COAL No. 8 | 4 | 5 | 386' 11" |
| HARD GRAY SHALE | 3 | 0 | 389' 11" |

# PITTSBURGH TESTING LABORATORY

ESTABLISHED 1881

PITTSBURGH, PA.

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ORDER No. PG-6307

LABORATORY No. 480759

CLIENT'S No.

FILE No.

## REPORT

June 8, 1956

Analysis of — COAL

Marked:- — M-17

Submitted by — Manor Real Estate Company

Reported to — Manor Real Estate Company
Buck Hill Bottom
Industrial Site Development

---

| | As Received | Dry Basis |
|---|---|---|
| MOISTURE | 1.76% | -----% |
| VOLATILE MATTER | 43.30 | 44.08 |
| FIXED CARBON | 46.54 | 47.37 |
| ASH | 8.40 | 8.55 |
| SULPHUR | 4.78 | 4.87 |
| BTU PER POUND | 13,312 | 13,550 |
| FUSION TEMPERATURE OF ASH | 1980°F. | |
| ASTM FREE SWELLING INDEX | ----- | |

PITTSBURGH TESTING LABORATORY

Lawrence K. Jones

Lawrence K. Jones,
Manager, Chemical Division

3 Copies: Manor Real Estate Co.

rms

# DIAMOND DRILL HOLE: C-98-04

**Field Engineer:** Bill Beam
**Surface Elevation:** 964.66
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 685,683
**Easting:** 2,420,867
**Drilling Company:** L.G. Hetager Drilling, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 9.00 | 0.00 | 9.00 | Casing | | | | 0.00 |
| 5.70 | 9.00 | 14.70 | Claystone, gy | | | | 0.00 |
| 20.30 | 14.70 | 35.00 | Shale, gy, sandy | | | | 0.00 |
| 10.60 | 35.00 | 45.60 | Sandstone, gy | | | y | 10.60 |
| 11.90 | 45.60 | 57.50 | Claystone, gy, limey | | | | 0.00 |
| 1.80 | 57.50 | 59.30 | Limestone, nodular | | | y | 1.80 |
| 14.70 | 59.30 | 74.00 | Shale, gy, limey w/ clay | | | | 0.00 |
| 2.30 | 74.00 | 76.30 | Limestone, shaley, nodular | | | y | 2.30 |
| 4.40 | 76.30 | 80.70 | Claystone, gy | | | | 0.00 |
| 2.10 | 80.70 | 82.80 | Limestone, gy | | | y | 2.10 |
| 3.20 | 82.80 | 86.00 | Shale, gy/red | | | | 0.00 |
| 10.90 | 86.00 | 96.90 | Claystone, gy, limey | | | | 0.00 |
| 3.90 | 96.90 | 100.80 | Shale, gy, sandy, limey | | | | 0.00 |
| 11.20 | 100.80 | 112.00 | Limestone, gy | | | y | 11.20 |
| 9.20 | 112.00 | 121.20 | Claystone, gy | | | | 0.00 |
| 12.80 | 121.20 | 134.00 | Shale, gy | | | | 0.00 |
| 17.10 | 134.00 | 151.10 | Limestone, nodular | | | y | 17.10 |
| 8.50 | 151.10 | 159.60 | Shale, gy | | | | 0.00 |
| 3.80 | 159.60 | 163.40 | Limestone, gy | | | y | 3.80 |
| 5.00 | 163.40 | 168.40 | Shale, gy | | | | 0.00 |
| 12.00 | 168.40 | 180.40 | Limestone, shaley, nodular | | | y | 12.00 |
| 11.00 | 180.40 | 191.40 | Shale, blk | | | | 0.00 |
| 0.70 | 191.40 | 192.10 | **Coal** | | | | 0.00 |
| 2.60 | 192.10 | 194.70 | Shale, blk | | | | 0.00 |
| 4.00 | 194.70 | 198.70 | Shale, gy, sandy | | | | 0.00 |
| 15.10 | 198.70 | 213.80 | Shale, blk | | | | 0.00 |
| 1.00 | 213.80 | 214.80 | **Coal** | | | | 0.00 |
| 0.20 | 214.80 | 215.00 | Claystone, gy | | | | 0.00 |
| 0.20 | 215.00 | 215.20 | **Coal** | | | | 0.00 |
| 0.20 | 215.20 | 215.40 | Shale, blk | | | | 0.00 |
| 0.70 | 215.40 | 216.10 | **Coal** | | | | 0.00 |
| 0.60 | 216.10 | 216.70 | Shale, blk | | | | 0.00 |
| 25.40 | 216.70 | 242.10 | Limestone, gy | | | y | 25.40 |
| 0.70 | 242.10 | 242.80 | Shale, gy, sandy | | | | 0.00 |
| 2.80 | 242.80 | 245.60 | Limestone, nodular | | | y | 2.80 |
| 0.70 | 245.60 | 246.30 | Claystone, gy | | | | 0.00 |
| 2.70 | 246.30 | 249.00 | Limestone, gy | | | y | 2.70 |
| 2.50 | 249.00 | 251.50 | Claystone, gy | | | | 0.00 |
| 0.40 | 251.50 | 251.90 | Shale, blk | | | | 0.00 |
| 1.20 | 251.90 | 253.10 | **Coal** | | | | 0.00 |
| 1.20 | 253.10 | 254.30 | Shale, blk | | | | 0.00 |
| 4.90 | 254.30 | 259.20 | Limestone, gy | | | y | 4.90 |
| 0.80 | 259.20 | 260.00 | Shale, blk | | | | 0.00 |
| 11.10 | 260.00 | 271.10 | Limestone, nodular | | | y | 11.10 |
| 13.60 | 271.10 | 284.70 | Claystone, gy | | | | 0.00 |
| 0.80 | 284.70 | 285.50 | **Coal** | | | | 0.00 |
| 0.20 | 285.50 | 285.70 | **Shale, dk** | | | | 0.00 |
| 0.60 | 285.70 | 286.30 | **Claystone, gy** | | | | 0.00 |
| 5.30 | 286.30 | 291.60 | **Coal, PITTSBURGH No.8** | | | | 0.00 |
| 10.40 | 291.60 | 302.00 | Limestone, nodular | | | y | 10.40 |
| Total Depth | | 302.00 | | | | | 118.20 |

Total Thickness of Hard Rock Overlying Mining Unit 118.20

*Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit* 39%

## DIAMOND DRILL HOLE: C-98-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 118.20 | 39% |
| Soft Rock: | 183.80 | 61% |
| | 302.00 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 49.20 | 2.38 | 1.95 | 74.4 | 25.2 |
| Coal | 3.77 | 4.96 | 2.07 | 155.00 | 151.2 |
| Bottom, 10 ft. | 340.00 | 1.83 | 1.60 | 57.00 | -283.0 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-29

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1110
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 673180
**Easting:** 2412800
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing | | | | 0.00 |
| 1.80 | 16.00 | 17.80 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 8.80 | 17.80 | 26.60 | Claystone, gy | | cv, ev | | 0.00 |
| 1.30 | 26.60 | 27.90 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 27.90 | 28.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.10 | 28.10 | 29.20 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 7.60 | 29.20 | 36.80 | Claystone, gy | | cv, ev | | 0.00 |
| 4.90 | 36.80 | 41.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.70 | 41.70 | 44.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 13.60 | 44.40 | 58.00 | Sandstone, gy, massive | | cs, es | y | 13.60 |
| 14.00 | 58.00 | 72.00 | Sandstone, gy, crossbeds | | cs, es | y | 14.00 |
| 36.20 | 72.00 | 108.20 | Sandstone, gy, sh stks | | cs, es | y | 36.20 |
| 0.15 | 108.20 | 108.35 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 108.35 | 108.55 | **Coal, bone stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.55 | 108.55 | 109.10 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 1.20 | 109.10 | 110.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 110.30 | 112.20 | Limestone, shaley, massive | | ak, cs, es | y | 1.90 |
| 4.10 | 112.20 | 116.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 8.00 | 116.30 | 124.30 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.40 | 124.30 | 128.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.60 | 128.70 | 130.30 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 130.30 | 131.00 | Shale, red/ gy | | cm, em | | 0.00 |
| 5.70 | 131.00 | 136.70 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 136.70 | 137.20 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.50 | 137.20 | 137.70 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 137.70 | 137.95 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 1.95 | 137.95 | 139.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 139.90 | 141.65 | Sandstone, gy, sh stks | | cs, es | y | 1.75 |
| 3.65 | 141.65 | 145.30 | Shale, gy, sandy, slumped | | cm, em | | 0.00 |
| 2.90 | 145.30 | 148.20 | Shale, gy, sandy, massive | | cm, em | | 0.00 |
| 1.30 | 148.20 | 149.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.90 | 149.50 | 152.40 | Limestone, shaley, layered | | ak, cs, es | y | 2.90 |
| 0.80 | 152.40 | 153.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 153.20 | 153.80 | Limestone, shaley, massive | | ak, cs, es | y | 0.60 |
| 3.10 | 153.80 | 156.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 156.90 | 157.25 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.05 | 157.25 | 158.30 | Claystone, gy | | cv, ev | | 0.00 |
| 1.55 | 158.30 | 159.85 | Shale, gy | | cm, em | | 0.00 |
| 3.05 | 159.85 | 162.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.40 | 162.90 | 166.30 | Sandstone, gy, sh stks | | cs, es | y | 3.40 |
| 2.30 | 166.30 | 168.60 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 168.60 | 168.70 | **Coal, pyrite, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.80 | 168.70 | 169.50 | **Claystone, gy** | | cv, ev | | 0.00 |
| 0.12 | 169.50 | 169.62 | **Bone, pyrite stks** | | ac, cv, ev | | 0.00 |
| 1.08 | 169.62 | 170.70 | Claystone, gy | | cv, ev | | 0.00 |
| 3.80 | 170.70 | 174.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.80 | 174.50 | 179.30 | Shale, gy | | cm, em | | 0.00 |
| 0.12 | 179.30 | 179.42 | **Coal, bone stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.18 | 179.42 | 179.60 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.70 | 179.60 | 180.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 180.30 | 181.50 | Limestone, shaley, massive | | ak, cs, es | y | 1.20 |
| 3.60 | 181.50 | 185.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 185.10 | 186.00 | Limestone, shaley, massive | | ak, cs, es | y | 0.90 |
| 0.50 | 186.00 | 186.50 | Shale, dk gy | | cm, em | | 0.00 |
| 3.30 | 186.50 | 189.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 189.80 | 191.00 | Limestone, shaley, layered | | ak, cs, es | y | 1.20 |
| 1.60 | 191.00 | 192.60 | Limestone, mosaic | | ak, cs, es | y | 1.60 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-29

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.30 | 192.60 | 194.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.70 | 194.90 | 197.60 | Limestone, shaley, layered | | ak, cs, es | y | 2.70 |
| 4.40 | 197.60 | 202.00 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.10 | 202.00 | 207.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.00 | 207.10 | 211.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.20 | 211.10 | 211.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.50 | 211.30 | 213.80 | Claystone, grn | | cv, ev | | 0.00 |
| 1.90 | 213.80 | 215.70 | Shale, grn | | cm, em | | 0.00 |
| 1.00 | 215.70 | 216.70 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.70 | 216.70 | 217.40 | Shale, grn | | cm, em | | 0.00 |
| 5.90 | 217.40 | 223.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.80 | 223.30 | 226.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.40 | 226.10 | 228.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.70 | 228.50 | 231.20 | Shale, gy, sandy, slumped | | cm, em | | 0.00 |
| 3.70 | 231.20 | 234.90 | Sandstone, gy, crossbeds | | cs, es | y | 3.70 |
| 2.00 | 234.90 | 236.90 | Limestone, shaley, massive | | ak, cs, es | y | 2.00 |
| 1.40 | 236.90 | 238.30 | Limestone, shaley, layered | | ak, cs, es | y | 1.40 |
| 0.80 | 238.30 | 239.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 239.10 | 240.30 | Limestone, shaley, massive | | ak, cs, es | y | 1.20 |
| 2.70 | 240.30 | 243.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 243.00 | 244.40 | Limestone, massive | | ak, cs, es | y | 1.40 |
| 1.00 | 244.40 | 245.40 | Limestone, layered | | ak, cs, es | y | 1.00 |
| 6.20 | 245.40 | 251.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 251.60 | 255.10 | Shale, grn, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 255.10 | 256.80 | Sandstone, gy, sh stks | | cs, es | y | 1.70 |
| 3.70 | 256.80 | 260.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 260.50 | 262.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 262.30 | 264.80 | Limestone, shaley, massive | | ak, cs, es | y | 2.50 |
| 3.40 | 264.80 | 268.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 268.20 | 269.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 2.30 | 269.80 | 272.10 | Limestone, shaley, massive | | ak, cs, es | y | 2.30 |
| 3.10 | 272.10 | 275.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.80 | 275.20 | 279.00 | Limestone, shaley, layered | | ak, cs, es | y | 3.80 |
| 7.50 | 279.00 | 286.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 286.50 | 287.40 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 1.70 | 287.40 | 289.10 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 289.10 | 294.10 | Limestone, massive | | ak, cs, es | y | 5.00 |
| 3.00 | 294.10 | 297.10 | Limestone, shaley, layered | | ak, cs, es | y | 3.00 |
| 0.70 | 297.10 | 297.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 297.80 | 299.40 | Limestone, mosaic | | ak, cs, es | y | 1.60 |
| 0.80 | 299.40 | 300.20 | Shale, grn | | cm, em | | 0.00 |
| 2.30 | 300.20 | 302.50 | Limestone, layered | | ak, cs, es | y | 2.30 |
| 3.20 | 302.50 | 305.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.80 | 305.70 | 311.50 | Limestone, shaley, layered | | ak, cs, es | y | 5.80 |
| 1.90 | 311.50 | 313.40 | Shale, grn, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 313.40 | 316.70 | Shale, gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 6.00 | 316.70 | 322.70 | Sandstone, gy, slumped | | cs, es | y | 6.00 |
| 0.20 | 322.70 | 322.90 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 0.20 | 322.90 | 323.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.50 | 323.10 | 323.60 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.20 | 323.60 | 323.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.90 | 323.80 | 324.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 19.20 | 324.70 | 343.90 | Shale, gy | | cm, em | | 0.00 |
| 2.30 | 343.90 | 346.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.10 | 346.20 | 347.30 | Shale, gy | | cm, em | | 0.00 |
| 1.50 | 347.30 | 348.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 348.80 | 348.90 | **Bone, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.52 | 348.90 | 349.42 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 349.42 | 349.44 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.41 | 349.44 | 349.85 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 349.85 | 350.10 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.30 | 350.10 | 351.40 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.30 | 351.40 | 351.70 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.50 | 351.70 | 352.20 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.40 | 352.20 | 352.60 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.00 | 352.60 | 353.60 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 5.80 | 353.60 | 359.40 | Limestone, mosaic | | ak, cs, es | y | 5.80 |
| 2.10 | 359.40 | 361.50 | Limestone, massive | | ak, cs, es | y | 2.10 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-29

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.00 | 361.50 | 362.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.90 | 362.50 | 367.40 | Limestone, mosaic | | ak, cs, es | y | 4.90 |
| 0.70 | 367.40 | 368.10 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 2.90 | 368.10 | 371.00 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 371.00 | 372.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.20 | 372.20 | 374.40 | Shale, gy | | cm, em | | 0.00 |
| 3.90 | 374.40 | 378.30 | Limestone, shaley, layered | | ak, cs, es | y | 3.90 |
| 3.30 | 378.30 | 381.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.15 | 381.60 | 381.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.35 | 381.75 | 383.10 | Shale, grn | | cm, em | | 0.00 |
| 11.20 | 383.10 | 394.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 394.30 | 395.80 | Shale, grn | | cm, em | | 0.00 |
| 4.20 | 395.80 | 400.00 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 400.00 | 401.40 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 401.40 | 401.80 | Limestone, shaley | | ak, cs, es | y | 0.40 |
| 2.30 | 401.80 | 404.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 404.10 | 405.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 405.70 | 409.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.65 | 409.10 | 412.75 | Shale, dk gy | | cm, em | | 0.00 |
| 1.20 | 412.75 | 413.95 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.30 | 413.95 | 414.25 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.65 | 414.25 | 414.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.75 | 414.90 | 415.65 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.85 | 415.65 | 416.50 | Sandstone, gy, sh pebbles | | cs, es | y | 0.85 |
| 1.90 | 416.50 | 418.40 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 418.40 | 419.05 | Sandstone, gy, massive | | cs, es | y | 0.65 |
| 2.50 | 419.05 | 421.55 | Sandstone, gy, coal bands | | ac, cs, es | y | 2.50 |
| 1.25 | 421.55 | 422.80 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 422.80 | 423.00 | Sandstone, gy, coal spars | | ac, cs, es | y | 0.20 |
| 0.85 | 423.00 | 423.85 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.60 | 423.85 | 424.45 | **Coal, sh layers, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.50 | 424.45 | 424.95 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.75 | 424.95 | 425.70 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 0.85 | 425.70 | 426.55 | Sandstone, gy, sh stks | | cs, es | y | 0.85 |
| 0.80 | 426.55 | 427.35 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.15 | 427.35 | 428.50 | Sandstone, gy, massive | | cs, es | y | 1.15 |
| 0.72 | 428.50 | 429.22 | **Coal, pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.04 | 429.22 | 429.26 | **Coal, dull** | | ac, cv, ev | | 0.00 |
| 0.55 | 429.26 | 429.81 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.06 | 429.81 | 429.87 | **Coal, dull** | | ac, cv, ev | | 0.00 |
| 1.40 | 429.87 | 431.27 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.60 | 431.27 | 431.87 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 1.05 | 431.87 | 432.92 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 432.92 | 433.02 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.40 | 433.02 | 436.42 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.60 | 436.42 | 439.02 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 439.02 | 439.77 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 1.30 | 439.77 | 441.07 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 441.07 | 441.82 | Shale, gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 441.82 | 443.12 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| | Total Depth | 443.12 | | | | | 153.85 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **153.85**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **35%**

Thickness Percent

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-29

| Thickness (ft.) | Depth From (ft.) (Ft.) | To (ft.) (%) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Hard Rock: | 153.85 | 35% | | | | | |
| Soft Rock: | 289.27 | 65% | | | | | |
| | 443.12 | | | | | | |

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-30

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1080
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 668760
**Easting:** 2416150
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 19.00 | 0.00 | 19.00 | Casing | | | | 0.00 |
| 5.65 | 19.00 | 24.65 | Shale, gy | Yes | cm, em | | 0.00 |
| 60.65 | 24.65 | 85.30 | Sandstone, gy, sh stks | | cs, es | y | 60.65 |
| 0.80 | 85.30 | 86.10 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.95 | 86.10 | 87.05 | Sandstone, gy, crossbeds | | cs, es | y | 0.95 |
| 0.80 | 87.05 | 87.85 | Sandstone, gy, coal spars | | cs, es | y | 0.80 |
| 7.20 | 87.85 | 95.05 | Sandstone, gy, sh stks | | cs, es | y | 7.20 |
| 0.20 | 95.05 | 95.25 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.35 | 95.25 | 95.60 | **Coal, bone stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.08 | 95.60 | 95.68 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.17 | 95.68 | 95.85 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.15 | 95.85 | 96.00 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.40 | 96.00 | 96.40 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 96.40 | 96.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 96.60 | 96.95 | Shale, dk gy | | cm, em | | 0.00 |
| 1.00 | 96.95 | 97.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 0.80 | 97.95 | 98.75 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 1.25 | 98.75 | 100.00 | Claystone, gy | | cv, ev | | 0.00 |
| 4.80 | 100.00 | 104.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.20 | 104.80 | 109.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 109.00 | 111.50 | Shale, gy | | cm, em | | 0.00 |
| 4.30 | 111.50 | 115.80 | Sandstone, gy, sh stks | | cs, es | y | 4.30 |
| 2.00 | 115.80 | 117.80 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.70 | 117.80 | 118.50 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 3.95 | 118.50 | 122.45 | Shale, gy | | cm, em | | 0.00 |
| 1.55 | 122.45 | 124.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 1.10 | 124.00 | 125.10 | Sandstone, gy, massive | | cs, es | y | 1.10 |
| 2.50 | 125.10 | 127.60 | Sandstone, gy, sh stks | | cs, es | y | 2.50 |
| 1.10 | 127.60 | 128.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.10 | 128.70 | 129.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 129.80 | 131.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.35 | 131.00 | 133.35 | Shale, gy | | cm, em | | 0.00 |
| 0.15 | 133.35 | 133.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 133.50 | 133.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 133.95 | 134.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 134.30 | 137.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 1.65 | 137.00 | 138.65 | Shale, gy | | cm, em | | 0.00 |
| 0.75 | 138.65 | 139.40 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 139.40 | 141.50 | Claystone, gy | | cv, ev | | 0.00 |
| 0.15 | 141.50 | 141.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.18 | 141.65 | 141.83 | **Bone, coal stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.06 | 141.83 | 141.89 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.09 | 141.89 | 141.98 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 1.27 | 141.98 | 143.25 | Claystone, gy | | cv, ev | | 0.00 |
| 2.20 | 143.25 | 145.45 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 145.45 | 145.55 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.60 | 145.55 | 146.15 | Shale, gy | | cm, em | | 0.00 |
| 0.75 | 146.15 | 146.90 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 146.90 | 148.15 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.95 | 148.15 | 149.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.15 | 149.10 | 150.25 | Shale, gy | | cm, em | | 0.00 |
| 0.55 | 150.25 | 150.80 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 6.50 | 150.80 | 157.30 | Sandstone, gy, sh stks | | cs, es | y | 6.50 |
| 2.75 | 157.30 | 160.05 | Sandstone, gy, crossbeds | | cs, es | y | 2.75 |
| 1.95 | 160.05 | 162.00 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.90 | 162.00 | 162.90 | Shale, gy | | cm, em | | 0.00 |
| 1.65 | 162.90 | 164.55 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.20 | 164.55 | 164.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 164.75 | 165.10 | **Coal, bone stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.05 | 165.10 | 165.15 | **Shale, gy** | | cm, em | | 0.00 |
| 0.07 | 165.15 | 165.22 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 4.03 | 165.22 | 169.25 | Shale, gy | | cm, em | | 0.00 |
| 1.15 | 169.25 | 170.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 170.40 | 171.20 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 0.60 | 171.20 | 171.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 171.80 | 172.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 1.20 | 172.25 | 173.45 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 0.40 | 173.45 | 173.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.95 | 173.85 | 176.80 | Limestone, nodular | | ak, cs, es | y | 2.95 |
| 2.10 | 176.80 | 178.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 178.90 | 179.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 179.10 | 179.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 0.65 | 179.70 | 180.35 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 0.90 | 180.35 | 181.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.40 | 181.25 | 181.65 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.25 | 181.65 | 181.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 1.25 | 181.90 | 183.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 183.15 | 183.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 183.60 | 184.00 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.70 | 184.00 | 184.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 184.70 | 185.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 185.90 | 186.30 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.60 | 186.30 | 186.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 186.90 | 187.25 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.50 | 187.25 | 187.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 187.75 | 188.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 1.00 | 188.10 | 189.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 189.10 | 189.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 189.35 | 189.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 0.65 | 189.65 | 190.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 190.30 | 191.00 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 1.75 | 191.00 | 192.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 192.75 | 193.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 0.15 | 193.00 | 193.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.25 | 193.15 | 193.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.45 | 193.40 | 194.85 | Claystone, gy | | cv, ev | | 0.00 |
| 1.30 | 194.85 | 196.15 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.25 | 196.15 | 199.40 | Shale, gy | | cm, em | | 0.00 |
| 1.80 | 199.40 | 201.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 201.20 | 201.65 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.25 | 201.65 | 202.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 202.90 | 203.20 | Shale, red | | cm, em | | 0.00 |
| 0.55 | 203.20 | 203.75 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.25 | 203.75 | 204.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 204.00 | 204.35 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 204.35 | 204.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 6.05 | 204.75 | 210.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 210.80 | 212.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 212.00 | 212.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 212.60 | 214.80 | Sandstone, gy, sh stks | | cs, es | y | 2.20 |
| 1.25 | 214.80 | 216.05 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.35 | 216.05 | 217.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 217.40 | 220.15 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.35 | 220.15 | 221.50 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 0.95 | 221.50 | 222.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 222.45 | 223.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 0.75 | 223.85 | 224.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 224.60 | 225.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.95 | 225.00 | 225.95 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 1.50 | 225.95 | 227.45 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 1.15 | 227.45 | 228.60 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 0.50 | 228.60 | 229.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 0.40 | 229.10 | 229.50 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.90 | 229.50 | 230.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 230.40 | 231.40 | Limestone, nodular | | ak, cs, es | y | 1.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.15 | 231.40 | 232.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 232.55 | 234.15 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 234.15 | 235.30 | Shale, gy | | cm, em | | 0.00 |
| 0.90 | 235.30 | 236.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 1.35 | 236.20 | 237.55 | Shale, red/ gy | | cm, em | | 0.00 |
| 4.90 | 237.55 | 242.45 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 242.45 | 242.70 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 242.70 | 243.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.20 | 243.10 | 244.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 244.30 | 244.55 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 3.30 | 244.55 | 247.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 247.85 | 249.00 | Core loss | | | | 0.00 |
| 1.50 | 249.00 | 250.50 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 3.45 | 250.50 | 253.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 253.95 | 257.15 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 257.15 | 257.85 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.15 | 257.85 | 258.00 | Claystone, grn | | cv, ev | | 0.00 |
| 1.10 | 258.00 | 259.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 1.05 | 259.10 | 260.15 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 1.95 | 260.15 | 262.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 262.10 | 262.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 262.75 | 265.05 | Limestone, nodular | | ak, cs, es | y | 2.30 |
| 2.15 | 265.05 | 267.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 267.20 | 269.15 | Limestone, shaley, nodular | | ak, cs, es | y | 1.95 |
| 1.80 | 269.15 | 270.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.95 | 270.95 | 273.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.95 |
| 0.55 | 273.90 | 274.45 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 1.50 | 274.45 | 275.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 275.95 | 277.95 | Shale, dk gy | | cm, em | | 0.00 |
| 6.25 | 277.95 | 284.20 | Limestone, nodular | | ak, cs, es | y | 6.25 |
| 3.65 | 284.20 | 287.85 | Limestone, layered | | ak, cs, es | y | 3.65 |
| 0.70 | 287.85 | 288.55 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 0.50 | 288.55 | 289.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 289.05 | 290.70 | Limestone, nodular | | ak, cs, es | y | 1.65 |
| 0.75 | 290.70 | 291.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 291.45 | 292.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 1.50 | 292.00 | 293.50 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 3.05 | 293.50 | 296.55 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 296.55 | 297.50 | Sandstone, gy, sh stks | | cs, es | y | 0.95 |
| 1.50 | 297.50 | 299.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 299.00 | 299.65 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 1.15 | 299.65 | 300.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 300.80 | 301.65 | Limestone, layered | | ak, cs, es | y | 0.85 |
| 2.25 | 301.65 | 303.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 303.90 | 307.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 307.50 | 309.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 309.10 | 311.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 311.05 | 312.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.75 | 312.50 | 313.25 | Shale, gy | | cm, em | | 0.00 |
| 0.55 | 313.25 | 313.80 | Claystone, gy | | cv, ev | | 0.00 |
| 9.85 | 313.80 | 323.65 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 323.65 | 323.90 | Sandstone, gy, sh stks | | cs, es | y | 0.25 |
| 1.25 | 323.90 | 325.15 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.70 | 325.15 | 325.85 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 325.85 | 326.45 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.45 | 326.45 | 326.90 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 0.25 | 326.90 | 327.15 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.10 | 327.15 | 327.25 | Sandstone, gy, sh stks | | cs, es | y | 0.10 |
| 0.30 | 327.25 | 327.55 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.10 | 327.55 | 327.65 | Sandstone, gy, sh stks | | cs, es | y | 0.10 |
| 1.35 | 327.65 | 329.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.75 | 329.00 | 330.75 | Sandstone, gy, sh stks | | cs, es | y | 1.75 |
| 0.85 | 330.75 | 331.60 | Sandstone, gy, massive | | cs, es | y | 0.85 |
| 0.50 | 331.60 | 332.10 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 1.75 | 332.10 | 333.85 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.60 | 333.85 | 335.45 | Sandstone, gy, sh stks | | cs, es | y | 1.60 |
| 1.25 | 335.45 | 336.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.65 | 336.70 | 337.35 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.90 | 337.35 | 339.25 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 339.25 | 339.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.65 | 339.45 | 340.10 | Claystone, gy | | cv, ev | | 0.00 |
| 0.10 | 340.10 | 340.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 340.20 | 340.30 | **Bone, coal stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.22 | 340.30 | 340.52 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.13 | 340.52 | 340.65 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.80 | 340.65 | 341.45 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.45 | 341.45 | 341.90 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.35 | 341.90 | 342.25 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.70 | 342.25 | 342.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.55 | 342.95 | 343.50 | Shale, gy | | cm, em | | 0.00 |
| 2.80 | 343.50 | 346.30 | Limestone, nodular | | ak, cs, es | y | 2.80 |
| 0.80 | 346.30 | 347.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 2.30 | 347.10 | 349.40 | Limestone, nodular | | ak, cs, es | y | 2.30 |
| 0.75 | 349.40 | 350.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 2.30 | 350.15 | 352.45 | Limestone, massive | | ak, cs, es | y | 2.30 |
| 0.50 | 352.45 | 352.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 352.95 | 353.65 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 0.95 | 353.65 | 354.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 0.60 | 354.60 | 355.20 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 1.75 | 355.20 | 356.95 | Limestone, mosaic | | ak, cs, es | y | 1.75 |
| 1.60 | 356.95 | 358.55 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 1.25 | 358.55 | 359.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 359.80 | 361.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 361.35 | 362.80 | Sandstone, gy, sh stks | | cs, es | y | 1.45 |
| 1.40 | 362.80 | 364.20 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.00 | 364.20 | 365.20 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 1.20 | 365.20 | 366.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.60 | 366.40 | 367.00 | Sandstone, gy, sh stks | | cs, es | y | 0.60 |
| 1.90 | 367.00 | 368.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 368.90 | 369.25 | Limestone, nodular | | ak, cs, es | y | 0.35 |
| 0.60 | 369.25 | 369.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 0.45 | 369.85 | 370.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 370.30 | 372.55 | Limestone, nodular | | ak, cs, es | y | 2.25 |
| 0.70 | 372.55 | 373.25 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 373.25 | 374.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 374.10 | 375.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 375.15 | 376.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.80 | 376.20 | 380.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 380.00 | 380.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 4.65 | 380.65 | 385.30 | Limestone, nodular | | ak, cs, es | y | 4.65 |
| 2.65 | 385.30 | 387.95 | Limestone, shaley, nodular | | ak, cs, es | y | 2.65 |
| 2.50 | 387.95 | 390.45 | Limestone, nodular | | ak, cs, es | y | 2.50 |
| 2.50 | 390.45 | 392.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 392.95 | 394.70 | Shale, gy | | cm, em | | 0.00 |
| 0.55 | 394.70 | 395.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 1.65 | 395.25 | 396.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 396.90 | 397.45 | Limestone, shaley, nodular | | ak, cs, es | y | 1.65 |
| 1.00 | 397.45 | 398.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 398.45 | 399.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 399.25 | 399.55 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 0.75 | 399.55 | 400.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 400.30 | 401.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 401.20 | 401.40 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.45 | 401.40 | 402.85 | Shale, gy | | cm, em | | 0.00 |
| 0.13 | 402.85 | 402.98 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 402.98 | 403.28 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.15 | 403.28 | 403.43 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.55 | 403.43 | 403.98 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.14 | 403.98 | 404.12 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.12 | 404.12 | 404.24 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.35 | 404.24 | 404.59 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 404.59 | 404.74 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 404.74 | 404.94 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.20 | 404.94 | 405.14 | Shale, dk gy | | cm, em | | 0.00 |
| 0.17 | 405.14 | 405.31 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.45 | 405.31 | 406.76 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.05 | 406.76 | 408.81 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.55 | 408.81 | 409.36 | Shale, dk gy | | cm, em | | 0.00 |
| 1.03 | 409.36 | 410.39 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.06 | 410.39 | 410.45 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 1.50 | 410.45 | 411.95 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.07 | 411.95 | 412.02 | **Fusain** | | ac, cv, ev | | 0.00 |
| 2.10 | 412.02 | 414.12 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 414.12 | 414.22 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 414.22 | 414.30 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 3.70 | 414.30 | 418.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 418.00 | 419.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 419.00 | 421.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 421.15 | 422.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 422.15 | 422.25 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 422.25 | 423.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.17 | 423.35 | 424.52 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 424.52 | 425.62 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 425.62 | 426.82 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 426.82 | 427.02 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.45 | 427.02 | 429.47 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.27 | 429.47 | 429.74 | Sandstone, gy, sh stks | | cs, es | y | 0.27 |
| 5.08 | 429.74 | 434.82 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 434.82 | 436.42 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 436.42 | | | | | 185.67 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **185.67**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **43%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 185.67 | 43% |
| Soft Rock: | 250.75 | 57% |
| | 436.42 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-31

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1310
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 664700
**Easting:** 2421380
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 22.00 | 0.00 | 22.00 | Casing | | | | 0.00 |
| 0.70 | 22.00 | 22.70 | Shale, dk gy | Y | cm, em | | 0.00 |
| 1.25 | 22.70 | 23.95 | Shale, dk gy, ss stks | Y | cm, em | | 0.00 |
| 4.30 | 23.95 | 28.25 | Shale, dk gy | | cm, em | | 0.00 |
| 4.15 | 28.25 | 32.40 | Claystone, gy | | cv, ev | | 0.00 |
| 2.65 | 32.40 | 35.05 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.05 | 35.05 | 36.10 | Claystone, gy | | cv, ev | | 0.00 |
| 1.30 | 36.10 | 37.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 37.40 | 37.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.20 | 37.90 | 38.10 | Claystone, gy | | cv, ev | | 0.00 |
| 4.00 | 38.10 | 42.10 | Sandstone, gy, sh stks | | cs, es | y | 4.00 |
| 11.20 | 42.10 | 53.30 | Sandstone, gy, crossbeds | | cs, es | y | 11.20 |
| 2.60 | 53.30 | 55.90 | Sandstone, gy, sh stks | | cs, es | y | 2.60 |
| 8.10 | 55.90 | 64.00 | Sandstone, gy, crossbeds | | cs, es | y | 8.10 |
| 1.30 | 64.00 | 65.30 | Shale, gy | | cm, em | | 0.00 |
| 1.10 | 65.30 | 66.40 | Shale, red | | cm, em | | 0.00 |
| 0.75 | 66.40 | 67.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 67.15 | 67.55 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.35 | 67.55 | 67.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 67.90 | 68.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.40 | 68.30 | 72.70 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 8.65 | 72.70 | 81.35 | Claystone, red | | cv, ev | | 0.00 |
| 2.00 | 81.35 | 83.35 | Shale, gy | | cm, em | | 0.00 |
| 0.65 | 83.35 | 84.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 84.00 | 84.65 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.35 | 84.65 | 85.00 | Claystone, gy | | cv, ev | | 0.00 |
| 4.05 | 85.00 | 89.05 | Claystone, red | | cv, ev | | 0.00 |
| 2.70 | 89.05 | 91.75 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 91.75 | 93.05 | Shale, grn, ss stks | | cm, em | | 0.00 |
| 1.00 | 93.05 | 94.05 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.35 | 94.05 | 94.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 94.40 | 95.15 | Sandstone, gy, sh stks | | cs, es | y | 0.75 |
| 0.70 | 95.15 | 95.85 | Shale, gy | | cm, em | | 0.00 |
| 1.30 | 95.85 | 97.15 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| 0.75 | 97.15 | 97.90 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 97.90 | 99.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.15 | 99.30 | 100.45 | Shale, dk gy | | cm, em | | 0.00 |
| 3.45 | 100.45 | 103.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.75 | 103.90 | 104.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.85 | 104.65 | 105.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.50 | 105.50 | 107.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.65 | 107.00 | 109.65 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.25 | 109.65 | 110.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 110.90 | 111.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.95 | 111.20 | 112.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.20 | 112.15 | 114.35 | Claystone, grn | | cv, ev | | 0.00 |
| 0.65 | 114.35 | 115.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.90 | 115.00 | 120.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 120.90 | 122.65 | Claystone, red | | cv, ev | | 0.00 |
| 1.30 | 122.65 | 123.95 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 123.95 | 124.25 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.75 | 124.25 | 125.00 | Core Loss | | | | 0.00 |
| 1.10 | 125.00 | 126.10 | Shale, grn | | cm, em | | 0.00 |
| 0.55 | 126.10 | 126.65 | Shale, grn, ss stks | | cm, em | | 0.00 |
| 0.90 | 126.65 | 127.55 | Shale, grn | | cm, em | | 0.00 |
| 2.45 | 127.55 | 130.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.45 | 130.00 | 132.45 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 132.45 | 134.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 134.30 | 135.00 | Core Loss | | | | 0.00 |
| 0.35 | 135.00 | 135.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 135.35 | 135.85 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.40 | 135.85 | 137.25 | Shale, grn | | cm, em | | 0.00 |
| 0.70 | 137.25 | 137.95 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 137.95 | 139.25 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.40 | 139.25 | 139.65 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.70 | 139.65 | 143.35 | Shale, red | | cm, em | | 0.00 |
| 0.60 | 143.35 | 143.95 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.05 | 143.95 | 145.00 | Shale, red | | cm, em | | 0.00 |
| 0.35 | 145.00 | 145.35 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.40 | 145.35 | 145.75 | Limestone, massive | | ak, cs, es | y | 0.40 |
| 3.35 | 145.75 | 149.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 149.10 | 150.75 | Claystone, gy | | cv, ev | | 0.00 |
| 1.25 | 150.75 | 152.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.10 | 152.00 | 153.10 | Claystone, red | | cv, ev | | 0.00 |
| 2.90 | 153.10 | 156.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 156.00 | 156.75 | Sandstone, gy, sh stks | | cs, es | y | 0.75 |
| 0.90 | 156.75 | 157.65 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 157.65 | 158.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.65 | 158.95 | 159.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.05 | 159.60 | 160.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.65 | 160.65 | 163.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.35 | 163.30 | 163.65 | Claystone, red/ purple | | cv, ev | | 0.00 |
| 1.25 | 163.65 | 164.90 | Claystone, red | | cv, ev | | 0.00 |
| 0.65 | 164.90 | 165.55 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.45 | 165.55 | 167.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.55 | 167.00 | 170.55 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 170.55 | 171.35 | Shale, red | | cm, em | | 0.00 |
| 3.40 | 171.35 | 174.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.95 | 174.75 | 175.70 | Sandstone, gy, sh layers | | cs, es | y | 0.95 |
| 0.85 | 175.70 | 176.55 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.55 | 176.55 | 178.10 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.55 | 178.10 | 179.65 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.85 | 179.65 | 181.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.65 | 181.50 | 183.15 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.80 | 183.15 | 183.95 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 183.95 | 184.75 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 0.25 | 184.75 | 185.00 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 185.00 | 185.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.35 | 185.45 | 185.80 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.40 | 185.80 | 186.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 8.10 | 186.20 | 194.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.50 | 194.30 | 200.80 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.85 | 200.80 | 203.65 | Claystone, red | | cv, ev | | 0.00 |
| 0.55 | 203.65 | 204.20 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.90 | 204.20 | 205.10 | Claystone, red | | cv, ev | | 0.00 |
| 0.75 | 205.10 | 205.85 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 4.25 | 205.85 | 210.10 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 7.95 | 210.10 | 218.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 218.05 | 219.65 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 2.15 | 219.65 | 221.80 | Sandstone, gy, sh stks | | cs, es | y | 2.15 |
| 3.20 | 221.80 | 225.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.70 | 225.00 | 226.70 | Shale, dk gy | | cm, em | | 0.00 |
| 6.15 | 226.70 | 232.85 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 232.85 | 233.65 | Shale, dk gy | | cm, em | | 0.00 |
| 1.95 | 233.65 | 235.60 | Shale, dk gy/ blk | | ac, cm, em | | 0.00 |
| 2.60 | 235.60 | 238.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 238.20 | 240.70 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 240.70 | 241.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 241.70 | 243.00 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 243.00 | 246.00 | Shale, gy | | cm, em | | 0.00 |
| 1.05 | 246.00 | 247.05 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.30 | 247.05 | 248.35 | Sandstone, gy, massive | | cs, es | y | 1.30 |
| 1.05 | 248.35 | 249.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.80 | 249.40 | 250.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.50 | 250.20 | 250.70 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.00 | 250.70 | 251.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 251.70 | 251.95 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 251.95 | 252.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 252.50 | 253.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.05 | 253.00 | 254.05 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 254.05 | 256.15 | Shale, red | | cm, em | | 0.00 |
| 0.45 | 256.15 | 256.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.85 | 256.60 | 260.45 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 260.45 | 261.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.85 | 261.00 | 262.85 | Shale, red | | cm, em | | 0.00 |
| 0.45 | 262.85 | 263.30 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 263.30 | 263.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.75 | 263.60 | 265.35 | Shale, dk gy | | cm, em | | 0.00 |
| 2.05 | 265.35 | 267.40 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 267.40 | 268.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 268.20 | 269.55 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 269.55 | 271.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.30 | 271.30 | 273.60 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.40 | 273.60 | 274.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 274.00 | 275.00 | Core Loss | | | | 0.00 |
| 1.80 | 275.00 | 276.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.85 | 276.80 | 280.65 | Sandstone, gy, massive | | cs, es | y | 3.85 |
| 2.95 | 280.65 | 283.60 | Sandstone, gy, sh stks | | cs, es | y | 2.95 |
| 5.95 | 283.60 | 289.55 | Sandstone, gy, crossbeds | | cs, es | y | 5.95 |
| 3.30 | 289.55 | 292.85 | Sandstone, gy, sh stks | | cs, es | y | 3.30 |
| 5.05 | 292.85 | 297.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.70 | 297.90 | 298.60 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 298.60 | 298.95 | **Bone, coal stks, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 0.95 | 298.95 | 299.90 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.50 | 299.90 | 300.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 9.60 | 300.40 | 310.00 | Claystone, gy | | cv, ev | | 0.00 |
| 3.90 | 310.00 | 313.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 313.90 | 315.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 9.10 | 315.90 | 325.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 325.00 | 326.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.60 | 326.25 | 328.85 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 1.40 | 328.85 | 330.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.15 | 330.25 | 332.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 332.40 | 332.85 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.40 | 332.85 | 333.25 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.55 | 333.25 | 333.80 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 2.65 | 333.80 | 336.45 | Sandstone, gy, crossbeds | | cs, es | y | 2.65 |
| 0.90 | 336.45 | 337.35 | Sandstone, gy, sh layers | | cs, es | y | 0.90 |
| 1.45 | 337.35 | 338.80 | Sandstone, gy, sh stks | | cs, es | y | 1.45 |
| 2.20 | 338.80 | 341.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 341.00 | 341.60 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.10 | 341.60 | 342.70 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 342.70 | 344.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 344.40 | 345.00 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.00 | 345.00 | 346.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 346.00 | 346.50 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.55 | 346.50 | 348.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 348.05 | 348.40 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.40 | 348.40 | 349.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.50 | 349.80 | 351.30 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 3.30 | 351.30 | 354.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 4.50 | 354.60 | 359.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 359.10 | 359.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 359.30 | 359.60 | **Coal, bone stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.30 | 359.60 | 359.90 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 359.90 | 360.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.15 | 360.10 | 360.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.90 | 360.25 | 361.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.30 | 361.15 | 361.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 361.45 | 361.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.05 | 361.95 | 365.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 365.00 | 365.40 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.60 | 365.40 | 366.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 366.00 | 366.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 0.95 | 366.95 | 367.90 | Shale, blk, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 367.90 | 370.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.80 |
| 8.15 | 370.70 | 378.85 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 378.85 | 381.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.75 | 381.90 | 384.65 | Shale, gy | | cm, em | | 0.00 |
| 2.75 | 384.65 | 387.40 | Limestone, shaley, nodular | | ak, cs, es | y | 2.75 |
| 3.80 | 387.40 | 391.20 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.40 | 391.20 | 394.60 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 394.60 | 395.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 1.85 | 395.05 | 396.90 | Limestone, nodular | | ak, cs, es | y | 1.85 |
| 0.50 | 396.90 | 397.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.45 | 397.40 | 397.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 0.25 | 397.85 | 398.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 398.10 | 398.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 1.55 | 398.40 | 399.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 399.95 | 400.65 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.35 | 400.65 | 401.00 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.10 | 401.00 | 402.10 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.55 | 402.10 | 402.65 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 4.20 | 402.65 | 406.85 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 406.85 | 406.95 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.05 | 406.95 | 407.00 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.90 | 407.00 | 407.90 | Shale, dk gy | | cm, em | | 0.00 |
| 3.20 | 407.90 | 411.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.40 | 411.10 | 412.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.95 | 412.50 | 413.45 | Sandstone, gy, sh stks | | cs, es | y | 0.95 |
| 0.65 | 413.45 | 414.10 | Shale, gy | | cm, em | | 0.00 |
| 3.50 | 414.10 | 417.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.00 | 417.60 | 419.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.50 | 419.60 | 422.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 422.10 | 423.00 | Shale, gy/ dk gy | | cm, em | | 0.00 |
| 0.20 | 423.00 | 423.20 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.10 | 423.20 | 423.30 | **Coal, bone stks, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 0.20 | 423.30 | 423.50 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.35 | 423.50 | 423.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 423.85 | 424.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.15 |
| 1.00 | 424.00 | 425.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 425.00 | 426.45 | Limestone, shaley, nodular | | ak, cs, es | y | 1.45 |
| 0.60 | 426.45 | 427.05 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 1.45 | 427.05 | 428.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 428.50 | 430.00 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 0.50 | 430.00 | 430.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 430.50 | 431.75 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 0.15 | 431.75 | 431.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 431.90 | 433.65 | Limestone, massive | | ak, cs, es | y | 1.75 |
| 0.50 | 433.65 | 434.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 434.15 | 435.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 435.15 | 437.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 437.70 | 439.40 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 439.40 | 439.80 | Limestone, massive | | ak, cs, es | y | 0.40 |
| 1.55 | 439.80 | 441.35 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 441.35 | 441.55 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 441.55 | 442.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 442.50 | 443.85 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 443.85 | 444.70 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 444.70 | 445.30 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.20 | 445.30 | 448.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 448.50 | 449.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 449.30 | 450.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 450.10 | 450.40 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 450.40 | 451.50 | Claystone, gy | | cv, ev | | 0.00 |
| 2.20 | 451.50 | 453.70 | Shale, gy | | cm, em | | 0.00 |
| 1.60 | 453.70 | 455.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.80 | 455.30 | 459.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.45 | 459.10 | 460.55 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 460.55 | 461.00 | Shale, red/ grn | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.75 | 461.00 | 461.75 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 461.75 | 462.15 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.35 | 462.15 | 462.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.00 | 462.50 | 464.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 464.50 | 465.00 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 1.25 | 465.00 | 466.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 466.25 | 467.40 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 2.35 | 467.40 | 469.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 469.75 | 470.90 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 470.90 | 474.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 474.30 | 475.30 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 2.40 | 475.30 | 477.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.25 | 477.70 | 478.95 | Shale, gy | | cm, em | | 0.00 |
| 1.05 | 478.95 | 480.00 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 0.90 | 480.00 | 480.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 480.90 | 482.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 0.75 | 482.10 | 482.85 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 4.75 | 482.85 | 487.60 | Limestone, shaley, layered | | ak, cs, es | y | 4.75 |
| 1.75 | 487.60 | 489.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 0.45 | 489.35 | 489.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 489.80 | 490.85 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 0.30 | 490.85 | 491.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.75 | 491.15 | 491.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 491.90 | 492.90 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 492.90 | 493.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 493.60 | 494.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 494.85 | 495.85 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 495.85 | 496.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 496.80 | 498.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 498.30 | 500.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 500.00 | 500.85 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.50 | 500.85 | 501.35 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.75 | 501.35 | 505.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 505.10 | 505.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 505.80 | 508.00 | Limestone, massive | | ak, cs, es | y | 2.20 |
| 2.50 | 508.00 | 510.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 510.50 | 513.05 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 513.05 | 514.10 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 514.10 | 514.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.20 | 514.60 | 514.80 | Claystone, grn | | cv, ev | | 0.00 |
| 1.25 | 514.80 | 516.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 0.40 | 516.05 | 516.45 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 4.05 | 516.45 | 520.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 520.50 | 522.60 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 0.60 | 522.60 | 523.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 523.20 | 523.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.90 | 523.60 | 524.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 524.50 | 525.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 0.80 | 525.35 | 526.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 526.15 | 528.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.45 | 528.40 | 533.85 | Limestone, shaley, nodular | | ak, cs, es | y | 5.45 |
| 0.85 | 533.85 | 534.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 534.70 | 535.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.55 | 535.60 | 536.15 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.25 | 536.15 | 538.40 | Limestone, massive | | ak, cs, es | y | 2.25 |
| 1.40 | 538.40 | 539.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 2.65 | 539.80 | 542.45 | Limestone, nodular | | ak, cs, es | y | 2.65 |
| 3.35 | 542.45 | 545.80 | Limestone, shaley, layered | | ak, cs, es | y | 3.35 |
| 0.80 | 545.80 | 546.60 | Shale, grn, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 546.60 | 546.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 546.70 | 546.90 | Limestone, massive | | ak, cs, es | y | 0.20 |
| 0.80 | 546.90 | 547.70 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 0.80 | 547.70 | 548.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 548.50 | 549.00 | Shale, grn | | cm, em | | 0.00 |
| 1.60 | 549.00 | 550.60 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 0.75 | 550.60 | 551.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 1.45 | 551.35 | 552.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 552.80 | 553.50 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.80 | 553.50 | 554.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 2.85 | 554.30 | 557.15 | Limestone, nodular | | ak, cs, es | y | 2.85 |
| 0.50 | 557.15 | 557.65 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 2.65 | 557.65 | 560.30 | Limestone, shaley, nodular | | ak, cs, es | y | 2.65 |
| 1.00 | 560.30 | 561.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 561.30 | 562.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 0.10 | 562.15 | 562.25 | Shale, grn | | cm, em | | 0.00 |
| 3.55 | 562.25 | 565.80 | Limestone, shaley, layered | | ak, cs, es | y | 3.55 |
| 0.75 | 565.80 | 566.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 566.55 | 568.55 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.48 | 568.55 | 569.03 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.27 | 569.03 | 569.30 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.27 |
| 0.25 | 569.30 | 569.55 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.08 | 569.55 | 569.63 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 569.63 | 569.75 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 569.75 | 569.93 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.96 | 569.93 | 570.89 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 570.89 | 570.91 | **pyrite** | | ac, cm, em | | 0.00 |
| 0.09 | 570.91 | 571.00 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 571.00 | 571.05 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.10 | 571.05 | 571.15 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.80 | 571.15 | 571.95 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 571.95 | 573.25 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 573.25 | 573.35 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 573.35 | 573.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 1.70 | 573.60 | 575.30 | Shale, gy | | cm, em | | 0.00 |
| 0.95 | 575.30 | 576.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 2.95 | 576.25 | 579.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.30 | 579.20 | 583.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 583.50 | 585.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 585.55 | 586.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 586.10 | 586.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 586.90 | 589.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 589.15 | 589.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 589.25 | 589.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 589.40 | 589.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.05 | 589.50 | 589.55 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.10 | 589.55 | 589.65 | Shale, grn | | cm, em | | 0.00 |
| 0.05 | 589.65 | 589.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.20 | 589.70 | 589.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 589.90 | 590.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.99 | 590.05 | 592.04 | Shale, dk gy | | cm, em | | 0.00 |
| 0.28 | 592.04 | 592.32 | **Coal, bone stks, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.03 | 592.32 | 592.35 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.19 | 592.35 | 592.54 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 592.54 | 592.72 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.01 | 592.72 | 592.73 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.06 | 592.73 | 592.79 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 592.79 | 592.82 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.08 | 592.82 | 592.90 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 592.90 | 592.92 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.05 | 592.92 | 592.97 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 592.97 | 593.15 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 593.15 | 593.30 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.25 | 593.30 | 593.55 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 593.55 | 593.60 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.30 | 593.60 | 593.90 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 593.90 | 594.00 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 594.00 | 595.05 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 595.05 | 595.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.25 | 595.30 | 597.55 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 0.55 | 597.55 | 598.10 | Limestone, shaley, mosaic | | ak, cs, es | y | 0.55 |
| 0.60 | 598.10 | 598.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 598.70 | 599.85 | Limestone, massive | | ak, cs, es | y | 1.15 |
| 1.10 | 599.85 | 600.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 0.55 | 600.95 | 601.50 | Limestone, sh pebbles | | ak, cs, es | y | 0.55 |
| 2.00 | 601.50 | 603.50 | Limestone, massive | | ak, cs, es | y | 2.00 |
| 0.65 | 603.50 | 504.15 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.85 | 604.15 | 605.00 | Limestone, massive | | ak, cs, es | y | 0.85 |
| 0.90 | 605.00 | 605.90 | Limestone, mosaic | | ak, cs, es | y | 0.90 |
| 0.60 | 605.90 | 606.50 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 0.25 | 606.50 | 606.75 | Limestone, mosaic | | ak, cs, es | y | 0.25 |
| 1.55 | 606.75 | 608.30 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 0.25 | 608.30 | 608.55 | Limestone, mosaic | | ak, cs, es | y | 0.25 |
| 1.45 | 608.55 | 610.00 | Limestone, nodular | | ak, cs, es | y | 1.45 |
| 2.10 | 610.00 | 612.10 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 612.10 | 612.85 | Shale, dk gy | | cm, em | | 0.00 |
| 2.05 | 612.85 | 614.90 | Sandstone, gy, massive | | cs, es | y | 2.05 |
| 0.45 | 614.90 | 615.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 615.35 | 616.35 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 616.35 | 617.10 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 617.10 | 617.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 617.90 | 618.85 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 618.85 | 619.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 619.60 | 620.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 620.05 | 620.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 620.35 | 620.70 | Shale, blk, ls nods | | cm, em | | 0.00 |
| 2.00 | 620.70 | 622.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.00 |
| 0.60 | 622.70 | 623.30 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 1.70 | 623.30 | 625.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 3.50 | 625.00 | 628.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 628.50 | 628.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 628.75 | 629.30 | Shale, dk gy | | cm, em | | 0.00 |
| 3.10 | 629.30 | 632.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 7.10 | 632.40 | 639.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 639.50 | 642.95 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 642.95 | 643.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.55 | 643.30 | 643.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.00 | 643.85 | 645.85 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 3.00 | 645.85 | 648.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 648.85 | 650.20 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.29 | 650.20 | 651.49 | Shale, gy | | cm, em | | 0.00 |
| 1.09 | 651.49 | 652.58 | Shale, dk gy | | cm, em | | 0.00 |
| 4.20 | 652.58 | 656.78 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.02 | 656.78 | 657.80 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.48 | 657.80 | 658.28 | Shale, dk gy | | cm, em | | 0.00 |
| 0.23 | 658.28 | 658.51 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.78 | 658.51 | 659.29 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.07 | 659.29 | 659.36 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.07 | 659.36 | 659.43 | **Coal, pyrite, Redstone** | | ac, cv, ev | | 0.00 |
| 1.58 | 659.43 | 661.01 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.10 | 661.01 | 662.11 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 2.05 | 662.11 | 664.16 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.15 | 664.16 | 664.31 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.41 | 664.31 | 664.72 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.52 | 664.72 | 665.24 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.90 | 665.24 | 666.14 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.51 | 666.14 | 666.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.10 | 666.65 | 667.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.76 | 667.75 | 668.51 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.12 | 668.51 | 669.63 | Shale, dk gy, coal spars | | ac, cm, em | | 0.00 |
| 0.65 | 669.63 | 670.28 | Shale, dk gy | | cm, em | | 0.00 |
| 0.84 | 670.28 | 671.12 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.21 | 671.12 | 671.33 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.07 | 671.33 | 671.40 | **Coal, pyrite, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.59 | 671.40 | 671.99 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 671.99 | 672.02 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.65 | 672.02 | 672.67 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 672.67 | 672.69 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.70 | 672.69 | 674.39 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 674.39 | 674.42 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 1.13 | 674.42 | 675.55 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 675.55 | 675.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.81 | 675.75 | 676.56 | Shale, gy | | cm, em | | 0.00 |
| 1.11 | 676.56 | 677.67 | Limestone, massive | | ak, cs, es | y | 1.11 |
| 2.12 | 677.67 | 679.79 | Limestone, shaley, nodular | | ak, cs, es | y | 2.12 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.80 | 679.79 | 684.59 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 684.59 | 685.09 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.23 | 685.09 | 685.32 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.15 | 685.32 | 685.47 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.10 | 685.47 | 685.57 | Shale, dk gy | | cm, em | | 0.00 |
| | Total Depth | 685.57 | | | | | 148.45 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **148.45**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **22%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 148.45 | 22% |
| Soft Rock: | 537.12 | 78% |
| | 685.57 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: AEC-2001-32

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1100
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 667500
**Easting:** 2417900
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing | | | | 0.00 |
| 3.50 | 16.00 | 19.50 | Shale, gy | Y | cm, em | | 0.00 |
| 2.00 | 19.50 | 21.50 | Shale, red/ grn | Y | cm, em | | 0.00 |
| 4.95 | 21.50 | 26.45 | Claystone, gy | Y | cv, ev | | 0.00 |
| 4.75 | 26.45 | 31.20 | Shale, gy, ss stks | Y | cm, em | | 0.00 |
| 6.10 | 31.20 | 37.30 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 37.30 | 39.20 | Shale, gy, sandy | Y | cm, em | | 0.00 |
| 5.55 | 39.20 | 44.75 | Claystone, gy | | cv, ev | | 0.00 |
| 1.75 | 44.75 | 46.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 46.50 | 46.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.90 | 46.90 | 47.80 | Claystone, gy | | cv, ev | | 0.00 |
| 2.90 | 47.80 | 50.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.05 | 50.70 | 52.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.25 | 52.75 | 53.00 | **Bone, coal stks, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 0.30 | 53.00 | 53.30 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 11.35 | 53.30 | 64.65 | Claystone, gy | | cv, ev | | 0.00 |
| 6.05 | 64.65 | 70.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 70.70 | 72.25 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 7.25 | 72.25 | 79.50 | Sandstone, gy, sh stks | | cs, es | y | 7.25 |
| 6.05 | 79.50 | 85.55 | Sandstone, gy massive | | cs, es | y | 6.05 |
| 4.85 | 85.55 | 90.40 | Sandstone, gy, sh stks | | cs, es | y | 4.85 |
| 14.80 | 90.40 | 105.20 | Sandstone, gy massive | | cs, es | y | 14.80 |
| 3.10 | 105.20 | 108.30 | Sandstone, gy, sh stks | | cs, es | y | 3.10 |
| 4.75 | 108.30 | 113.05 | Sandstone, gy massive | | cs, es | y | 4.75 |
| 1.50 | 113.05 | 114.55 | Sandstone, gy, sh stks | | cs, es | y | 1.50 |
| 13.75 | 114.55 | 128.30 | Sandstone, gy massive | | cs, es | y | 13.75 |
| 6.20 | 128.30 | 134.50 | Sandstone, gy, sh stks | | cs, es | y | 6.20 |
| 1.35 | 134.50 | 135.85 | Sandstone, gy massive | | cs, es | y | 1.35 |
| 1.05 | 135.85 | 136.90 | Sandstone, gy, sh stks | | cs, es | y | 1.05 |
| 0.15 | 136.90 | 137.05 | Sandstone, gy sh pebbles | | cs, es | y | 0.15 |
| 0.10 | 137.05 | 137.15 | Sandstone, gy, sh stks | | cs, es | y | 0.10 |
| 2.25 | 137.15 | 139.40 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 139.40 | 139.60 | **Bone, coal stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.70 | 139.60 | 140.30 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.30 | 140.30 | 140.60 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.55 | 140.60 | 141.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 141.15 | 141.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.60 | 141.50 | 143.10 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 6.70 | 143.10 | 149.80 | Shale, gy | | cm, em | | 0.00 |
| 4.70 | 149.80 | 154.50 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 7.90 | 154.50 | 162.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.00 | 162.40 | 165.40 | Shale, gy | | cm, em | | 0.00 |
| 0.55 | 165.40 | 165.95 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 8.65 | 165.95 | 174.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.00 | 174.60 | 175.60 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 175.60 | 177.50 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 1.20 | 177.50 | 178.70 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 178.70 | 180.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 1.20 | 180.80 | 182.00 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 182.00 | 183.45 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 183.45 | 184.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.95 | 184.45 | 185.40 | Shale, gy | | cm, em | | 0.00 |
| 11.50 | 185.40 | 196.90 | Shale, dk gy, silty | | cm, em | | 0.00 |
| 3.40 | 196.90 | 200.30 | Shale, dk gy | | cm, em | | 0.00 |
| 4.30 | 200.30 | 204.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.95 | 204.60 | 207.55 | Shale, gy | | cm, em | | 0.00 |
| 0.15 | 207.55 | 207.70 | Shale, blk | | ac, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.10 | 207.70 | 207.80 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.15 | 207.80 | 207.95 | **Coal, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 0.25 | 207.95 | 208.20 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.10 | 208.20 | 208.30 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 208.30 | 208.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.75 | 208.45 | 210.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.95 | 210.20 | 214.15 | Claystone, gy | | cv, ev | | 0.00 |
| 0.85 | 214.15 | 215.00 | Limestone, massive | | ak, cs, es | y | 0.85 |
| 0.30 | 215.00 | 215.30 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 0.60 | 215.30 | 215.90 | Shale, gy | | cm, em | | 0.00 |
| 0.95 | 215.90 | 216.85 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 1.00 | 216.85 | 217.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.05 | 217.85 | 218.90 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 0.45 | 218.90 | 219.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 219.35 | 220.65 | Limestone, mosaic | | ak, cs, es | y | 1.30 |
| 1.15 | 220.65 | 221.80 | Shale, dk gy | | cm, em | | 0.00 |
| 5.50 | 221.80 | 227.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.65 | 227.30 | 227.95 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 227.95 | 228.35 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.15 | 228.35 | 230.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 230.50 | 231.00 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 231.00 | 232.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 0.30 | 232.10 | 232.40 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 232.40 | 235.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 235.40 | 236.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.40 | 236.30 | 236.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.95 | 236.70 | 237.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 237.65 | 239.40 | Claystone, grn | | cv, ev | | 0.00 |
| 6.20 | 239.40 | 245.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.95 | 245.60 | 246.55 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.05 | 246.55 | 248.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 248.60 | 249.25 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 1.35 | 249.25 | 250.60 | Shale, dk gy | | cm, em | | 0.00 |
| 3.60 | 250.60 | 254.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 254.20 | 255.05 | Shale, gy | | cm, em | | 0.00 |
| 1.25 | 255.05 | 256.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 256.30 | 257.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.00 | 257.60 | 259.60 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.45 | 259.60 | 261.05 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.95 | 261.05 | 264.00 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 264.00 | 264.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 0.65 | 264.70 | 265.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 265.35 | 266.55 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 0.25 | 266.55 | 266.80 | Claystone, gy | | cv, ev | | 0.00 |
| 1.25 | 266.80 | 268.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 268.05 | 270.10 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 2.40 | 270.10 | 272.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 272.50 | 273.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 273.85 | 275.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 1.75 | 275.25 | 277.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.90 | 277.00 | 277.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 277.90 | 278.95 | Shale, grn, ss stks | | cm, em | | 0.00 |
| 2.50 | 278.95 | 281.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 281.45 | 282.50 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 282.50 | 283.30 | Shale, red | | cm, em | | 0.00 |
| 0.60 | 283.30 | 283.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 0.90 | 283.90 | 284.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 284.80 | 285.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.50 | 285.20 | 285.70 | Shale, grn | | cm, em | | 0.00 |
| 0.45 | 285.70 | 286.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.85 | 286.15 | 288.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 1.15 | 288.00 | 289.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 289.15 | 292.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 292.25 | 293.50 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 3.20 | 293.50 | 296.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 296.70 | 299.80 | Shale, gy | | cm, em | | 0.00 |
| 3.55 | 299.80 | 303.35 | Limestone, shaley, nodular | | ak, cs, es | y | 3.55 |
| 1.65 | 303.35 | 305.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.80 | 305.00 | 306.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 0.50 | 306.80 | 307.30 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 1.45 | 307.30 | 308.75 | Limestone, shaley, nodular | | ak, cs, es | y | 1.45 |
| 1.15 | 308.75 | 309.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 309.90 | 313.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 313.65 | 314.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 314.50 | 316.30 | Limestone, nodular | | ak, cs, es | y | 1.80 |
| 2.60 | 316.30 | 318.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.60 |
| 1.85 | 318.90 | 320.75 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 320.75 | 322.00 | Limestone, mosaic | | ak, cs, es | y | 1.25 |
| 3.85 | 322.00 | 325.85 | Limestone, nodular | | ak, cs, es | y | 3.85 |
| 0.50 | 325.85 | 326.35 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 0.85 | 326.35 | 327.20 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 4.90 | 327.20 | 332.10 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 332.10 | 333.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 333.30 | 333.75 | Shale, dk gy | | cm, em | | 0.00 |
| 2.05 | 333.75 | 335.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 1.65 | 335.80 | 337.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 337.45 | 338.10 | Shale, dk gy | | cm, em | | 0.00 |
| 2.15 | 338.10 | 340.25 | Limestone, shaley, nodular | | ak, cs, es | y | 2.15 |
| 2.40 | 340.25 | 342.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 342.65 | 345.30 | Limestone, nodular | | ak, cs, es | y | 2.65 |
| 2.15 | 345.30 | 347.45 | Limestone, shaley, nodular | | ak, cs, es | y | 2.15 |
| 1.30 | 347.45 | 348.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.05 | 348.75 | 350.80 | Claystone, blk/ tan, ls nods | | ac, cv, ev | | 0.00 |
| 0.40 | 350.80 | 351.20 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.28 | 351.20 | 351.48 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.12 | 351.48 | 351.60 | **Coal, bone stks, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.75 | 351.60 | 352.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.50 | 352.35 | 352.85 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 352.85 | 352.90 | **Bone coal stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 352.90 | 353.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 353.00 | 354.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 354.30 | 355.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 355.60 | 359.20 | Claystone, gy | | cv, ev | | 0.00 |
| 2.90 | 359.20 | 362.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.60 | 362.10 | 363.70 | Sandstone, gy, sh stks | | cs, es | y | 1.60 |
| 8.70 | 363.70 | 372.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.65 | 372.40 | 375.05 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.15 | 375.05 | 375.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 375.20 | 375.35 | **Bone coal stks, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.40 | 375.35 | 375.75 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 375.75 | 375.85 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.11 | 375.85 | 375.96 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.06 | 375.96 | 376.02 | **Bone coal stks** | | ac, cv, ev | | 0.00 |
| 0.21 | 376.02 | 376.23 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 376.23 | 376.34 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.66 | 376.34 | 377.00 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.13 | 377.00 | 377.13 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.25 | 377.13 | 377.38 | **Bone coal stks** | | ac, cv, ev | | 0.00 |
| 0.32 | 377.38 | 377.70 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.11 | 377.70 | 377.81 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.11 | 377.81 | 377.92 | **Bone coal stks** | | ac, cv, ev | | 0.00 |
| 0.27 | 377.92 | 378.19 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 378.19 | 378.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.05 | 378.35 | 379.40 | Shale, dk gy | | cm, em | | 0.00 |
| 3.00 | 379.40 | 382.40 | Limestone, nodular | | ak, cs, es | y | 3.00 |
| 3.60 | 382.40 | 386.00 | Limestone, shaley, nodular | | ak, cs, es | y | 3.60 |
| 2.55 | 386.00 | 388.55 | Limestone, nodular | | ak, cs, es | y | 2.55 |
| 2.05 | 388.55 | 390.60 | Limestone, shaley, layered | | ak, cs, es | y | 2.05 |
| 2.60 | 390.60 | 393.20 | Limestone, shaley, mosaic | | ak, cs, es | y | 2.60 |
| 1.30 | 393.20 | 394.50 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 5.15 | 394.50 | 399.65 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 399.65 | 401.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.25 | 401.70 | 402.95 | Sandstone, gy, sh stks | | cs, es | y | 1.25 |
| 2.15 | 402.95 | 405.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 405.10 | 406.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 406.00 | 408.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: AEC-2001-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.80 | 408.20 | 411.00 | Limestone, shaley, layered | | ak, cs, es | y | 2.80 |
| 1.80 | 411.00 | 412.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 412.80 | 413.00 | **Coal, bone stks, Redstone** | | ac, cv, ev | | 0.00 |
| 0.90 | 413.00 | 413.90 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.70 | 413.90 | 415.60 | Shale, dk gy | | cm, em | | 0.00 |
| 3.40 | 415.60 | 419.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.19 | 419.00 | 424.19 | Limestone, nodular | | ak, cs, es | y | 5.19 |
| 1.90 | 424.19 | 426.09 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 426.09 | 426.99 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 1.00 | 426.99 | 427.99 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.85 | 427.99 | 429.84 | Limestone, nodular | | ak, cs, es | y | 1.85 |
| 0.30 | 429.84 | 430.14 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 0.40 | 430.14 | 430.54 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 430.54 | 430.94 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.35 | 430.94 | 431.29 | Limestone, nodular | | ak, cs, es | y | 0.35 |
| 0.95 | 431.29 | 432.24 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 432.24 | 432.39 | Limestone, shaley, nodular | | ak, cs, es | y | 0.15 |
| 1.70 | 432.39 | 434.09 | Claystone, gy | | cv, ev | | 0.00 |
| 0.55 | 434.09 | 434.64 | Limestone, shaley, layered | | ak, cs, es | y | 0.55 |
| 1.00 | 434.64 | 435.64 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 435.64 | 436.59 | Limestone, shaley, layered | | ak, cs, es | y | 0.95 |
| 1.65 | 436.59 | 438.24 | Claystone, grn | | cv, ev | | 0.00 |
| 2.65 | 438.24 | 440.89 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.40 | 440.89 | 441.29 | **Coal, sh layers, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 441.29 | 441.54 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.90 | 441.54 | 442.44 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 442.44 | 442.54 | **Coal, sh layers, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.58 | 442.54 | 443.12 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.13 | 443.12 | 443.25 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.22 | 443.25 | 443.47 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 443.47 | 443.50 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.03 | 443.50 | 443.53 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.47 | 443.53 | 444.00 | **Shale, dk gy** | | cm, em | | 0.00 |
| 4.60 | 444.00 | 448.60 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.35 | 448.60 | 448.95 | Shale, dk gy | | cm, em | | 0.00 |
| 2.00 | 448.95 | 450.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 450.95 | 452.95 | Sandstone, gy, calcite cement | | ak, cs, es | y | 2.00 |
| 6.00 | 452.95 | 458.95 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 458.95 | | | | | 147.74 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **147.74**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **32%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 147.74 | 32% |
| Soft Rock: | 311.21 | 68% |
| | 458.95 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-27

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1014
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 669287
**Easting:** 2424116
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 39.00 | 0.00 | 39.00 | Casing | | | | 0.00 |
| 7.00 | 39.00 | 46.00 | Claystone, gy | | | | 0.00 |
| 6.70 | 46.00 | 52.70 | Claystone, red/ gy, ls nods | | | | 0.00 |
| 5.00 | 52.70 | 57.70 | Claystone, gy, ls nods | | | | 0.00 |
| 4.30 | 57.70 | 62.00 | Shale, gy, ss stks | | | | 0.00 |
| 0.75 | 62.00 | 62.75 | Sandstone, gy, crossbeds | | | | 0.00 |
| 2.60 | 62.75 | 65.35 | Shale, gy, ss stks | | | y | 0.75 |
| 6.60 | 65.35 | 71.95 | Shale, dk gy | | | | 0.00 |
| 0.20 | 71.95 | 72.15 | **coal, dull, WAYNESBURG "A"** | | | | 0.00 |
| 0.30 | 72.15 | 72.45 | **Coal, bone stks** | | | | 0.00 |
| 0.45 | 72.45 | 72.90 | **Sandstone, gy, coal bands** | | | | 0.00 |
| 0.50 | 72.90 | 73.40 | **Coal, bone stks** | | | y | 0.45 |
| 0.25 | 73.40 | 73.65 | **Shale, blk** | | | | 0.00 |
| 0.35 | 73.65 | 74.00 | **Shale, blk, coal stks** | | | | 0.00 |
| 0.15 | 74.00 | 74.15 | **Bone, coal stks** | | | | 0.00 |
| 0.10 | 74.15 | 74.25 | **Shale, blk** | | | | 0.00 |
| 5.55 | 74.25 | 79.80 | **coal, dull** | | | | 0.00 |
| 0.70 | 79.80 | 80.50 | **Bone, coal layers** | | | | 0.00 |
| 0.75 | 80.50 | 81.25 | **Shale, dk gy** | | | | 0.00 |
| 0.30 | 81.25 | 81.55 | **Coal** | | | | 0.00 |
| 0.23 | 81.55 | 81.78 | **Shale, dk gy** | | | | 0.00 |
| 0.06 | 81.78 | 81.84 | **Bone, coal layers** | | | | 0.00 |
| 0.16 | 81.84 | 82.00 | **Shale, blk** | | | | 0.00 |
| 1.10 | 82.00 | 83.10 | **coal, dull** | | | | 0.00 |
| 0.25 | 83.10 | 83.35 | Flintclay, gy | | | | 0.00 |
| 0.25 | 83.35 | 83.60 | Limestone, shaley, massive | | | | 0.00 |
| 0.10 | 83.60 | 83.70 | Shale, blk | | | y | 0.25 |
| 0.40 | 83.70 | 84.10 | Shale, dk gy | | | | 0.00 |
| 0.65 | 84.10 | 84.75 | Shale, blk | | | | 0.00 |
| 1.70 | 84.75 | 86.45 | Limestone | | | | 0.00 |
| 0.65 | 86.45 | 87.10 | Claystone, gy | | | y | 1.70 |
| 0.40 | 87.10 | 87.50 | Claystone, dk gy | | | | 0.00 |
| 0.10 | 87.50 | 87.60 | Shale, blk | | | | 0.00 |
| 0.25 | 87.60 | 87.85 | Shale, dk gy | | | | 0.00 |
| 0.50 | 87.85 | 88.35 | Limestone, shaley, nodular | | | | 0.00 |
| 0.85 | 88.35 | 89.20 | Claystone, gy, ls nods | | | y | 0.50 |
| 1.25 | 89.20 | 90.45 | Shale, gy | | | | 0.00 |
| 2.70 | 90.45 | 93.15 | Claystone, gy, sandy | | | | 0.00 |
| 2.90 | 93.15 | 96.05 | Sandstone, gy, sh stks | | | | 0.00 |
| 8.90 | 96.05 | 104.95 | Shale, gy | | | y | 2.90 |
| 0.10 | 104.95 | 105.05 | Shale, blk | | | | 0.00 |
| 3.00 | 105.05 | 108.05 | Limestone, shaley, layered | | | | 0.00 |
| 4.60 | 108.05 | 112.65 | Shale, gy, ls nods | | | y | 3.00 |
| 2.40 | 112.65 | 115.05 | Shale, dk gy | | | | 0.00 |
| 0.30 | 115.05 | 115.35 | Shale, blk | | | | 0.00 |
| 2.10 | 115.35 | 117.45 | Shale, dk gy, layered | | | | 0.00 |
| 1.80 | 117.45 | 119.25 | Limestone, shaley, layered | | | | 0.00 |
| 1.70 | 119.25 | 120.95 | Claystone, gy | | | y | 1.80 |
| 4.40 | 120.95 | 125.35 | Claystone, blk | | | | 0.00 |
| 0.25 | 125.35 | 125.60 | Shale, blk | | | | 0.00 |
| 2.35 | 125.60 | 127.95 | Claystone, gy, sandy | | | | 0.00 |
| 7.20 | 127.95 | 135.15 | Sandstone, gy, sh stks | | | | 0.00 |
| 1.10 | 135.15 | 136.25 | Shale, dk gy | | | y | 7.20 |
| 0.10 | 136.25 | 136.35 | Sandstone, gy, sh stks | | | | 0.00 |
| 0.30 | 136.35 | 136.65 | Claystone, gy | | | y | 0.10 |
| 1.10 | 136.65 | 137.75 | Claystone, dk gy | | | | 0.00 |
| 2.20 | 137.75 | 139.95 | Shale, gy, sandy, layered | | | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.00 | 139.95 | 140.95 | Shale, gy, sandy | | | | 0.00 |
| 3.40 | 140.95 | 144.35 | Shale, gy | | | | 0.00 |
| 5.20 | 144.35 | 149.55 | Shale, dk gy | | | | 0.00 |
| 0.55 | 149.55 | 150.10 | **Coal, sh stks, WAYNESBURG No. 11** | | | | 0.00 |
| 6.55 | 150.10 | 156.65 | Claystone, gy | | | | 0.00 |
| 7.40 | 156.65 | 164.05 | Limestone, shaley, layered | | | y | 7.40 |
| 1.40 | 164.05 | 165.45 | Shale, dk gy | | | | 0.00 |
| 2.90 | 165.45 | 168.35 | Shale, grn | | | | 0.00 |
| 0.50 | 168.35 | 168.85 | Shale, red | | | | 0.00 |
| 1.50 | 168.85 | 170.35 | Shale, red/ gy | | | | 0.00 |
| 0.50 | 170.35 | 170.85 | Limestone, shaley, layered | | | y | 0.50 |
| 1.40 | 170.85 | 172.25 | Claystone, gy | | | | 0.00 |
| 5.70 | 172.25 | 177.95 | Limestone, shaley, layered | | | y | 5.70 |
| 2.60 | 177.95 | 180.55 | Claystone, red/ gy | | | | 0.00 |
| 0.65 | 180.55 | 181.20 | Shale, dk gy, layered | | | | 0.00 |
| 1.35 | 181.20 | 182.55 | Claystone, grn | | | | 0.00 |
| 3.30 | 182.55 | 185.85 | Shale, gy, sandy | | | | 0.00 |
| 2.70 | 185.85 | 188.55 | Shale, gy | | | | 0.00 |
| 0.40 | 188.55 | 188.95 | Shale, red | | | | 0.00 |
| 1.60 | 188.95 | 190.55 | Shale, red/ gy | | | | 0.00 |
| 5.90 | 190.55 | 196.45 | Limestone, shaley, layered | | | y | 5.90 |
| 4.40 | 196.45 | 200.85 | Claystone, grn, ls nods | | | | 0.00 |
| 0.60 | 200.85 | 201.45 | Limestone, shaley | | | y | 0.60 |
| 3.30 | 201.45 | 204.75 | Shale, grn | | | | 0.00 |
| 1.10 | 204.75 | 205.85 | Limestone, massive | | | y | 1.10 |
| 3.20 | 205.85 | 209.05 | Claystone, gy, ls nods | | | | 0.00 |
| 7.30 | 209.05 | 216.35 | Limestone, layered | | | y | 7.30 |
| 3.40 | 216.35 | 219.75 | Claystone, gy, ls nods | | | | 0.00 |
| 0.40 | 219.75 | 220.15 | Shale, blk | | | | 0.00 |
| 4.30 | 220.15 | 224.45 | Limestone, shaley, layered | | | y | 4.30 |
| 3.90 | 224.45 | 228.35 | Shale, grn | | | | 0.00 |
| 1.00 | 228.35 | 229.35 | Limestone, shaley, layered | | | y | 1.00 |
| 12.20 | 229.35 | 241.55 | Claystone, gy, ls nods | | | | 0.00 |
| 0.70 | 241.55 | 242.25 | Claystone, dk gy | | | | 0.00 |
| 1.30 | 242.25 | 243.55 | Claystone, grn | | | | 0.00 |
| 11.30 | 243.55 | 254.85 | Limestone, shaley, layered | | | y | 11.30 |
| 1.70 | 254.85 | 256.55 | Claystone, gy, ls nods | | | | 0.00 |
| 4.60 | 256.55 | 261.15 | Limestone, shaley, layered | | | y | 4.60 |
| 2.50 | 261.15 | 263.65 | Claystone, gy | | | | 0.00 |
| 6.40 | 263.65 | 270.05 | Limestone, massive | | | y | 6.40 |
| 11.30 | 270.05 | 281.35 | Claystone, gy, ls nods | | | | 0.00 |
| 5.50 | 281.35 | 286.85 | Limestone, massive | | | y | 5.50 |
| 5.60 | 286.85 | 292.45 | Limestone, shaley, layered | | | y | 5.60 |
| 3.10 | 292.45 | 295.55 | Claystone, dk gy | | | | 0.00 |
| 0.80 | 295.55 | 296.35 | Shale, blk | | | | 0.00 |
| 1.20 | 296.35 | 297.55 | Claystone, dk gy | | | | 0.00 |
| 4.20 | 297.55 | 301.75 | Claystone, gy, ls nods | | | | 0.00 |
| 2.10 | 301.75 | 303.85 | Sandstone, gy, sh stks | | | y | 2.10 |
| 4.50 | 303.85 | 308.35 | Shale, gy, sandy | | | | 0.00 |
| 9.50 | 308.35 | 317.85 | Shale, dk gy, layered | | | | 0.00 |
| 0.40 | 317.85 | 318.25 | Sandstone, gy, sh stks | | | y | 0.40 |
| 1.20 | 318.25 | 319.45 | Shale, dk gy, layered | | | | 0.00 |
| 0.20 | 319.45 | 319.65 | **Coal** | | | | 0.00 |
| 2.70 | 319.65 | 322.35 | Shale, gy | | | | 0.00 |
| 1.90 | 322.35 | 324.25 | **Coal, sh stks, FISHPOT** | | | | 0.00 |
| 0.90 | 324.25 | 325.15 | Claystone, gy, ls nods | | | | 0.00 |
| 8.70 | 325.15 | 333.85 | Limestone, massive | | | y | 8.70 |
| 0.80 | 333.85 | 334.65 | Claystone, gy, ls nods | | | | 0.00 |
| 1.70 | 334.65 | 336.35 | Limestone, shaley, layered | | | y | 1.70 |
| 4.20 | 336.35 | 340.55 | Limestone, shaley, mosaic | | | y | 4.20 |
| 4.80 | 340.55 | 345.35 | Claystone, grn, sandy, ls nods | | | | 0.00 |
| 0.60 | 345.35 | 345.95 | Sandstone, gy, sh stks | | | y | 0.60 |
| 2.20 | 345.95 | 348.15 | Shale, grn | | | | 0.00 |
| 0.50 | 348.15 | 348.65 | Sandstone, gy, sh stks | | | y | 0.50 |
| 0.70 | 348.65 | 349.35 | Shale, gy, ss stks | | | | 0.00 |
| 2.70 | 349.35 | 352.05 | Shale, gy, interbedded ss | | | | 0.00 |
| 1.40 | 352.05 | 353.45 | Shale, gy, ss stks | | | | 0.00 |
| 0.60 | 353.45 | 354.05 | Shale, gy | | | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.40 | 354.05 | 356.45 | Shale, dk gy, layered | | | | 0.00 |
| 2.30 | 356.45 | 358.75 | Limestone, shaley, layered | | | y | 2.30 |
| 2.50 | 358.75 | 361.25 | Claystone, gy | | | | 0.00 |
| 1.90 | 361.25 | 363.15 | **Coal, bone stks, REDSTONE** | | | | 0.00 |
| 0.30 | 363.15 | 363.45 | Claystone, gy | | | | 0.00 |
| 0.90 | 363.45 | 364.35 | Shale, dk gy, coal stks | | | | 0.00 |
| 3.10 | 364.35 | 367.45 | Limestone, massive | | | y | 3.10 |
| 1.70 | 367.45 | 369.15 | Limestone, nodular | | | y | 1.70 |
| 2.80 | 369.15 | 371.95 | Limestone, massive | | | y | 2.80 |
| 0.80 | 371.95 | 372.75 | Limestone, nodular | | | y | 0.80 |
| 0.20 | 372.75 | 372.95 | Shale, dk gy, ls nods | | | | 0.00 |
| 1.30 | 372.95 | 374.25 | Limestone, massive | | | y | 1.30 |
| 0.20 | 374.25 | 374.45 | Shale, dk gy | | | | 0.00 |
| 1.00 | 374.45 | 375.45 | Limestone, mosaic | | | y | 1.00 |
| 0.30 | 375.45 | 375.75 | Shale, dk gy | | | | 0.00 |
| 0.85 | 375.75 | 376.60 | Limestone, nodular | | | y | 0.85 |
| 2.10 | 376.60 | 378.70 | Limestone, massive | | | y | 2.10 |
| 0.10 | 378.70 | 378.80 | Shale, dk gy | | | | 0.00 |
| 1.55 | 378.80 | 380.35 | Limestone, nodular | | | y | 1.55 |
| 0.50 | 380.35 | 380.85 | Claystone, gy, ls nods | | | | 0.00 |
| 0.70 | 380.85 | 381.55 | Claystone, gy | | | | 0.00 |
| 0.60 | 381.55 | 382.15 | Shale, gy | | | | 0.00 |
| 0.55 | 382.15 | 382.70 | Limestone, shaley, layered | | | y | 0.55 |
| 0.70 | 382.70 | 383.40 | Shale, dk gy | | | | 0.00 |
| 0.50 | 383.40 | 383.90 | Limestone, shaley, nodular | | | y | 0.50 |
| 0.60 | 383.90 | 384.50 | Shale, dk gy | | | | 0.00 |
| 1.45 | 384.50 | 385.95 | Claystone, gy | | | | 0.00 |
| 0.60 | 385.95 | 386.55 | Shale, gy/ gm | | | | 0.00 |
| 0.30 | 386.55 | 386.85 | Shale, dk gy | | | | 0.00 |
| 0.60 | 386.85 | 387.45 | Claystone, dk gy | | | | 0.00 |
| 0.45 | 387.45 | 387.90 | **Coal, sh layers, PITTSBURGH No. 8 ROOF COAL** | | | | 0.00 |
| 0.10 | 387.90 | 388.00 | Shale, blk | | | | 0.00 |
| 0.45 | 388.00 | 388.45 | Shale, gy | | | | 0.00 |
| 0.20 | 388.45 | 388.65 | Claystone, blk/ tan | | | | 0.00 |
| 0.10 | 388.65 | 388.75 | Shale, blk | | | | 0.00 |
| 0.25 | 388.75 | 389.00 | **Coal, PITTSBURGH No. 8** | | | | 0.00 |
| 0.15 | 389.00 | 389.15 | **Shale, blk** | | | | 0.00 |
| 5.05 | 389.15 | 394.20 | **Coal, bone stks** | | | | 0.00 |
| 2.00 | 394.20 | 396.20 | Shale, dk gy | | | | 0.00 |
| 1.90 | 396.20 | 398.10 | Claystone, gy, ls nods | | | | 0.00 |
| 1.80 | 398.10 | 399.90 | Limestone, massive | | | y | 1.80 |
| 4.30 | 399.90 | 404.20 | Shale, gy, ls nods | | | | 0.00 |
| | Total Depth | 404.20 | | | | | 124.40 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **124.40**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **31%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 124.40 | 31% |
| Soft Rock: | 279.80 | 69% |
| | 404.20 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) | | |
| Roof, 10 ft. | | | | | | | |
| Coal | | | | | | | |
| Bottom, 10 ft. | | | | | | | |

ATTACHMENT 13

# DIAMOND DRILL HOLE: CLC 2001-29

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,210.16
**Drill Hole Coordinates (State Plane 1927 NA Datum)**
**Northing:** 681,382
**Easting:** 2,419,418
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 7.00 | 25.00 | 32.00 | Claystone, gy, sandy | | cm, em | | 0.00 |
| 10.00 | 32.00 | 42.00 | Shale, gy, sandy | YES | cs, es | | 0.00 |
| 3.30 | 42.00 | 45.30 | Shale, gy | YES | cm, em | | 0.00 |
| 4.10 | 45.30 | 49.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.70 | 49.40 | 50.10 | Shale, dk gy | | cm, em | | 0.00 |
| 3.40 | 50.10 | 53.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 53.50 | 54.30 | Limestone | | ak, cs, es | y | 0.80 |
| 8.70 | 54.30 | 63.00 | Claystone, red/ gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 6.80 | 63.00 | 69.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 7.60 | 69.80 | 77.40 | Claystone, red w/ ls nods | | ak, cv, ev | | 0.00 |
| 6.60 | 77.40 | 84.00 | Claystone, red/ gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 11.20 | 84.00 | 95.20 | Shale, gy w/ ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 95.20 | 96.60 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.40 | 96.60 | 102.00 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 102.00 | 102.50 | Limestone, shaley, layered | | ak, cs, es | y | 0.50 |
| 2.50 | 102.50 | 105.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 105.00 | 106.10 | Limestone | | ak, cs, es | y | 1.10 |
| 10.20 | 106.10 | 116.30 | Claystone, red/ grn/ gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.60 | 116.30 | 121.90 | Shale, gy | | cm, em | | 0.00 |
| 1.10 | 121.90 | 123.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.20 | 123.00 | 128.20 | Shale, gy, sandy | | cs, es | | 0.00 |
| 4.20 | 128.20 | 132.40 | Shale, red | | cm, em | | 0.00 |
| 4.50 | 132.40 | 136.90 | Shale, gy, sandy, slumped | | cs, es | | 0.00 |
| 1.10 | 136.90 | 138.00 | Shale, gy | | cm, em | | 0.00 |
| 4.50 | 138.00 | 142.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 142.50 | 143.10 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 143.10 | 143.20 | Shale, blk w/ coal stks | | ac, cm, em | | 0.00 |
| 2.10 | 143.20 | 145.30 | Limestone, shaley, layered | | ak, cs, es | y | 2.10 |
| 6.30 | 145.30 | 151.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 151.60 | 152.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 152.70 | 152.80 | **Bone** | | ac, cv, ev | | 0.00 |
| 4.20 | 152.80 | 157.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 157.00 | 157.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.50 | 157.80 | 158.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 158.30 | 158.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.40 | 158.60 | 159.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.00 | 159.00 | 161.00 | **Coal w/ bone stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 8.00 | 161.00 | 169.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 6.70 | 169.00 | 175.70 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 6.00 | 175.70 | 181.70 | Shale, gy | | cm, em | | 0.00 |
| 4.70 | 181.70 | 186.40 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 2.00 | 186.40 | 188.40 | Shale, gy, sandy, slumped | | cs, es | | 0.00 |
| 28.40 | 188.40 | 216.80 | Sandstone, gy, massive | | cs, es | y | 28.40 |
| 8.70 | 216.80 | 225.50 | Shale, dk gy w/ ss stks | | cs, es | | 0.00 |
| 0.50 | 225.50 | 226.00 | Sandstone, gy w/ coal spars | | cs, es | y | 0.50 |
| 1.80 | 226.00 | 227.80 | Shale, gy | | cm, em | | 0.00 |
| 0.90 | 227.80 | 228.70 | **Coal w/ bone stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.80 | 228.70 | 229.50 | Limestone, shaley, layered | | ak, cs, es | y | 0.80 |
| 0.90 | 229.50 | 230.40 | Claystone, dk gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 230.40 | 232.50 | Limestone | | ak, cs, es | y | 2.10 |
| 6.70 | 232.50 | 239.20 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC 2001-29

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.60 | 239.20 | 240.80 | Sandstone, gy w/ sh stks | | cs, es | y | 1.60 |
| 7.40 | 240.80 | 248.20 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 0.60 | 248.20 | 248.80 | Sandstone, gy w/ sh stks | | cs, es | y | 0.60 |
| 3.10 | 248.80 | 251.90 | Shale, red/ grn/ gy | | cm, em | | 0.00 |
| 5.90 | 251.90 | 257.80 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 3.50 | 257.80 | 261.30 | Shale, dk gy/ gy | | cm, em | | 0.00 |
| 1.20 | 261.30 | 262.50 | Limestone, shaley, layered | | ak, cs, es | y | 1.20 |
| 5.10 | 262.50 | 267.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 267.60 | 267.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.60 | 267.90 | 269.50 | Shale, gy, sandy | | cs, es | | 0.00 |
| 18.50 | 269.50 | 288.00 | Sandstone, gy w/ sh stks | | cs, es | y | 18.50 |
| 4.70 | 288.00 | 292.70 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 0.60 | 292.70 | 293.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 293.30 | 295.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 295.00 | 296.60 | Limestone | | ak, cs, es | y | 1.60 |
| 3.70 | 296.60 | 300.30 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 300.30 | 302.80 | Limestone, shaley, layered | | ak, cs, es | y | 2.50 |
| 1.60 | 302.80 | 304.40 | Limestone, massive | | ak, cs, es | y | 1.60 |
| 1.00 | 304.40 | 305.40 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 305.40 | 307.30 | Limestone, mosaic | | ak, cs, es | y | 1.90 |
| 3.70 | 307.30 | 311.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 311.00 | 312.90 | Limestone, shaley, layered | | ak, cs, es | y | 1.90 |
| 0.70 | 312.90 | 313.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 313.60 | 314.00 | Limestone, shaley | | ak, cs, es | y | 0.40 |
| 3.40 | 314.00 | 317.40 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 317.40 | 319.00 | Limestone, massive | | ak, cs, es | y | 1.60 |
| 2.90 | 319.00 | 321.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 321.90 | 323.90 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 1.40 | 323.90 | 325.30 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.20 | 325.30 | 326.50 | Sandstone, gy w/ sh stks | | cs, es | y | 1.20 |
| 0.70 | 326.50 | 327.20 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 2.00 | 327.20 | 329.20 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 329.20 | 330.70 | Shale, red/ gy/ grn | | cm, em | | 0.00 |
| 3.20 | 330.70 | 333.90 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 333.90 | 334.70 | Limestone | | ak, cs, es | y | 0.80 |
| 3.30 | 334.70 | 338.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 338.00 | 341.30 | Claystone, gy, sandy w/ ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 341.30 | 344.40 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.50 | 344.40 | 345.90 | Sandstone, gy w/ sh stks | | cs, es | y | 1.50 |
| 1.00 | 345.90 | 346.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.60 | 346.90 | 348.50 | Limestone, shaley, layered | | ak, cs, es | y | 1.60 |
| 2.30 | 348.50 | 350.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 7.10 | 350.80 | 357.90 | Limestone, nodular | | ak, cs, es | y | 7.10 |
| 0.90 | 357.90 | 358.80 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 358.80 | 360.00 | Limestone, massive | | ak, cs, es | y | 1.20 |
| 1.30 | 360.00 | 361.30 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 361.30 | 366.30 | Limestone, shaley, layered | | ak, cs, es | y | 5.00 |
| 1.00 | 366.30 | 367.30 | Sandstone, gy w/ sh stks | | cs, es | y | 1.00 |
| 2.40 | 367.30 | 369.70 | Shale, gy w/ ss stks | | cs, es | | 0.00 |
| 1.40 | 369.70 | 371.10 | Limestone | | ak, cs, es | y | 1.40 |
| 2.30 | 371.10 | 373.40 | Claystone, gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 373.40 | 373.60 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 2.40 | 373.60 | 376.00 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.70 | 376.00 | 381.70 | Limestone, massive | | ak, cs, es | y | 5.70 |
| 8.60 | 381.70 | 390.30 | Claystone, gy/ grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.20 | 390.30 | 393.50 | Limestone, massive | | ak, cs, es | y | 3.20 |
| 7.10 | 393.50 | 400.60 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.60 | 400.60 | 405.20 | Limestone, shaley, layered | | ak, cs, es | y | 4.60 |
| 4.30 | 405.20 | 409.50 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 9.50 | 409.50 | 419.00 | Limestone, shaley, layered | | ak, cs, es | y | 9.50 |
| 1.20 | 419.00 | 420.20 | Claystone, dk gy/ gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 16.20 | 420.20 | 436.40 | Limestone, shaley, layered | | ak, cs, es | y | 16.20 |
| 4.45 | 436.40 | 440.85 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 3.00 | 440.85 | 443.85 | Coal w/ bone and sh layers, SEWICKLEY No. 9 | | ac, cv, ev | | 0.00 |



AEC 03390

# DIAMOND DRILL HOLE: CLC 2001-29

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.85 | 443.85 | 447.70 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 447.70 | 451.10 | Sandstone, gy, slumped | | cs, es | y | 3.40 |
| 4.90 | 451.10 | 456.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 8.10 | 456.00 | 464.10 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 464.10 | 464.55 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 3.20 | 464.55 | 467.75 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.85 | 467.75 | 468.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 17.20 | 468.60 | 485.80 | Limestone, shaley, layered | | ak, cs, es | y | 17.20 |
| 1.10 | 485.80 | 486.90 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 5.90 | 486.90 | 492.80 | Sandstone, gy, churned | | cs, es | y | 5.90 |
| 3.60 | 492.80 | 496.40 | Shale, gy w/ interbedded ss | | cs, es | | 0.00 |
| 1.90 | 496.40 | 498.30 | Shale, gy, w/ ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 498.30 | 500.10 | Limestone, massive | | ak, cs, es | y | 1.80 |
| 6.50 | 500.10 | 506.60 | Claystone, grn | | cv, ev | | 0.00 |
| 0.30 | 506.60 | 506.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.40 | 506.90 | 507.30 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 1.40 | 507.30 | 508.70 | Claystone, gy | | cv, ev | | 0.00 |
| 2.00 | 508.70 | 510.70 | Claystone, grn w/ ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 510.70 | 514.20 | Claystone, gy/ grn | | cv, ev | | 0.00 |
| 0.40 | 514.20 | 514.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.28 | 514.60 | 515.88 | **Coal w/ pyrite, ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.87 | 515.88 | 516.75 | Claystone, dk gy/ gy | | cv, ev | | 0.00 |
| 2.00 | 516.75 | 518.75 | **Coal w/ pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 3.70 | 518.75 | 522.45 | **Coal w/ bone** | | ac, cv, ev | | 0.00 |
| 0.15 | 522.45 | 522.60 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 2.10 | 522.60 | 524.70 | Claystone, dk gy/ gy | | cv, ev | | 0.00 |
| 1.10 | 524.70 | 525.80 | Limestone | | ak, cs, es | y | 1.10 |
| 1.40 | 525.80 | 527.20 | Claystone, gy w/ ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 527.20 | 531.30 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 531.30 | 532.30 | Shale, gy, sandy | | cs, es | | 0.00 |
| 1.90 | 532.30 | 534.20 | Sandstone, gy w/ sh stks | | cs, es | y | 1.90 |
| 0.80 | 534.20 | 535.00 | Shale, gy, sandy | | cs, es | | 0.00 |
| 0.70 | 535.00 | 535.70 | Sandstone, gy w/ sh stks | | cs, es | y | 0.70 |
| | Total Depth | 535.70 | | | | | 162.10 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit **162.10**

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit **30%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 162.10 | 30% |
| Soft Rock: | 373.60 | 70% |
| | 535.70 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2001-32

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1273
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 666601
**Easting:** 2410357
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 43.00 | 0.00 | 43.00 | Casing | | | | 0.00 |
| 9.00 | 43.00 | 52.00 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 52.00 | 54.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 5.20 | 54.50 | 59.70 | Sandstone, gy, crossbeds | Y | cs, es | y | 5.20 |
| 1.10 | 59.70 | 60.80 | Shale, red/ grn | | cm, em | | 0.00 |
| 10.00 | 60.80 | 70.80 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 4.20 | 70.80 | 75.00 | Shale, gy | | cm, em | | 0.00 |
| 16.40 | 75.00 | 91.40 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 4.90 | 91.40 | 96.30 | Shale, gy | | cm, em | | 0.00 |
| 9.10 | 96.30 | 105.40 | Sandstone, gy, sh stks | | cs, es | y | 9.10 |
| 1.00 | 105.40 | 106.40 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 106.40 | 107.10 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 8.40 | 107.10 | 115.50 | Shale, red/ grn | | cm, em | | 0.00 |
| 6.50 | 115.50 | 122.00 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 7.10 | 122.00 | 129.10 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.40 | 129.10 | 131.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.70 | 131.50 | 133.20 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 133.20 | 133.40 | Limestone, shaley | | ak, cs, es | y | 0.20 |
| 9.00 | 133.40 | 142.40 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.20 | 142.40 | 147.60 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 147.60 | 147.80 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 2.80 | 147.80 | 150.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 150.60 | 152.20 | Limestone, shaley, massive | | ak, cs, es | y | 1.60 |
| 2.80 | 152.20 | 155.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 7.50 | 155.00 | 162.50 | Shale, gy | | cm, em | | 0.00 |
| 1.60 | 162.50 | 164.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.60 | 164.10 | 164.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 164.70 | 164.90 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 5.30 | 164.90 | 170.20 | Claystone, tan | | cv, ev | | 0.00 |
| 1.05 | 170.20 | 171.25 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.00 | 171.25 | 172.25 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 10.75 | 172.25 | 183.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.70 | 183.00 | 185.70 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 8.70 | 185.70 | 194.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 194.40 | 196.30 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 196.30 | 198.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 198.75 | 198.95 | Sandstone, gy, massive | | cs, es | y | 0.20 |
| 0.70 | 198.95 | 199.65 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 6.05 | 199.65 | 205.70 | Sandstone, gy, sh stks | | cs, es | y | 6.05 |
| 1.40 | 205.70 | 207.10 | Shale, gy | | cm, em | | 0.00 |
| 27.10 | 207.10 | 234.20 | Sandstone, gy, sh stks | | cs, es | y | 27.10 |
| 3.60 | 234.20 | 237.80 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.70 | 237.80 | 238.50 | Sandstone, gy, massive | | cs, es | y | 0.70 |
| 1.00 | 238.50 | 239.50 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 3.50 | 239.50 | 243.00 | Sandstone, gy, massive | | cs, es | y | 3.50 |
| 1.10 | 243.00 | 244.10 | **Coal, bone stks, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 4.50 | 244.10 | 248.60 | Claystone, gy | | cv, ev | | 0.00 |
| 5.20 | 248.60 | 253.80 | Claystone, grn | | cv, ev | | 0.00 |
| 6.60 | 253.80 | 260.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.50 | 260.40 | 264.90 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 264.90 | 265.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.00 | 265.60 | 268.60 | Shale, gy | | cm, em | | 0.00 |
| 2.40 | 268.60 | 271.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.50 | 271.00 | 273.50 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 273.50 | 273.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 273.60 | 274.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 274.20 | 275.00 | Limestone, shaley | | ak, cs, es | y | 0.80 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 9.50 | 275.00 | 284.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 284.50 | 285.00 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 0.15 | 285.00 | 285.15 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.65 | 285.15 | 286.80 | Limestone, massive | | ak, cs, es | y | 1.65 |
| 2.40 | 286.80 | 289.20 | Claystone, tan | | cv, ev | | 0.00 |
| 0.40 | 289.20 | 289.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 289.60 | 290.90 | Claystone, tan | | cv, ev | | 0.00 |
| 0.60 | 290.90 | 291.50 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 3.20 | 291.50 | 294.70 | Claystone, gy | | cv, ev | | 0.00 |
| 1.30 | 294.70 | 296.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.70 | 296.00 | 296.70 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 3.60 | 296.70 | 300.30 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.70 | 300.30 | 302.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 302.00 | 302.05 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.55 | 302.05 | 303.60 | Shale, gy | | cm, em | | 0.00 |
| 1.50 | 303.60 | 305.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.60 | 305.10 | 309.70 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 309.70 | 309.90 | **Coal, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.30 | 309.90 | 310.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.70 | 310.20 | 313.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.10 | 313.90 | 314.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 6.50 | 314.00 | 320.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 320.50 | 322.60 | Limestone, layered | | ak, cs, es | y | 2.10 |
| 1.30 | 322.60 | 323.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 323.90 | 324.90 | Limestone, massive | | ak, cs, es | y | 1.00 |
| 7.50 | 324.90 | 332.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 332.40 | 333.10 | Limestone, massive | | ak, cs, es | y | 0.70 |
| 0.70 | 333.10 | 333.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 333.80 | 335.60 | Limestone, shaley, layered | | ak, cs, es | y | 1.80 |
| 0.10 | 335.60 | 335.70 | Claystone, grn | | cv, ev | | 0.00 |
| 1.00 | 335.70 | 336.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 336.70 | 337.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.30 | 337.30 | 337.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.40 | 337.60 | 341.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.50 | 341.00 | 343.50 | Core Loss | | | | 0.00 |
| 3.50 | 343.50 | 347.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.80 | 347.00 | 349.80 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 349.80 | 351.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 6.10 | 351.70 | 357.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 357.80 | 358.60 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.20 | 358.60 | 359.80 | Shale, gy | | cm, em | | 0.00 |
| 2.00 | 359.80 | 361.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 6.00 | 361.80 | 367.80 | Sandstone, gy, crossbeds | | cs, es | y | 6.00 |
| 1.30 | 367.80 | 369.10 | Shale, gy | | cm, em | | 0.00 |
| 7.70 | 369.10 | 376.80 | Limestone, shaley, layered | | ak, cs, es | y | 7.70 |
| 2.80 | 376.80 | 379.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 379.60 | 380.90 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.90 | 380.90 | 382.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.30 | 382.80 | 385.10 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 385.10 | 386.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.60 | 386.00 | 387.60 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 387.60 | 387.80 | Shale, red | | cm, em | | 0.00 |
| 2.50 | 387.80 | 390.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 390.30 | 391.00 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 0.40 | 391.00 | 391.40 | Shale, dk gy, layered | | cm, em | | 0.00 |
| 0.70 | 391.40 | 392.10 | Limestone, shaley, layered | | ak, cs, es | y | 0.70 |
| 0.60 | 392.10 | 392.70 | Claystone, grn | | cv, ev | | 0.00 |
| 3.20 | 392.70 | 395.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 395.90 | 397.60 | Limestone, massive | | ak, cs, es | y | 1.70 |
| 3.20 | 397.60 | 400.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 400.80 | 402.40 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 402.40 | 403.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.50 | 403.00 | 404.50 | Shale, gy | | cm, em | | 0.00 |
| 1.60 | 404.50 | 406.10 | Limestone, shaley, layered | | ak, cs, es | y | 1.60 |
| 2.10 | 406.10 | 408.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 408.20 | 410.20 | Limestone, massive | | ak, cs, es | y | 2.00 |
| 5.80 | 410.20 | 416.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.80 | 416.00 | 419.80 | Limestone, layered | | ak, cs, es | y | 3.80 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.30 | 419.80 | 422.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 422.10 | 427.10 | Limestone, massive | | ak, cs, es | y | 5.00 |
| 4.60 | 427.10 | 431.70 | Limestone, shaley, layered | | ak, cs, es | y | 4.60 |
| 5.30 | 431.70 | 437.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 437.00 | 438.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 438.00 | 442.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 442.60 | 442.80 | Sandstone, gy, massive | | cs, es | y | 0.20 |
| 0.40 | 442.80 | 443.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 31.30 | 443.20 | 474.50 | Sandstone, gy, sh stks | | cs, es | y | 31.30 |
| 17.70 | 474.50 | 492.20 | Sandstone, gy, massive | | cs, es | y | 17.70 |
| 1.80 | 492.20 | 494.00 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 494.00 | 495.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 495.00 | 495.40 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.50 | 495.40 | 495.90 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.05 | 495.90 | 495.95 | **Limestone, shaley** | | ak, cs, es | y | 0.05 |
| 0.05 | 495.95 | 496.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 496.00 | 496.20 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.30 | 496.20 | 497.50 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 497.50 | 497.75 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.45 | 497.75 | 498.20 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 498.20 | 498.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.15 | 498.35 | 499.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.90 | 499.50 | 506.40 | Limestone, shaley, layered | | ak, cs, es | y | 6.90 |
| 0.70 | 506.40 | 507.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 507.10 | 508.80 | Limestone, shaley, layered | | ak, cs, es | y | 1.70 |
| 0.30 | 508.80 | 509.10 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 509.10 | 509.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.70 | 509.40 | 514.10 | Limestone, shaley, mosaic | | ak, cs, es | y | 4.70 |
| 1.00 | 514.10 | 515.10 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 515.10 | 518.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 518.60 | 520.00 | Claystone, grn | | cv, ev | | 0.00 |
| 0.90 | 520.00 | 520.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.30 | 520.90 | 525.20 | Claystone, grn | | cv, ev | | 0.00 |
| 8.70 | 525.20 | 533.90 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 533.90 | 538.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 20.00 | 538.00 | 558.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 558.00 | 561.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.70 | 561.70 | 563.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.60 | 563.40 | 565.00 | Sandstone, gy, massive churned | | cs, es | y | 1.60 |
| 0.60 | 565.00 | 565.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.05 | 565.60 | 566.65 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 5.05 | 566.65 | 571.70 | Sandstone, gy, sh stks | | cs, es | y | 5.05 |
| 6.55 | 571.70 | 578.25 | Sandstone, gy, coal spars | | ac, cs, es | y | 6.55 |
| 1.85 | 578.25 | 580.10 | Shale, gy | | cm, em | | 0.00 |
| 1.07 | 580.10 | 581.17 | **Coal, pyrite, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.07 | 581.17 | 581.24 | **Pyrite** | | ac, cm, em | | 0.00 |
| 2.86 | 581.24 | 584.10 | **Coal** | | ac, cv, ev | | 0.00 |
| 2.70 | 584.10 | 586.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 586.80 | 587.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 587.60 | 589.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 589.00 | 590.35 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 590.35 | 591.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 591.00 | 592.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 592.50 | 593.40 | Claystone, blk/ tan, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 593.40 | 594.15 | Limestone, layered | | ak, cs, es | y | 0.75 |
| | Total Depth | 594.15 | | | | | 174.90 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2001-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **174.90** |

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **29%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 174.90 | 29% |
| Soft Rock: | 419.25 | 71% |
| | 594.15 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2001-33

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1205
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 671330
**Easting:** 2406270
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 43.60 | 0.00 | 43.60 | Casing | | | | 0.00 |
| 5.60 | 43.60 | 49.20 | Shale, gy, ls nods | Y | ak, cm, em | | 0.00 |
| 0.90 | 49.20 | 50.10 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 50.10 | 52.35 | Shale, red/ grn | Y | cm, em | | 0.00 |
| 0.25 | 52.35 | 52.60 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 52.60 | 53.60 | Claystone, gy | Y | cv, ev | | 0.00 |
| 2.30 | 53.60 | 55.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 5.70 | 55.90 | 61.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 61.60 | 63.15 | Shale, gy | | cm, em | | 0.00 |
| 1.85 | 63.15 | 65.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 65.00 | 65.60 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.15 | 65.60 | 65.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 65.75 | 66.55 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 66.55 | 67.75 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 67.75 | 68.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.03 | 68.25 | 68.28 | **Bone** | | ac, cv, ev | | 0.00 |
| 0.01 | 68.28 | 68.29 | **Coal, fusain** | | ac, cv, ev | | 0.00 |
| 0.15 | 68.29 | 68.44 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 68.44 | 68.47 | **Bone** | | ac, cv, ev | | 0.00 |
| 0.03 | 68.47 | 68.50 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.12 | 68.50 | 68.62 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.39 | 68.62 | 69.01 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 69.01 | 69.09 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.43 | 69.09 | 69.52 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.01 | 69.52 | 69.53 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.03 | 69.53 | 69.56 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 69.56 | 69.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.33 | 69.70 | 70.03 | Limestone, shaley, nodular | | ak, cs, es | y | 0.33 |
| 0.52 | 70.03 | 70.55 | Shale, gy | | cm, em | | 0.00 |
| 0.05 | 70.55 | 70.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 70.60 | 71.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.25 | 71.00 | 71.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 71.25 | 71.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.05 | 71.30 | 71.35 | Shale, grn | | cm, em | | 0.00 |
| 0.20 | 71.35 | 71.55 | Shale, gy | | cm, em | | 0.00 |
| 1.10 | 71.55 | 72.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 0.25 | 72.65 | 72.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 72.90 | 73.10 | Claystone, grn | | cv, ev | | 0.00 |
| 0.10 | 73.10 | 73.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.70 | 73.20 | 73.90 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 73.90 | 74.70 | Limestone, shaley, massive | | ak, cs, es | y | 0.80 |
| 0.60 | 74.70 | 75.30 | Claystone, gy | | cv, ev | | 0.00 |
| 2.45 | 75.30 | 77.75 | Claystone, gy, is nods | | ak, cv, ev | | 0.00 |
| 0.15 | 77.75 | 77.90 | Shale, dk gy | | cm, em | | 0.00 |
| 2.20 | 77.90 | 80.10 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 80.10 | 80.55 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 80.55 | 80.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.85 | 80.75 | 81.60 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 81.60 | 82.40 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.85 | 82.40 | 85.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.50 | 85.25 | 85.75 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.22 | 85.75 | 86.97 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.04 | 86.97 | 87.01 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.23 | 87.01 | 87.24 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 87.24 | 87.27 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 87.27 | 87.30 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.10 | 87.30 | 87.40 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.05 | 87.40 | 87.45 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 2.30 | 87.45 | 89.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.75 | 89.75 | 94.50 | Claystone, gy | | cv, ev | | 0.00 |
| 1.05 | 94.50 | 95.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 95.55 | 97.75 | Claystone, gy | | cv, ev | | 0.00 |
| 0.10 | 97.75 | 97.85 | Claystone, grn | | cv, ev | | 0.00 |
| 4.40 | 97.85 | 102.25 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 102.25 | 102.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 102.65 | 104.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 104.15 | 104.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 104.50 | 105.55 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.30 | 105.55 | 105.85 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.25 | 105.85 | 106.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.60 | 106.10 | 106.70 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 4.15 | 106.70 | 110.85 | Sandstone, gy, sh stks | | cs, es | y | 4.15 |
| 5.65 | 110.85 | 116.50 | Sandstone, gy, crossbeds | | cs, es | y | 5.65 |
| 5.00 | 116.50 | 121.50 | Sandstone, gy, sh stks | | cs, es | y | 5.00 |
| 4.85 | 121.50 | 126.35 | Sandstone, gy, massive | | cs, es | y | 4.85 |
| 0.30 | 126.35 | 126.65 | Sandstone, gy, sh stks | | cs, es | y | 0.30 |
| 11.25 | 126.65 | 137.90 | Sandstone, gy, massive | | cs, es | y | 11.25 |
| 5.30 | 137.90 | 143.20 | Sandstone, gy, sh stks | | cs, es | y | 5.30 |
| 2.30 | 143.20 | 145.50 | Sandstone, gy, massive | | cs, es | y | 2.30 |
| 0.95 | 145.50 | 146.45 | Sandstone, gy, sh stks | | cs, es | y | 0.95 |
| 0.15 | 146.45 | 146.60 | Claystone, gy, sandy | | cv, ev | | 0.00 |
| 1.55 | 146.60 | 148.15 | Sandstone, gy, sh stks | | cs, es | y | 1.55 |
| 0.30 | 148.15 | 148.45 | Claystone, gy, sandy | | cv, ev | | 0.00 |
| 10.95 | 148.45 | 159.40 | Sandstone, gy, sh stks | | cs, es | y | 10.95 |
| 0.30 | 159.40 | 159.70 | **Coal, pyrite, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 0.25 | 159.70 | 159.95 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.00 | 159.95 | 160.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 160.95 | 165.30 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.35 | 165.30 | 166.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.20 | 166.65 | 171.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.05 | 171.85 | 175.90 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 175.90 | 176.40 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 176.40 | 179.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.40 | 179.10 | 181.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 181.50 | 182.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 182.15 | 182.80 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 182.80 | 183.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.60 | 183.20 | 187.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 187.80 | 188.50 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 188.50 | 188.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.00 | 188.80 | 189.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 189.80 | 190.65 | Limestone, shaley, layered | | ak, cs, es | y | 0.85 |
| 0.65 | 190.65 | 191.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 0.80 | 191.30 | 192.10 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 192.10 | 192.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.95 | 192.90 | 198.85 | Sandstone, gy, sh stks | | cs, es | y | 5.95 |
| 0.80 | 198.85 | 199.65 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 2.60 | 199.65 | 202.25 | Limestone, shaley, layered | | ak, cs, es | y | 2.60 |
| 1.95 | 202.25 | 204.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.30 | 204.20 | 205.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.70 | 205.50 | 208.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.10 | 208.20 | 209.30 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.00 | 209.30 | 212.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.00 | 212.30 | 213.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 213.30 | 213.90 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.80 | 213.90 | 214.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.60 | 214.70 | 220.30 | Sandstone, gy, crossbeds | | cs, es | y | 5.60 |
| 1.40 | 220.30 | 221.70 | Sandstone, gy, sh stks | | cs, es | y | 1.40 |
| 1.20 | 221.70 | 222.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 222.90 | 223.45 | Shale, gy | | cm, em | | 0.00 |
| 0.85 | 223.45 | 224.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 224.30 | 224.50 | **Coal, sh layers, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.30 | 224.50 | 224.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 224.80 | 225.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 225.30 | 225.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2001-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 7.20 | 225.70 | 232.90 | Shale, dk gy | | cm, em | | 0.00 |
| 6.50 | 232.90 | 239.40 | Limestone, shaley, layered | | ak, cs, es | y | 6.50 |
| 1.15 | 239.40 | 240.55 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 5.65 | 240.55 | 246.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 246.20 | 247.00 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 247.00 | 248.25 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.35 | 248.25 | 249.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 249.60 | 250.20 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 2.20 | 250.20 | 252.40 | Claystone, gy | | cv, ev | | 0.00 |
| 4.00 | 252.40 | 256.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.40 | 256.40 | 259.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.25 | 259.80 | 260.05 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.45 | 260.05 | 262.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.40 | 262.50 | 262.90 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.45 | 262.90 | 263.35 | Shale, red | | cm, em | | 0.00 |
| 0.60 | 263.35 | 263.95 | Shale, red/ grn, sandy | | cm, em | | 0.00 |
| 0.55 | 263.95 | 264.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 264.50 | 265.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.90 | 265.30 | 266.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 266.20 | 267.00 | Shale, dk gy | | cm, em | | 0.00 |
| 5.45 | 267.00 | 272.45 | Limestone, shaley, layered | | ak, cs, es | y | 5.45 |
| 0.40 | 272.45 | 272.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.15 | 272.85 | 274.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 274.00 | 274.50 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 2.60 | 274.50 | 277.10 | Shale, gy | | cm, em | | 0.00 |
| 1.95 | 277.10 | 279.05 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 279.05 | 279.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.10 | 279.40 | 280.50 | Limestone, massive | | ak, cs, es | y | 1.10 |
| 0.90 | 280.50 | 281.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 281.40 | 283.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.95 |
| 1.05 | 283.35 | 284.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 284.40 | 286.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 7.60 | 286.70 | 294.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.35 | 294.30 | 297.65 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.60 | 297.65 | 299.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.15 | 299.25 | 299.40 | Sandstone, gy, sh stks | | cs, es | y | 0.15 |
| 2.10 | 299.40 | 301.50 | Claystone, dk gy, sandy | | cv, ev | | 0.00 |
| 2.75 | 301.50 | 304.25 | Sandstone, gy, sh stks | | cs, es | y | 2.75 |
| 0.65 | 304.25 | 304.90 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 304.90 | 305.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.85 | 305.65 | 307.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 307.50 | 311.60 | Limestone, shaley, nodular | | ak, cs, es | y | 4.10 |
| 2.35 | 311.60 | 313.95 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 313.95 | 314.70 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.80 | 314.70 | 315.50 | Shale, gy | | cm, em | | 0.00 |
| 3.85 | 315.50 | 319.35 | Limestone, shaley, nodular | | ak, cs, es | y | 3.85 |
| 2.20 | 319.35 | 321.55 | Limestone, nodular | | ak, cs, es | y | 2.20 |
| 0.70 | 321.55 | 322.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.55 | 322.25 | 325.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.55 |
| 4.50 | 325.80 | 330.30 | Limestone, layered | | ak, cs, es | y | 4.50 |
| 1.35 | 330.30 | 331.65 | Limestone, breccia | | ak, cs, es | y | 1.35 |
| 1.80 | 331.65 | 333.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.15 | 333.45 | 338.60 | Limestone, nodular | | ak, cs, es | y | 5.15 |
| 2.90 | 338.60 | 341.50 | Limestone, shaley, layered | | ak, cs, es | y | 2.90 |
| 1.00 | 341.50 | 342.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 342.50 | 347.40 | Limestone, shaley, layered | | ak, cs, es | y | 4.90 |
| 4.30 | 347.40 | 351.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.50 | 351.70 | 352.20 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 8.70 | 352.20 | 360.90 | Sandstone, gy, sh stks | | cs, es | y | 8.70 |
| 1.80 | 360.90 | 362.70 | Sandstone, gy, crossbeds | | cs, es | y | 1.80 |
| 4.40 | 362.70 | 367.10 | Sandstone, gy, massive | | cs, es | y | 4.40 |
| 1.00 | 367.10 | 368.10 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 1.90 | 368.10 | 370.00 | Sandstone, gy, massive | | cs, es | y | 1.90 |
| 10.40 | 370.00 | 380.40 | Sandstone, gy, crossbeds | | cs, es | y | 10.40 |
| 1.70 | 380.40 | 382.10 | Sandstone, gy, massive | | cs, es | y | 1.70 |
| 0.15 | 382.10 | 382.25 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.15 |
| 1.00 | 382.25 | 383.25 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 0.85 | 383.25 | 384.10 | Sandstone, gy, massive | | cs, es | y | 0.85 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2001-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.35 | 384.10 | 384.45 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.35 |
| 0.80 | 384.45 | 385.25 | Sandstone, gy, massive | | cs, es | y | 0.80 |
| 0.50 | 385.25 | 385.75 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.50 |
| 3.55 | 385.75 | 389.30 | Sandstone, gy, massive | | cs, es | y | 3.55 |
| 2.00 | 389.30 | 391.30 | Sandstone, gy, coal bands | | ac, cs, es | y | 2.00 |
| 5.40 | 391.30 | 396.70 | Sandstone, gy, sh stks | | cs, es | y | 5.40 |
| 7.80 | 396.70 | 404.50 | Sandstone, gy, massive | | cs, es | y | 7.80 |
| 4.50 | 404.50 | 409.00 | Sandstone, gy, sh stks | | cs, es | y | 4.50 |
| 0.25 | 409.00 | 409.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 409.25 | 409.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.25 | 409.40 | 409.65 | **Coal, sh layers, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.45 | 409.65 | 410.10 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.85 | 410.10 | 410.95 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 410.95 | 411.15 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.50 | 411.15 | 411.65 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 411.65 | 411.80 | **Coal, bone layers** | | ac, cv, ev | | 0.00 |
| 0.75 | 411.80 | 412.55 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 412.55 | 414.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 1.55 | 414.25 | 415.80 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.55 |
| 0.35 | 415.80 | 416.15 | Shale, blk, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 416.15 | 416.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 0.75 | 416.90 | 417.65 | Limestone, massive | | ak, cs, es | y | 0.75 |
| 0.95 | 417.65 | 418.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 0.25 | 418.60 | 418.85 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 418.85 | 419.10 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.85 | 419.10 | 419.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 419.95 | 420.60 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 1.50 | 420.60 | 422.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 0.70 | 422.10 | 422.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 422.80 | 423.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 2.65 | 423.60 | 426.25 | Limestone, shaley, mosaic | | ak, cs, es | y | 2.65 |
| 1.25 | 426.25 | 427.50 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 0.45 | 427.50 | 427.95 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 0.25 | 427.95 | 428.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 428.20 | 428.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 428.50 | 429.15 | Sandstone, gy, sh stks | | cs, es | y | 0.65 |
| 0.50 | 429.15 | 429.65 | Shale, grn | | cm, em | | 0.00 |
| 0.60 | 429.65 | 430.25 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.15 | 430.25 | 430.40 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 430.40 | 432.30 | Shale, grn | | cm, em | | 0.00 |
| 2.70 | 432.30 | 435.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 435.00 | 435.35 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.65 | 435.35 | 438.00 | Shale, gy | | cm, em | | 0.00 |
| 4.00 | 438.00 | 442.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 442.00 | 446.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 9.85 | 446.60 | 456.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 456.45 | 457.00 | Claystone, grn, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 457.00 | 458.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 458.70 | 458.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 458.90 | 459.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 6.45 | 459.90 | 466.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 466.35 | 466.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.25 | 466.75 | 471.00 | Sandstone, gy, sh stks | | cs, es | y | 4.25 |
| 1.05 | 471.00 | 472.05 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 2.15 | 472.05 | 474.20 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.15 | 474.20 | 474.35 | Sandstone, gy, sh stks | | cs, es | y | 0.15 |
| 0.65 | 474.35 | 475.00 | Sandstone, gy, massive | | cs, es | y | 0.65 |
| 0.45 | 475.00 | 475.45 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.75 | 475.45 | 477.20 | Sandstone, gy, sh stks | | cs, es | y | 1.75 |
| 3.70 | 477.20 | 480.90 | Shale, gy | | cm, em | | 0.00 |
| 0.35 | 480.90 | 481.25 | Sandstone, gy, coal bands | | ac, cs, es | y | 0.35 |
| 0.35 | 481.25 | 481.60 | Sandstone, gy, crossbeds | | cs, es | y | 0.35 |
| 0.03 | 481.60 | 481.63 | Coal | | ac, cv, ev | | 0.00 |
| 0.32 | 481.63 | 481.95 | Sandstone, gy, crossbeds | | cs, es | y | 0.32 |
| 0.08 | 481.95 | 482.03 | Coal | | ac, cv, ev | | 0.00 |
| 0.75 | 482.03 | 482.78 | Sandstone, gy, crossbeds | | cs, es | y | 0.75 |
| 0.11 | 482.78 | 482.89 | Coal | | ac, cv, ev | | 0.00 |
| 1.46 | 482.89 | 484.35 | Sandstone, gy, coal bands | | ac, cs, es | y | 1.46 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2001-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.15 | 484.35 | 487.50 | Sandstone, gy, coal spars | | ac, cs, es | y | 3.15 |
| 0.70 | 487.50 | 488.20 | Sandstone, gy sh pebbles | | cs, es | y | 0.70 |
| 2.88 | 488.20 | 491.08 | Sandstone, gy, coal spars | | ac, cs, es | y | 2.88 |
| 0.17 | 491.08 | 491.25 | **Bone, coal layers, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.89 | 491.25 | 492.14 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.46 | 492.14 | 492.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 492.60 | 492.62 | **Claystone, gy** | | cv, ev | | 0.00 |
| 2.66 | 492.62 | 495.28 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.47 | 495.28 | 496.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 496.75 | 497.75 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 3.35 | 497.75 | 501.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.14 | 501.10 | 505.24 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.31 | 505.24 | 506.55 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 506.55 | 506.80 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.50 | 506.80 | 507.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.55 | 507.30 | 507.85 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.75 | 507.85 | 508.60 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 508.60 | | | | | 215.49 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **215.49**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **42%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 215.49 | 42% |
| Soft Rock: | 293.11 | 58% |
| | 508.60 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-01

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,230
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 674920
**Easting:** 2409530
**Drilling Company:** Kerogen Resources, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 12.00 | 0.00 | 12.00 | Casing | | | | 0.00 |
| 2.85 | 12.00 | 14.85 | Shale, gy | yes | cm, em | | 0.00 |
| 1.05 | 14.85 | 15.90 | Claystone, gy | yes | cv, ev | | 0.00 |
| 4.70 | 15.90 | 20.60 | Claystone, red/ grn | yes | cv, ev | | 0.00 |
| 5.90 | 20.60 | 26.50 | Sandstone, gy, massive | yes | cs, es | y | 5.90 |
| 3.00 | 26.50 | 29.50 | Shale, gy, sandy, massive | | cs, es | | 0.00 |
| 6.75 | 29.50 | 36.25 | Claystone, gy | | cv, ev | | 0.00 |
| 1.25 | 36.25 | 37.50 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.80 | 37.50 | 38.30 | Shale, gy | | cm, em | | 0.00 |
| 2.85 | 38.30 | 41.15 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.25 | 41.15 | 43.40 | Claystone, gy | | cv, ev | | 0.00 |
| 2.95 | 43.40 | 46.35 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 11.95 | 46.35 | 58.30 | Claystone, red | | cv, ev | | 0.00 |
| 2.00 | 58.30 | 60.30 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 0.80 | 60.30 | 61.10 | Claystone, gy | | cv, ev | | 0.00 |
| 3.40 | 61.10 | 64.50 | Shale, gy, sand stks, ls nods | | ak, cs, es | | 0.00 |
| 1.20 | 64.50 | 65.70 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 65.70 | 66.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 66.50 | 69.80 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 4.80 | 69.80 | 74.60 | Sandstone, gy, crossbeds | | cs, es | y | 4.80 |
| 2.70 | 74.60 | 77.30 | Shale, gy, sand stks, ls nods | | ak, cs, es | | 0.00 |
| 0.65 | 77.30 | 77.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 77.95 | 80.40 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 3.95 | 80.40 | 84.35 | Shale, gy | | cm, em | | 0.00 |
| 0.75 | 84.35 | 85.10 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.80 | 85.10 | 86.90 | Claystone, red | | cv, ev | | 0.00 |
| 1.80 | 86.90 | 88.70 | Claystone, gy | | cv, ev | | 0.00 |
| 1.35 | 88.70 | 90.05 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 90.05 | 93.35 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 93.35 | 95.00 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 95.00 | 95.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 95.85 | 97.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 97.40 | 102.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 8.50 | 102.00 | 110.50 | Shale, gy, sandy, massive | | cs, es | | 0.00 |
| 0.90 | 110.50 | 111.40 | Sandstone, gy, crossbeds | | cs, es | y | 0.90 |
| 2.10 | 111.40 | 113.50 | Shale, gy, sandy, massive | | cs, es | | 0.00 |
| 3.80 | 113.50 | 117.30 | Sandstone, gy, sh stks | | cs, es | y | 3.80 |
| 2.25 | 117.30 | 119.55 | Sandstone, gy, crossbeds | | cs, es | y | 2.25 |
| 1.65 | 119.55 | 121.20 | Sandstone, gy, massive | | cs, es | y | 1.65 |
| 2.20 | 121.20 | 123.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 123.40 | 123.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 1.75 | 123.75 | 125.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 125.50 | 126.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 126.30 | 128.70 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 1.30 | 128.70 | 130.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.60 | 130.00 | 132.60 | Shale, gy | | cm, em | | 0.00 |
| 1.10 | 132.60 | 133.70 | Shale, dk gy | | cm, em | | 0.00 |
| 4.30 | 133.70 | 138.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.35 | 138.00 | 140.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 14.05 | 140.35 | 154.40 | Claystone, gy | | cv, ev | | 0.00 |
| 2.90 | 154.40 | 157.30 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 1.70 | 157.30 | 159.00 | Claystone, gy, ss stks, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 159.00 | 162.30 | Shale, gy, sandy, massive | | cs, es | | 0.00 |
| 10.20 | 162.30 | 172.50 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 5.80 | 172.50 | 178.30 | Sandstone, gy, sh stks | | cs, es | y | 5.80 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-01

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.70 | 178.30 | 183.00 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 4.15 | 183.00 | 187.15 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 3.45 | 187.15 | 190.60 | Sandstone, gy, sh stks | | cs, es | y | 3.45 |
| 3.50 | 190.60 | 194.10 | Sandstone, gy, crossbeds | | cs, es | y | 3.50 |
| 2.30 | 194.10 | 196.40 | Sandstone, gy, massive | | cs, es | y | 2.30 |
| 1.10 | 196.40 | 197.50 | Shale, gy, sandy, massive | | cs, es | | 0.00 |
| 6.80 | 197.50 | 204.30 | Sandstone, gy, massive | | cs, es | y | 6.80 |
| 3.50 | 204.30 | 207.80 | Sandstone, gy, sh stks | | cs, es | y | 3.50 |
| 1.10 | 207.80 | 208.90 | Sandstone, gy, coal layers | | ac, cs, es | y | 1.10 |
| 0.17 | 208.90 | 209.07 | **Coal, Washington No.12** | | ac, cv, ev | | 0.00 |
| 0.11 | 209.07 | 209.18 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.15 | 209.18 | 209.33 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.17 | 209.33 | 209.50 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 209.50 | 209.53 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.39 | 209.53 | 209.92 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 209.92 | 209.94 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.09 | 209.94 | 210.03 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.47 | 210.03 | 210.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 210.50 | 212.60 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 7.90 | 212.60 | 220.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.25 | 220.50 | 225.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 225.75 | 228.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 10.40 | 228.20 | 238.60 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.30 | 238.60 | 238.90 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 2.65 | 238.90 | 241.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 241.55 | 242.00 | Limestone, massive | | ak, cs, es | y | 0.45 |
| 0.75 | 242.00 | 242.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 8.90 | 242.75 | 251.65 | Sandstone, gy, sh stks | | cs, es | y | 8.90 |
| 3.00 | 251.65 | 254.65 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.40 | 254.65 | 255.05 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.40 | 255.05 | 255.45 | Limestone, sh layers | | ak, cs, es | y | 0.40 |
| 0.65 | 255.45 | 256.10 | Limestone, massive | | ak, cs, es | y | 0.65 |
| 0.75 | 256.10 | 256.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 256.85 | 257.50 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 1.20 | 257.50 | 258.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 258.70 | 259.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 259.10 | 259.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.90 | 259.65 | 260.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 260.55 | 260.95 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.05 | 260.95 | 262.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 262.00 | 263.30 | Shale, dk gy | | cm, em | | 0.00 |
| 3.95 | 263.30 | 267.25 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 1.45 | 267.25 | 268.70 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 0.80 | 268.70 | 269.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 269.50 | 270.95 | Sandstone, gy, massive | | cs, es | y | 1.45 |
| 3.45 | 270.95 | 274.40 | Sandstone, gy, sh stks | | cs, es | y | 3.45 |
| 0.50 | 274.40 | 274.90 | Sandstone, gy, crossbeds | | cs, es | y | 0.50 |
| 1.35 | 274.90 | 276.25 | Sandstone, gy, sh stks | | cs, es | y | 1.35 |
| 2.95 | 276.25 | 279.20 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 2.05 | 279.20 | 281.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.12 | 281.25 | 281.37 | **Bone, coal stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.08 | 281.37 | 281.45 | **Claystone, blk** | | ac, cv, ev | | 0.00 |
| 0.15 | 281.45 | 281.60 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 281.60 | 281.75 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.02 | 281.75 | 281.77 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.13 | 281.77 | 281.90 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.25 | 281.90 | 283.15 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 0.60 | 283.15 | 283.75 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 3.50 | 283.75 | 287.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 287.25 | 288.30 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 1.25 | 288.30 | 289.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 289.55 | 291.15 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 0.55 | 291.15 | 291.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 291.70 | 292.35 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 0.30 | 292.35 | 292.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 292.65 | 293.25 | Limestone, massive | | ak, cs, es | y | 0.60 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-01

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.10 | 293.25 | 294.35 | Limestone, mosaic | | ak, cs, es | y | 1.10 |
| 1.75 | 294.35 | 296.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 296.10 | 297.60 | Limestone, layered | | ak, cs, es | y | 1.50 |
| 0.90 | 297.60 | 298.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 298.50 | 299.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 299.75 | 300.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 3.10 | 300.20 | 303.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 303.30 | 303.90 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 1.10 | 303.90 | 305.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 305.00 | 305.40 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 1.00 | 305.40 | 306.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.00 | 306.40 | 311.40 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 2.30 | 311.40 | 313.70 | Sandstone, gy, sh stks | | cs, es | y | 2.30 |
| 3.10 | 313.70 | 316.80 | Claystone, gy | | cv, ev | | 0.00 |
| 2.05 | 316.80 | 318.85 | Shale, gy | | cm, em | | 0.00 |
| 0.95 | 318.85 | 319.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 319.80 | 320.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 1.80 | 320.40 | 322.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 8.15 | 322.20 | 330.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 330.35 | 332.80 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.85 | 332.80 | 333.65 | Shale, gy | | cm, em | | 0.00 |
| 1.55 | 333.65 | 335.20 | Limestone, massive | | ak, cs, es | y | 1.55 |
| 2.95 | 335.20 | 338.15 | Limestone, shaley, nodular | | ak, cs, es | y | 2.95 |
| 0.95 | 338.15 | 339.10 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 2.50 | 339.10 | 341.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.50 |
| 2.85 | 341.60 | 344.45 | Limestone, nodular | | ak, cs, es | y | 2.85 |
| 1.45 | 344.45 | 345.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 345.90 | 346.60 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 1.30 | 346.60 | 347.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 347.90 | 350.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.90 |
| 2.90 | 350.80 | 353.70 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 353.70 | 355.30 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.50 | 355.30 | 356.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 356.80 | 357.80 | Limestone, massive | | ak, cs, es | y | 1.00 |
| 1.25 | 357.80 | 359.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 359.05 | 359.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 0.95 | 359.75 | 360.70 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 360.70 | 363.10 | Limestone, nodular | | ak, cs, es | y | 2.40 |
| 1.70 | 363.10 | 364.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.90 | 364.80 | 368.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 368.70 | 369.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 1.10 | 369.90 | 371.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 371.00 | 372.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 0.70 | 372.50 | 373.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 373.20 | 374.50 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 6.80 | 374.50 | 381.30 | Limestone, shaley, nodular | | ak, cs, es | y | 6.80 |
| 1.85 | 381.30 | 383.15 | Limestone, nodular | | ak, cs, es | y | 1.85 |
| 1.05 | 383.15 | 384.20 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 0.45 | 384.20 | 384.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 0.65 | 384.65 | 385.30 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 0.90 | 385.30 | 386.20 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 7.50 | 386.20 | 393.70 | Limestone, nodular | | ak, cs, es | y | 7.50 |
| 6.10 | 393.70 | 399.80 | Limestone, layered | | ak, cs, es | y | 6.10 |
| 1.80 | 399.80 | 401.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.50 | 401.60 | 407.10 | Limestone, nodular | | ak, cs, es | y | 5.50 |
| 2.60 | 407.10 | 409.70 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 409.70 | 411.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 411.90 | 413.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 413.45 | 414.80 | Shale, gy, sandy, ls nods | | ak, cs, es | | 0.00 |
| 10.90 | 414.80 | 425.70 | Sandstone, gy, sh stks | | cs, es | y | 10.90 |
| 1.35 | 425.70 | 427.05 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 2.25 | 427.05 | 429.30 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.60 | 429.30 | 429.90 | Sandstone, gy, massive | | cs, es | y | 0.60 |
| 0.35 | 429.90 | 430.25 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 1.15 | 430.25 | 431.40 | Sandstone, gy, sh stks | | cs, es | y | 1.15 |
| 3.25 | 431.40 | 434.65 | Sandstone, gy, massive | | cs, es | y | 3.25 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-01

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.50 | 434.65 | 436.15 | Sandstone, gy, sh stks | | cs, es | y | 1.50 |
| 7.85 | 436.15 | 444.00 | Sandstone, gy, massive | | cs, es | y | 7.85 |
| 17.75 | 444.00 | 461.75 | Sandstone, gy, sh stks | | cs, es | y | 17.75 |
| 0.85 | 461.75 | 462.60 | Shale, gy, ss layers | | cm, em | | 0.00 |
| 0.45 | 462.60 | 463.05 | Claystone, bwn/ blk, layered | | ac, cv, ev | | 0.00 |
| 0.30 | 463.05 | 463.35 | **Bone, coal stks, Sewickley No.9** | | ac, cm, em | | 0.00 |
| 0.83 | 463.35 | 464.18 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 464.18 | 464.32 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.35 | 464.32 | 464.67 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.73 | 464.67 | 465.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.45 | 465.40 | 470.85 | Limestone, nodular | | ak, cs, es | y | 5.45 |
| 1.50 | 470.85 | 472.35 | Limestone, layered | | ak, cs, es | y | 1.50 |
| 2.05 | 472.35 | 474.40 | Limestone, massive | | ak, cs, es | y | 2.05 |
| 0.55 | 474.40 | 474.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.95 | 474.95 | 478.90 | Limestone, mosaic | | ak, cs, es | y | 3.95 |
| 1.10 | 478.90 | 480.00 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 0.60 | 480.00 | 480.60 | Sandstone, gy, sh stks | | cs, es | y | 0.60 |
| 0.90 | 480.60 | 481.50 | Shale, grn, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.65 | 481.50 | 482.15 | Shale, gy, ss layers | | cs, es | | 0.00 |
| 2.00 | 482.15 | 484.15 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.35 | 484.15 | 485.50 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 3.15 | 485.50 | 488.65 | Claystone, dk gy, ls nods | | ac, cv, ev | | 0.00 |
| 0.35 | 488.65 | 489.00 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.55 | 489.00 | 490.55 | **Core loss, Fishpot?** | | | | 0.00 |
| 4.45 | 490.55 | 495.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 495.00 | 498.80 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 498.80 | 501.10 | Claystone, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.65 | 501.10 | 504.75 | Claystone, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 504.75 | 507.00 | Claystone, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 507.00 | 508.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.75 | 508.90 | 513.65 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 2.25 | 513.65 | 515.90 | Sandstone, gy, sh stks | | cs, es | y | 2.25 |
| 4.70 | 515.90 | 520.60 | Shale, dk gy | | cm, em | | 0.00 |
| 2.45 | 520.60 | 523.05 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 2.05 | 523.05 | 525.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 525.10 | 525.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 2.10 | 525.40 | 527.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 527.50 | 527.90 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 8.35 | 527.90 | 536.25 | Sandstone, gy, sh stks | | cs, es | y | 8.35 |
| 5.95 | 536.25 | 542.20 | Sandstone, gy, crossbeds | | cs, es | y | 5.95 |
| 1.50 | 542.20 | 543.70 | Sandstone, gy, coal stks | | ac, cs, es | y | 1.50 |
| 1.30 | 543.70 | 545.00 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| 1.05 | 545.00 | 546.05 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 0.25 | 546.05 | 546.30 | **Coal, bone stks, Pittsburgh No.8** | | ac, cv, ev | | 0.00 |
| 0.50 | 546.30 | 546.80 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.06 | 546.80 | 546.86 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.67 | 546.86 | 547.53 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 547.53 | 547.56 | **Claystone, dk gy** | | cm, em | | 0.00 |
| 1.82 | 547.56 | 549.38 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.07 | 549.38 | 549.45 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.85 | 549.45 | 550.30 | **Coal** | | ac, cv, ev | | 0.00 |
| 6.30 | 550.30 | 556.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 556.60 | 557.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 557.80 | 558.80 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 4.20 | 558.80 | 563.00 | Shale, gy, sandy, ls nods | | ak, cs, es | | 0.00 |
| 2.65 | 563.00 | 565.65 | Sandstone, gy, sh stks | | cs, es | y | 2.65 |
| 2.35 | 565.65 | 568.00 | Shale, gy, ss layers | | cs, es | | 0.00 |
| | Total Depth | 568.00 | | | | | 212.70 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

Total Thickness of Hard Rock Overlying Mining Unit 212.70

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-01**

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit | | | | | | | 37% |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 212.70 | 37% |
| Soft Rock: | 355.30 | 63% |
| | 568.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-06

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1250
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 682470
**Easting:** 2424400
**Drilling Company:** Kerogen Resources, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 24.00 | 0.00 | 24.00 | Casing | | | | 0.00 |
| 0.15 | 24.00 | 24.15 | Shale, gy | YES | cm, em | | 0.00 |
| 1.35 | 24.15 | 25.50 | Sandstone, gy, sh stks | YES | cs, es | y | 1.35 |
| 1.85 | 25.50 | 27.35 | Shale, gy | YES | cm, em | | 0.00 |
| 4.80 | 27.35 | 32.15 | Claystone, dk gy | YES | cv, ev | | 0.00 |
| 2.75 | 32.15 | 34.90 | Claystone, gy | YES | cv, ev | | 0.00 |
| 0.50 | 34.90 | 35.40 | Shale, blk | YES | ac, cm, em | | 0.00 |
| 2.30 | 35.40 | 37.70 | Limestone, shaley, nodular | YES | ak, cs, es | y | 2.30 |
| 2.90 | 37.70 | 40.60 | Shale, gy, ss stks and ls nods | YES | ak, cm, em | | 0.00 |
| 0.40 | 40.60 | 41.00 | Shale, dk gy | YES | cm, em | | 0.00 |
| 0.45 | 41.00 | 41.45 | Limestone, nodular | YES | ak, cs, es | y | 0.45 |
| 4.20 | 41.45 | 45.65 | Claystone, dk gy, ls nods | YES | ak, cv, ev | | 0.00 |
| 5.85 | 45.65 | 51.50 | Claystone, red/ gy, ls nods | YES | ak, cv, ev | | 0.00 |
| 0.85 | 51.50 | 52.35 | Shale, gy, interbedded ss | YES | cm, em | | 0.00 |
| 1.50 | 52.35 | 53.85 | Shale, gy | YES | cm, em | | 0.00 |
| 0.90 | 53.85 | 54.75 | Sandstone, gy, sh stks | YES | cs, es | y | 0.90 |
| 1.45 | 54.75 | 56.20 | Shale, gy, interbedded ss | YES | cm, em | | 0.00 |
| 1.50 | 56.20 | 57.70 | Sandstone, gy, sh stks | YES | cs, es | y | 1.50 |
| 1.40 | 57.70 | 59.10 | Shale, gy, interbedded ss | YES | cm, em | | 0.00 |
| 4.75 | 59.10 | 63.85 | Shale, gy, ss stks | YES | cm, em | | 0.00 |
| 1.55 | 63.85 | 65.40 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.90 | 65.40 | 69.30 | Claystone, red | | cv, ev | | 0.00 |
| 1.05 | 69.30 | 70.35 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 5.90 | 70.35 | 76.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.75 | 76.25 | 80.00 | Shale, dk gy | | cm, em | | 0.00 |
| 3.60 | 80.00 | 83.60 | Claystone, gy | | cv, ev | | 0.00 |
| 7.20 | 83.60 | 90.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.10 | 90.80 | 91.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 0.90 | 91.90 | 92.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.45 | 92.80 | 94.25 | Shale, red | | cm, em | | 0.00 |
| 0.80 | 94.25 | 95.05 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 95.05 | 95.70 | Shale, red | | cm, em | | 0.00 |
| 3.65 | 95.70 | 99.35 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 99.35 | 101.20 | Shale, red | | cm, em | | 0.00 |
| 4.50 | 101.20 | 105.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 105.70 | 106.10 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.90 | 106.10 | 107.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 107.00 | 107.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 6.15 | 107.75 | 113.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 113.90 | 114.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 4.00 | 114.40 | 118.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 118.40 | 119.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 8.30 | 119.50 | 127.80 | Claystone, red | | cv, ev | | 0.00 |
| 0.10 | 127.80 | 127.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.65 | 127.90 | 132.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 132.55 | 133.75 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 133.75 | 134.60 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 134.60 | 134.95 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 134.95 | 137.15 | Shale, gy | | cm, em | | 0.00 |
| 3.35 | 137.15 | 140.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.50 | 140.50 | 145.00 | Shale, red/ gy | | cm, em | | 0.00 |
| 2.70 | 145.00 | 147.70 | Shale, dk gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 147.70 | 150.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.25 | 150.50 | 150.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 6.15 | 150.75 | 156.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 156.90 | 159.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-06

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.70 | 159.10 | 163.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 163.80 | 165.50 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 165.50 | 167.20 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 167.20 | 167.90 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 167.90 | 168.60 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 5.40 | 168.60 | 174.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.90 | 174.00 | 179.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 179.90 | 182.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 182.55 | 184.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.45 | 184.70 | 190.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 190.15 | 190.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 0.90 | 190.45 | 191.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 5.20 | 191.35 | 196.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 196.55 | 197.75 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 3.20 | 197.75 | 200.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.85 | 200.95 | 205.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 205.80 | 206.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 206.30 | 206.50 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.10 | 206.50 | 207.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.25 | 207.60 | 208.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 2.80 | 208.85 | 211.65 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.46 | 211.65 | 212.11 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.09 | 212.11 | 212.20 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.10 | 212.20 | 213.30 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.23 | 213.30 | 213.53 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.31 | 213.53 | 213.84 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 213.84 | 214.02 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 214.02 | 214.27 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.45 | 214.27 | 214.72 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.13 | 214.72 | 214.85 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.37 | 214.85 | 215.22 | **Shale, dk gy** | | ac, cm, em | | 0.00 |
| 0.29 | 215.22 | 215.51 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.80 | 215.51 | 216.31 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 5.94 | 216.31 | 222.25 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.15 | 222.25 | 228.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 17.00 | 228.40 | 245.40 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 245.40 | 245.90 | Sandstone, gy, sh stks | | cs, es | y | 0.50 |
| 8.20 | 245.90 | 254.10 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 254.10 | 257.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.24 | 257.40 | 257.64 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.21 | 257.64 | 257.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.49 | 257.85 | 258.34 | **Coal, sh stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.17 | 258.34 | 258.51 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.92 | 258.51 | 259.43 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.73 | 259.43 | 260.16 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.21 | 260.16 | 260.37 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.29 | 260.37 | 260.66 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.98 | 260.66 | 261.64 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.46 | 261.64 | 262.10 | **Shale, dk gy** | | ac, cm, em | | 0.00 |
| 0.78 | 262.10 | 262.88 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.29 | 262.88 | 263.17 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 263.17 | 263.23 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.40 | 263.23 | 263.63 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.87 | 263.63 | 264.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 264.50 | 265.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 265.25 | 265.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 3.95 | 265.95 | 269.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.40 | 269.90 | 274.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 274.30 | 275.95 | Sandstone, gy, sh stks | | cs, es | y | 1.65 |
| 5.95 | 275.95 | 281.90 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 281.90 | 283.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 283.10 | 283.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 1.70 | 283.40 | 285.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 285.10 | 286.15 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 286.15 | 288.90 | Sandstone, gy, sh stks | | cs, es | y | 2.75 |
| 3.35 | 288.90 | 292.25 | Shale, gy, ss layers | | cm, em | | 0.00 |
| 1.00 | 292.25 | 293.25 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 2.55 | 293.25 | 295.80 | Shale, dk gy, ss stks | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-06

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.35 | 295.80 | 297.15 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.95 | 297.15 | 298.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 298.10 | 298.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 0.50 | 298.85 | 299.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 299.35 | 300.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 300.05 | 300.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 300.60 | 302.60 | Claystone, blk/ tan, layered | | cv, ev | | 0.00 |
| 3.00 | 302.60 | 305.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.95 | 305.60 | 308.55 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 308.55 | 309.35 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.10 | 309.35 | 310.45 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 310.45 | 311.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 311.75 | 314.90 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 8.60 | 314.90 | 323.50 | Sandstone, gy, sh stks | | cs, es | y | 8.60 |
| 0.60 | 323.50 | 324.10 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 1.05 | 324.10 | 325.15 | Shale, dk gy | | ac, cm, em | | 0.00 |
| 0.19 | 325.15 | 325.34 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.05 | 325.34 | 325.39 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.10 | 325.39 | 325.49 | **Bone, coal layers, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 1.16 | 325.49 | 326.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.95 | 326.65 | 327.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 327.60 | 328.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 0.95 | 328.80 | 329.75 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 3.15 | 329.75 | 332.90 | Limestone, shaley, layered | | ak, cs, es | y | 3.15 |
| 2.00 | 332.90 | 334.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 334.90 | 335.65 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 1.70 | 335.65 | 337.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 337.35 | 339.05 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 0.75 | 339.05 | 339.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 339.80 | 340.25 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 1.70 | 340.25 | 341.95 | Limestone, mosaic | | ak, cs, es | y | 1.70 |
| 2.45 | 341.95 | 344.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 344.40 | 344.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 344.70 | 345.10 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 1.40 | 345.10 | 346.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 0.65 | 346.50 | 347.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 347.15 | 347.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 1.10 | 347.90 | 349.00 | Claystone, grn | | cv, ev | | 0.00 |
| 0.90 | 349.00 | 349.90 | Limestone, shaley, layered | | ak, cs, es | y | 0.90 |
| 1.70 | 349.90 | 351.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 351.60 | 351.95 | Limestone, nodular | | ak, cs, es | y | 0.35 |
| 0.75 | 351.95 | 352.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 352.70 | 354.05 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 0.30 | 354.05 | 354.35 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 354.35 | 354.85 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 2.70 | 354.85 | 357.55 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.30 | 357.55 | 358.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.45 | 358.85 | 361.30 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 361.30 | 361.60 | Sandstone, gy, sh stks | | ak, cs, es | y | 0.30 |
| 1.40 | 361.60 | 363.00 | Shale, grn, ss stks | | cm, em | | 0.00 |
| 1.20 | 363.00 | 364.20 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 364.20 | 364.90 | Shale, red | | cm, em | | 0.00 |
| 0.40 | 364.90 | 365.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.65 | 365.30 | 366.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 366.95 | 367.90 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 4.35 | 367.90 | 372.25 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 372.25 | 373.00 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 2.10 | 373.00 | 375.10 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 375.10 | 375.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 2.50 | 375.95 | 378.45 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 378.45 | 379.20 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 1.00 | 379.20 | 380.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.05 | 380.20 | 381.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 381.25 | 382.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.50 | 382.30 | 382.80 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 2.70 | 382.80 | 385.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 385.50 | 387.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 1.80 | 387.75 | 389.55 | Limestone, layered | | ak, cs, es | y | 1.80 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-06

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.70 | 389.55 | 390.25 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 0.65 | 390.25 | 390.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 390.90 | 393.25 | Limestone, shaley, nodular | | ak, cs, es | y | 2.35 |
| 0.80 | 393.25 | 394.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 394.05 | 396.55 | Limestone, shaley, nodular | | ak, cs, es | y | 2.50 |
| 2.90 | 396.55 | 399.45 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 399.45 | 399.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 399.90 | 402.65 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 3.65 | 402.65 | 406.30 | Limestone, shaley, nodular | | ak, cs, es | y | 3.65 |
| 1.30 | 406.30 | 407.60 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 2.65 | 407.60 | 410.25 | Limestone, shaley, nodular | | ak, cs, es | y | 2.65 |
| 0.65 | 410.25 | 410.90 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 410.90 | 414.60 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 414.60 | 417.75 | Limestone, shaley, nodular | | ak, cs, es | y | 3.15 |
| 1.75 | 417.75 | 419.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 419.50 | 420.90 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 5.90 | 420.90 | 426.80 | Limestone, shaley, nodular | | ak, cs, es | y | 5.90 |
| 3.70 | 426.80 | 430.50 | Limestone, nodular | | ak, cs, es | y | 3.70 |
| 0.50 | 430.50 | 431.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 431.00 | 432.20 | Limestone, massive | | ak, cs, es | y | 1.20 |
| 1.40 | 432.20 | 433.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 5.45 | 433.60 | 439.05 | Limestone, massive | | ak, cs, es | y | 5.45 |
| 2.05 | 439.05 | 441.10 | Limestone, layered | | ak, cs, es | y | 2.05 |
| 1.25 | 441.10 | 442.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 0.90 | 442.35 | 443.25 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 443.25 | 444.55 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 2.95 | 444.55 | 447.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 447.50 | 450.15 | Limestone, shaley, nodular | | ak, cs, es | y | 2.65 |
| 1.30 | 450.15 | 451.45 | Limestone, massive | | ak, cs, es | y | 1.30 |
| 2.95 | 451.45 | 454.40 | Limestone, nodular | | ak, cs, es | y | 2.95 |
| 1.80 | 454.40 | 456.20 | Limestone, layered | | ak, cs, es | y | 1.80 |
| 1.50 | 456.20 | 457.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 457.70 | 458.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 2.75 | 458.25 | 461.00 | Claystone, blk/ tan, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 461.00 | 461.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.10 | 461.20 | 461.30 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.27 | 461.30 | 461.57 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.23 | 461.57 | 461.80 | **Coal, sh stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.10 | 461.80 | 461.90 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.40 | 461.90 | 464.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.90 | 464.30 | 466.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 466.20 | 466.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 466.70 | 468.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.15 | 468.10 | 469.25 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.55 | 469.25 | 470.80 | Sandstone, gy, sh stks | | cs, es | y | 1.55 |
| 7.80 | 470.80 | 478.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 478.60 | 479.25 | Sandstone, gy, sh stks | | cs, es | y | 0.65 |
| 1.45 | 479.25 | 480.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 5.95 | 480.70 | 486.65 | Sandstone, gy, sh stks | | cs, es | y | 5.95 |
| 4.45 | 486.65 | 491.10 | Sandstone, gy, coal stks | | cs, es | y | 4.45 |
| 9.45 | 491.10 | 500.55 | Sandstone, gy, sh stks | | cs, es | y | 9.45 |
| 0.75 | 500.55 | 501.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.31 | 501.30 | 501.61 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.27 | 501.61 | 501.88 | **Bone, coal layers, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.44 | 501.88 | 502.32 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.22 | 502.32 | 502.54 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.33 | 502.54 | 502.87 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.31 | 502.87 | 503.18 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.67 | 503.18 | 503.85 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.70 | 503.85 | 506.55 | Limestone, nodular | | ak, cs, es | y | 2.70 |
| 0.90 | 506.55 | 507.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 507.45 | 507.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 2.45 | 507.85 | 510.30 | Limestone, mosaic | | ak, cs, es | y | 2.45 |
| 0.65 | 510.30 | 510.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 510.95 | 512.50 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 0.75 | 512.50 | 513.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 513.25 | 514.30 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 3.90 | 514.30 | 518.20 | Limestone, shaley, nodular | | ak, cs, es | y | 3.90 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-06

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.95 | 518.20 | 520.15 | Limestone, nodular | | ak, cs, es | y | 1.95 |
| 0.35 | 520.15 | 520.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.55 | 520.50 | 522.05 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 1.30 | 522.05 | 523.35 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 523.35 | 524.05 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 0.40 | 524.05 | 524.45 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 4.15 | 524.45 | 528.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 528.60 | 530.95 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 530.95 | 531.45 | Sandstone, gy, sh stks | | ak, cs, es | y | 0.50 |
| 3.50 | 531.45 | 534.95 | Shale, gy, ss stks and ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 534.95 | 536.45 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 1.95 | 536.45 | 538.40 | Limestone, nodular | | ak, cs, es | y | 1.95 |
| 0.95 | 538.40 | 539.35 | Limestone, shaley, layered | | ak, cs, es | y | 0.95 |
| 0.30 | 539.35 | 539.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.65 | 539.65 | 542.30 | Limestone, shaley, nodular | | ak, cs, es | y | 2.65 |
| 2.55 | 542.30 | 544.85 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 544.85 | 545.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 545.40 | 545.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.20 | 545.80 | 546.00 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.90 | 546.00 | 546.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 546.90 | 547.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 547.75 | 548.55 | Limestone, shaley, layered | | ak, cs, es | y | 0.80 |
| 0.75 | 548.55 | 549.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 549.30 | 549.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.95 | 549.85 | 556.80 | Limestone, massive | | ak, cs, es | y | 6.95 |
| 0.40 | 556.80 | 557.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 557.20 | 560.65 | Limestone, layered | | ak, cs, es | y | 3.45 |
| 1.00 | 560.65 | 561.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 561.65 | 563.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 563.55 | 564.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 1.60 | 564.30 | 565.90 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 565.90 | 567.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 567.30 | 567.60 | Shale, gy | | cm, em | | 0.00 |
| 0.13 | 567.60 | 567.73 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 567.73 | 569.03 | Claystone, blk/ tan, layered | | cv, ev | | 0.00 |
| 0.30 | 569.03 | 569.33 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 569.33 | 569.43 | Claystone, blk/ tan, layered | | cv, ev | | 0.00 |
| 0.19 | 569.43 | 569.62 | **Coal, pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.59 | 569.62 | 570.21 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 570.21 | 570.23 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.96 | 570.23 | 571.19 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 571.19 | 571.23 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.64 | 571.23 | 571.87 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.01 | 571.87 | 571.88 | **Shale, dk gy** | | ac, cm, em | | 0.00 |
| 1.47 | 571.88 | 573.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 573.35 | 573.39 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.99 | 573.39 | 574.38 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.70 | 574.38 | 575.08 | Shale, dk gy | | cm, em | | 0.00 |
| 2.25 | 575.08 | 577.33 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 0.90 | 577.33 | 578.23 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.10 | 578.23 | 581.33 | Shale, gy, sandy, ls nods | | ak, cs, es | | 0.00 |
| 1.00 | 581.33 | 582.33 | Sandstone, gy, sh stks, calcite cemented | | ak, cs, es | y | 1.00 |
| 0.35 | 582.33 | 582.68 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.30 | 582.68 | 582.98 | Sandstone, gy, ss stks | | cs, es | y | 0.30 |
| 1.90 | 582.98 | 584.88 | Shale, gy, ss stks | | cm, em | | 0.00 |
| | Total Depth | 584.88 | | | | | 164.80 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-06

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| | | | | | | | 164.80 |

Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit 28%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 164.80 | 28% |
| Soft Rock: | 420.08 | 72% |
| | 584.88 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 247.50 | 1.19 | 1.07 | 37.20 | -210.50 |
| Coal | | | | | |
| Bottom, 10 ft. | 338.00 | 1.79 | 1.65 | 55.95 | -282.15 |

ATTACHMENT 13

## DIAMOND DRILL HOLE:CLC-2002-08

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,250
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 676633
**Easting:** 2424498
**Drilling Company:** Kerogen Resources, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.00 | 0.00 | 20.00 | Casing | | | | 0.00 |
| 0.65 | 20.00 | 20.65 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.40 | 20.65 | 21.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 21.05 | 21.75 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 0.15 | 21.75 | 21.90 | Claystone, gy | | cv, ev | | 0.00 |
| 0.95 | 21.90 | 22.85 | Sandstone, gy, sh stks | | cs, es | y | 0.95 |
| 0.55 | 22.85 | 23.40 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 23.40 | 24.20 | Shale, red | | cm, em | | 0.00 |
| 0.60 | 24.20 | 24.80 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 5.40 | 24.80 | 30.20 | Shale, red | | cm, em | | 0.00 |
| 2.10 | 30.20 | 32.30 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 1.70 | 32.30 | 34.00 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 1.00 | 34.00 | 35.00 | Claystone, gy | | cv, ev | | 0.00 |
| 5.10 | 35.00 | 40.10 | Shale, dk gy | yes | cm, em | | 0.00 |
| 4.90 | 40.10 | 45.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 45.00 | 47.90 | Shale, dk gy | yes | cm, em | | 0.00 |
| 1.05 | 47.90 | 48.95 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 1.90 | 48.95 | 50.85 | Claystone, red | | cv, ev | | 0.00 |
| 2.55 | 50.85 | 53.40 | Claystone, gy | | cv, ev | | 0.00 |
| 1.20 | 53.40 | 54.60 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.40 | 54.60 | 55.00 | Sandstone, gy, sh stks | | cs, es | y | 0.40 |
| 1.35 | 55.00 | 56.35 | Claystone, gy | | cv, ev | | 0.00 |
| 3.55 | 56.35 | 59.90 | Shale, red | | cm, em | | 0.00 |
| 4.20 | 59.90 | 64.10 | Shale, gy, sandy, ls nods | | ak, cs, es | | 0.00 |
| 2.50 | 64.10 | 66.60 | Sandstone, gy, sh stks | | cs, es | y | 2.50 |
| 1.40 | 66.60 | 68.00 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 2.90 | 68.00 | 70.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 70.90 | 71.45 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 2.70 | 71.45 | 74.15 | Claystone, red | | cv, ev | | 0.00 |
| 0.85 | 74.15 | 75.00 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.40 | 75.00 | 76.40 | Shale, gy, sandy | | cs, es | | 0.00 |
| 2.30 | 76.40 | 78.70 | Shale, gy, ls nods | | cm, em | | 0.00 |
| 2.55 | 78.70 | 81.25 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 1.15 | 81.25 | 82.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.70 | 82.40 | 87.10 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.35 | 87.10 | 87.45 | Claystone, red | | cv, ev | | 0.00 |
| 1.85 | 87.45 | 89.30 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 6.70 | 89.30 | 96.00 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 0.90 | 96.00 | 96.90 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 2.70 | 96.90 | 99.60 | Shale, red | | cm, em | | 0.00 |
| 1.15 | 99.60 | 100.75 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 4.55 | 100.75 | 105.30 | Shale, red | | cm, em | | 0.00 |
| 1.95 | 105.30 | 107.25 | Claystone, gy | | cv, ev | | 0.00 |
| 3.60 | 107.25 | 110.85 | Shale, red | | cm, em | | 0.00 |
| 0.75 | 110.85 | 111.60 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 5.40 | 111.60 | 117.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 117.00 | 117.85 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 2.05 | 117.85 | 119.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 8.20 | 119.90 | 128.10 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 3.20 | 128.10 | 131.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.00 | 131.30 | 133.30 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 3.10 | 133.30 | 136.40 | Claystone, red | | cv, ev | | 0.00 |
| 7.00 | 136.40 | 143.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 143.40 | 145.90 | Claystone, red/ gy/ gn, ls nods | | ak, cv, ev | | 0.00 |
| 5.25 | 145.90 | 151.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 151.15 | 153.20 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 8.60 | 153.20 | 161.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 161.80 | 162.60 | Shale, red/ gy/ gn | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-08

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.00 | 162.60 | 164.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.45 | 164.60 | 168.05 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 3.60 | 168.05 | 171.65 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.25 | 171.65 | 172.90 | Claystone, red | | cv, ev | | 0.00 |
| 2.10 | 172.90 | 175.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.15 | 175.00 | 178.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 178.15 | 180.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 2.60 | 180.70 | 183.30 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 183.30 | 183.50 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 3.55 | 183.50 | 187.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 187.05 | 188.80 | Shale, gy, ss stks | | cs, es | | 0.00 |
| 9.85 | 188.80 | 198.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 198.65 | 199.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 3.35 | 199.70 | 203.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 203.05 | 205.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.80 | 205.95 | 208.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 208.75 | 211.75 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 0.85 | 211.75 | 212.60 | Sandstone, gy, sh stks | | cs, es | y | 0.85 |
| 0.80 | 212.60 | 213.40 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 1.85 | 213.40 | 215.25 | Sandstone, gy, massive | | cs, es | y | 1.85 |
| 2.85 | 215.25 | 218.10 | Shale, dk gy, sandy, ls nods | | ak, cs, es | | 0.00 |
| 2.80 | 218.10 | 220.90 | Shale, dk gy | | cm, em | | 0.00 |
| 2.25 | 220.90 | 223.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.48 | 223.15 | 223.63 | Shale, dk gy | | cm, em | | 0.00 |
| 0.19 | 223.63 | 223.82 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.73 | 223.82 | 224.55 | **Shale, blk, coal stks, Washington No.12** | | ac, cm, em | | 0.00 |
| 0.54 | 224.55 | 225.09 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.96 | 225.09 | 226.05 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.39 | 226.05 | 226.44 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.12 | 226.44 | 226.56 | **Bone w/ coal layers** | | ac, cv, ev | | 0.00 |
| 0.31 | 226.56 | 226.87 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.09 | 226.87 | 226.96 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.75 | 226.96 | 227.71 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.13 | 227.71 | 227.84 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.28 | 227.84 | 228.12 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 2.53 | 228.12 | 230.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.40 | 230.65 | 233.05 | Shale, gy | | cm, em | | 0.00 |
| 3.35 | 233.05 | 236.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 236.40 | 237.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 237.85 | 239.40 | Claystone, gy | | cv, ev | | 0.00 |
| 18.20 | 239.40 | 257.60 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.40 | 257.60 | 259.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 259.00 | 260.35 | Shale, gy, sandy | | cs, es | | 0.00 |
| 5.40 | 260.35 | 265.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 265.75 | 267.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.12 | 267.00 | 268.12 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 268.12 | 268.27 | **Coal w/ bone stks, Little Washington** | | ac, cv, ev | | 0.00 |
| 1.99 | 268.27 | 270.26 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 270.26 | 270.36 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.50 | 270.36 | 270.86 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 1.62 | 270.86 | 272.48 | Shale, dk gy | | cm, em | | 0.00 |
| 0.12 | 272.48 | 272.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.78 | 272.60 | 277.38 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.14 | 277.38 | 277.52 | **Coal w/ sh layers, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.34 | 277.52 | 277.86 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.41 | 277.86 | 278.27 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.17 | 278.27 | 278.44 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.13 | 278.44 | 278.57 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.02 | 278.57 | 278.59 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 278.59 | 278.84 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.14 | 278.84 | 278.98 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.19 | 278.98 | 279.17 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 279.17 | 279.28 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.64 | 279.28 | 279.92 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.35 | 279.92 | 280.27 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.13 | 280.27 | 280.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 280.40 | 280.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 280.90 | 281.40 | Shale, blk | | ac, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE:CLC-2002-08

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.25 | 281.40 | 283.65 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 7.85 | 283.65 | 291.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 11.70 | 291.50 | 303.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 303.20 | 304.95 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.30 | 304.95 | 306.25 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| 2.15 | 306.25 | 308.40 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 1.75 | 308.40 | 310.15 | Sandstone, gy, sh stks | | cs, es | y | 1.75 |
| 0.25 | 310.15 | 310.40 | Sandstone, gy, sh stks | | cs, es | y | 0.25 |
| 3.25 | 310.40 | 313.65 | Sandstone, gy, sh stks | | cs, es | y | 3.25 |
| 2.15 | 313.65 | 315.80 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 1.40 | 315.80 | 317.20 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 317.20 | 318.60 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.40 |
| 1.80 | 318.60 | 320.40 | Limestone, nodular | | ak, cs, es | y | 1.80 |
| 1.75 | 320.40 | 322.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 322.15 | 322.60 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 2.60 | 322.60 | 325.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 325.20 | 326.10 | Claystone, bwn/ blk, churned | | ac, cv, ev | | 0.00 |
| 0.50 | 326.10 | 326.60 | Claystone, gy | | cv, ev | | 0.00 |
| 0.34 | 326.60 | 326.94 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.46 | 326.94 | 327.40 | **Coal w/ sh layers, Waynesburg No.11** | | ac, cv, ev | | 0.00 |
| 0.14 | 327.40 | 327.54 | **Bone w/ coal layers** | | ac, cv, ev | | 0.00 |
| 7.26 | 327.54 | 334.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.15 | 334.80 | 339.95 | Shale, dk gy, sandy | | cs, es | | 0.00 |
| 1.60 | 339.95 | 341.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.38 | 341.55 | 341.93 | **Shale, blk, coal stks, Little Waynesburg** | | ac, cv, ev | | 0.00 |
| 0.10 | 341.93 | 342.03 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.09 | 342.03 | 342.12 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.83 | 342.12 | 343.95 | Claystone, gy | | cv, ev | | 0.00 |
| 1.05 | 343.95 | 345.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 345.00 | 346.10 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 4.80 | 346.10 | 350.90 | Limestone, shaley, nodular | | ak, cs, es | y | 4.80 |
| 3.05 | 350.90 | 353.95 | Limestone, shaley, sh layers | | ak, cs, es | y | 3.05 |
| 1.15 | 353.95 | 355.10 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 1.05 | 355.10 | 356.15 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.05 |
| 0.45 | 356.15 | 356.60 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 0.25 | 356.60 | 356.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 356.85 | 357.45 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 0.95 | 357.45 | 358.40 | Limestone, mosaic | | ak, cs, es | y | 0.95 |
| 3.05 | 358.40 | 361.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 361.45 | 362.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 0.85 | 362.30 | 363.15 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 2.35 | 363.15 | 365.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.55 | 365.50 | 370.05 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 370.05 | 370.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 370.40 | 371.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 371.60 | 372.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.25 | 372.60 | 373.85 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.15 | 373.85 | 380.00 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.65 | 380.00 | 380.65 | Shale, red/ gy/ gn | | cm, em | | 0.00 |
| 0.65 | 380.65 | 381.30 | Shale, gn | | cm, em | | 0.00 |
| 1.80 | 381.30 | 383.10 | Claystone, red/ gy/ gn | | cv, ev | | 0.00 |
| 0.75 | 383.10 | 383.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 1.00 | 383.85 | 384.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 384.85 | 385.40 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 0.55 | 385.40 | 385.95 | Limestone, shaley, sh layers | | ak, cs, es | y | 0.55 |
| 5.95 | 385.95 | 391.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 391.90 | 392.60 | Limestone, massive | | ak, cs, es | y | 0.70 |
| 0.40 | 392.60 | 393.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 5.60 | 393.00 | 398.60 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 398.60 | 399.45 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.15 | 399.45 | 400.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 400.60 | 402.90 | Limestone, shaley, massive | | ak, cs, es | y | 2.30 |
| 1.05 | 402.90 | 403.95 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 0.85 | 403.95 | 404.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 404.80 | 408.50 | Limestone, layered | | ak, cs, es | y | 3.70 |
| 1.10 | 408.50 | 409.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 409.60 | 410.15 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 2.18 | 410.15 | 412.33 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-08

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.67 | 412.33 | 414.00 | Limestone, nodular | | ak, cs, es | y | 1.67 |
| 1.20 | 414.00 | 415.20 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 415.20 | 417.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 5.25 | 417.60 | 422.85 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 4.35 | 422.85 | 427.20 | Limestone, shaley, nodular | | ak, cs, es | y | 4.35 |
| 1.90 | 427.20 | 429.10 | Limestone, massive | | ak, cs, es | y | 1.90 |
| 2.00 | 429.10 | 431.10 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.00 |
| 0.95 | 431.10 | 432.05 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 3.15 | 432.05 | 435.20 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 435.20 | 437.25 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 0.45 | 437.25 | 437.70 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 2.70 | 437.70 | 440.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 440.40 | 441.50 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 2.30 | 441.50 | 443.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 0.70 | 443.80 | 444.50 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 5.55 | 444.50 | 450.05 | Limestone, shaley, nodular | | ak, cs, es | y | 5.55 |
| 0.90 | 450.05 | 450.95 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 2.00 | 450.95 | 452.95 | Limestone, shaley, nodular | | ak, cs, es | y | 2.00 |
| 2.35 | 452.95 | 455.30 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 5.65 | 455.30 | 460.95 | Limestone, massive | | ak, cs, es | y | 5.65 |
| 0.50 | 460.95 | 461.45 | Shale, dk gy | | cm, em | | 0.00 |
| 1.35 | 461.45 | 462.80 | Limestone, sh layers | | ak, cs, es | y | 1.35 |
| 1.45 | 462.80 | 464.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.45 |
| 0.75 | 464.25 | 465.00 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 465.00 | 466.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 1.30 | 466.10 | 467.40 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 467.40 | 471.00 | Limestone, shaley, nodular | | ak, cs, es | y | 3.60 |
| 0.60 | 471.00 | 471.60 | Shale, dk gy | | cm, em | | 0.00 |
| 5.00 | 471.60 | 476.60 | Limestone, massive | | ak, cs, es | y | 5.00 |
| 2.75 | 476.60 | 479.35 | Limestone, nodular | | ak, cs, es | y | 2.75 |
| 4.85 | 479.35 | 484.20 | Limestone, shaley, sh layers | | ak, cs, es | y | 4.85 |
| 2.35 | 484.20 | 486.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 486.55 | 488.10 | Claystone, bwn/ blk, layered | | ac, cv, ev | | 0.00 |
| 1.30 | 488.10 | 489.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.50 | 489.40 | 490.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 490.90 | 491.75 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 491.75 | 494.25 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.90 | 494.25 | 495.15 | Shale, dk gy, ss stks | | cs, es | | 0.00 |
| 0.75 | 495.15 | 495.90 | Sandstone, gy, sh stks | | cs, es | y | 0.75 |
| 5.45 | 495.90 | 501.35 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 9.85 | 501.35 | 511.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 511.20 | 511.65 | Shale, dk gy, ss layers | | cs, es | | 0.00 |
| 0.95 | 511.65 | 512.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 1.10 | 512.60 | 513.70 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.70 | 513.70 | 514.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.13 | 514.40 | 516.53 | Shale, dk gy | | cm, em | | 0.00 |
| 0.24 | 516.53 | 516.77 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 516.77 | 517.37 | Shale, blk, coal stks | | ac, cv, ev | | 0.00 |
| 0.30 | 517.37 | 517.67 | Sandstone, gy, coal layers | | ac, cs, es | y | 0.30 |
| 0.59 | 517.67 | 518.26 | Shale, blk, coal stks | | ac, cv, ev | | 0.00 |
| 1.20 | 518.26 | 519.46 | Shale, dk gy | | cm, em | | 0.00 |
| 0.58 | 519.46 | 520.04 | **Coal w/ sh layers, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.20 | 520.04 | 520.24 | **Bone w/ coal layers** | | ac, cv, ev | | 0.00 |
| 0.05 | 520.24 | 520.29 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.07 | 520.29 | 520.36 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 520.36 | 520.41 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.18 | 520.41 | 520.59 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 520.59 | 520.73 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.19 | 520.73 | 520.92 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.21 | 520.92 | 521.13 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 521.13 | 521.15 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.23 | 521.15 | 521.38 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.09 | 521.38 | 521.47 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.38 | 521.47 | 521.85 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 521.85 | 522.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 522.35 | 524.60 | Limestone, nodular | | ak, cs, es | y | 2.25 |
| 0.60 | 524.60 | 525.20 | Limestone, shaley, sh layers | | ak, cs, es | y | 0.60 |
| 1.20 | 525.20 | 526.40 | Limestone, nodular | | ak, cs, es | y | 1.20 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-08

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.40 | 526.40 | 526.80 | Limestone, mosaic | | ak, cs, es | y | 0.40 |
| 1.30 | 526.80 | 528.10 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 0.70 | 528.10 | 528.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 528.80 | 530.60 | Limestone, massive | | ak, cs, es | y | 1.80 |
| 0.80 | 530.60 | 531.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 531.40 | 533.70 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.30 |
| 1.90 | 533.70 | 535.60 | Limestone, mosaic | | ak, cs, es | y | 1.90 |
| 1.20 | 535.60 | 536.80 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 0.75 | 536.80 | 537.55 | Limestone, massive | | ak, cs, es | y | 0.75 |
| 0.95 | 537.55 | 538.50 | Limestone, sh layers | | ak, cs, es | y | 0.95 |
| 1.20 | 538.50 | 539.70 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 539.70 | 541.50 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.80 |
| 7.70 | 541.50 | 549.20 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.80 | 549.20 | 550.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 550.00 | 552.00 | Shale, gy/ dk gy, layered | | cm, em | | 0.00 |
| 0.70 | 552.00 | 552.70 | Shale, dk gy | | cm, em | | 0.00 |
| 2.00 | 552.70 | 554.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.00 |
| 2.15 | 554.70 | 556.85 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 2.58 | 556.85 | 559.43 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.19 | 559.43 | 559.62 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.12 | 559.62 | 559.74 | **Shale, blk, coal stks, Redstone** | | ac, cv, ev | | 0.00 |
| 0.25 | 559.74 | 559.99 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.14 | 559.99 | 560.13 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 560.13 | 560.21 | **Shale, blk, coal stks** | | ac, cv, ev | | 0.00 |
| 0.29 | 560.21 | 560.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.60 | 560.50 | 562.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 562.10 | 563.25 | Limestone, sh layers | | ak, cs, es | y | 1.15 |
| 1.05 | 563.25 | 564.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 564.30 | 565.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.20 | 565.35 | 565.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 565.55 | 567.90 | Limestone, nodular | | ak, cs, es | y | 2.35 |
| 1.55 | 567.90 | 569.45 | Limestone, massive | | ak, cs, es | y | 1.55 |
| 2.80 | 569.45 | 572.25 | Limestone, nodular | | ak, cs, es | y | 2.80 |
| 3.20 | 572.25 | 575.45 | Limestone, massive | | ak, cs, es | y | 3.20 |
| 2.90 | 575.45 | 578.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 578.35 | 578.75 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 3.85 | 578.75 | 582.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.99 | 582.60 | 583.59 | Shale, gy/ dk gy, layered | | cm, em | | 0.00 |
| 0.21 | 583.59 | 583.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.14 | 583.80 | 583.94 | **Shale, blk, coal stks, No.8 roof coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 583.94 | 584.04 | **Shale, dk gy, coal stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 584.04 | 584.18 | **Bone w/ coal layers** | | ac, cv, ev | | 0.00 |
| 0.20 | 584.18 | 584.38 | **Coal w/ sh layers** | | ac, cv, ev | | 0.00 |
| 0.14 | 584.38 | 584.52 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 584.52 | 584.57 | **Shale, blk, coal stks** | | ac, cv, ev | | 0.00 |
| 0.38 | 584.57 | 584.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.44 | 584.95 | 585.39 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.89 | 585.39 | 587.28 | **Coal, Pittsburgh No.8** | | ac, cv, ev | | 0.00 |
| 0.04 | 587.28 | 587.32 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.55 | 587.32 | 587.87 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 587.87 | 587.90 | **Shale, blk, coal stks** | | ac, cv, ev | | 0.00 |
| 2.15 | 587.90 | 590.05 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.59 | 590.05 | 590.64 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.59 | 590.64 | 591.23 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.72 | 591.23 | 591.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.72 |
| 0.95 | 591.95 | 592.90 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 0.55 | 592.90 | 593.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 593.45 | 593.90 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 0.70 | 593.90 | 594.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 594.60 | 596.00 | Shale, gy, sandy, ls nods | | ak, cs, es | | 0.00 |
| 1.70 | 596.00 | 597.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 597.70 | 599.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 599.20 | 600.45 | Shale, gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 0.90 | 600.45 | 601.35 | Sandstone, gy, sh stks | | cs, es | y | 0.90 |
| 2.60 | 601.35 | 603.95 | Shale, dk gy, ss stks, ls nods | | ak, cs, es | | 0.00 |
| 603.95 | Total Depth | 603.95 | | | | | 142.74 |

ATTACHMENT 13

## DIAMOND DRILL HOLE:CLC-2002-08

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 142.74

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 24%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 142.74 | 24% |
| Soft Rock: | 461.21 | 76% |
| | 603.95 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-13

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,035
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 671110
**Easting:** 2424450
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.00 | 0.00 | 54.00 | core loss to flood waters | | | | 0.00 |
| 2.80 | 54.00 | 56.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.80 | 56.80 | 58.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.30 | 58.60 | 62.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.10 | 62.90 | 70.00 | Shale, gy, ss layers | | cm, em | | 0.00 |
| 9.10 | 70.00 | 79.10 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 7.40 | 79.10 | 86.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 86.50 | 86.70 | **Coal w/ bone stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.24 | 86.70 | 86.94 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 0.17 | 86.94 | 87.11 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.47 | 87.11 | 87.58 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.04 | 87.58 | 87.62 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.25 | 87.62 | 87.87 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.49 | 87.87 | 88.36 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.05 | 88.36 | 88.41 | **Pyrite** | | ac, cs, es | | 0.00 |
| 1.20 | 88.41 | 89.61 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.88 | 89.61 | 90.49 | **Coal w/ bone layers** | | ac, cv, ev | | 0.00 |
| 0.68 | 90.49 | 91.17 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.50 | 91.17 | 91.67 | **Claystone, blk** | | ac, cv, ev | | 0.00 |
| 0.49 | 91.67 | 92.16 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.22 | 92.16 | 92.38 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.13 | 92.38 | 92.51 | **Bone w/ coal stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 92.51 | 92.67 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 92.67 | 92.75 | **Coal w/ pyrite** | | ac, cv, ev | | 0.00 |
| 0.31 | 92.75 | 93.06 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 93.06 | 93.31 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.77 | 93.31 | 95.08 | Shale, dk gy | | cm, em | | 0.00 |
| 0.49 | 95.08 | 95.57 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.71 | 95.57 | 96.28 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.09 | 96.28 | 96.37 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.45 | 96.37 | 96.82 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 0.98 | 96.82 | 97.80 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.30 | 97.80 | 98.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.50 | 98.10 | 99.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 2.00 | 99.60 | 101.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.55 | 101.60 | 105.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 105.15 | 106.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.80 | 106.50 | 110.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.10 | 110.30 | 115.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 115.40 | 117.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 117.10 | 118.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 118.35 | 119.05 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 6.00 | 119.05 | 125.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 125.05 | 125.95 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.55 | 125.95 | 128.50 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 128.50 | 130.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 130.20 | 130.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 130.55 | 130.90 | Shale, dk gy | | cm, em | | 0.00 |
| 3.45 | 130.90 | 134.35 | Limestone, shaley, nodular | | ak, cs, es | y | 3.45 |
| 0.40 | 134.35 | 134.75 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 134.75 | 135.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.85 | 135.10 | 135.95 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.16 | 135.95 | 136.11 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.17 | 136.11 | 136.28 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.67 | 136.28 | 136.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.55 | 136.95 | 138.50 | Claystone, bwn/ blk, layered | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-13

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.50 | 138.50 | 139.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 139.00 | 139.25 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.95 | 139.25 | 140.20 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 140.20 | 141.25 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 141.25 | 141.80 | Shale, dk gy, ss layers | | cm, em | | 0.00 |
| 6.00 | 141.80 | 147.80 | Sandstone, gy, sh stks | | cs, es | y | 6.00 |
| 0.85 | 147.80 | 148.65 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 148.65 | 149.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 149.35 | 149.60 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.35 | 149.60 | 149.95 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 149.95 | 151.40 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 151.40 | 153.40 | Shale, dk gy, ss layers | | cm, em | | 0.00 |
| 9.30 | 153.40 | 162.70 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.19 | 162.70 | 162.89 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 162.89 | 162.99 | **Coal w/ shale layers, WAYNESBURG No.11** | | ac, cv, ev | | 0.00 |
| 0.04 | 162.99 | 163.03 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.15 | 163.03 | 163.18 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.05 | 163.18 | 163.23 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.14 | 163.23 | 163.37 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 163.37 | 163.49 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.06 | 163.49 | 163.55 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 5.95 | 163.55 | 169.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 169.50 | 170.00 | Limestone, shaley, sh layers | | ak, cs, es | y | 0.50 |
| 0.50 | 170.00 | 170.50 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 1.60 | 170.50 | 172.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 172.10 | 172.50 | Shale, blk, ls nods | | ac, cm, em | | 0.00 |
| 0.40 | 172.50 | 172.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.00 | 172.90 | 173.90 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 1.15 | 173.90 | 175.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 175.05 | 175.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 0.30 | 175.80 | 176.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 176.10 | 176.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 0.90 | 176.95 | 177.85 | Limestone, shaley, mosaic | | ak, cs, es | y | 0.90 |
| 0.70 | 177.85 | 178.55 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 178.55 | 180.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 180.65 | 181.60 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 181.60 | 182.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.35 |
| 0.70 | 182.95 | 183.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 183.65 | 185.35 | Claystone, gn, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 185.35 | 185.80 | Claystone, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 185.80 | 186.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 2.40 | 186.80 | 189.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 189.20 | 189.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 2.15 | 189.50 | 191.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 191.65 | 192.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.30 | 192.45 | 192.75 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 0.95 | 192.75 | 193.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 193.70 | 194.60 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 194.60 | 195.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 195.65 | 196.30 | Claystone, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.15 | 196.30 | 202.45 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.85 | 202.45 | 204.30 | Shale, red/ gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 204.30 | 204.50 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 1.90 | 204.50 | 206.40 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.90 |
| 0.50 | 206.40 | 206.90 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 0.35 | 206.90 | 207.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 2.15 | 207.25 | 209.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 209.40 | 211.60 | Limestone, nodular | | ak, cs, es | y | 2.20 |
| 2.60 | 211.60 | 214.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 214.20 | 215.80 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 215.80 | 216.30 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 2.70 | 216.30 | 219.00 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 219.00 | 220.20 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 0.85 | 220.20 | 221.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 221.05 | 223.15 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 0.75 | 223.15 | 223.90 | Shale, blk, ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 223.90 | 227.90 | Limestone, sh layers | | ak, cs, es | y | 4.00 |
| 1.50 | 227.90 | 229.40 | Limestone, nodular | | ak, cs, es | y | 1.50 |

ATTACHMENT 13

## DIAMOND DRILL HOLE:CLC-2002-13

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.70 | 229.40 | 231.10 | Limestone, sh layers | | ak, cs, es | y | 1.70 |
| 1.35 | 231.10 | 232.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 232.45 | 233.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.20 | 233.20 | 238.40 | Limestone, shaley, nodular | | ak, cs, es | y | 5.20 |
| 2.40 | 238.40 | 240.80 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 240.80 | 242.20 | Shale, gn, ss stks | | cm, em | | 0.00 |
| 0.85 | 242.20 | 243.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 243.05 | 244.15 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 1.50 | 244.15 | 245.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 2.15 | 245.65 | 247.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 247.80 | 249.30 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 3.25 | 249.30 | 252.55 | Limestone, shaley, nodular | | ak, cs, es | y | 3.25 |
| 0.40 | 252.55 | 252.95 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 1.05 | 252.95 | 254.00 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.05 |
| 0.40 | 254.00 | 254.40 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 3.55 | 254.40 | 257.95 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 3.85 | 257.95 | 261.80 | Limestone, shaley, sh layers | | ak, cs, es | y | 3.85 |
| 3.70 | 261.80 | 265.50 | Limestone, shaley, nodular | | ak, cs, es | y | 3.70 |
| 1.60 | 265.50 | 267.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 267.10 | 270.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 270.70 | 273.00 | Limestone, nodular | | ak, cs, es | y | 2.30 |
| 2.90 | 273.00 | 275.90 | Limestone, sh layers | | ak, cs, es | y | 2.90 |
| 2.80 | 275.90 | 278.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.95 | 278.70 | 284.65 | Limestone, nodular | | ak, cs, es | y | 5.95 |
| 1.45 | 284.65 | 286.10 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.45 |
| 1.15 | 286.10 | 287.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 0.70 | 287.25 | 287.95 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 287.95 | 289.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 1.15 | 289.70 | 290.85 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 290.85 | 293.30 | Limestone, shaley, nodular | | ak, cs, es | y | 2.45 |
| 1.60 | 293.30 | 294.90 | Shale, gn, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 294.90 | 296.10 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 4.35 | 296.10 | 300.45 | Limestone, sh layers | | ak, cs, es | y | 4.35 |
| 1.85 | 300.45 | 302.30 | Core loss | | | | 0.00 |
| 2.40 | 302.30 | 304.70 | Limestone, shaley, sh layers | | ak, cs, es | y | 2.40 |
| 1.30 | 304.70 | 306.00 | Shale, blk, ls nods | | ac, cm, em | | 0.00 |
| 0.20 | 306.00 | 306.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.20 |
| 2.90 | 306.20 | 309.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.51 | 309.10 | 309.61 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.47 | 309.61 | 310.08 | Shale, dk gy | | cm, em | | 0.00 |
| 0.21 | 310.08 | 310.29 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.49 | 310.29 | 310.78 | **Coal w/ shale layers, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.29 | 310.78 | 311.07 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.26 | 311.07 | 311.33 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.36 | 311.33 | 311.69 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.86 | 311.69 | 312.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.10 | 312.55 | 315.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 315.65 | 317.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 8.20 | 317.85 | 326.05 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 8.35 | 326.05 | 334.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 334.40 | 335.80 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.51 | 335.80 | 336.31 | Shale, dk gy | | cm, em | | 0.00 |
| 0.31 | 336.31 | 336.62 | **Coal w/ shale layers, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.13 | 336.62 | 336.75 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.13 | 336.75 | 337.88 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.65 | 337.88 | 338.53 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.19 | 338.53 | 338.72 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.17 | 338.72 | 338.89 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.22 | 338.89 | 339.11 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.56 | 339.11 | 339.67 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.83 | 339.67 | 340.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.40 | 340.50 | 342.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 1.30 | 342.90 | 344.20 | Limestone, shaley, sh layers | | ak, cs, es | y | 1.30 |
| 5.35 | 344.20 | 349.55 | Limestone, nodular | | ak, cs, es | y | 5.35 |
| 0.65 | 349.55 | 350.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 350.20 | 352.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 3.20 | 352.00 | 355.20 | Limestone, nodular | | ak, cs, es | y | 3.20 |
| 1.85 | 355.20 | 357.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-13

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.50 | 357.05 | 359.55 | Limestone, nodular | | ak, cs, es | y | 2.50 |
| 5.40 | 359.55 | 364.95 | Limestone, shaley, nodular | | ak, cs, es | y | 5.40 |
| 2.75 | 364.95 | 367.70 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 367.70 | 368.70 | Sandstone, gy, sh stks, ls nods | | ak, cs, es | y | 1.00 |
| 4.30 | 368.70 | 373.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 373.00 | 374.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 374.80 | 377.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.19 | 377.25 | 377.44 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.08 | 377.44 | 377.52 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.19 | 377.52 | 377.71 | **Coal w/ shale layers, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.21 | 377.71 | 377.92 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.10 | 377.92 | 378.02 | **Coal w/ shale layers** | | ac, cv, ev | | 0.00 |
| 0.28 | 378.02 | 378.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 378.30 | 378.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.65 | 378.45 | 380.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.25 | 380.10 | 380.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.25 | 380.35 | 381.60 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 1.00 | 381.60 | 382.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 382.60 | 383.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.40 | 383.40 | 383.80 | Shale, dk gy | | cm, em | | 0.00 |
| 11.10 | 383.80 | 394.90 | Limestone, nodular | | ak, cs, es | y | 11.10 |
| 3.50 | 394.90 | 398.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.70 | 398.40 | 404.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.09 | 404.10 | 405.19 | Claystone, bwn/ blk, layered | | ac, cv, ev | | 0.00 |
| 0.13 | 405.19 | 405.32 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.39 | 405.32 | 405.71 | Claystone, bwn/ blk, churned | | ac, cv, ev | | 0.00 |
| 0.13 | 405.71 | 405.84 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.24 | 405.84 | 406.08 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.76 | 406.08 | 406.84 | **Coal w/ pyrite, PITTSBURGH No.8** | | ac, cv, ev | | 0.00 |
| 0.89 | 406.84 | 407.73 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 407.73 | 407.76 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.58 | 407.76 | 408.34 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 408.34 | 408.37 | **Shale, dk gy** | | cm, em | | 0.00 |
| 2.54 | 408.37 | 410.91 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.06 | 410.91 | 410.97 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.16 | 410.97 | 411.13 | **Coal w/ bone stks** | | ac, cv, ev | | 0.00 |
| 0.01 | 411.13 | 411.14 | Pyrite | | ac, cs, es | | 0.00 |
| 1.71 | 411.14 | 412.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 412.85 | 413.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 0.40 | 413.80 | 414.20 | Claystone, gn, ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 414.20 | 416.10 | Shale, gy, sandy, massive | | cm, em | | 0.00 |
| 0.85 | 416.10 | 416.95 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.95 | 416.95 | 417.90 | Sandstone, gy, sh stks | | cs, es | y | 0.95 |
| 2.55 | 417.90 | 420.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 420.45 | 421.10 | Claystone, bwn/ blk, churned | | ac, cv, ev | | 0.00 |
| 1.55 | 421.10 | 422.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 368.65 | Total Depth | 368.65 | | | | | 126.10 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **126.10**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **34%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 126.10 | 34% |
| Soft Rock: | 242.55 | 66% |
| | 368.65 | |

ATTACHMENT 13

DIAMOND DRILL HOLE:CLC-2002-13

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

# DIAMOND DRILL HOLE: CLC-2002-18

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,320
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 691,650
**Easting:** 2,428,350
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 57.00 | 0.00 | 57.00 | Casing | | | | 0.00 |
| 5.90 | 57.00 | 62.90 | shale, gy, churned | yes | cm, em | | 0.00 |
| 4.70 | 62.90 | 67.60 | shale, gy, sandy | yes | cm, em | | 0.00 |
| 1.00 | 67.60 | 68.60 | shale, red | yes | cm, em | | 0.00 |
| 0.80 | 68.60 | 69.40 | shale, red/ gy, churned | | cm, em | | 0.00 |
| 4.10 | 69.40 | 73.50 | claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 73.50 | 75.00 | claystone, red/ gy | | cv, ev | | 0.00 |
| 2.65 | 75.00 | 77.65 | sandstone, gy, massive | | cs, es | y | 2.65 |
| 3.05 | 77.65 | 80.70 | shale, gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 80.70 | 82.20 | claystone, red/ gy | | cv, ev | | 0.00 |
| 4.60 | 82.20 | 86.80 | shale, gy, ss streaks | | cm, em | | 0.00 |
| 1.25 | 86.80 | 88.05 | claystone, red | | cv, ev | | 0.00 |
| 1.30 | 88.05 | 89.35 | claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 89.35 | 89.70 | limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 5.40 | 89.70 | 95.10 | shale, dk gy, churned | | cm, em | | 0.00 |
| 5.10 | 95.10 | 100.20 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.90 | 100.20 | 101.10 | shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.95 | 101.10 | 106.05 | sandstone, gy, massive | yes | cs, es | y | 4.95 |
| 4.05 | 106.05 | 110.10 | sandstone, gy, sh streaks | yes | cs, es | y | 4.05 |
| 3.30 | 110.10 | 113.40 | sandstone, gy, crossbedded | yes | cs, es | y | 3.30 |
| 0.90 | 113.40 | 114.30 | sandstone, gy, sh streaks | | cs, es | y | 0.90 |
| 2.00 | 114.30 | 116.30 | shale, dk gy, churned | | cm, em | | 0.00 |
| 1.10 | 116.30 | 117.40 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.20 | 117.40 | 118.60 | shale, gy, ss streaks, ls nods | yes | ak, cm, em | | 0.00 |
| 0.50 | 118.60 | 119.10 | sandstone, gy, sh streaks | yes | ak, cm, em | y | 0.50 |
| 0.75 | 119.10 | 119.85 | shale, gy, ss streaks | yes | ak, cm, em | | 0.00 |
| 0.95 | 119.85 | 120.80 | sandstone, gy, sh streaks | yes | cs, es | y | 0.95 |
| 7.40 | 120.80 | 128.20 | shale, gy, ss streaks | | ak, cm, em | | 0.00 |
| 2.10 | 128.20 | 130.30 | shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 130.30 | 131.70 | shale, red, churned | | cm, em | | 0.00 |
| 2.30 | 131.70 | 134.00 | claystone, gy | | cv, ev | | 0.00 |
| 1.25 | 134.00 | 135.25 | claystone, red/ gy | | cv, ev | | 0.00 |
| 4.25 | 135.25 | 139.50 | shale, gy, ss streaks, ls nods | | ak, cs, es | | 0.00 |
| 1.00 | 139.50 | 140.50 | claystone, red/ gy | | cv, ev | | 0.00 |
| 1.65 | 140.50 | 142.15 | claystone, red | | cv, ev | | 0.00 |
| 2.75 | 142.15 | 144.90 | shale, dk gy, churned | | cm, em | | 0.00 |
| 7.60 | 144.90 | 152.50 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 1.50 | 152.50 | 154.00 | shale, dk gy, ss layers | | cm, em | | 0.00 |
| 2.60 | 154.00 | 156.60 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 4.55 | 156.60 | 161.15 | shale, red | | cm, em | | 0.00 |
| 1.20 | 161.15 | 162.35 | core loss | | | | 0.00 |
| 4.55 | 162.35 | 166.90 | shale, red | | cm, em | | 0.00 |
| 3.45 | 166.90 | 170.35 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.40 | 170.35 | 170.75 | limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 4.65 | 170.75 | 175.40 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 11.00 | 175.40 | 186.40 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 8.30 | 186.40 | 194.70 | shale, red, churned | | cm, em | | 0.00 |
| 1.60 | 194.70 | 196.30 | shale, red/ gy, churned | | cm, em | | 0.00 |
| 15.20 | 196.30 | 211.50 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.90 | 211.50 | 213.40 | claystone, red, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 213.40 | 216.10 | claystone, red/ gy, churned | | cv, ev | | 0.00 |
| 2.20 | 216.10 | 218.30 | shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 218.30 | 219.10 | shale, red, churned | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-18

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.70 | 219.10 | 222.80 | claystone, red/ gy | | cv, ev | | 0.00 |
| 1.10 | 222.80 | 223.90 | claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 223.90 | 226.10 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.65 | 226.10 | 227.75 | limestone, shaley, nodular | | ak, cs, es | y | 1.65 |
| 1.65 | 227.75 | 229.40 | claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.65 | 229.40 | 235.05 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 2.20 | 235.05 | 237.25 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 1.45 | 237.25 | 238.70 | shale, dk gy, ss layers | | cm, em | | 0.00 |
| 1.80 | 238.70 | 240.50 | shale, red/ gy, churned | | cm, em | | 0.00 |
| 3.50 | 240.50 | 244.00 | claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.10 | 244.00 | 249.10 | shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 249.10 | 252.40 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.90 | 252.40 | 253.30 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 5.10 | 253.30 | 258.40 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 2.50 | 258.40 | 260.90 | shale, dk gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 260.90 | 263.00 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.70 | 263.00 | 264.70 | limestone, shaley, nodular | | ak, cs, es | y | 1.70 |
| 5.40 | 264.70 | 270.10 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 5.64 | 270.10 | 275.74 | claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.28 | 275.74 | 276.02 | shale, blk, churned | | cv, ev | | 0.00 |
| 0.46 | 276.02 | 276.48 | claystone, dk gy | | ac, cv, ev | | 0.00 |
| 0.62 | 276.48 | 277.10 | shale, blk, coal streaks | | ac, cv, ev | | 0.00 |
| 1.05 | 277.10 | 278.15 | **coal w/ sh streaks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.37 | 278.15 | 278.52 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 0.35 | 278.52 | 278.87 | **coal w/ sh streaks** | | ac, cv, ev | | 0.00 |
| 0.29 | 278.87 | 279.16 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.60 | 279.16 | 279.76 | **coal** | | ac, cv, ev | | 0.00 |
| 0.14 | 279.76 | 279.90 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 0.27 | 279.90 | 280.17 | **coal w/ sh streaks** | | ac, cv, ev | | 0.00 |
| 0.13 | 280.17 | 280.30 | **shale, dk gy, churned** | | cm, em | | 0.00 |
| 0.32 | 280.30 | 280.62 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 0.34 | 280.62 | 280.96 | **shale, dk gy, churned** | | cm, em | | 0.00 |
| 0.71 | 280.96 | 281.67 | **coal** | | ac, cv, ev | | 0.00 |
| 0.16 | 281.67 | 281.83 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.67 | 281.83 | 282.50 | shale, dk gy, churned | | cm, em | | 0.00 |
| 4.50 | 282.50 | 287.00 | claystone, gy | | cm, em | | 0.00 |
| 4.45 | 287.00 | 291.45 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 4.25 | 291.45 | 295.70 | shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 295.70 | 298.40 | shale, gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 298.40 | 300.30 | shale, dk gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 300.30 | 300.90 | shale, gy, ss layers, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 300.90 | 302.70 | shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 302.70 | 303.60 | sandstone, gy, sh streaks | | cs, es | y | 0.90 |
| 6.85 | 303.60 | 310.45 | shale, dk gy, ss streaks, ls nods | | ak, cs, es | | 0.00 |
| 0.45 | 310.45 | 310.90 | limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 2.40 | 310.90 | 313.30 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 9.75 | 313.30 | 323.05 | shale, dk gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 323.05 | 324.70 | sandstone, gy, sh streaks | | cs, es | y | 1.65 |
| 2.00 | 324.70 | 326.70 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 9.50 | 326.70 | 336.20 | sandstone, gy, sh streaks | | cs, es | y | 9.50 |
| 4.10 | 336.20 | 340.30 | sandstone, gy, massive | | cs, es | y | 4.10 |
| 2.50 | 340.30 | 342.80 | sandstone, gy, sh streaks | | cs, es | y | 2.50 |
| 0.65 | 342.80 | 343.45 | shale, blk, coal streaks | | ac, cm, em | | 0.00 |
| 0.80 | 343.45 | 344.25 | limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 1.14 | 344.25 | 345.39 | shale, blk, coal layers | | ac, cm, em | | 0.00 |
| 0.46 | 345.39 | 345.85 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 2.45 | 345.85 | 348.30 | limestone, shaley, nodular | | ak, cs, es | y | 2.45 |
| 1.30 | 348.30 | 349.60 | shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 349.60 | 353.00 | limestone, shaley, nodular | | ak, cs, es | y | 3.40 |
| 2.70 | 353.00 | 355.70 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 2.60 | 355.70 | 358.30 | sandstone, gy, sh streaks | | cs, es | y | 2.60 |
| 8.20 | 358.30 | 366.50 | shale, dk gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 4.05 | 366.50 | 370.55 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 5.50 | 370.55 | 376.05 | shale, gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-18

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.45 | 376.05 | 379.50 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.34 | 379.50 | 382.84 | shale, gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 0.27 | 382.84 | 383.11 | shale, dk gy, churned | | cm, em | | 0.00 |
| 0.08 | 383.11 | 383.19 | shale, blk, coal streaks | | ac, cm, em | | 0.00 |
| 0.17 | 383.19 | 383.36 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 0.73 | 383.36 | 384.09 | **coal w/ pyrite, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.26 | 384.09 | 384.35 | **claystone, dk gy** | | cv, ev | | 0.00 |
| 0.58 | 384.35 | 384.93 | **coal w/ sh streaks** | | ac, cv, ev | | 0.00 |
| 0.49 | 384.93 | 385.42 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.73 | 385.42 | 386.15 | claystone, gy | | cv, ev | | 0.00 |
| 1.75 | 386.15 | 387.90 | shale, dk gy, ss layers | | cm, em | | 0.00 |
| 5.10 | 387.90 | 393.00 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 3.75 | 393.00 | 396.75 | shale, dk gy, churned | | cm, em | | 0.00 |
| 0.95 | 396.75 | 397.70 | shale, dk gy, ss streaks | | cm, em | | 0.00 |
| 2.05 | 397.70 | 399.75 | shale, dk gy, churned | | cm, em | | 0.00 |
| 0.37 | 399.75 | 400.12 | **coal w/ bone streaks, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 1.38 | 400.12 | 401.50 | shale, dk gy, churned | | cm, em | | 0.00 |
| 1.80 | 401.50 | 403.30 | limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 2.90 | 403.30 | 406.20 | limestone, nodular | | ak, cs, es | y | 2.90 |
| 2.75 | 406.20 | 408.95 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.25 | 408.95 | 410.20 | limestone, shaley, mosaic | | ak, cs, es | y | 1.25 |
| 1.90 | 410.20 | 412.10 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.60 | 412.10 | 413.70 | limestone, nodular | | ak, cs, es | y | 1.60 |
| 0.80 | 413.70 | 414.50 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.70 | 414.50 | 416.20 | limestone, shaley, mosaic | | ak, cs, es | y | 1.70 |
| 3.80 | 416.20 | 420.00 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.60 | 420.00 | 420.60 | claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 420.60 | 423.90 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 4.85 | 423.90 | 428.75 | limestone, layered | | ak, cs, es | y | 4.85 |
| 6.75 | 428.75 | 435.50 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 7.15 | 435.50 | 442.65 | shale, gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 442.65 | 443.35 | shale, gy, ss streaks | | cm, em | | 0.00 |
| 0.53 | 443.35 | 443.88 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.82 | 443.88 | 447.70 | shale, gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 447.70 | 449.35 | limestone, nodular | | ak, cs, es | y | 1.65 |
| 1.55 | 449.35 | 450.90 | claystone, gy | | cv, ev | | 0.00 |
| 2.85 | 450.90 | 453.75 | shale, green, ls nods, churned | | ak, cv, ev | | 0.00 |
| 0.75 | 453.75 | 454.50 | claystone, red/ gy | | cv, ev | | 0.00 |
| 9.10 | 454.50 | 463.60 | limestone, shaley, layered | | ak, cs, es | y | 9.10 |
| 2.40 | 463.60 | 466.00 | limestone, massive | | ak, cs, es | y | 2.40 |
| 0.55 | 466.00 | 466.55 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.65 | 466.55 | 467.20 | limestone, massive | | ak, cs, es | y | 0.65 |
| 2.00 | 467.20 | 469.20 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.50 | 469.20 | 469.70 | limestone, massive | | ak, cs, es | y | 0.50 |
| 3.60 | 469.70 | 473.30 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.60 | 473.30 | 476.90 | shale, green, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.10 | 476.90 | 478.00 | limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 2.80 | 478.00 | 480.80 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 2.70 | 480.80 | 483.50 | limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 0.90 | 483.50 | 484.40 | limestone, nodular | | ak, cs, es | y | 0.90 |
| 2.70 | 484.40 | 487.10 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.25 | 487.10 | 490.35 | shale, green, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.85 | 490.35 | 492.20 | limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 4.90 | 492.20 | 497.10 | shale, gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.90 | 497.10 | 498.00 | limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 1.75 | 498.00 | 499.75 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 11.70 | 499.75 | 511.45 | limestone, shaley, layered | | ak, cs, es | y | 11.70 |
| 1.60 | 511.45 | 513.05 | claystone, green, ls nods | | ak, cv, ev | | 0.00 |
| 5.80 | 513.05 | 518.85 | limestone, massive | | ak, cs, es | y | 5.80 |
| 2.10 | 518.85 | 520.95 | limestone, layered | | ak, cs, es | y | 2.10 |
| 1.10 | 520.95 | 522.05 | limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 1.10 | 522.05 | 523.15 | shale, green, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.50 | 523.15 | 524.65 | limestone, massive | | ak, cs, es | y | 1.50 |
| 1.15 | 524.65 | 525.80 | shale, green, ls nods, churned | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-18

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.80 | 525.80 | 528.60 | limestone, shaley, nodular | | ak, cs, es | y | 2.80 |
| 2.05 | 528.60 | 530.65 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 4.05 | 530.65 | 534.70 | limestone, nodular | | ak, cs, es | y | 4.05 |
| 2.40 | 534.70 | 537.10 | limestone, shaley, layered | | ak, cs, es | y | 2.40 |
| 4.25 | 537.10 | 541.35 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.50 | 541.35 | 542.85 | claystone, gy | | cv, ev | | 0.00 |
| 0.46 | 542.85 | 543.31 | shale, dk gy, coal streaks | | ac, cm, em | | 0.00 |
| 0.16 | 543.31 | 543.47 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 0.74 | 543.47 | 544.21 | **bone w/ coal streaks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.07 | 544.21 | 544.28 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 1.42 | 544.28 | 545.70 | claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 545.70 | 546.75 | shale, gy, sandy | | cm, em | | 0.00 |
| 18.20 | 546.75 | 564.95 | sandstone, gy, sh streaks | | cs, es | y | 18.20 |
| 2.20 | 564.95 | 567.15 | sandstone, gy, massive | | cs, es | y | 2.20 |
| 2.45 | 567.15 | 569.60 | sandstone, gy, sh streaks | | cs, es | y | 2.45 |
| 5.99 | 569.60 | 575.59 | shale, dk gy, layered | | cm, em | | 0.00 |
| 0.08 | 575.59 | 575.67 | **coal w/ bone streaks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.48 | 575.67 | 576.15 | **shale, blk, churned** | | ac, cm, em | | 0.00 |
| 0.06 | 576.15 | 576.21 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.25 | 576.21 | 576.46 | **sandstone, gy, coal streaks** | | cs, es | y | 0.25 |
| 0.30 | 576.46 | 576.76 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.16 | 576.76 | 576.92 | **limestone, shaley** | | ak, cs, es | y | 0.16 |
| 0.76 | 576.92 | 577.68 | **coal w/ sh streaks** | | ac, cv, ev | | 0.00 |
| 0.33 | 577.68 | 578.01 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.42 | 578.01 | 578.43 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 0.26 | 578.43 | 578.69 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.08 | 578.69 | 578.77 | **shale, blk, churned** | | ac, cm, em | | 0.00 |
| 0.25 | 578.77 | 579.02 | **bone w/ coal streaks** | | ac, cv, ev | | 0.00 |
| 0.08 | 579.02 | 579.10 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 0.60 | 579.10 | 579.70 | shale, dk gy, churned | | cm, em | | 0.00 |
| 2.05 | 579.70 | 581.75 | limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 1.10 | 581.75 | 582.85 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.75 | 582.85 | 586.60 | limestone, nodular | | ak, cs, es | y | 3.75 |
| 0.65 | 586.60 | 587.25 | limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.10 | 587.25 | 588.35 | limestone, nodular | | ak, cs, es | y | 1.10 |
| 1.70 | 588.35 | 590.05 | limestone, mosaic | | ak, cs, es | y | 1.70 |
| 1.40 | 590.05 | 591.45 | limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 2.30 | 591.45 | 593.75 | limestone, massive | | ak, cs, es | y | 2.30 |
| 3.25 | 593.75 | 597.00 | limestone, shaley, nodular | | ak, cs, es | y | 3.25 |
| 2.35 | 597.00 | 599.35 | shale, gy, ss streaks, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 599.35 | 600.35 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.50 | 600.35 | 600.85 | sandstone, gy, sh streaks | | cs, es | y | 0.50 |
| 1.30 | 600.85 | 602.15 | shale, dk gy, ss layers | | cm, em | | 0.00 |
| 3.40 | 602.15 | 605.55 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.10 | 605.55 | 608.65 | limestone, massive | | ak, cs, es | y | 3.10 |
| 2.15 | 608.65 | 610.80 | limestone, shaley, layered | | ak, cs, es | y | 2.15 |
| 5.45 | 610.80 | 616.25 | claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 616.25 | 618.05 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.65 | 618.05 | 618.70 | limestone, massive | | ak, cs, es | y | 0.65 |
| 0.25 | 618.70 | 618.95 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 3.30 | 618.95 | 622.25 | limestone, massive | | ak, cs, es | y | 3.30 |
| 0.45 | 622.25 | 622.70 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 1.75 | 622.70 | 624.45 | limestone, massive | | ak, cs, es | y | 1.75 |
| 1.50 | 624.45 | 625.95 | limestone, shaley, massive | | ak, cs, es | y | 1.50 |
| 2.45 | 625.95 | 628.40 | limestone, massive | | ak, cs, es | y | 2.45 |
| 0.55 | 628.40 | 628.95 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 0.65 | 628.95 | 629.60 | limestone, nodular | | ak, cs, es | y | 0.65 |
| 0.45 | 629.60 | 630.05 | shale, dk gy, ls nods, churned | | ak, cm, em | | 0.00 |
| 2.00 | 630.05 | 632.05 | limestone, massive | | ak, cs, es | y | 2.00 |
| 1.15 | 632.05 | 633.20 | limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 2.35 | 633.20 | 635.55 | claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 635.55 | 636.20 | limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 0.55 | 636.20 | 636.75 | claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 636.75 | 637.80 | claystone, green, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-18

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.35 | 637.80 | 639.15 | claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 639.15 | 639.95 | claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.74 | 639.95 | 640.69 | claystone, blk/ tan, churned | | ac, cv, ev | | 0.00 |
| 0.09 | 640.69 | 640.78 | claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.15 | 640.78 | 640.93 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 0.10 | 640.93 | 641.03 | claystone, blk/ tan, churned | | ac, cv, ev | | 0.00 |
| 0.13 | 641.03 | 641.16 | shale, blk, coal streaks | | ac, cm, em | | 0.00 |
| 0.40 | 641.16 | 641.56 | **coal w/ bone streaks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.08 | 641.56 | 641.64 | **shale, dk gy, churned** | | cm, em | | 0.00 |
| 0.11 | 641.64 | 641.75 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.03 | 641.75 | 641.78 | shale, blk, coal streaks | | ac, cm, em | | 0.00 |
| 0.20 | 641.78 | 641.98 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 0.53 | 641.98 | 642.51 | shale, dk gy, churned | | cm, em | | 0.00 |
| 0.15 | 642.51 | 642.66 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 0.16 | 642.66 | 642.82 | **coal w/ pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 1.11 | 642.82 | 643.93 | **coal** | | ac, cv, ev | | 0.00 |
| 0.95 | 643.93 | 644.88 | **coal w/ bone streaks** | | ac, cv, ev | | 0.00 |
| 0.03 | 644.88 | 644.91 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 0.39 | 644.91 | 645.30 | **coal** | | ac, cv, ev | | 0.00 |
| 0.12 | 645.30 | 645.42 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 1.61 | 645.42 | 647.03 | **coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 647.03 | 647.06 | **shale, blk, coal streaks** | | ac, cm, em | | 0.00 |
| 1.24 | 647.06 | 648.30 | **coal** | | ac, cv, ev | | 0.00 |
| 0.28 | 648.30 | 648.58 | shale, blk, churned | | ac, cm, em | | 0.00 |
| 1.60 | 648.58 | 650.18 | shale, dk gy, churned | | cm, em | | 0.00 |
| 0.75 | 650.18 | 650.93 | claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 650.93 | 651.28 | limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 4.75 | 651.28 | 656.03 | claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 656.03 | 657.83 | shale, gy, sandy, ls nods, churned | | ak, cm, em | | 0.00 |
| 4.26 | 657.83 | 662.09 | sandstone, gy, sh streaks | | cs, es | y | 4.26 |
| | Total Depth | 662.09 | | | | | 180.97 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **180.97**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **27%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 180.97 | 27% |
| Soft Rock: | 481.12 | 73% |
| | 662.09 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-18

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| Stratum | Neutralization Potential, tons/1C tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) | | |
| Roof, 10 ft. | 137.65 | 1.73 | 1.47 | 54.18 | -108.77 | | |
| Coal | | | | | | | |
| Bottom, 10 ft. | 326.00 | 1.73 | 1.63 | 54.05 | -272.00 | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-20

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1,325.00
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 688450
**Easting:** 2426390
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.00 | 0.00 | 20.00 | Casing | | | | 0.00 |
| 0.95 | 20.00 | 20.95 | Shale, gy | Y | cm, em | | 0.00 |
| 1.00 | 20.95 | 21.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 21.95 | 23.00 | Limestone, shaley, nodular | Y | ak, cs, es | y | 1.05 |
| 5.70 | 23.00 | 28.70 | Claystone, dk gy, ls nods | Y | ak, cv, ev | | 0.00 |
| 1.00 | 28.70 | 29.70 | Core loss | | | | 0.00 |
| 1.65 | 29.70 | 31.35 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.30 | 31.35 | 32.65 | Claystone, gy | | cv, ev | | 0.00 |
| 2.15 | 32.65 | 34.80 | Sandstone, gy, crossbeds | Y | cs, es | y | 2.15 |
| 3.85 | 34.80 | 38.65 | Shale, gy, interbedded ss | Y | cm, em | | 0.00 |
| 1.60 | 38.65 | 40.25 | Shale, gy, sandy | Y | cm, em | | 0.00 |
| 2.15 | 40.25 | 42.40 | Claystone, gy | | cv, ev | | 0.00 |
| 7.20 | 42.40 | 49.60 | Claystone, red | | cv, ev | | 0.00 |
| 7.95 | 49.60 | 57.55 | Shale, gy, sandy, ls nods | Y | ak, cm, em | | 0.00 |
| 4.70 | 57.55 | 62.25 | Shale, gy, sandy | Y | cm, em | | 0.00 |
| 3.30 | 62.25 | 65.55 | Sandstone, gy, sh stks | | cs, es | y | 3.30 |
| 1.70 | 65.55 | 67.25 | Claystone, gy | | cv, ev | | 0.00 |
| 4.25 | 67.25 | 71.50 | Sandstone, gy, massive | Y | cs, es | y | 4.25 |
| 1.30 | 71.50 | 72.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 72.80 | 73.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 7.20 | 73.60 | 80.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 80.80 | 81.15 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.55 | 81.15 | 82.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 82.70 | 83.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.05 | 83.10 | 85.15 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 85.15 | 85.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 85.40 | 87.05 | Shale, dk gy | | cm, em | | 0.00 |
| 5.85 | 87.05 | 92.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 92.90 | 93.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.90 | 93.75 | 99.65 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 99.65 | 103.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 103.05 | 103.45 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.25 | 103.45 | 106.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 106.70 | 108.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.00 | 108.25 | 109.25 | Shale, gy, sandy | | cm, em | | 0.00 |
| 6.70 | 109.25 | 115.95 | Claystone, dk gy, ls nods | | ak,cv | | 0.00 |
| 4.60 | 115.95 | 120.55 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 120.55 | 124.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.10 | 124.00 | 131.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 131.10 | 132.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 132.25 | 135.15 | Sandstone, gy, crossbeds | | cs, es | y | 2.90 |
| 3.10 | 135.15 | 138.25 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.00 | 138.25 | 141.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 141.25 | 143.15 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.00 | 143.15 | 144.15 | Claystone, gy | | cv, ev | | 0.00 |
| 3.90 | 144.15 | 148.05 | Claystone, red | | cv, ev | | 0.00 |
| 1.65 | 148.05 | 149.70 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.95 | 149.70 | 150.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.65 | 150.65 | 153.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 153.30 | 153.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.45 | 153.70 | 154.15 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.20 | 154.15 | 155.35 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.70 | 155.35 | 157.05 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.35 | 157.05 | 157.40 | Claystone, gy | | cv, ev | | 0.00 |
| 0.25 | 157.40 | 157.65 | Claystone, red | | cv, ev | | 0.00 |
| 0.80 | 157.65 | 158.45 | Claystone, red/ gy | | cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-20

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.10 | 158.45 | 159.55 | Shale, gy | | cm, em | | 0.00 |
| 3.60 | 159.55 | 163.15 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.30 | 163.15 | 163.45 | Shale, dk gy | | cm, em | | 0.00 |
| 12.10 | 163.45 | 175.55 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.05 | 175.55 | 177.60 | Shale, red | | cm, em | | 0.00 |
| 1.35 | 177.60 | 178.95 | Shale, dk gy | | cm, em | | 0.00 |
| 4.15 | 178.95 | 183.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 183.10 | 183.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.95 | 183.50 | 184.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 184.45 | 184.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 4.50 | 184.90 | 189.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 189.40 | 189.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.75 | 189.80 | 191.55 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 191.55 | 191.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 191.95 | 192.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 0.45 | 192.50 | 192.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 192.95 | 193.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 1.70 | 193.25 | 194.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 9.20 | 194.95 | 204.15 | Claystone, red | | cv, ev | | 0.00 |
| 1.00 | 204.15 | 205.15 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.65 | 205.15 | 208.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 208.80 | 209.60 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.20 | 209.60 | 211.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 211.80 | 212.60 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 212.60 | 216.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.90 | 216.10 | 220.00 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.20 | 220.00 | 222.20 | Claystone, red | | cv, ev | | 0.00 |
| 5.75 | 222.20 | 227.95 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.65 | 227.95 | 228.60 | Shale, gy | | cm, em | | 0.00 |
| 0.75 | 228.60 | 229.35 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.40 | 229.35 | 229.75 | Shale, gy | | cm, em | | 0.00 |
| 1.50 | 229.75 | 231.25 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.70 | 231.25 | 231.95 | Claystone, gy | | cv, ev | | 0.00 |
| 1.15 | 231.95 | 233.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 233.10 | 234.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 0.95 | 234.50 | 235.45 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.75 | 235.45 | 238.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 238.20 | 238.85 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.05 | 238.85 | 240.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 240.90 | 241.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 241.35 | 242.20 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.05 | 242.20 | 245.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.40 | 245.25 | 252.65 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 252.65 | 254.70 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 8.20 | 254.70 | 262.90 | Sandstone, gy, crossbeds | | cs, es | y | 8.20 |
| 1.00 | 262.90 | 263.90 | Sandstone, gy, massive | | cs, es | y | 1.00 |
| 4.20 | 263.90 | 268.10 | Sandstone, gy, crossbeds | | cs, es | y | 4.20 |
| 0.55 | 268.10 | 268.65 | Shale, dk gy | | cm, em | | 0.00 |
| 0.75 | 268.65 | 269.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.15 | 269.40 | 269.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 269.55 | 270.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 12.55 | 270.40 | 282.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 8.05 | 282.95 | 291.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 291.00 | 291.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.03 | 291.60 | 291.63 | Pyrite | | ac, cs, es | | 0.00 |
| 0.91 | 291.63 | 292.54 | **Coal , bone stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.74 | 292.54 | 293.28 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.83 | 293.28 | 294.11 | **Coal , bone stks** | | ac, cv, ev | | 0.00 |
| 0.75 | 294.11 | 294.86 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 294.86 | 295.02 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.49 | 295.02 | 295.51 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 1.00 | 295.51 | 296.51 | **Coal , bone stks** | | ac, cv, ev | | 0.00 |
| 0.09 | 296.51 | 296.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.70 | 296.60 | 298.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 11.05 | 298.30 | 309.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.35 | 309.35 | 315.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.05 | 315.70 | 318.75 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 318.75 | 321.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-20

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.85 | 321.10 | 321.95 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 321.95 | 324.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 324.45 | 326.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.95 | 326.55 | 331.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.70 | 331.50 | 336.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.45 | 336.20 | 341.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 341.65 | 342.30 | Shale, gy | | cm, em | | 0.00 |
| 0.29 | 342.30 | 342.59 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.19 | 342.59 | 342.78 | **Coal, bone stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.69 | 342.78 | 343.47 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 343.47 | 343.49 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.96 | 343.49 | 344.45 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.47 | 344.45 | 344.92 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 1.84 | 344.92 | 346.76 | **Coal, sh layers** | | ac, cv, ev | | 0.00 |
| 0.02 | 346.76 | 346.78 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.16 | 346.78 | 347.94 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 347.94 | 348.00 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.42 | 348.00 | 348.42 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.24 | 348.42 | 348.66 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.07 | 348.66 | 348.73 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.02 | 348.73 | 349.75 | Limestone, shaley, nodular | | ak, cs, es | y | 1.02 |
| 0.20 | 349.75 | 349.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.05 | 349.95 | 350.00 | Limestone | | ak, cs, es | y | 0.05 |
| 0.45 | 350.00 | 350.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.80 | 350.45 | 351.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.70 | 351.25 | 351.95 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 351.95 | 353.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 1.85 | 353.00 | 354.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 354.85 | 358.05 | Limestone, shaley, nodular | | ak, cs, es | y | 3.20 |
| 1.90 | 358.05 | 359.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 359.95 | 362.25 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 362.25 | 363.45 | Sandstone, gy, sh stks | | cs, es | y | 1.20 |
| 2.90 | 363.45 | 366.35 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 366.35 | 368.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 368.05 | 368.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.00 | 368.40 | 373.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 373.40 | 374.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 374.10 | 374.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 3.75 | 374.35 | 378.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 378.10 | 378.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 378.85 | 380.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.70 | 380.80 | 381.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 381.50 | 382.70 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 382.70 | 385.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.43 | 385.55 | 385.98 | Shale, dk gy | | cm, em | | 0.00 |
| 0.27 | 385.98 | 386.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.13 | 386.25 | 386.38 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.43 | 386.38 | 386.81 | **Coal, bone stks, WAYNESBURG No.11** | | ac, cv, ev | | 0.00 |
| 0.79 | 386.81 | 387.60 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.68 | 387.60 | 388.28 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.37 | 388.28 | 388.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.15 | 388.65 | 389.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.60 | 389.80 | 396.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 6.10 | 396.40 | 402.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 402.50 | 403.70 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.54 | 403.70 | 404.24 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.41 | 404.24 | 404.65 | **Coal, sh stks, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 2.55 | 404.65 | 407.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 407.20 | 410.25 | Limestone, shaley, nodular | | ak, cs, es | y | 3.05 |
| 2.10 | 410.25 | 412.35 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.30 | 412.35 | 413.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 413.65 | 414.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.55 | 414.35 | 415.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 415.90 | 416.20 | Limestone, massive | | ak, cs, es | y | 0.30 |
| 0.60 | 416.20 | 416.80 | Limestone, mosaic | | ak, cs, es | y | 0.60 |
| 0.70 | 416.80 | 417.50 | Limestone, massive | | ak, cs, es | y | 0.70 |
| 0.90 | 417.50 | 418.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 418.40 | 418.80 | Limestone, massive | | ak, cs, es | y | 0.40 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-20

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.30 | 418.80 | 419.10 | Limestone, mosaic | | ak, cs, es | y | 0.30 |
| 0.65 | 419.10 | 419.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 8.85 | 419.75 | 428.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 428.60 | 430.10 | Limestone, shaley, layered | | ak, cs, es | y | 1.50 |
| 0.25 | 430.10 | 430.35 | Claystone, grn | | cv, ev | | 0.00 |
| 0.20 | 430.35 | 430.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.60 | 430.55 | 433.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.65 | 433.15 | 437.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.65 | 437.80 | 441.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 441.45 | 442.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 442.35 | 442.90 | Shale, dk gy | | cm, em | | 0.00 |
| 1.00 | 442.90 | 443.90 | Shale, red | | cm, em | | 0.00 |
| 0.35 | 443.90 | 444.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 444.25 | 444.35 | Shale, red | | cm, em | | 0.00 |
| 0.15 | 444.35 | 444.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 444.50 | 444.75 | Limestone, shaley, massive | | ak, cs, es | y | 0.25 |
| 0.70 | 444.75 | 445.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 445.45 | 446.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 5.40 | 446.70 | 452.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 452.10 | 452.70 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 4.35 | 452.70 | 457.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 457.05 | 457.65 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 0.90 | 457.65 | 458.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 458.55 | 460.00 | Limestone, massive | | ak, cs, es | y | 1.45 |
| 1.35 | 460.00 | 461.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 461.35 | 463.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 2.00 | 463.10 | 465.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 465.10 | 466.40 | Limestone, shaley, layered | | ak, cs, es | y | 1.30 |
| 1.00 | 466.40 | 467.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 467.40 | 468.40 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 0.55 | 468.40 | 468.95 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 0.35 | 468.95 | 469.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 469.30 | 470.35 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 1.80 | 470.35 | 472.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 472.15 | 473.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 5.20 | 473.10 | 478.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 478.30 | 479.15 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 479.15 | 480.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.30 | 480.20 | 484.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 484.50 | 486.70 | Limestone, massive | | ak, cs, es | y | 2.20 |
| 1.40 | 486.70 | 488.10 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 488.10 | 489.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 489.75 | 490.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 3.20 | 490.35 | 493.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 493.55 | 495.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 3.60 | 495.60 | 499.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 499.20 | 501.85 | Limestone, massive | | ak, cs, es | y | 2.65 |
| 1.45 | 501.85 | 503.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 503.30 | 503.80 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 3.15 | 503.80 | 506.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 506.95 | 510.45 | Limestone, massive | | ak, cs, es | y | 3.50 |
| 0.50 | 510.45 | 510.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 510.95 | 511.50 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 0.70 | 511.50 | 512.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 512.20 | 512.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 2.95 | 512.95 | 515.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.00 | 515.90 | 521.90 | Limestone, nodular | | ak, cs, es | y | 6.00 |
| 0.60 | 521.90 | 522.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 522.50 | 523.90 | Limestone, layered, cly stks | | ak, cs, es | y | 1.40 |
| 1.25 | 523.90 | 525.15 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 1.10 | 525.15 | 526.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 526.25 | 527.65 | Limestone, massive | | ak, cs, es | y | 1.40 |
| 0.65 | 527.65 | 528.30 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 528.30 | 528.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 528.55 | 528.85 | Shale, grn | | cm, em | | 0.00 |
| 1.25 | 528.85 | 530.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 3.60 | 530.10 | 533.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.85 | 533.70 | 538.55 | Limestone, massive | | ak, cs, es | y | 4.85 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-20

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.95 | 538.55 | 542.50 | Limestone, shaley, nodular | | ak, cs, es | y | 3.95 |
| 1.00 | 542.50 | 543.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 543.50 | 545.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 545.95 | 546.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.35 | 546.30 | 546.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 546.65 | 547.65 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 547.65 | 548.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.68 | 548.10 | 548.78 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.62 | 548.78 | 549.40 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 549.40 | 549.65 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.40 | 549.65 | 550.05 | Shale, dk gy | | cm, em | | 0.00 |
| 1.95 | 550.05 | 552.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.65 | 552.00 | 555.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 555.65 | 557.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 557.25 | 559.95 | Sandstone, gy, sh stks | | cs, es | y | 2.70 |
| 1.15 | 559.95 | 561.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.10 | 561.10 | 566.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 5.35 | 566.20 | 571.55 | Sandstone, gy, crossbeds | | cs, es | y | 5.35 |
| 7.95 | 571.55 | 579.50 | Sandstone, gy, sh stks | | cs, es | y | 7.95 |
| 2.55 | 579.50 | 582.05 | Sandstone, gy, crossbeds, churned | | cs, es | y | 2.55 |
| 0.90 | 582.05 | 582.95 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 582.95 | 583.05 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.18 | 583.05 | 583.23 | **Coal, bone stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.07 | 583.23 | 583.30 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.38 | 583.30 | 583.68 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.26 | 583.68 | 583.94 | **Coal, sh layers** | | ac, cv, ev | | 0.00 |
| 0.19 | 583.94 | 584.13 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 584.13 | 584.41 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.06 | 584.41 | 584.47 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.55 | 584.47 | 585.02 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.58 | 585.02 | 585.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.45 | 585.60 | 587.05 | Limestone, massive | | ak, cs, es | y | 1.45 |
| 1.10 | 587.05 | 588.15 | Limestone, cly stks | | ak, cs, es | y | 1.10 |
| 0.45 | 588.15 | 588.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 588.60 | 589.20 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 0.55 | 589.20 | 589.75 | Limestone, mosaic | | ak, cs, es | y | 0.55 |
| 0.85 | 589.75 | 590.60 | Limestone, massive | | ak, cs, es | y | 0.85 |
| 0.70 | 590.60 | 591.30 | Limestone, layered | | ak, cs, es | y | 0.70 |
| 0.15 | 591.30 | 591.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 591.45 | 592.45 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 1.25 | 592.45 | 593.70 | Limestone, massive | | ak, cs, es | y | 1.25 |
| 0.50 | 593.70 | 594.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 594.20 | 595.20 | Limestone, massive | | ak, cs, es | y | 1.00 |
| 3.30 | 595.20 | 598.50 | Limestone, shaley, nodular | | ak, cs, es | y | 3.30 |
| 2.10 | 598.50 | 600.60 | Limestone, massive | | ak, cs, es | y | 2.10 |
| 0.10 | 600.60 | 600.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 600.70 | 602.85 | Limestone, shaley, nodular | | ak, cs, es | y | 2.15 |
| 3.95 | 602.85 | 606.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.85 | 606.80 | 612.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 612.65 | 615.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 615.05 | 618.10 | Limestone, massive | | ak, cs, es | y | 3.05 |
| 0.25 | 618.10 | 618.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 618.35 | 618.70 | Limestone, massive | | ak, cs, es | y | 0.35 |
| 0.50 | 618.70 | 619.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 619.20 | 621.55 | Limestone, shaley, nodular | | ak, cs, es | y | 2.35 |
| 0.50 | 621.55 | 622.05 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 622.05 | 623.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 623.05 | 624.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 624.70 | 624.95 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.15 | 624.95 | 625.10 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.50 | 625.10 | 626.60 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 626.60 | 627.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 627.60 | 628.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 0.85 | 628.45 | 629.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.35 | 629.30 | 629.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.35 | 629.65 | 630.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.05 | 630.00 | 636.05 | Limestone, massive | | ak, cs, es | y | 6.05 |
| 1.25 | 636.05 | 637.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-20

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.45 | 637.30 | 637.75 | Limestone, massive | | ak, cs, es | y | 0.45 |
| 3.30 | 637.75 | 641.05 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 641.05 | 641.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 4.25 | 641.50 | 645.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 645.75 | 647.10 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.10 | 647.10 | 647.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.25 | 647.20 | 647.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.33 | 647.45 | 647.78 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.65 | 647.78 | 648.43 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 648.43 | 648.45 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.14 | 648.45 | 648.59 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.73 | 648.59 | 649.32 | Claystone, gy | | cv, ev | | 0.00 |
| 0.15 | 649.32 | 649.47 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.45 | 649.47 | 649.92 | **Bone, coal layers, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.59 | 649.92 | 650.51 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.96 | 650.51 | 651.47 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 651.47 | 651.52 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.41 | 651.52 | 651.93 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 651.93 | 652.08 | **Bone** | | ac, cv, ev | | 0.00 |
| 1.49 | 652.08 | 653.57 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 653.57 | 653.60 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.22 | 653.60 | 654.82 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 654.82 | 654.87 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.95 | 654.87 | 656.82 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.20 | 656.82 | 661.02 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.80 | 661.02 | 663.82 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 663.82 | 664.67 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 664.67 | 667.07 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 667.07 | 668.37 | Shale, gy, ss stks | | cm, em | | 0.00 |
| | Total Depth | 668.37 | | | | | 138.67 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **138.67**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **24%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 138.67 | 24% |
| Soft Rock: | 432.88 | 76% |
| | 571.55 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 174.24 | 2.31 | 1.77 | 72.37 | -101.75 |
| Coal Bottom, 10 ft. | 106.70 | 2.65 | 2.52 | 82.80 | -24.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-23

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1260
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 684790
**Easting:** 2430800
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 24.00 | 0.00 | 24.00 | Casing | | | | 0.00 |
| 13.80 | 24.00 | 37.80 | Shale, gy, ss stks | Y | cm, em | | 0.00 |
| 1.60 | 37.80 | 39.40 | Shale, red/ gy | Y | cm, em | | 0.00 |
| 5.80 | 39.40 | 45.20 | Claystone, gy | | cv, ev | | 0.00 |
| 1.45 | 45.20 | 46.65 | Limestone, shaley, layered | | ak, cs, es | y | 1.45 |
| 1.45 | 46.65 | 48.10 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 48.10 | 50.20 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 3.50 | 50.20 | 53.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 53.70 | 56.10 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.65 | 56.10 | 60.75 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 3.55 | 60.75 | 64.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 64.30 | 66.50 | Sandstone, gy, sh stks | | cs, es | y | 2.20 |
| 2.15 | 66.50 | 68.65 | Sandstone, gy, massive | | cs, es | y | 2.15 |
| 0.75 | 68.65 | 69.40 | Sandstone, gy, sh stks, calc. cemented | | cs, es | y | 0.75 |
| 1.20 | 69.40 | 70.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 70.60 | 71.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 71.50 | 74.00 | Sandstone, gy, massive | | cs, es | y | 2.50 |
| 1.40 | 74.00 | 75.40 | Sandstone, gy, sh stks, calc. cemented | | cs, es | y | 1.40 |
| 1.95 | 75.40 | 77.35 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 77.35 | 78.95 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 78.95 | 82.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 82.10 | 83.20 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.20 | 83.20 | 84.40 | Claystone, gy | | cv, ev | | 0.00 |
| 4.10 | 84.40 | 88.50 | Claystone, red | | cv, ev | | 0.00 |
| 2.15 | 88.50 | 90.65 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.45 | 90.65 | 94.10 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 94.10 | 95.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 7.75 | 95.75 | 103.50 | Sandstone, gy, sh stks | | cs, es | y | 7.75 |
| 2.90 | 103.50 | 106.40 | Sandstone, gy, crossbedded | | cs, es | y | 2.90 |
| 6.95 | 106.40 | 113.35 | Sandstone, gy, massive | | cs, es | y | 6.95 |
| 1.95 | 113.35 | 115.30 | Sandstone, gy, sh stks | | cs, es | y | 1.95 |
| 0.70 | 115.30 | 116.00 | Shale, dk gy | | cm, em | | 0.00 |
| 3.70 | 116.00 | 119.70 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.50 | 119.70 | 121.20 | Shale, gy | | cm, em | | 0.00 |
| 0.90 | 121.20 | 122.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.60 | 122.10 | 125.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 125.70 | 126.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 2.90 | 126.30 | 129.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 129.20 | 129.75 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 3.95 | 129.75 | 133.70 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 0.25 | 133.70 | 133.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 1.05 | 133.95 | 135.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 135.00 | 136.60 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 9.50 | 136.60 | 146.10 | Shale, red | | cm, em | | 0.00 |
| 3.60 | 146.10 | 149.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 149.70 | 151.30 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.80 | 151.30 | 153.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 153.10 | 155.80 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 5.90 | 155.80 | 161.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 161.70 | 162.60 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 9.60 | 162.60 | 172.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 172.20 | 173.30 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 173.30 | 175.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 175.80 | 177.10 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.25 | 177.10 | 180.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 180.35 | 182.40 | Limestone, nodular | | ak, cs, es | y | 2.05 |
| 1.00 | 182.40 | 183.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-23

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.55 | 183.40 | 183.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.95 | 183.95 | 185.90 | Limestone, shaley, layered | | ak, cs, es | y | 1.95 |
| 2.30 | 185.90 | 188.20 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.85 | 188.20 | 189.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 189.05 | 191.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.75 |
| 4.20 | 191.80 | 196.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.50 | 196.00 | 198.50 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.30 | 198.50 | 199.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 10.00 | 199.80 | 209.80 | Sandstone, gy, sh stks | | cs, es | y | 10.00 |
| 0.80 | 209.80 | 210.60 | Sandstone, gy, massive | | cs, es | y | 0.80 |
| 0.45 | 210.60 | 211.05 | Sandstone, gy, sh clasts | | cs, es | y | 0.45 |
| 2.35 | 211.05 | 213.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 213.40 | 213.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 1.80 | 213.70 | 215.50 | Shale, dk gy | | cm, em | | 0.00 |
| 4.30 | 215.50 | 219.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 5.70 | 219.80 | 225.50 | Limestone, shaley, layered | | ak, cs, es | y | 5.70 |
| 3.70 | 225.50 | 229.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 229.20 | 229.95 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 2.35 | 229.95 | 232.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.75 | 232.30 | 236.05 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.70 | 236.05 | 236.75 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.07 | 236.75 | 236.82 | Pyrite | | ac, cs, es | | 0.00 |
| 0.73 | 236.82 | 237.55 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.70 | 237.55 | 238.25 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.89 | 238.25 | 239.14 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.21 | 239.14 | 239.35 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.49 | 239.35 | 239.84 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.23 | 239.84 | 240.07 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.19 | 240.07 | 241.26 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 11.94 | 241.26 | 253.20 | Claystone, gy | | cv, ev | | 0.00 |
| 2.10 | 253.20 | 255.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 255.30 | 255.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 4.15 | 255.85 | 260.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 260.00 | 263.40 | Sandstone, gy, sh stks | | cs, es | y | 3.40 |
| 2.70 | 263.40 | 266.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 266.10 | 268.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 268.00 | 269.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 269.25 | 271.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 5.20 | 271.60 | 276.80 | Sandstone, gy, sh stks | | cs, es | y | 5.20 |
| 1.30 | 276.80 | 278.10 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 278.10 | 279.15 | Sandstone, gy, sh stks | | cs, es | y | 1.05 |
| 1.35 | 279.15 | 280.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 280.50 | 281.30 | Sandstone, gy, sh stks | | cs, es | y | 0.80 |
| 4.60 | 281.30 | 285.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 285.90 | 287.15 | Shale, gy | | cm, em | | 0.00 |
| 0.21 | 287.15 | 287.36 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.81 | 287.36 | 288.17 | **Coal, bone stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.13 | 288.17 | 288.30 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.22 | 288.30 | 288.52 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.11 | 288.52 | 288.63 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.35 | 288.63 | 288.98 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.35 | 288.98 | 289.33 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 1.65 | 289.33 | 290.98 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.84 | 290.98 | 291.82 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.88 | 291.82 | 292.70 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 292.70 | 292.72 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.14 | 292.72 | 292.86 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 292.86 | 293.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.65 | 293.00 | 293.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 0.85 | 293.65 | 294.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.20 | 294.50 | 295.70 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 0.80 | 295.70 | 296.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 296.50 | 297.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 3.05 | 297.10 | 300.15 | Shale, gy | | cm, em | | 0.00 |
| 2.00 | 300.15 | 302.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 302.15 | 304.05 | Sandstone, gy, massive | | cs, es | y | 1.90 |
| 7.35 | 304.05 | 311.40 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 311.40 | 312.30 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-23

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 5.70 | 312.30 | 318.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.50 | 318.00 | 322.50 | Sandstone, gy, sh stks | | cs, es | y | 4.50 |
| 2.30 | 322.50 | 324.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.80 | 324.80 | 326.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 326.60 | 327.65 | Limestone, shaley, layered | | ak, cs, es | y | 1.05 |
| 0.25 | 327.65 | 327.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 327.90 | 328.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 328.45 | 329.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.15 | 329.60 | 329.75 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 329.75 | 330.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.08 | 330.80 | 330.88 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.22 | 330.88 | 331.10 | **Coal, sh stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.94 | 331.10 | 332.04 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.32 | 332.04 | 332.36 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 332.36 | 332.64 | Shale, dk gy | | cm, em | | 0.00 |
| 5.06 | 332.64 | 337.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 7.55 | 337.70 | 345.25 | Sandstone, gy, sh stks, coal stks | | cs, es | y | 7.55 |
| 6.05 | 345.25 | 351.30 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 3.40 | 351.30 | 354.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.12 | 354.70 | 354.82 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.06 | 354.82 | 354.88 | **Coal, pyrite, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 1.42 | 354.88 | 356.30 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 356.30 | 356.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 356.80 | 359.40 | Limestone, nodular | | ak, cs, es | y | 2.60 |
| 3.75 | 359.40 | 363.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 363.15 | 364.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 2.05 | 364.05 | 366.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 366.10 | 367.65 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 0.95 | 367.65 | 368.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 368.60 | 369.30 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 1.10 | 369.30 | 370.40 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.10 |
| 2.20 | 370.40 | 372.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 372.60 | 374.30 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 3.80 | 374.30 | 378.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.55 | 378.10 | 380.65 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 0.50 | 380.65 | 381.15 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 2.05 | 381.15 | 383.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.20 | 383.20 | 389.40 | Shale, grn | | cm, em | | 0.00 |
| 1.45 | 389.40 | 390.85 | Sandstone, gy, sh stks | | cs, es | y | 1.45 |
| 1.15 | 390.85 | 392.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 392.00 | 392.55 | Sandstone, gy, sh stks | | cs, es | y | 0.55 |
| 1.75 | 392.55 | 394.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 394.30 | 395.75 | Shale, red | | cm, em | | 0.00 |
| 0.65 | 395.75 | 396.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 396.40 | 396.80 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 0.85 | 396.80 | 397.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 397.65 | 398.90 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 1.70 | 398.90 | 400.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 400.60 | 401.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 1.90 | 401.85 | 403.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 403.75 | 405.00 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 4.55 | 405.00 | 409.55 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 409.55 | 410.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 9.35 | 410.85 | 420.20 | Limestone, shaley, nodular | | ak, cs, es | y | 9.35 |
| 2.40 | 420.20 | 422.60 | Limestone, massive | | ak, cs, es | y | 2.40 |
| 2.50 | 422.60 | 425.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 425.10 | 425.65 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 3.25 | 425.65 | 428.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 428.90 | 430.75 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 430.75 | 431.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.65 | 431.90 | 436.55 | Core loss | | | | 0.00 |
| 0.45 | 436.55 | 437.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.20 | 437.00 | 441.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 441.20 | 442.75 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 442.75 | 445.50 | Limestone, shaley, nodular | | ak, cs, es | y | 2.75 |
| 3.00 | 445.50 | 448.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 448.50 | 451.30 | Limestone, shaley, nodular | | ak, cs, es | y | 2.80 |
| 2.00 | 451.30 | 453.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-23

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.40 | 453.30 | 455.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 3.25 | 455.70 | 458.95 | Limestone, nodular | | ak, cs, es | y | 3.25 |
| 3.95 | 458.95 | 462.90 | Limestone, shaley, nodular | | ak, cs, es | y | 3.95 |
| 1.55 | 462.90 | 464.45 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 6.95 | 464.45 | 471.40 | Limestone, massive | | ak, cs, es | y | 6.95 |
| 3.05 | 471.40 | 474.45 | Limestone, shaley, layered | | ak, cs, es | y | 3.05 |
| 1.05 | 474.45 | 475.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 475.50 | 476.90 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 1.10 | 476.90 | 478.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 478.00 | 481.00 | Limestone, shaley, nodular | | ak, cs, es | y | 3.00 |
| 4.35 | 481.00 | 485.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 485.35 | 488.50 | Limestone, layered | | ak, cs, es | y | 3.15 |
| 1.20 | 488.50 | 489.70 | Limestone, shaley, massive | | ak, cs, es | y | 1.20 |
| 4.45 | 489.70 | 494.15 | Limestone, shaley, layered | | ak, cs, es | y | 4.45 |
| 2.15 | 494.15 | 496.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 496.30 | 497.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.29 | 497.25 | 497.54 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.28 | 497.54 | 497.82 | **Coal, sh stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.27 | 497.82 | 498.09 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.52 | 498.09 | 498.61 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 2.49 | 498.61 | 501.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.90 | 501.10 | 503.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 11.00 | 503.00 | 514.00 | Limestone, shaley, nodular | | ak, cs, es | y | 11.00 |
| 2.40 | 514.00 | 516.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.35 | 516.40 | 521.75 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.33 | 521.75 | 523.08 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.12 | 523.08 | 524.20 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.51 | 524.20 | 524.71 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 1.57 | 524.71 | 526.28 | Shale, dk gy | | cm, em | | 0.00 |
| 0.94 | 526.28 | 527.22 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.26 | 527.22 | 527.48 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.09 | 527.48 | 527.57 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.26 | 527.57 | 527.83 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 527.83 | 527.87 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.28 | 527.87 | 528.15 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 528.15 | 528.26 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.69 | 528.26 | 528.95 | Shale, dk gy | | cm, em | | 0.00 |
| 4.15 | 528.95 | 533.10 | Limestone, shaley, nodular | | ak, cs, es | y | 4.15 |
| 1.05 | 533.10 | 534.15 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 1.75 | 534.15 | 535.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 1.05 | 535.90 | 536.95 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 0.35 | 536.95 | 537.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.20 | 537.30 | 544.50 | Limestone, nodular | | ak, cs, es | y | 7.20 |
| 4.80 | 544.50 | 549.30 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 6.30 | 549.30 | 555.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 555.60 | 556.85 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 556.85 | 557.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 557.85 | 561.30 | Limestone, nodular | | ak, cs, es | y | 3.45 |
| 2.25 | 561.30 | 563.55 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.68 | 563.55 | 564.23 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.11 | 564.23 | 564.34 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.10 | 564.34 | 564.44 | **Coal, sh stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.20 | 564.44 | 564.64 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.86 | 564.64 | 565.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 565.50 | 565.90 | Sandstone, gy, sh stks | | cs, es | y | 0.40 |
| 0.70 | 565.90 | 566.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.40 | 566.60 | 569.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 569.00 | 570.55 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 0.83 | 570.55 | 571.38 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 571.38 | 572.13 | Limestone, massive | | ak, cs, es | y | 0.75 |
| 0.25 | 572.13 | 572.38 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 572.38 | 572.73 | Limestone, massive | | ak, cs, es | y | 0.35 |
| 1.25 | 572.73 | 573.98 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.60 | 573.98 | 581.58 | Limestone, nodular | | ak, cs, es | y | 7.60 |
| 5.10 | 581.58 | 586.68 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 586.68 | 587.43 | Claystone, gy | | cv, ev | | 0.00 |
| 1.98 | 587.43 | 589.41 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.52 | 589.41 | 589.93 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-23

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.02 | 589.93 | 589.95 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.15 | 589.95 | 590.10 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 590.10 | 590.25 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.86 | 590.25 | 591.11 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.27 | 591.11 | 591.38 | **Coal, pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 1.66 | 591.38 | 593.04 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.98 | 593.04 | 595.02 | **Coal, broken** | | ac, cv, ev | | 0.00 |
| 1.02 | 595.02 | 596.04 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.24 | 596.04 | 596.28 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.07 | 596.28 | 596.35 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.95 | 596.35 | 597.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 597.30 | 597.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 597.70 | 597.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.20 |
| 0.85 | 597.90 | 598.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 598.75 | 599.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 2.00 | 599.50 | 601.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.65 | 601.50 | 604.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 604.15 | 606.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 403.75 | | | | | 101.90 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **101.90**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **25%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 101.90 | 25% |
| Soft Rock: | 301.85 | 75% |
| | 403.75 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 184.96 | 1.57 | 1.20 | 49.16 | -136.05 |
| Coal | | | | | |
| Bottom, 10 ft. | 40.37 | 2.11 | 1.90 | 65.90 | 25.55 |



AEC 03439

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-27

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1315
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 690320
**Easting:** 2430440
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 19.00 | 0.00 | 19.00 | Casing | | | | 0.00 |
| 1.20 | 19.00 | 20.20 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 1.95 | 20.20 | 22.15 | Claystone, dk gy, ls nods | Y | ak, cv, ev | | 0.00 |
| 0.65 | 22.15 | 22.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 5.75 | 22.80 | 28.55 | Claystone, gy | Y | cv, ev | | 0.00 |
| 1.10 | 28.55 | 29.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 0.40 | 29.65 | 30.05 | Claystone, gy | | cv, ev | | 0.00 |
| 2.30 | 30.05 | 32.35 | Claystone, dk gy | Y | cv, ev | | 0.00 |
| 2.30 | 32.35 | 34.65 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 34.65 | 35.75 | Sandstone, gy, sh stks | | cs, es | y | 1.10 |
| 0.50 | 35.75 | 36.25 | Claystone, gy, sandy | | cv, ev | | 0.00 |
| 0.75 | 36.25 | 37.00 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 2.65 | 37.00 | 39.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 39.65 | 42.35 | Shale, gy | | cm, em | | 0.00 |
| 1.05 | 42.35 | 43.40 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.35 | 43.40 | 43.75 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.00 | 43.75 | 48.75 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 48.75 | 49.55 | Sandstone, gy, sh stks | | cs, es | y | 0.80 |
| 7.80 | 49.55 | 57.35 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.45 | 57.35 | 60.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 60.80 | 61.20 | Shale, blk/ tan | | ac, cm, em | | 0.00 |
| 0.25 | 61.20 | 61.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 61.45 | 61.75 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.35 | 61.75 | 62.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 62.10 | 62.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 2.10 | 62.35 | 64.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 64.45 | 65.25 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 2.30 | 65.25 | 67.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 10.00 | 67.55 | 77.55 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 77.55 | 81.25 | Shale, dk gy | | cm, em | | 0.00 |
| 1.60 | 81.25 | 82.85 | Shale, gy | | cm, em | | 0.00 |
| 1.75 | 82.85 | 84.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 7.55 | 84.60 | 92.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 11.70 | 92.15 | 103.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 103.85 | 107.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 107.30 | 108.85 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.95 | 108.85 | 110.80 | Sandstone, gy, sh stks | | cs, es | y | 1.95 |
| 6.85 | 110.80 | 117.65 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 117.65 | 118.95 | Shale, gy | | cm, em | | 0.00 |
| 3.60 | 118.95 | 122.55 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.00 | 122.55 | 123.55 | Claystone, red | | cv, ev | | 0.00 |
| 0.90 | 123.55 | 124.45 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.30 | 124.45 | 128.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.90 | 128.75 | 129.65 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.30 | 129.65 | 130.95 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 130.95 | 131.45 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 5.50 | 131.45 | 136.95 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 0.95 | 136.95 | 137.90 | Shale, red | | cm, em | | 0.00 |
| 14.55 | 137.90 | 152.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 152.45 | 154.25 | Sandstone, gy, sh stks | | cs, es | y | 1.80 |
| 1.40 | 154.25 | 155.65 | Shale, dk gy | | cm, em | | 0.00 |
| 0.11 | 155.65 | 155.76 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.13 | 155.76 | 155.89 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 3.66 | 155.89 | 159.55 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.50 | 159.55 | 161.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 2.10 | 161.05 | 163.15 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.90 | 163.15 | 165.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 165.05 | 168.45 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.50 | 168.45 | 168.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 18.70 | 168.95 | 187.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.65 | 187.65 | 193.30 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.85 | 193.30 | 197.15 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 197.15 | 198.85 | Claystone, gy | | cv, ev | | 0.00 |
| 3.10 | 198.85 | 201.95 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.35 | 201.95 | 204.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 204.30 | 206.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 206.80 | 207.75 | Shale, red/ gy | | cm, em | | 0.00 |
| 2.25 | 207.75 | 210.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.45 | 210.00 | 217.45 | Shale, red/ gy | | cm, em | | 0.00 |
| 2.90 | 217.45 | 220.35 | Shale, dk gy | | cm, em | | 0.00 |
| 3.10 | 220.35 | 223.45 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.55 | 223.45 | 224.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.65 | 224.00 | 224.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 2.10 | 224.65 | 226.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 226.75 | 228.45 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 1.20 | 228.45 | 229.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 21.90 | 229.65 | 251.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.00 | 251.55 | 258.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 258.55 | 260.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 260.70 | 261.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 2.05 | 261.00 | 263.05 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 263.05 | 264.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 0.65 | 264.05 | 264.70 | Shale, dk gy, ls layers | | ak, cm, em | | 0.00 |
| 1.05 | 264.70 | 265.75 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 1.50 | 265.75 | 267.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.20 | 267.25 | 273.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 273.45 | 275.65 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.47 | 275.65 | 278.12 | Shale, dk gy | | cm, em | | 0.00 |
| 0.41 | 278.12 | 278.53 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.15 | 278.53 | 278.68 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.11 | 278.68 | 278.79 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 2.23 | 278.79 | 281.02 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.41 | 281.02 | 281.43 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.06 | 281.43 | 281.49 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.64 | 281.49 | 282.13 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.41 | 282.13 | 282.54 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.48 | 282.54 | 283.02 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.25 | 283.02 | 284.27 | Shale, dk gy | | cm, em | | 0.00 |
| 7.00 | 284.27 | 291.27 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.95 | 291.27 | 296.22 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.75 | 296.22 | 300.97 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 300.97 | 305.07 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 305.07 | 305.97 | Sandstone, gy, sh stks | | cs, es | y | 0.90 |
| 0.70 | 305.97 | 306.67 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 10.40 | 306.67 | 317.07 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 317.07 | 320.77 | Sandstone, gy, massive | | cs, es | y | 3.70 |
| 12.30 | 320.77 | 333.07 | Sandstone, gy, sh stks | | cs, es | y | 12.30 |
| 4.95 | 333.07 | 338.02 | Sandstone, gy, massive | | cs, es | y | 4.95 |
| 4.75 | 338.02 | 342.77 | Sandstone, gy, sh stks | | cs, es | y | 4.75 |
| 1.55 | 342.77 | 344.32 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 1.55 | 344.32 | 345.87 | Sandstone, gy, sh stks | | cs, es | y | 1.55 |
| 0.43 | 345.87 | 346.30 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.62 | 346.30 | 346.92 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.04 | 346.92 | 347.96 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.51 | 347.96 | 349.47 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 349.47 | 350.57 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 0.90 | 350.57 | 351.47 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 2.70 | 351.47 | 354.17 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 354.17 | 355.77 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 3.80 | 355.77 | 359.57 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 10.00 | 359.57 | 369.57 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 369.57 | 370.77 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 370.77 | 371.77 | Shale, dk gy | | cm, em | | 0.00 |
| 3.20 | 371.77 | 374.97 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.00 | 374.97 | 378.97 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 378.97 | 379.87 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 6.67 | 379.87 | 386.54 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.29 | 386.54 | 386.83 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.66 | 386.83 | 387.49 | **Coal, sh stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.52 | 387.49 | 388.01 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.76 | 388.01 | 388.77 | Shale, gy | | cm, em | | 0.00 |
| 6.30 | 388.77 | 395.07 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 11.47 | 395.07 | 406.54 | Shale, dk gy | | cm, em | | 0.00 |
| 0.23 | 406.54 | 406.77 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.75 | 406.77 | 407.52 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.95 | 407.52 | 408.47 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 408.47 | 411.97 | Limestone, nodular | | ak, cs, es | y | 3.50 |
| 3.50 | 411.97 | 415.47 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 415.47 | 416.17 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.80 | 416.17 | 417.97 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 417.97 | 419.57 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 0.90 | 419.57 | 420.47 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 420.47 | 422.27 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 7.60 | 422.27 | 429.87 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 429.87 | 433.07 | Limestone, nodular | | ak, cs, es | y | 3.20 |
| 7.80 | 433.07 | 440.87 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 440.87 | 443.07 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 443.07 | 444.67 | Sandstone, gy, massive | | cs, es | y | 1.60 |
| 0.70 | 444.67 | 445.37 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 445.37 | 447.07 | Shale, red | | cm, em | | 0.00 |
| 1.80 | 447.07 | 448.87 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 448.87 | 449.87 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 3.60 | 449.87 | 453.47 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 453.47 | 454.67 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 2.30 | 454.67 | 456.97 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 4.10 | 456.97 | 461.07 | Shale, grn, sandy | | cm, em | | 0.00 |
| 2.10 | 461.07 | 463.17 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 1.00 | 463.17 | 464.17 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 0.90 | 464.17 | 465.07 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 3.05 | 465.07 | 468.12 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 468.12 | 469.67 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 1.10 | 469.67 | 470.77 | Limestone, massive | | ak, cs, es | y | 1.10 |
| 1.20 | 470.77 | 471.97 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 1.00 | 471.97 | 472.97 | Limestone, massive | | ak, cs, es | y | 1.00 |
| 4.75 | 472.97 | 477.72 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 477.72 | 478.87 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 5.10 | 478.87 | 483.97 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 483.97 | 484.97 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 1.70 | 484.97 | 486.67 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 486.67 | 488.17 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 1.40 | 488.17 | 489.57 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 489.57 | 490.22 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 0.55 | 490.22 | 490.77 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 490.77 | 491.32 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 10.15 | 491.32 | 501.47 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 501.47 | 502.57 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 0.80 | 502.57 | 503.37 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 7.20 | 503.37 | 510.57 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 510.57 | 512.87 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 2.70 | 512.87 | 515.57 | Limestone, nodular | | ak, cs, es | y | 2.70 |
| 3.40 | 515.57 | 518.97 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 518.97 | 520.12 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.00 | 520.12 | 526.12 | Limestone, massive | | ak, cs, es | y | 6.00 |
| 0.90 | 526.12 | 527.02 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 527.02 | 528.32 | Limestone, layered | | ak, cs, es | y | 1.30 |
| 2.05 | 528.32 | 530.37 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 530.37 | 532.42 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 1.35 | 532.42 | 533.77 | Claystone, grn | | cv, ev | | 0.00 |
| 4.15 | 533.77 | 537.92 | Limestone, shaley, layered | | ak, cs, es | y | 4.15 |
| 0.60 | 537.92 | 538.52 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 538.52 | 541.72 | Limestone, nodular | | ak, cs, es | y | 3.20 |
| 0.55 | 541.72 | 542.27 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.65 | 542.27 | 543.92 | Limestone, massive | | ak, cs, es | y | 1.65 |
| 1.40 | 543.92 | 545.32 | Limestone, shaley, layered | | ak, cs, es | y | 1.40 |
| 2.80 | 545.32 | 548.12 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 548.12 | 548.57 | Limestone, nodular | | ak, cs, es | y | 0.45 |
| 1.68 | 548.57 | 550.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.58 | 550.25 | 550.83 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.19 | 550.83 | 551.02 | Shale, dk gy | | cm, em | | 0.00 |
| 0.78 | 551.02 | 551.80 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.09 | 551.80 | 551.89 | **Limestone, shaley** | | ak, cs, es | y | 0.09 |
| 0.48 | 551.89 | 552.37 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 1.15 | 552.37 | 553.52 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.10 | 553.52 | 555.62 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.25 | 555.62 | 556.87 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 5.75 | 556.87 | 562.62 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 562.62 | 564.12 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 564.12 | 565.62 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.35 | 565.62 | 568.97 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 568.97 | 570.42 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 570.42 | 574.02 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.55 | 574.02 | 575.57 | Shale, dk gy | | cm, em | | 0.00 |
| 2.45 | 575.57 | 578.02 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.75 | 578.02 | 579.77 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.91 | 579.77 | 580.68 | Sandstone, gy, coal spars | | cs, es | y | 0.91 |
| 1.03 | 580.68 | 581.71 | Shale, dk gy | | cm, em | | 0.00 |
| 0.83 | 581.71 | 582.54 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.33 | 582.54 | 582.87 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.39 | 582.87 | 583.26 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 583.26 | 583.38 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.24 | 583.38 | 583.62 | Shale, dk gy | | cm, em | | 0.00 |
| 0.75 | 583.62 | 584.37 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 584.37 | 585.72 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 1.00 | 585.72 | 586.72 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 586.72 | 589.82 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 4.00 | 589.82 | 593.82 | Limestone, nodular | | ak, cs, es | y | 4.00 |
| 3.20 | 593.82 | 597.02 | Limestone, shaley, nodular | | ak, cs, es | y | 3.20 |
| 2.65 | 597.02 | 599.67 | Limestone, massive | | ak, cs, es | y | 2.65 |
| 1.55 | 599.67 | 601.22 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 0.80 | 601.22 | 602.02 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 602.02 | 603.42 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 1.35 | 603.42 | 604.77 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 604.77 | 607.62 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 607.62 | 609.52 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 609.52 | 612.37 | Shale, dk gy | | cm, em | | 0.00 |
| 1.60 | 612.37 | 613.97 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 613.97 | 615.52 | Limestone, massive | | ak, cs, es | y | 1.55 |
| 1.25 | 615.52 | 616.77 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 616.77 | 617.82 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 0.95 | 617.82 | 618.77 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 618.77 | 620.92 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 620.92 | 621.57 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.28 | 621.57 | 621.85 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.22 | 621.85 | 622.07 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.75 | 622.07 | 622.82 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 622.82 | 623.42 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 623.42 | 623.92 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 623.92 | 624.87 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 0.45 | 624.87 | 625.32 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.23 | 625.32 | 627.55 | Limestone, shaley, nodular | | ak, cs, es | y | 2.23 |
| 6.35 | 627.55 | 633.90 | Limestone, nodular | | ak, cs, es | y | 6.35 |
| 0.05 | 633.90 | 633.95 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 633.95 | 635.30 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 0.30 | 635.30 | 635.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.45 | 635.60 | 638.05 | Limestone, nodular | | ak, cs, es | y | 2.45 |
| 5.85 | 638.05 | 643.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 643.90 | 644.60 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 0.25 | 644.60 | 644.85 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.25 | 644.85 | 645.10 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 645.10 | 645.30 | Shale, blk | | ac, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-27

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.44 | 645.30 | 645.74 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.09 | 645.74 | 645.83 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.52 | 645.83 | 646.35 | Coal, pyrite, PITTSBURGH No. 8 ROOF COAL | | ac, cv, ev | | 0.00 |
| 0.02 | 646.35 | 646.37 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.15 | 646.37 | 646.52 | Coal, bone stks | | ac, cv, ev | | 0.00 |
| 0.15 | 646.52 | 646.67 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.31 | 646.67 | 646.98 | Shale, dk gy | | cm, em | | 0.00 |
| 0.48 | 646.98 | 647.46 | Claystone, gy | | cv, ev | | 0.00 |
| 0.08 | 647.46 | 647.54 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.58 | 647.54 | 648.12 | Coal, bone stks, PITTSBURGH No. 8 | | ac, cv, ev | | 0.00 |
| 1.49 | 648.12 | 649.61 | Coal | | ac, cv, ev | | 0.00 |
| 0.02 | 649.61 | 649.63 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.56 | 649.63 | 650.19 | Coal | | ac, cv, ev | | 0.00 |
| 0.03 | 650.19 | 650.22 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.98 | 650.22 | 651.20 | Coal | | ac, cv, ev | | 0.00 |
| 0.02 | 651.20 | 651.22 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.73 | 651.22 | 652.95 | Coal | | ac, cv, ev | | 0.00 |
| 1.35 | 652.95 | 654.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.20 | 654.30 | 656.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 656.50 | 656.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 1.50 | 656.80 | 658.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.10 | 658.30 | 662.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 662.40 | 662.70 | Sandstone, gy, sh stks | | cs, es | y | 0.30 |
| 0.20 | 662.70 | 662.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 662.90 | 665.60 | Sandstone, gy, calc. cemented | | ak, cs, es | y | 2.70 |
| | Total Depth | 665.60 | | | | | 143.08 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** 143.08

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** 21%

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 143.08 | 21% |
| Soft Rock: | 522.52 | 79% |
| | 665.60 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 220.62 | 1.27 | 0.95 | 39.54 | -181.28 |
| Coal Bottom, 10 ft. | 210.75 | 2.46 | 2.34 | 76.70 | -133.85 |

ATTACHMENT 13

# DIAMOND DRILL HOLE: CLC-2002-30

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1260
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 691190
**Easting:** 2436130
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing | | | | 0.00 |
| 12.40 | 16.00 | 28.40 | Claystone, gy | Y | cv, ev | | 0.00 |
| 1.45 | 28.40 | 29.85 | Shale, gy, ss stks | Y | cm, em | | 0.00 |
| 0.20 | 29.85 | 30.05 | Limestone, shaley | Y | ak, cs, es | y | 0.20 |
| 0.35 | 30.05 | 30.40 | Claystone, gy | Y | cv, ev | | 0.00 |
| 0.25 | 30.40 | 30.65 | Limestone, shaley, massive | Y | ak, cs, es | y | 0.25 |
| 9.45 | 30.65 | 40.10 | Shale, gy | Y | cm, em | | 0.00 |
| 0.85 | 40.10 | 40.95 | Claystone, red | Y | cv, ev | | 0.00 |
| 1.80 | 40.95 | 42.75 | Claystone, gy | | cv, ev | | 0.00 |
| 0.75 | 42.75 | 43.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.35 | 43.50 | 45.85 | Claystone, gy | | cv, ev | | 0.00 |
| 1.20 | 45.85 | 47.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 47.05 | 48.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 48.20 | 48.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 48.40 | 49.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 49.75 | 50.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 50.25 | 52.95 | Limestone, shaley, massive | | ak, cs, es | y | 2.70 |
| 3.05 | 52.95 | 56.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.50 | 56.00 | 60.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.65 | 60.50 | 64.15 | Sandstone, gy, sh stks | | cs, es | y | 3.65 |
| 1.20 | 64.15 | 65.35 | Sandstone, gy, crossbeds | | cs, es | y | 1.20 |
| 0.15 | 65.35 | 65.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 5.80 | 65.50 | 71.30 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.20 | 71.30 | 72.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 72.50 | 75.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 75.90 | 77.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 77.05 | 79.40 | Sandstone, gy, sh stks | | cs, es | y | 2.35 |
| 6.55 | 79.40 | 85.95 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 85.95 | 86.35 | Claystone, red | | cv, ev | | 0.00 |
| 2.05 | 86.35 | 88.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.50 | 88.40 | 89.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.55 | 89.90 | 90.45 | Claystone, gy | | cv, ev | | 0.00 |
| 4.55 | 90.45 | 95.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.15 | 95.00 | 96.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 96.15 | 96.85 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 7.00 | 96.85 | 103.85 | Sandstone, gy, sh stks | | cs, es | y | 7.00 |
| 13.05 | 103.85 | 116.90 | Sandstone, gy, crossbeds | | cs, es | y | 13.05 |
| 1.80 | 116.90 | 118.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 118.70 | 118.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.50 | 118.90 | 119.40 | Claystone, red | | cv, ev | | 0.00 |
| 8.35 | 119.40 | 127.75 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.15 | 127.75 | 130.90 | Claystone, red | | cv, ev | | 0.00 |
| 5.10 | 130.90 | 136.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 136.00 | 137.90 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 137.90 | 138.15 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.10 | 138.15 | 139.25 | Claystone, gy | | cv, ev | | 0.00 |
| 5.35 | 139.25 | 144.60 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 5.50 | 144.60 | 150.10 | Claystone, red | | cv, ev | | 0.00 |
| 3.05 | 150.10 | 153.15 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 153.15 | 155.25 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.05 | 155.25 | 159.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 6.80 | 159.30 | 166.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 166.10 | 166.95 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.25 | 166.95 | 168.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 168.20 | 169.70 | Claystone, red | | cv, ev | | 0.00 |
| 2.10 | 169.70 | 171.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.50 | 171.80 | 175.30 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.30 | 175.30 | 179.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.30 | 179.60 | 181.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.10 | 181.90 | 185.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 185.00 | 188.10 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 1.05 | 188.10 | 189.15 | Claystone, gy | | cv, ev | | 0.00 |
| 1.30 | 189.15 | 190.45 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.55 | 190.45 | 192.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.80 | 192.00 | 194.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 10.25 | 194.80 | 205.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 205.05 | 205.25 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 205.25 | 205.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 205.95 | 210.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.85 | 210.30 | 213.15 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.00 | 213.15 | 214.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.15 | 214.15 | 216.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.75 | 216.30 | 222.05 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 222.05 | 222.35 | Shale, dk gy, ls layers | | cm, em | | 0.00 |
| 0.40 | 222.35 | 222.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 0.50 | 222.75 | 223.25 | Claystone, gy | | cv, ev | | 0.00 |
| 1.35 | 223.25 | 224.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.44 | 224.60 | 225.04 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.19 | 225.04 | 225.23 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.92 | 225.23 | 226.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.92 |
| 1.10 | 226.15 | 227.25 | Claystone, dk gy, ls nods | | cm, em | | 0.00 |
| 0.50 | 227.25 | 227.75 | Shale, dk gy | | cm, em | | 0.00 |
| 7.30 | 227.75 | 235.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 235.05 | 236.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 236.30 | 236.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.58 | 236.40 | 236.98 | **Coal, pyrite, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.73 | 236.98 | 237.71 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.56 | 237.71 | 238.27 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.75 | 238.27 | 239.02 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 239.02 | 239.22 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.97 | 239.22 | 240.19 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.38 | 240.19 | 240.57 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.40 | 240.57 | 240.97 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.53 | 240.97 | 241.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 6.50 | 241.50 | 248.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.50 | 248.00 | 254.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 254.50 | 257.60 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 3.10 |
| 6.85 | 257.60 | 264.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 264.45 | 266.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 266.00 | 268.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 268.90 | 271.75 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 6.65 | 271.75 | 278.40 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 278.40 | 279.95 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.40 | 279.95 | 284.35 | Sandstone, gy, sh stks | | cs, es | y | 4.40 |
| 6.65 | 284.35 | 291.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.78 | 291.00 | 295.78 | Shale, dk gy | | cm, em | | 0.00 |
| 0.74 | 295.78 | 296.52 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.51 | 296.52 | 297.03 | **Coal, pyrite, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 1.23 | 297.03 | 298.26 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.41 | 298.26 | 298.67 | **Coal, bone layers** | | ac, cv, ev | | 0.00 |
| 0.96 | 298.67 | 299.63 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 299.63 | 299.93 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.52 | 299.93 | 300.45 | Shale, dk gy | | cm, em | | 0.00 |
| 5.05 | 300.45 | 305.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 305.50 | 306.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 7.05 | 306.75 | 313.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 313.80 | 315.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.45 | 315.10 | 319.55 | Sandstone, gy, sh stks | | cs, es | y | 4.45 |
| 1.65 | 319.55 | 321.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.80 | 321.20 | 324.00 | Shale, gy | | cm, em | | 0.00 |
| 2.95 | 324.00 | 326.95 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 326.95 | 328.20 | Limestone, shaley, layered | | ak, cs, es | y | 1.25 |
| 7.30 | 328.20 | 335.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.65 | 335.50 | 343.15 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.55 | 343.15 | 343.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.54 | 343.70 | 345.24 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.45 | 345.24 | 345.69 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.41 | 345.69 | 346.10 | **Coal, pyrite, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.12 | 346.10 | 346.22 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.68 | 346.22 | 347.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.80 | 347.90 | 349.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 349.70 | 350.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 350.90 | 352.20 | Sandstone, gy, sh stks | | cs, es | y | 1.30 |
| 0.65 | 352.20 | 352.85 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.70 | 352.85 | 356.55 | Sandstone, gy, crossbeds | | cs, es | y | 3.70 |
| 1.55 | 356.55 | 358.10 | Shale, gy | | cm, em | | 0.00 |
| 4.90 | 358.10 | 363.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.76 | 363.00 | 365.76 | Shale, dk gy | | cm, em | | 0.00 |
| 0.06 | 365.76 | 365.82 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 365.82 | 366.02 | **Coal, bone stks, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 0.28 | 366.02 | 366.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.50 | 366.30 | 369.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.50 |
| 2.05 | 369.80 | 371.85 | Limestone, nodular | | ak, cs, es | y | 2.05 |
| 2.80 | 371.85 | 374.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 374.65 | 375.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 375.70 | 376.50 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 1.70 | 376.50 | 378.20 | Shale, dk gy | | cm, em | | 0.00 |
| 1.65 | 378.20 | 379.85 | Limestone, nodular | | ak, cs, es | y | 1.65 |
| 5.45 | 379.85 | 385.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 385.30 | 386.75 | Limestone, nodular | | ak, cs, es | y | 1.45 |
| 3.45 | 386.75 | 390.20 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 390.20 | 392.70 | Limestone, layered | | ak, cs, es | y | 2.50 |
| 0.85 | 392.70 | 393.55 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 393.55 | 394.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 394.05 | 394.65 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 2.55 | 394.65 | 397.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 397.20 | 399.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.65 | 399.10 | 400.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 400.75 | 401.40 | Sandstone, gy, massive | | cs, es | y | 0.65 |
| 1.45 | 401.40 | 402.85 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 2.05 | 402.85 | 404.90 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 404.90 | 406.35 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.40 | 406.35 | 406.75 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 406.75 | 407.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 0.65 | 407.25 | 407.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 407.90 | 409.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.35 |
| 1.05 | 409.25 | 410.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 410.30 | 411.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 2.15 | 411.10 | 413.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 413.25 | 414.05 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 1.90 | 414.05 | 415.95 | Claystone, grn | | cv, ev | | 0.00 |
| 1.05 | 415.95 | 417.00 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 4.85 | 417.00 | 421.85 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 421.85 | 423.00 | Limestone, massive | | ak, cs, es | y | 1.15 |
| 1.15 | 423.00 | 424.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 424.15 | 424.80 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 1.85 | 424.80 | 426.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 426.65 | 429.85 | Limestone, shaley, nodular | | ak, cs, es | y | 3.20 |
| 0.70 | 429.85 | 430.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 430.55 | 432.40 | Limestone, massive | | ak, cs, es | y | 1.85 |
| 1.80 | 432.40 | 434.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 434.20 | 434.95 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 1.95 | 434.95 | 436.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 436.90 | 438.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.90 |
| 3.90 | 438.80 | 442.70 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 442.70 | 443.25 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 3.55 | 443.25 | 446.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.55 | 446.80 | 451.35 | Limestone, shaley, nodular | | ak, cs, es | y | 4.55 |
| 3.95 | 451.35 | 455.30 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 455.30 | 457.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.75 |
| 2.50 | 457.05 | 459.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.95 | 459.55 | 465.50 | Limestone, shaley, nodular | | ak, cs, es | y | 5.95 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.20 | 465.50 | 466.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 466.70 | 469.30 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 469.30 | 471.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.65 | 471.05 | 476.70 | Limestone, nodular | | ak, cs, es | y | 5.65 |
| 4.10 | 476.70 | 480.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 480.80 | 483.40 | Limestone, nodular | | ak, cs, es | y | 2.60 |
| 1.20 | 483.40 | 484.60 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.65 | 484.60 | 490.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 490.25 | 493.75 | Limestone, shaley, nodular | | ak, cs, es | y | 3.50 |
| 5.55 | 493.75 | 499.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 499.30 | 501.45 | Limestone, massive | | ak, cs, es | y | 2.15 |
| 2.95 | 501.45 | 504.40 | Limestone, shaley, layered | | ak, cs, es | y | 2.95 |
| 3.20 | 504.40 | 507.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.97 | 507.60 | 510.57 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.15 | 510.57 | 510.72 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.02 | 510.72 | 510.74 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.45 | 510.74 | 511.19 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.18 | 511.19 | 511.37 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.21 | 511.37 | 511.58 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 511.58 | 511.70 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.07 | 511.70 | 511.77 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.19 | 511.77 | 511.96 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 511.96 | 512.04 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.21 | 512.04 | 513.25 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.09 | 513.25 | 513.34 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 513.34 | 513.38 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.27 | 513.38 | 514.65 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 514.65 | 515.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.80 | 515.70 | 516.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.90 | 516.50 | 519.40 | Limestone, nodular | | ak, cs, es | y | 2.90 |
| 8.50 | 519.40 | 527.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 527.90 | 529.40 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 529.40 | 531.00 | Sandstone, gy, sh stks, calcite cemented | | ak, cs, es | y | 1.60 |
| 2.60 | 531.00 | 533.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 533.60 | 534.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.00 | 534.10 | 535.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.10 | 535.10 | 537.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.08 | 537.20 | 537.28 | **Coal, bone stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.21 | 537.28 | 537.49 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.70 | 537.49 | 538.19 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.17 | 538.19 | 538.36 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.44 | 538.36 | 538.80 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 538.80 | 538.95 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.08 | 538.95 | 539.03 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.07 | 539.03 | 539.10 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.60 | 539.10 | 539.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 539.70 | 540.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 540.40 | 544.10 | Limestone, shaley, layered | | ak, cs, es | y | 3.70 |
| 1.35 | 544.10 | 545.45 | Limestone, mosaic | | ak, cs, es | y | 1.35 |
| 3.35 | 545.45 | 548.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.35 |
| 1.60 | 548.80 | 550.40 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 2.60 | 550.40 | 553.00 | Limestone, shaley, layered | | ak, cs, es | y | 2.60 |
| 1.10 | 553.00 | 554.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 554.10 | 556.50 | Limestone, massive | | ak, cs, es | y | 2.40 |
| 2.10 | 556.50 | 558.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 0.70 | 558.60 | 559.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 559.30 | 559.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 4.90 | 559.90 | 564.80 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 564.80 | 566.85 | Sandstone, gy, sh stks | | cs, es | y | 2.05 |
| 2.45 | 566.85 | 569.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 569.30 | 570.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 570.60 | 572.45 | Limestone, massive | | ak, cs, es | y | 1.85 |
| 1.55 | 572.45 | 574.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 1.10 | 574.00 | 575.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 575.10 | 576.30 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 2.40 | 576.30 | 578.70 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.15 | 578.70 | 578.85 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 0.26 | 578.85 | 579.11 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.46 | 579.11 | 579.57 | **Coal, sh stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.11 | 579.57 | 579.68 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.82 | 579.68 | 581.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 581.50 | 584.95 | Limestone, shaley, nodular | | ak, cs, es | y | 3.45 |
| 0.45 | 584.95 | 585.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 585.40 | 589.40 | Limestone, nodular | | ak, cs, es | y | 4.00 |
| 0.25 | 589.40 | 589.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 589.65 | 591.40 | Limestone, massive | | ak, cs, es | y | 0.25 |
| 0.40 | 591.40 | 591.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.55 | 591.80 | 594.35 | Limestone, massive | | ak, cs, es | y | 0.40 |
| 3.70 | 594.35 | 598.05 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.50 | 598.05 | 599.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 599.55 | 601.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 601.20 | 602.30 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 602.30 | 602.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.06 | 602.80 | 602.86 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.82 | 602.86 | 603.68 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.65 | 603.68 | 604.33 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 0.31 | 604.33 | 604.64 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.05 | 604.64 | 604.69 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.17 | 604.69 | 604.86 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.32 | 604.86 | 605.18 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.14 | 605.18 | 605.32 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.62 | 605.32 | 605.94 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 0.23 | 605.94 | 606.17 | **Bone, coal layers, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.33 | 606.17 | 606.50 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 2.22 | 606.50 | 608.72 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 608.72 | 608.75 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.49 | 608.75 | 609.24 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 609.24 | 609.26 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 1.02 | 609.26 | 610.28 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 610.28 | 610.31 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.04 | 610.31 | 611.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 611.35 | 611.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 611.50 | 612.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.60 | 612.10 | 615.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.25 | 615.70 | 619.95 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 619.95 | 620.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.80 | 620.40 | 621.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 621.20 | 622.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 622.40 | 623.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 623.30 | 623.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.75 | 623.75 | 624.50 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 1.10 | 624.50 | 625.60 | Sandstone, gy, sh stks | | cs, es | y | 1.10 |
| | Total Depth | 625.60 | | | | | 148.97 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **148.97**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **24%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 148.97 | 24% |
| Soft Rock: | 476.63 | 76% |
| | 625.60 | |



AEC 03449

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-30

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 159.69 | 1.68 | 1.46 | 52.57 | -107.25 |
| Coal | | | | | |
| Bottom, 10 ft. | 325.50 | 1.95 | 1.77 | 60.95 | -264.50 |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-31**

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1310
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 672560
**Easting:** 2426700
**Drilling Company:** L J Hughes & Sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 5.20 | 25.00 | 30.20 | Shale, dk gy | Yes | cm, em | | 0.00 |
| 5.60 | 30.20 | 35.80 | Shale, gy, ls nods | Yes | ak, cm, em | | 0.00 |
| 2.40 | 35.80 | 38.20 | Claystone, gy, ls nods | Yes | ak, cv, ev | | 0.00 |
| 0.75 | 38.20 | 38.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 7.05 | 38.95 | 46.00 | Claystone, gy, ls nods | Yes | ak, cv, ev | | 0.00 |
| 10.00 | 46.00 | 56.00 | Core Loss | | | | 0.00 |
| 10.00 | 56.00 | 66.00 | Claystone, red | | cv, ev | | 0.00 |
| 4.20 | 66.00 | 70.20 | Sandstone, gy, sh stks | Yes | cs, es | y | 4.20 |
| 6.20 | 70.20 | 76.40 | Shale, red | | cm, em | | 0.00 |
| 0.85 | 76.40 | 77.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 77.25 | 77.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 3.35 | 77.95 | 81.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 9.10 | 81.30 | 90.40 | Claystone, red | | cv, ev | | 0.00 |
| 9.50 | 90.40 | 99.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 99.90 | 104.10 | Shale, red | | cm, em | | 0.00 |
| 1.35 | 104.10 | 105.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 105.45 | 106.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 106.50 | 111.40 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 111.40 | 115.75 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.85 | 115.75 | 120.60 | Shale, red | | cm, em | | 0.00 |
| 2.00 | 120.60 | 122.60 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.20 | 122.60 | 123.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 123.80 | 127.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 7.85 | 127.50 | 135.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 8.15 | 135.35 | 143.50 | Shale, red | | cm, em | | 0.00 |
| 4.10 | 143.50 | 147.60 | Shale, red/ gy, ss stks | | cm, em | | 0.00 |
| 1.60 | 147.60 | 149.20 | Shale, red | | cm, em | | 0.00 |
| 3.00 | 149.20 | 152.20 | Shale, red/ gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 152.20 | 153.50 | Shale, red | | cm, em | | 0.00 |
| 0.60 | 153.50 | 154.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 0.75 | 154.10 | 154.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.95 | 154.85 | 158.80 | Shale, red, ls nods | | ak, cm, em | | 0.00 |
| 6.10 | 158.80 | 164.90 | Shale, red | | cm, em | | 0.00 |
| 2.40 | 164.90 | 167.30 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.20 | 167.30 | 169.50 | Sandstone, gy, sh stks | | cs, es | y | 2.20 |
| 0.90 | 169.50 | 170.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.00 | 170.40 | 171.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.60 | 171.40 | 173.00 | Claystone, red | | cv, ev | | 0.00 |
| 1.25 | 173.00 | 174.25 | Shale, red/ gy | | cm, em | | 0.00 |
| 5.25 | 174.25 | 179.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.95 | 179.50 | 182.45 | Shale, red/ gy, ss stks | | cm, em | | 0.00 |
| 0.85 | 182.45 | 183.30 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.95 | 183.30 | 185.25 | Shale, red | | cm, em | | 0.00 |
| 2.20 | 185.25 | 187.45 | Shale, red/ gy | | cm, em | | 0.00 |
| 2.05 | 187.45 | 189.50 | Shale, red | | cm, em | | 0.00 |
| 2.50 | 189.50 | 192.00 | Shale, red/ gy | | cm, em | | 0.00 |
| 4.50 | 192.00 | 196.50 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 13.70 | 196.50 | 210.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 210.20 | 212.80 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 212.80 | 215.15 | Shale, red, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 215.15 | 218.60 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 218.60 | 221.30 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 221.30 | 223.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 223.10 | 227.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 227.20 | 229.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.85 | 229.40 | 236.25 | Shale, dk gy, ss stks | | cm, em | | 0.00 |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-31**

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 7.20 | 236.25 | 243.45 | Sandstone, gy, sh stks | | cs, es | y | 7.20 |
| 4.35 | 243.45 | 247.80 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.40 | 247.80 | 249.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 249.20 | 249.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 3.45 | 249.50 | 252.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 252.95 | 256.25 | Limestone, shaley, nodular | | ak, cs, es | y | 3.30 |
| 1.20 | 256.25 | 257.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 257.45 | 258.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.20 | 258.80 | 261.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 261.00 | 261.90 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.10 | 261.90 | 269.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.20 | 269.00 | 274.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.50 | 274.20 | 277.70 | Sandstone, gy, sh stks | | cs, es | y | 3.50 |
| 2.60 | 277.70 | 280.30 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 280.30 | 280.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 3.00 | 280.90 | 283.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 283.90 | 285.50 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 285.50 | 286.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 3.60 | 286.10 | 289.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 289.70 | 291.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.20 |
| 1.50 | 291.90 | 293.40 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 5.35 | 293.40 | 298.75 | Sandstone, gy, sh stks | | cs, es | y | 5.35 |
| 3.85 | 298.75 | 302.60 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 302.60 | 303.05 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.75 | 303.05 | 304.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.68 | 304.80 | 307.48 | Claystone, blk/ tan | | ac, cv, ev | | 0.00 |
| 0.32 | 307.48 | 307.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.00 | 307.80 | 309.80 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.34 | 309.80 | 310.14 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.38 | 310.14 | 311.52 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 2.28 | 311.52 | 313.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 10.40 | 313.80 | 324.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 324.20 | 326.20 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 5.10 | 326.20 | 331.30 | Sandstone, gy, sh stks | | cs, es | y | 5.10 |
| 5.70 | 331.30 | 337.00 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 5.70 |
| 10.90 | 337.00 | 347.90 | Sandstone, gy, sh stks | | cs, es | y | 10.90 |
| 6.40 | 347.90 | 354.30 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 354.30 | 355.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.90 | 355.10 | 357.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.97 | 357.00 | 357.97 | **Coal, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.15 | 357.97 | 358.12 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.25 | 358.12 | 358.37 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.19 | 358.37 | 358.56 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.24 | 358.56 | 358.80 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.38 | 358.80 | 359.18 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.10 | 359.18 | 360.28 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.26 | 360.28 | 360.54 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.28 | 360.54 | 360.82 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.12 | 360.82 | 361.94 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 1.08 | 361.94 | 363.02 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.26 | 363.02 | 363.28 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.19 | 363.28 | 363.47 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.24 | 363.47 | 363.71 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.50 | 363.71 | 364.21 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.23 | 364.21 | 364.44 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.18 | 364.44 | 364.62 | Shale, dk gy | | cm, em | | 0.00 |
| 0.46 | 364.62 | 365.08 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.26 | 365.08 | 365.34 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.96 | 365.34 | 366.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 366.30 | 367.40 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 5.70 | 367.40 | 373.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.90 | 373.10 | 377.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.55 | 377.00 | 384.55 | Sandstone, gy, sh stks | | cs, es | y | 7.55 |
| 0.60 | 384.55 | 385.15 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.85 | 385.15 | 386.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 386.00 | 386.45 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 1.30 | 386.45 | 387.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.55 | 387.75 | 390.30 | Sandstone, gy, sh stks | | cs, es | y | 2.55 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.50 | 390.30 | 390.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 3.00 | 390.80 | 393.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.55 | 393.80 | 398.35 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 398.35 | 400.40 | Shale, dk gy | | cm, em | | 0.00 |
| 3.70 | 400.40 | 404.10 | Limestone, shaley, nodular | | ak, cs, es | y | 3.70 |
| 2.00 | 404.10 | 406.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 406.10 | 406.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 406.60 | 407.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.40 | 407.40 | 407.80 | Shale, dk gy | | cm, em | | 0.00 |
| 1.50 | 407.80 | 409.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.30 | 409.30 | 409.60 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.65 | 409.60 | 410.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 410.25 | 410.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.95 | 410.45 | 412.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.70 | 412.40 | 417.10 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.41 | 417.10 | 417.51 | Shale, dk gy | | cm, em | | 0.00 |
| 0.16 | 417.51 | 417.67 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.23 | 417.67 | 417.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.80 | 417.90 | 418.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.50 | 418.70 | 425.20 | Sandstone, gy, sh stks | | cs, es | y | 6.50 |
| 2.15 | 425.20 | 427.35 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 3.85 | 427.35 | 431.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.41 | 431.20 | 431.61 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.13 | 431.61 | 431.74 | **Coal, sh stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.06 | 431.74 | 431.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 431.80 | 433.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 0.60 | 433.10 | 433.70 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 4.35 | 433.70 | 438.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 438.05 | 438.45 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 2.50 | 438.45 | 440.95 | Limestone, shaley, layered | | ak, cs, es | y | 2.50 |
| 0.85 | 440.95 | 441.80 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.40 | 441.80 | 443.20 | Limestone, shaley, layered | | ak, cs, es | y | 1.40 |
| 0.75 | 443.20 | 443.95 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 1.45 | 443.95 | 445.40 | Limestone, mosaic | | ak, cs, es | y | 1.45 |
| 0.65 | 445.40 | 446.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 2.30 | 446.05 | 448.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.05 | 448.35 | 450.40 | Limestone, nodular | | ak, cs, es | y | 2.05 |
| 6.80 | 450.40 | 457.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 457.20 | 458.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 3.60 | 458.80 | 462.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 462.40 | 463.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 463.20 | 467.40 | Shale, gm, ss stks | | cm, em | | 0.00 |
| 3.95 | 467.40 | 471.35 | Shale, red, gy, ss stks | | cm, em | | 0.00 |
| 6.95 | 471.35 | 478.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 478.30 | 480.70 | Limestone, nodular | | ak, cs, es | y | 2.40 |
| 4.85 | 480.70 | 485.55 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 485.55 | 487.65 | Limestone, shaley, layered | | ak, cs, es | y | 2.10 |
| 2.15 | 487.65 | 489.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.80 | 489.80 | 495.60 | Limestone, layered | | ak, cs, es | y | 5.80 |
| 1.55 | 495.60 | 497.15 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 1.15 | 497.15 | 498.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 498.30 | 499.10 | Limestone, massive | | ak, cs, es | y | 0.80 |
| 2.30 | 499.10 | 501.40 | Limestone, shaley, layered | | ak, cs, es | y | 2.30 |
| 6.55 | 501.40 | 507.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 507.95 | 508.80 | Limestone, layered | | ak, cs, es | y | 0.85 |
| 0.75 | 508.80 | 509.55 | Limestone, massive | | ak, cs, es | y | 0.75 |
| 3.15 | 509.55 | 512.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 512.70 | 515.70 | Limestone, massive | | ak, cs, es | y | 3.00 |
| 2.00 | 515.70 | 517.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.00 |
| 4.90 | 517.70 | 522.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.10 | 522.60 | 527.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 527.70 | 529.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 6.90 | 529.30 | 536.20 | Limestone, shaley, layered | | ak, cs, es | y | 6.90 |
| 1.40 | 536.20 | 537.60 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 1.40 | 537.60 | 539.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 539.00 | 540.40 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 2.80 | 540.40 | 543.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.80 | 543.20 | 548.00 | Limestone, nodular | | ak, cs, es | y | 4.80 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.20 | 548.00 | 550.20 | Limestone, shaley, layered | | ak, cs, es | y | 2.20 |
| 3.10 | 550.20 | 553.30 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 1.20 | 553.30 | 554.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 554.50 | 557.70 | Limestone, nodular | | ak, cs, es | y | 3.20 |
| 4.05 | 557.70 | 561.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.75 | 561.75 | 567.50 | Limestone, nodular | | ak, cs, es | y | 5.75 |
| 4.65 | 567.50 | 572.15 | Limestone, shaley, nodular | | ak, cs, es | y | 4.65 |
| 1.25 | 572.15 | 573.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 573.40 | 574.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.31 | 574.10 | 574.41 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.09 | 574.41 | 575.50 | Shale, dk gy | | cm, em | | 0.00 |
| 6.00 | 575.50 | 581.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 9.40 | 581.50 | 590.90 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.45 | 590.90 | 593.35 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 593.35 | 594.25 | Sandstone, gy, sh stks | | cs, es | y | 0.90 |
| 11.10 | 594.25 | 605.35 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.83 | 605.35 | 606.18 | Sandstone, gy, coal stks | | ac, cs, es | y | 0.83 |
| 0.45 | 606.18 | 606.63 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.95 | 606.63 | 608.58 | Shale, dk gy | | cm, em | | 0.00 |
| 0.32 | 608.58 | 608.90 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.44 | 608.90 | 609.34 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 609.34 | 609.39 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.40 | 609.39 | 609.79 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.22 | 609.79 | 610.01 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.58 | 610.01 | 610.59 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 610.59 | 610.67 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.63 | 610.67 | 611.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 611.30 | 614.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 1.20 | 614.00 | 615.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 615.20 | 617.95 | Limestone, nodular | | ak, cs, es | y | 2.75 |
| 2.25 | 617.95 | 620.20 | Limestone, massive | | ak, cs, es | y | 2.25 |
| 1.80 | 620.20 | 622.00 | Limestone, layered | | ak, cs, es | y | 1.80 |
| 2.80 | 622.00 | 624.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.80 |
| 1.50 | 624.80 | 626.30 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 1.55 | 626.30 | 627.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 627.85 | 630.70 | Limestone, nodular | | ak, cs, es | y | 2.85 |
| 3.40 | 630.70 | 634.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 7.65 | 634.10 | 641.75 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 641.75 | 643.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.45 |
| 1.40 | 643.20 | 644.60 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 1.70 | 644.60 | 646.30 | Limestone, shaley, layered | | ak, cs, es | y | 1.70 |
| 1.45 | 646.30 | 647.75 | Limestone, nodular | | ak, cs, es | y | 1.45 |
| 2.05 | 647.75 | 649.80 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.41 | 649.80 | 650.21 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.59 | 650.21 | 650.80 | **Bone, coal layers, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.80 | 650.80 | 651.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.20 | 651.60 | 652.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.20 |
| 8.80 | 652.80 | 661.60 | Limestone, nodular | | ak, cs, es | y | 8.80 |
| 0.70 | 661.60 | 662.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 662.30 | 664.70 | Limestone, nodular | | ak, cs, es | y | 2.40 |
| 4.30 | 664.70 | 669.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.55 | 669.00 | 672.55 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.13 | 672.55 | 672.68 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.21 | 672.68 | 672.89 | Shale, dk gy | | cm, em | | 0.00 |
| 0.61 | 672.89 | 673.50 | **Coal, sh stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.38 | 673.50 | 673.88 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.20 | 673.88 | 674.08 | **Coal sh stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 674.08 | 674.26 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.39 | 674.26 | 674.65 | **Coal, bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 1.32 | 674.65 | 675.97 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.06 | 675.97 | 676.03 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 2.20 | 676.03 | 678.23 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 678.23 | 678.31 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.92 | 678.31 | 679.23 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 679.23 | 679.26 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.06 | 679.26 | 679.32 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.12 | 679.32 | 679.44 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.43 | 679.44 | 679.87 | Shale, blk | | ac, cm, em | | 0.00 |



AEC 03454

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-31

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.05 | 679.87 | 680.92 | Shale, dk gy | | cm, em | | 0.00 |
| 2.65 | 680.92 | 683.57 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 683.57 | 686.12 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.53 | 686.12 | 688.65 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 688.65 | 689.10 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 689.10 | 690.40 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 690.40 | 694.10 | Sandstone, gy, calcite cemented | | ak, cs, es | Y | 3.70 |
| 8.95 | 694.10 | 703.05 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 703.05 | | | | | 186.13 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **186.13**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **26%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 186.13 | 26% |
| Soft Rock: | 516.92 | 74% |
| | 703.05 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-32

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1230
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 679250
**Easting:** 2423760
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 10.00 | 0.00 | 10.00 | Casing | | | | 0.00 |
| 1.40 | 10.00 | 11.40 | Claystone, gy | Yes | cv, ev | | 0.00 |
| 0.80 | 11.40 | 12.20 | Claystone, red/ gy | Yes | cv, ev | | 0.00 |
| 2.30 | 12.20 | 14.50 | Shale, gy | Yes | cm, em | | 0.00 |
| 1.90 | 14.50 | 16.40 | Claystone, dk gy | Yes | cv, ev | | 0.00 |
| 2.80 | 16.40 | 19.20 | Shale, dk gy, ss stks | Yes | cm, em | | 0.00 |
| 3.80 | 19.20 | 23.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.95 | 23.00 | 23.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 23.95 | 24.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 5.85 | 24.95 | 30.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.25 | 30.80 | 36.05 | Claystone, red | | cv, ev | | 0.00 |
| 1.15 | 36.05 | 37.20 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.05 | 37.20 | 39.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 39.25 | 40.60 | Shale, dk gy, ss stks | Yes | cm, em | | 0.00 |
| 0.80 | 40.60 | 41.40 | Core Loss | | | | 0.00 |
| 2.55 | 41.40 | 43.95 | Shale, dk gy, ss stks | Yes | cm, em | | 0.00 |
| 1.60 | 43.95 | 45.55 | Shale, gy | | cm, em | | 0.00 |
| 2.15 | 45.55 | 47.70 | Shale, red/ gy | | cm, em | | 0.00 |
| 11.90 | 47.70 | 59.60 | Claystone, red | | cv, ev | | 0.00 |
| 1.50 | 59.60 | 61.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.70 | 61.10 | 61.80 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 4.20 | 61.80 | 66.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.45 | 66.00 | 70.45 | Claystone, red | | cv, ev | | 0.00 |
| 0.75 | 70.45 | 71.20 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 71.20 | 72.00 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.10 | 72.00 | 76.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 5.60 | 76.10 | 81.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.60 | 81.70 | 86.30 | Shale, red | | cm, em | | 0.00 |
| 6.05 | 86.30 | 92.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 92.35 | 93.70 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.10 | 93.70 | 96.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 96.80 | 98.60 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 98.60 | 99.30 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 1.20 | 99.30 | 100.50 | Shale, gy | | cm, em | | 0.00 |
| 1.25 | 100.50 | 101.75 | Shale, red/ gy | | cm, em | | 0.00 |
| 10.80 | 101.75 | 112.55 | Shale, red | | cm, em | | 0.00 |
| 0.55 | 112.55 | 113.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.60 | 113.10 | 113.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.95 | 113.70 | 116.65 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.55 | 116.65 | 121.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.50 | 121.20 | 123.70 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 123.70 | 125.50 | Shale, red | | cm, em | | 0.00 |
| 2.30 | 125.50 | 127.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 127.80 | 128.60 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.50 | 128.60 | 130.10 | Shale, dk gy | | cm, em | | 0.00 |
| 2.60 | 130.10 | 132.70 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 132.70 | 134.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.55 | 134.10 | 135.65 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.95 | 135.65 | 139.60 | Shale, red/ gy, ss stks | | cm, em | | 0.00 |
| 1.50 | 139.60 | 141.10 | Shale, dk gy | | cm, em | | 0.00 |
| 2.30 | 141.10 | 143.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 5.70 | 143.40 | 149.10 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 149.10 | 150.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 150.80 | 153.50 | Shale, red | | cm, em | | 0.00 |
| 0.95 | 153.50 | 154.45 | Shale, dk gy | | cm, em | | 0.00 |
| 3.85 | 154.45 | 158.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.10 | 158.30 | 163.40 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.50 | 163.40 | 165.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 165.90 | 166.95 | Shale, red/ gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 7.85 | 166.95 | 174.80 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 174.80 | 177.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 177.95 | 178.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 178.40 | 179.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.19 | 179.00 | 179.19 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 179.19 | 179.39 | Shale, dk gy | | cm, em | | 0.00 |
| 1.41 | 179.39 | 180.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 180.80 | 182.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 0.85 | 182.30 | 183.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 183.15 | 183.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 8.20 | 183.90 | 192.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 192.10 | 192.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.00 | 192.35 | 195.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 195.35 | 195.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.10 | 195.80 | 196.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 196.90 | 197.25 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.64 | 197.25 | 197.89 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.33 | 197.89 | 198.22 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.58 | 198.22 | 199.80 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.27 | 199.80 | 200.07 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.23 | 200.07 | 201.30 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 2.40 | 201.30 | 203.70 | Shale, dk gy | | cm, em | | 0.00 |
| 10.60 | 203.70 | 214.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.00 | 214.30 | 221.30 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 7.40 | 221.30 | 228.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 10.30 | 228.70 | 239.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 239.00 | 239.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.38 | 239.55 | 239.93 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.08 | 239.93 | 240.01 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.04 | 240.01 | 242.05 | Shale, dk gy | | cm, em | | 0.00 |
| 0.39 | 242.05 | 242.44 | Shale, blk | | ac, cm, em | | 0.00 |
| 3.03 | 242.44 | 245.47 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.43 | 245.47 | 245.90 | **Coal, sh stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.33 | 245.90 | 246.23 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.20 | 246.23 | 246.43 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.49 | 246.43 | 246.92 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.13 | 246.92 | 247.05 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.95 | 247.05 | 248.00 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.40 | 248.00 | 248.40 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.52 | 248.40 | 248.92 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.39 | 248.92 | 250.31 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.38 | 250.31 | 250.69 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.51 | 250.69 | 252.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 252.20 | 253.50 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 7.95 | 253.50 | 261.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 261.45 | 263.80 | Sandstone, gy, massive | | cs, es | y | 2.35 |
| 2.00 | 263.80 | 265.80 | Sandstone, gy, sh stks | | cs, es | y | 2.00 |
| 4.70 | 265.80 | 270.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.85 | 270.50 | 276.35 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 276.35 | 280.70 | Shale, dk gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 280.70 | 283.70 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.79 | 283.70 | 284.49 | Shale, dk gy | | cm, em | | 0.00 |
| 2.21 | 284.49 | 286.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.05 | 286.70 | 287.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 287.75 | 288.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 1.60 | 288.30 | 289.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 289.90 | 290.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.60 | 290.60 | 292.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 292.20 | 293.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.65 | 293.05 | 293.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 293.70 | 293.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.27 | 293.95 | 294.22 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.18 | 294.22 | 294.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 8.60 | 294.40 | 303.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 8.40 | 303.00 | 311.40 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.67 | 311.40 | 312.07 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.23 | 312.07 | 312.30 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.31 | 312.30 | 312.61 | **Coal, bone stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 1.69 | 312.61 | 314.30 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.20 | 314.30 | 315.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 315.50 | 317.45 | Limestone, shaley, layered | | ak, cs, es | y | 1.95 |
| 4.65 | 317.45 | 322.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 322.10 | 322.40 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 2.20 | 322.40 | 324.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 324.60 | 325.95 | Limestone, massive | | ak, cs, es | y | 1.35 |
| 1.40 | 325.95 | 327.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 327.35 | 328.00 | Limestone, massive | | ak, cs, es | y | 0.65 |
| 1.10 | 328.00 | 329.10 | Limestone, mosaic | | ak, cs, es | y | 1.10 |
| 2.60 | 329.10 | 331.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.85 | 331.70 | 333.55 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 6.75 | 333.55 | 340.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 340.30 | 341.55 | Limestone, massive | | ak, cs, es | y | 1.25 |
| 1.80 | 341.55 | 343.35 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 2.60 | 343.35 | 345.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 345.95 | 349.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 349.45 | 349.75 | Sandstone, gy, sh stks | | cs, es | y | 0.30 |
| 1.45 | 349.75 | 351.20 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 351.20 | 353.35 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.95 | 353.35 | 354.30 | Claystone, gy | | cv, ev | | 0.00 |
| 1.20 | 354.30 | 355.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 355.50 | 356.10 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 4.90 | 356.10 | 361.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 361.00 | 361.85 | Limestone, massive | | ak, cs, es | y | 0.85 |
| 1.70 | 361.85 | 363.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 363.55 | 364.30 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 1.30 | 364.30 | 365.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.40 | 365.60 | 368.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 368.00 | 368.95 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 1.10 | 368.95 | 370.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 370.05 | 371.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 1.05 | 371.60 | 372.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 372.65 | 373.30 | Limestone, nodular | | ak, cs, es | y | 0.65 |
| 4.30 | 373.30 | 377.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 377.60 | 378.20 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 0.60 | 378.20 | 378.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 378.80 | 380.20 | Limestone, massive | | ak, cs, es | y | 1.40 |
| 2.75 | 380.20 | 382.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 382.95 | 383.35 | Limestone, massive | | ak, cs, es | y | 0.40 |
| 11.75 | 383.35 | 395.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 395.10 | 397.50 | Limestone, massive | | ak, cs, es | y | 2.40 |
| 2.90 | 397.50 | 400.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 400.40 | 404.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 404.20 | 404.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 404.85 | 405.65 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.90 | 405.65 | 406.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 406.55 | 407.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 2.15 | 407.10 | 409.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 409.25 | 410.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 2.55 | 410.50 | 413.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.10 | 413.05 | 420.15 | Limestone, shaley, nodular | | ak, cs, es | y | 7.10 |
| 0.60 | 420.15 | 420.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 420.75 | 422.25 | Limestone, massive | | ak, cs, es | y | 1.50 |
| 1.15 | 422.25 | 423.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.50 | 423.40 | 428.90 | Limestone, massive | | ak, cs, es | y | 5.50 |
| 0.75 | 428.90 | 429.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 429.65 | 431.05 | Limestone, layered | | ak, cs, es | y | 1.40 |
| 3.50 | 431.05 | 434.55 | Limestone, shaley, nodular | | ak, cs, es | y | 3.50 |
| 1.55 | 434.55 | 436.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 436.10 | 439.15 | Limestone, shaley, nodular | | ak, cs, es | y | 3.05 |
| 1.80 | 439.15 | 440.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 440.95 | 443.75 | Limestone, massive | | ak, cs, es | y | 2.80 |
| 0.30 | 443.75 | 444.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 444.05 | 444.75 | Limestone, massive | | ak, cs, es | y | 0.70 |
| 3.10 | 444.75 | 447.85 | Limestone, shaley, layered | | ak, cs, es | y | 3.10 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.50 | 447.85 | 451.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 451.35 | 451.75 | Limestone, shaley, layered | | ak, cs, es | y | 0.40 |
| 1.81 | 451.75 | 453.56 | Claystone, gy | | cv, ev | | 0.00 |
| 0.19 | 453.56 | 453.75 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.58 | 453.75 | 454.33 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.19 | 454.33 | 454.52 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.53 | 454.52 | 455.05 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.35 | 455.05 | 457.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 457.40 | 459.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 459.15 | 462.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.85 | 462.40 | 466.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 466.25 | 467.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.90 | 467.00 | 467.90 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 13.15 | 467.90 | 481.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.06 | 481.05 | 482.11 | Shale, dk gy | | cm, em | | 0.00 |
| 0.14 | 482.11 | 482.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.24 | 482.25 | 482.49 | **Coal, bone stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.17 | 482.49 | 482.66 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.58 | 482.66 | 483.24 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.12 | 483.24 | 483.36 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.31 | 483.36 | 483.67 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.10 | 483.67 | 484.77 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.27 | 484.77 | 485.04 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.58 | 485.04 | 485.62 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 485.62 | 485.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 485.80 | 486.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 486.40 | 488.10 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 1.00 | 488.10 | 489.10 | Limestone, mosaic | | ak, cs, es | y | 1.00 |
| 0.30 | 489.10 | 489.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 489.40 | 491.50 | Limestone, mosaic | | ak, cs, es | y | 2.10 |
| 0.80 | 491.50 | 492.30 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 0.10 | 492.30 | 492.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.15 | 492.40 | 494.55 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 0.35 | 494.55 | 494.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 494.90 | 496.95 | Limestone, massive | | ak, cs, es | y | 2.05 |
| 0.25 | 496.95 | 497.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 497.20 | 498.40 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.20 |
| 2.35 | 498.40 | 500.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.35 |
| 0.50 | 500.75 | 501.25 | Limestone, massive | | ak, cs, es | y | 0.50 |
| 2.35 | 501.25 | 503.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.35 |
| 0.65 | 503.60 | 504.25 | Claystone, gm, ls nods | | ac, cv, ev | | 0.00 |
| 0.75 | 504.25 | 505.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 7.60 | 505.00 | 512.60 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 512.60 | 516.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 516.80 | 518.95 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 0.70 | 518.95 | 519.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 519.65 | 521.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.54 | 521.75 | 523.29 | Claystone, gy | | cv, ev | | 0.00 |
| 0.39 | 523.29 | 523.68 | **Bone, coal layers, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.57 | 523.68 | 524.25 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 524.25 | 524.53 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.32 | 524.53 | 524.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.50 | 524.85 | 525.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 525.35 | 526.50 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 1.60 | 526.50 | 528.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 528.10 | 529.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.65 | 529.00 | 529.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 529.65 | 532.05 | Limestone, nodular | | ak, cs, es | y | 2.40 |
| 1.50 | 532.05 | 533.55 | Limestone, massive | | ak, cs, es | y | 1.50 |
| 2.50 | 533.55 | 536.05 | Limestone, shaley, nodular | | ak, cs, es | y | 2.50 |
| 0.90 | 536.05 | 536.95 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 0.10 | 536.95 | 537.05 | Shale, dk gy | | cm, em | | 0.00 |
| 2.05 | 537.05 | 539.10 | Limestone, nodular | | ak, cs, es | y | 2.05 |
| 0.95 | 539.10 | 540.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 1.50 | 540.05 | 541.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 541.55 | 542.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 542.85 | 543.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 0.65 | 543.15 | 543.80 | Shale, dk gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-32

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.35 | 543.80 | 544.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 1.10 | 544.15 | 545.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 545.25 | 546.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.85 | 546.55 | 548.40 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.11 | 548.40 | 548.51 | Shale, dk gy | | cm, em | | 0.00 |
| 0.17 | 548.51 | 548.68 | **Coal, sh stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.10 | 548.68 | 548.78 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.17 | 548.78 | 548.95 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.12 | 548.95 | 549.07 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.17 | 549.07 | 549.24 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.40 | 549.24 | 549.64 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.09 | 549.64 | 549.73 | **Coal, bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.60 | 549.73 | 550.33 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 550.33 | 550.37 | **Pyrite** | | ac, cs, es | | 0.00 |
| 1.00 | 550.37 | 551.37 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.06 | 551.37 | 551.43 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 551.43 | 551.51 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.40 | 551.51 | 551.91 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 551.91 | 551.95 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 2.48 | 551.95 | 554.43 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.09 | 554.43 | 554.52 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.03 | 554.52 | 554.55 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 554.55 | 554.57 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.08 | 554.57 | 554.65 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.05 | 554.65 | 555.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 555.70 | 556.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 0.50 | 556.30 | 556.80 | Limestone, nodular | | ak, cs, es | y | 0.50 |
| 0.65 | 556.80 | 557.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.40 | 557.45 | 558.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 558.85 | 562.15 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.40 | 562.15 | 564.55 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 564.55 | 565.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 565.70 | | | | | 94.50 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **94.50**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **17%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 94.50 | 17% |
| Soft Rock: | 471.20 | 83% |
| | 565.70 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |



AEC 03460

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-33

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1250
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 681560
**Easting:** 2427890
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 19.00 | 0.00 | 19.00 | Casing | | | | 0.00 |
| 3.50 | 19.00 | 22.50 | Shale, gy | Yes | cm, em | | 0.00 |
| 0.70 | 22.50 | 23.20 | Shale, gy, ls nods | Yes | ak, cm, em | | 0.00 |
| 3.80 | 23.20 | 27.00 | Claystone, red/ gy | Yes | cv, ev | | 0.00 |
| 2.90 | 27.00 | 29.90 | Claystone, dk gy | Yes | cv, ev | | 0.00 |
| 2.15 | 29.90 | 32.05 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 32.05 | 33.55 | Shale, gy | | cm, em | | 0.00 |
| 1.25 | 33.55 | 34.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 2.00 | 34.80 | 36.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.20 | 36.80 | 43.00 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 11.65 | 43.00 | 54.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 54.65 | 55.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 0.85 | 55.50 | 56.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 56.35 | 57.80 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 1.45 |
| 3.80 | 57.80 | 61.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 61.60 | 64.20 | Shale, gy | | cm, em | | 0.00 |
| 3.70 | 64.20 | 67.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.90 | 67.90 | 70.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.45 | 70.80 | 76.25 | Claystone, red | | cv, ev | | 0.00 |
| 1.25 | 76.25 | 77.50 | Claystone, gy | | cv, ev | | 0.00 |
| 1.95 | 77.50 | 79.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.90 | 79.45 | 85.35 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.80 | 85.35 | 87.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.65 | 87.15 | 89.80 | Shale, gy | | cm, em | | 0.00 |
| 2.10 | 89.80 | 91.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.00 | 91.90 | 92.90 | Shale, dk gy | | cm, em | | 0.00 |
| 4.30 | 92.90 | 97.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 97.20 | 97.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.85 | 97.65 | 98.50 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 98.50 | 98.80 | Claystone, red | | cv, ev | | 0.00 |
| 2.80 | 98.80 | 101.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 101.60 | 103.20 | Shale, gy | | cm, em | | 0.00 |
| 2.15 | 103.20 | 105.35 | Shale, red | | cm, em | | 0.00 |
| 0.75 | 105.35 | 106.10 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 106.10 | 106.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.55 | 106.20 | 110.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 110.75 | 111.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 4.65 | 111.70 | 116.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 116.35 | 117.20 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.15 | 117.20 | 118.35 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.85 | 118.35 | 119.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.05 | 119.20 | 123.25 | Claystone, red | | cv, ev | | 0.00 |
| 1.55 | 123.25 | 124.80 | Shale, gy | | cm, em | | 0.00 |
| 0.55 | 124.80 | 125.35 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.35 | 125.35 | 126.70 | Shale, gy | | cm, em | | 0.00 |
| 3.85 | 126.70 | 130.55 | Claystone, red | | cv, ev | | 0.00 |
| 0.95 | 130.55 | 131.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 5.40 | 131.50 | 136.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 9.90 | 136.90 | 146.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.95 | 146.80 | 148.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 148.75 | 152.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 5.90 | 152.00 | 157.90 | Shale, gy, ls nods | | ak, cm | | 0.00 |
| 2.35 | 157.90 | 160.25 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.90 | 160.25 | 164.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.35 | 164.15 | 167.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 167.50 | 170.05 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.25 | 170.05 | 172.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.70 | 172.30 | 175.00 | Shale, dk gy | | cm, em | | 0.00 |
| 1.55 | 175.00 | 176.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 176.55 | 177.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 177.10 | 177.75 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.05 | 177.75 | 181.80 | Shale, gy | | cm, em | | 0.00 |
| 2.00 | 181.80 | 183.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 183.80 | 184.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 6.55 | 184.10 | 190.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.05 | 190.65 | 194.70 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 194.70 | 195.00 | Claystone, gy | | cv, ev | | 0.00 |
| 0.15 | 195.00 | 195.15 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.35 | 195.15 | 197.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 197.50 | 198.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 2.90 | 198.20 | 201.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 201.10 | 202.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 202.20 | 203.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.80 | 203.10 | 206.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 206.90 | 210.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.68 | 210.30 | 215.98 | Shale, dk gy | | cm, em | | 0.00 |
| 0.59 | 215.98 | 216.57 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.67 | 216.57 | 218.24 | **Coal, pyrite, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.23 | 218.24 | 218.47 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.75 | 218.47 | 219.22 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 219.22 | 219.38 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.45 | 219.38 | 219.83 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.72 | 219.83 | 220.55 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 2.70 | 220.55 | 223.25 | Claystone, gy | | cv, ev | | 0.00 |
| 14.50 | 223.25 | 237.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 237.75 | 238.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.65 | 238.80 | 242.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 242.45 | 245.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.95 | 245.15 | 248.10 | Sandstone, gy, sh stks | | cs, es | y | 2.95 |
| 7.65 | 248.10 | 255.75 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 7.65 |
| 3.45 | 255.75 | 259.20 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.22 | 259.20 | 263.42 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 263.42 | 263.92 | **Coal, bone stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.06 | 263.92 | 263.98 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.38 | 263.98 | 264.36 | **Bone coal layers** | | ac, cv, ev | | 0.00 |
| 0.15 | 264.36 | 264.51 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.23 | 264.51 | 264.74 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 3.29 | 264.74 | 268.03 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.22 | 268.03 | 269.25 | **Bone coal layers** | | ac, cv, ev | | 0.00 |
| 0.38 | 269.25 | 269.63 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.67 | 269.63 | 270.30 | Shale, dk gy, ls nods | | ak, cm ,em | | 0.00 |
| 0.90 | 270.30 | 271.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.90 | 271.20 | 273.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 9.55 | 273.10 | 282.65 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.75 | 282.65 | 290.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 290.40 | 291.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 7.30 | 291.30 | 298.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 298.60 | 300.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 300.50 | 302.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 302.25 | 303.40 | Shale, dk gy | | cm, em | | 0.00 |
| 1.95 | 303.40 | 305.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 305.35 | 306.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.70 | 306.05 | 307.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 307.75 | 308.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.55 | 308.35 | 309.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 309.90 | 311.75 | Shale, gy | | cm, em | | 0.00 |
| 1.15 | 311.75 | 312.90 | Sandstone, gy, sh stks | | cs, es | y | 1.15 |
| 4.55 | 312.90 | 317.45 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.90 | 317.45 | 318.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.05 | 318.35 | 325.40 | Sandstone, gy, sh stks | | cs, es | y | 7.05 |
| 3.75 | 325.40 | 329.15 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.36 | 329.15 | 333.51 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.06 | 333.51 | 333.57 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.14 | 333.57 | 333.71 | **Coal, pyrite, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.89 | 333.71 | 334.60 | Claystone, dk gy | | cv, ev | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.35 | 334.60 | 335.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 335.95 | 337.75 | Limestone, nodular | | ak, cs, es | y | 1.80 |
| 1.55 | 337.75 | 339.30 | Shale, gy | | cm, em | | 0.00 |
| 3.25 | 339.30 | 342.55 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 342.55 | 343.15 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 1.80 | 343.15 | 344.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 344.95 | 346.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 1.05 | 346.50 | 347.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 347.55 | 348.10 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 1.40 | 348.10 | 349.50 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.40 |
| 2.80 | 349.50 | 352.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 352.30 | 353.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 4.15 | 353.60 | 357.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.55 | 357.75 | 361.30 | Limestone, shaley, nodular | | ak, cs, es | y | 3.55 |
| 1.90 | 361.30 | 363.20 | Claystone, tan | | cv, ev | | 0.00 |
| 0.75 | 363.20 | 363.95 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.40 | 363.95 | 365.35 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.20 | 365.35 | 366.55 | Shale, gy | | cm, em | | 0.00 |
| 1.25 | 366.55 | 367.80 | Sandstone, gy, sh stks | | cs, es | y | 1.25 |
| 2.20 | 367.80 | 370.00 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.90 | 370.00 | 370.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 370.90 | 371.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.40 | 371.50 | 372.90 | Claystone, red | | cv, ev | | 0.00 |
| 0.70 | 372.90 | 373.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 373.60 | 373.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 1.25 | 373.95 | 375.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 375.20 | 376.30 | Limestone, massive | | ak, cs, es | y | 1.10 |
| 1.80 | 376.30 | 378.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 378.10 | 379.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 2.00 | 379.00 | 381.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 381.00 | 381.75 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 2.75 | 381.75 | 384.50 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 3.90 | 384.50 | 388.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 388.40 | 389.60 | Limestone, massive | | ak, cs, es | y | 1.20 |
| 1.55 | 389.60 | 391.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 391.15 | 392.70 | Limestone, shaley, massive | | ak, cs, es | y | 1.55 |
| 0.55 | 392.70 | 393.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 393.25 | 394.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 1.80 | 394.20 | 396.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 396.00 | 399.40 | Limestone, nodular | | ak, cs, es | y | 3.40 |
| 2.50 | 399.40 | 401.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 401.90 | 402.45 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 3.75 | 402.45 | 406.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 406.20 | 409.35 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 409.35 | 410.20 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 6.40 | 410.20 | 416.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 416.60 | 418.75 | Limestone, shaley, layered | | ak, cs, es | y | 2.15 |
| 4.25 | 418.75 | 423.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 423.00 | 423.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 423.45 | 424.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 3.55 | 424.95 | 428.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 428.50 | 431.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.50 |
| 5.15 | 431.00 | 436.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 436.15 | 439.25 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 0.25 | 439.25 | 439.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 439.50 | 442.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.30 |
| 3.60 | 442.80 | 446.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.65 | 446.40 | 451.05 | Limestone, massive | | ak, cs, es | y | 4.65 |
| 0.85 | 451.05 | 451.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 451.90 | 454.60 | Limestone, shaley, layered | | ak, cs, es | y | 2.70 |
| 0.90 | 454.60 | 455.50 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.30 | 455.50 | 456.80 | Limestone, massive | | ak, cs, es | y | 1.30 |
| 1.15 | 456.80 | 457.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 457.95 | 459.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 0.70 | 459.20 | 459.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 459.90 | 463.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 463.10 | 466.50 | Limestone, massive | | ak, cs, es | y | 3.40 |
| 0.25 | 466.50 | 466.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.15 | 466.75 | 467.90 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 0.50 | 467.90 | 468.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 468.40 | 469.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 2.70 | 469.50 | 472.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 472.20 | 473.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 473.00 | 473.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 473.45 | 473.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.43 | 473.85 | 475.28 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.05 | 475.28 | 475.33 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.25 | 475.33 | 475.58 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.57 | 475.58 | 476.15 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.06 | 476.15 | 476.21 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.19 | 476.21 | 477.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 477.40 | 478.45 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 478.45 | 479.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 9.70 | 479.90 | 489.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 6.30 | 489.60 | 495.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 495.90 | 498.10 | Shale, gy | | cm, em | | 0.00 |
| 1.80 | 498.10 | 499.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 499.90 | 500.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 500.60 | 502.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.97 | 502.05 | 504.02 | Shale, dk gy | | cm, em | | 0.00 |
| 0.16 | 504.02 | 504.18 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.22 | 504.18 | 504.40 | Sandstone, gy, sh stks | | cs, es | y | 0.22 |
| 1.31 | 504.40 | 505.71 | Sandstone, gy, coal bands | | cs, es | y | 1.31 |
| 0.08 | 505.71 | 505.79 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.62 | 505.79 | 507.41 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.92 | 507.41 | 508.33 | **Coal, bone stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.24 | 508.33 | 508.57 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.67 | 508.57 | 509.24 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 509.24 | 509.35 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.80 | 509.35 | 510.15 | Shale, dk gy | | cm, em | | 0.00 |
| 2.60 | 510.15 | 512.75 | Limestone, massive | | ak, cs, es | y | 2.60 |
| 0.35 | 512.75 | 513.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 513.10 | 515.75 | Limestone, shaley, mosaic | | ak, cs, es | y | 2.65 |
| 0.55 | 515.75 | 516.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 516.30 | 518.05 | Limestone, massive | | ak, cs, es | y | 1.75 |
| 0.45 | 518.05 | 518.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.40 | 518.50 | 524.90 | Limestone, massive | | ak, cs, es | y | 6.40 |
| 0.20 | 524.90 | 525.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.90 | 525.10 | 527.00 | Limestone, massive | | ak, cs, es | y | 1.90 |
| 0.45 | 527.00 | 527.45 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 527.45 | 527.90 | Limestone, massive | | ak, cs, es | y | 0.45 |
| 0.40 | 527.90 | 528.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 528.30 | 529.25 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 1.05 | 529.25 | 530.30 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 530.30 | 531.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 531.70 | 532.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 532.20 | 533.40 | Sandstone, gy, sh stks | | cs, es | y | 1.20 |
| 0.30 | 533.40 | 533.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.10 | 533.70 | 534.80 | Sandstone, gy, sh stks | | cs, es | y | 1.10 |
| 0.40 | 534.80 | 535.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.55 | 535.20 | 538.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 538.75 | 539.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 539.55 | 542.70 | Limestone, shaley, nodular | | ak, cs, es | y | 3.15 |
| 1.30 | 542.70 | 544.00 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 544.00 | 545.35 | Claystone, gy | | cv, ev | | 0.00 |
| 0.18 | 545.35 | 545.53 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.43 | 545.53 | 545.96 | **Coal, bone stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.10 | 545.96 | 546.06 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.41 | 546.06 | 546.47 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 546.47 | 546.53 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.62 | 546.53 | 547.15 | Claystone, gy | | cv, ev | | 0.00 |
| 1.85 | 547.15 | 549.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.60 | 549.00 | 550.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 550.60 | 552.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 0.35 | 552.20 | 552.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 552.55 | 553.95 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-33

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 5.40 | 553.95 | 559.35 | Limestone, massive | | ak, cs, es | y | 5.40 |
| 1.70 | 559.35 | 561.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 561.05 | 562.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 3.60 | 562.90 | 566.50 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.26 | 566.50 | 568.76 | Claystone, gy | | cv, ev | | 0.00 |
| 0.15 | 568.76 | 568.91 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.54 | 568.91 | 569.45 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.09 | 569.45 | 569.54 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.59 | 569.54 | 570.13 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.07 | 570.13 | 570.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.08 | 570.20 | 570.28 | Pyrite | | ac, cs, es | | 0.00 |
| 0.73 | 570.28 | 571.01 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.13 | 571.01 | 571.14 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 1.03 | 571.14 | 572.17 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.04 | 572.17 | 572.21 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.06 | 572.21 | 572.27 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.12 | 572.27 | 572.39 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 572.39 | 572.44 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.78 | 572.44 | 573.22 | Shale, dk gy | | cm, em | | 0.00 |
| 0.37 | 573.22 | 573.59 | **Coal, bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 1.62 | 573.59 | 575.21 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 575.21 | 575.24 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.55 | 575.24 | 575.79 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 575.79 | 575.81 | **Claystone, gy** | | cv, ev | | 0.00 |
| 1.22 | 575.81 | 577.03 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 577.03 | 577.06 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 1.24 | 577.06 | 578.30 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 578.30 | 578.40 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.12 | 578.40 | 578.52 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.15 | 578.52 | 579.67 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.85 | 579.67 | 582.52 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.95 | 582.52 | 586.47 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 586.47 | 588.27 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 588.27 | 588.47 | Claystone, gy | | cv, ev | | 0.00 |
| 4.15 | 588.47 | 592.62 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 592.62 | 594.52 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 594.52 | 594.72 | Claystone, gy | | cv, ev | | 0.00 |
| 1.00 | 594.72 | 595.72 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 595.72 | | | | | 112.78 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **112.78**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **19%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 112.78 | 19% |
| Soft Rock: | 482.94 | 81% |
| | 595.72 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 31.76 | 2.77 | 2.08 | 86.58 | 54.65 |
| Coal | | | | | |
| Bottom, 10 ft. | 182.60 | 2.39 | 2.15 | 74.70 | -107.77 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-36

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1175
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 669020
**Easting:** 2412900
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 18.00 | 0.00 | 18.00 | Casing | | | | 0.00 |
| 1.85 | 18.00 | 19.85 | Sandstone, gy, sh stks | Yes | cs, es | y | 1.85 |
| 0.85 | 19.85 | 20.70 | Sandstone, gy, massive | | cs, es | y | 0.85 |
| 2.65 | 20.70 | 23.35 | Sandstone, gy, sh stks | Yes | cs, es | y | 2.65 |
| 3.15 | 23.35 | 26.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 26.50 | 28.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 28.40 | 31.65 | Claystone, gy | | cv, ev | | 0.00 |
| 0.70 | 31.65 | 32.35 | Claystone, red | | cv, ev | | 0.00 |
| 1.20 | 32.35 | 33.55 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.45 | 33.55 | 37.00 | Claystone, red | | cv, ev | | 0.00 |
| 0.45 | 37.00 | 37.45 | Claystone, gy | | cv, ev | | 0.00 |
| 5.70 | 37.45 | 43.15 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 43.15 | 44.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.25 | 44.60 | 46.85 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.90 | 46.85 | 48.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.25 | 48.75 | 51.00 | Claystone, red | | cv, ev | | 0.00 |
| 0.30 | 51.00 | 51.30 | Claystone, gy | | cv, ev | | 0.00 |
| 3.35 | 51.30 | 54.65 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.75 | 54.65 | 57.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.40 | 57.40 | 60.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.52 | 60.80 | 61.32 | Shale, dk gy | | cm, em | | 0.00 |
| 0.29 | 61.32 | 61.61 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.04 | 61.61 | 61.65 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.45 | 61.65 | 62.10 | Claystone, gy | | cv, ev | | 0.00 |
| 2.95 | 62.10 | 65.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.45 | 65.05 | 65.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 65.50 | 69.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 69.70 | 70.05 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 9.10 | 70.05 | 79.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 79.15 | 80.20 | Sandstone, gy, sh stks | | cs, es | y | 1.05 |
| 4.30 | 80.20 | 84.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 84.50 | 85.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.24 | 85.55 | 86.79 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.73 | 86.79 | 87.52 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.14 | 87.52 | 87.66 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.23 | 87.66 | 88.89 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 5.11 | 88.89 | 94.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.20 | 94.00 | 96.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.45 | 96.20 | 100.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 35.90 | 100.65 | 136.55 | Sandstone, gy, sh stks | | cs, es | y | 35.90 |
| 6.35 | 136.55 | 142.90 | Sandstone, gy, crossbeds | | cs, es | y | 6.35 |
| 1.60 | 142.90 | 144.50 | Sandstone, gy, sh stks | | cs, es | y | 1.60 |
| 1.40 | 144.50 | 145.90 | Sandstone, gy, crossbeds | | cs, es | y | 1.40 |
| 12.05 | 145.90 | 157.95 | Sandstone, gy, sh stks | | cs, es | y | 12.05 |
| 0.45 | 157.95 | 158.40 | Sandstone, gy, massive | | cs, es | y | 0.45 |
| 11.15 | 158.40 | 169.55 | Sandstone, gy, sh stks | | cs, es | y | 11.15 |
| 1.37 | 169.55 | 170.92 | Sandstone, gy, coal spars | | cs, es | y | 1.37 |
| 0.59 | 170.92 | 171.51 | **Coal, bone stks, LITTLE WASHINGTON** | | ac, cv, ev | | 0.00 |
| 0.08 | 171.51 | 171.59 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.44 | 171.59 | 172.03 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.17 | 172.03 | 172.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.30 | 172.20 | 173.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 173.50 | 174.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 5.25 | 174.50 | 179.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.25 | 179.75 | 186.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.30 | 186.00 | 190.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 190.30 | 191.15 | Shale, gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-36

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.20 | 191.15 | 192.35 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.25 | 192.35 | 193.60 | Shale, dk gy | | cm, em | | 0.00 |
| 1.70 | 193.60 | 195.30 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.80 | 195.30 | 199.10 | Shale, dk gy | | cm, em | | 0.00 |
| 1.10 | 199.10 | 200.20 | Limestone, massive | | ak, cs, es | y | 1.10 |
| 0.20 | 200.20 | 200.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 200.40 | 201.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.60 | 201.30 | 201.90 | Shale, dk gy | | cm, em | | 0.00 |
| 6.51 | 201.90 | 208.41 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.45 | 208.41 | 208.86 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.94 | 208.86 | 209.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.94 |
| 2.15 | 209.80 | 211.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 211.95 | 212.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.25 | 212.45 | 213.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 213.70 | 215.10 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.14 | 215.10 | 215.24 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.86 | 215.24 | 218.10 | Shale, dk gy | | cm, em | | 0.00 |
| 5.15 | 218.10 | 223.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 223.25 | 224.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 224.50 | 228.60 | Sandstone, gy, sh stks | | cs, es | y | 4.10 |
| 4.20 | 228.60 | 232.80 | Sandstone, gy, crossbeds | | cs, es | y | 4.20 |
| 3.50 | 232.80 | 236.30 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.24 | 236.30 | 237.54 | Shale, dk gy | | cm, em | | 0.00 |
| 0.42 | 237.54 | 237.96 | **Coal, bone stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.20 | 237.96 | 238.16 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 238.16 | 238.30 | Shale, dk gy | | cm, em | | 0.00 |
| 5.20 | 238.30 | 243.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 243.50 | 243.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.00 | 243.90 | 244.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 244.90 | 247.25 | Limestone, nodular | | ak, cs, es | y | 2.35 |
| 0.40 | 247.25 | 247.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 247.65 | 248.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 0.55 | 248.70 | 249.25 | Limestone, massive | | ak, cs, es | y | 0.55 |
| 0.85 | 249.25 | 250.10 | Limestone, mosaic | | ak, cs, es | y | 0.85 |
| 2.10 | 250.10 | 252.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 252.20 | 253.70 | Limestone, shaley, layered | | ak, cs, es | y | 1.50 |
| 0.85 | 253.70 | 254.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 254.55 | 255.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 1.35 | 255.10 | 256.45 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.15 | 256.45 | 257.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 257.60 | 258.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.70 | 258.40 | 259.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 1.35 | 259.10 | 260.45 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 260.45 | 260.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 260.95 | 261.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.90 | 261.60 | 263.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 263.50 | 264.50 | Limestone, massive | | ak, cs, es | y | 1.00 |
| 1.05 | 264.50 | 265.55 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 265.55 | 266.25 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.85 | 266.25 | 267.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.80 | 267.10 | 267.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.05 | 267.90 | 268.95 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.90 | 268.95 | 272.85 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.10 | 272.85 | 274.95 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.85 | 274.95 | 277.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 277.80 | 278.45 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.40 | 278.45 | 281.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 281.85 | 285.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 285.65 | 288.00 | Sandstone, gy, sh stks | | cs, es | y | 2.35 |
| 3.60 | 288.00 | 291.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 291.60 | 292.65 | Limestone, shaley, massive | | ak, cs, es | y | 1.05 |
| 1.15 | 292.65 | 293.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.30 | 293.80 | 301.10 | Limestone, shaley, layered | | ak, cs, es | y | 7.30 |
| 1.05 | 301.10 | 302.15 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 1.20 | 302.15 | 303.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 303.35 | 304.00 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 304.00 | 305.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 305.90 | 307.50 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-36

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 5.05 | 307.50 | 312.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 312.55 | 312.95 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 312.95 | 313.25 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 2.75 | 313.25 | 316.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 316.00 | 317.50 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.75 | 317.50 | 320.25 | Limestone, shaley, nodular | | ak, cs, es | y | 2.75 |
| 2.10 | 320.25 | 322.35 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 322.35 | 325.35 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 325.35 | 325.80 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 325.80 | 330.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 330.40 | 332.25 | Limestone, shaley, nodular | | ak, cs, es | y | 1.85 |
| 8.70 | 332.25 | 340.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 340.95 | 341.55 | Limestone, nodular | | ak, cs, es | y | 0.60 |
| 3.25 | 341.55 | 344.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.30 | 344.80 | 350.10 | Limestone, nodular | | ak, cs, es | y | 5.30 |
| 1.65 | 350.10 | 351.75 | Limestone, layered | | ak, cs, es | y | 1.65 |
| 3.05 | 351.75 | 354.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 354.80 | 355.90 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 355.90 | 358.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.10 |
| 1.50 | 358.00 | 359.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 359.50 | 360.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 9.50 | 360.05 | 369.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 369.55 | 371.50 | Shale, breccia | | cm, em | | 0.00 |
| 1.80 | 371.50 | 373.30 | Shale, dk gy | | cm, em | | 0.00 |
| 4.00 | 373.30 | 377.30 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.45 | 377.30 | 378.75 | Sandstone, gy, sh stks | | cs, es | y | 1.45 |
| 6.60 | 378.75 | 385.35 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 385.35 | 387.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.65 | 387.25 | 391.90 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.00 | 391.90 | 394.90 | Sandstone, gy, sh stks | | cs, es | y | 3.00 |
| 1.20 | 394.90 | 396.10 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.28 | 396.10 | 403.38 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.52 | 403.38 | 403.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.10 | 403.90 | 404.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.06 | 404.00 | 404.06 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.07 | 404.06 | 404.13 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.67 | 404.13 | 404.80 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.04 | 404.80 | 404.84 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.17 | 404.84 | 405.01 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.08 | 405.01 | 405.09 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.98 | 405.09 | 406.07 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.37 | 406.07 | 406.44 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.52 | 406.44 | 406.96 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 406.96 | 407.02 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.38 | 407.02 | 407.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 407.40 | 408.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 408.00 | 411.20 | Limestone, shaley, nodular | | ak, cs, es | y | 3.20 |
| 3.55 | 411.20 | 414.75 | Limestone, shaley, layered | | ak, cs, es | y | 3.55 |
| 2.55 | 414.75 | 417.30 | Limestone, massive | | ak, cs, es | y | 2.55 |
| 0.40 | 417.30 | 417.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 417.70 | 420.00 | Limestone, shaley, layered | | ak, cs, es | y | 2.30 |
| 2.80 | 420.00 | 422.80 | Limestone, shaley, mosaic | | ak, cs, es | y | 2.80 |
| 0.50 | 422.80 | 423.30 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 423.30 | 424.75 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 424.75 | 426.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.55 | 426.45 | 429.00 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.80 | 429.00 | 434.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 434.80 | 436.20 | Claystone, gy | | cv, ev | | 0.00 |
| 3.80 | 436.20 | 440.00 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 8.00 | 440.00 | 448.00 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 448.00 | 451.10 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 3.10 |
| 2.65 | 451.10 | 453.75 | Sandstone, gy, sh stks | | cs, es | y | 2.65 |
| 1.00 | 453.75 | 454.75 | Sandstone, gy, massive | | cs, es | y | 1.00 |
| 0.85 | 454.75 | 455.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.60 | 455.60 | 458.20 | Sandstone, gy, crossbeds | | cs, es | y | 2.60 |
| 2.95 | 458.20 | 461.15 | Sandstone, gy, massive | | cs, es | y | 2.95 |
| 8.10 | 461.15 | 469.25 | Sandstone, gy, crossbeds | | cs, es | y | 8.10 |
| 1.85 | 469.25 | 471.10 | Sandstone, gy, massive | | cs, es | y | 1.85 |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-36**

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.90 | 471.10 | 476.00 | Sandstone, gy, sh stks | | cs, es | y | 4.90 |
| 3.78 | 476.00 | 479.78 | Sandstone, gy, massive | | cs, es | y | 3.78 |
| 0.85 | 479.78 | 480.63 | Sandstone, gy, crossbeds | | cs, es | y | 0.85 |
| 0.95 | 480.63 | 481.58 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 481.58 | 481.83 | Sandstone, gy, massive | | cs, es | y | 0.25 |
| 0.40 | 481.83 | 482.23 | Sandstone, gy, coal spars | | cs, es | y | 0.40 |
| 5.90 | 482.23 | 488.13 | Sandstone, gy, massive | | cs, es | y | 5.90 |
| 3.60 | 488.13 | 491.73 | Sandstone, gy, crossbeds | | cs, es | y | 3.60 |
| 3.28 | 491.73 | 495.01 | Sandstone, gy, massive | | cs, es | y | 3.28 |
| 0.25 | 495.01 | 495.26 | Sandstone, gy, sh stks | | cs, es | y | 0.25 |
| 1.25 | 495.26 | 496.51 | Sandstone, gy, massive | | cs, es | y | 1.25 |
| 0.21 | 496.51 | 496.72 | Sandstone, gy, pyrite | | cs, es | y | 0.21 |
| 0.66 | 496.72 | 497.38 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.43 | 497.38 | 497.81 | **Coal, pyrite, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.52 | 497.81 | 498.33 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.05 | 498.33 | 498.38 | **Claystone, blk** | | ac, cv, ev | | 0.00 |
| 0.27 | 498.38 | 498.65 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.52 | 498.65 | 500.17 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 500.17 | 500.19 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.08 | 500.19 | 500.27 | **Fusain** | | ac, cv, ev | | 0.00 |
| 0.88 | 500.27 | 501.15 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.24 | 501.15 | 501.39 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.50 | 501.39 | 501.89 | Shale, dk gy | | cm, em | | 0.00 |
| 2.25 | 501.89 | 504.14 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 504.14 | 505.14 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 2.10 | 505.14 | 507.24 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 507.24 | 508.99 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.55 | 508.99 | 509.54 | Claystone, gy | | cv, ev | | 0.00 |
| 0.45 | 509.54 | 509.99 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.45 | 509.99 | 510.44 | Claystone, gy | | cv, ev | | 0.00 |
| 0.95 | 510.44 | 511.39 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.83 | 511.39 | 512.22 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| | Total Depth | 512.22 | | | | | 192.13 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **192.13**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **38%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 192.13 | 38% |
| Soft Rock: | 320.09 | 62% |
| | 512.22 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 4.74 | 0.51 | 0.42 | 15.9 | 11.2 |
| Coal | 12.10 | 5.08 | 2.51 | 159.0 | 147.0 |
| Bottom, 10 ft. | 38.80 | 3.31 | 2.86 | 103.0 | 64.6 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: Y+O-04

**Field Engineer:** Unknown
**Surface Elevation:** 980
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 685490
**Easting:** 2431690
**Drilling Company:** Unknown

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 6.00 | 0.00 | 6.00 | Surface material | | | | 0.00 |
| 2.50 | 6.00 | 8.50 | **Coal, sh stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 2.50 | 8.50 | 11.00 | Shale, dk gy | | cm, em | | 0.00 |
| 4.00 | 11.00 | 15.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 8.00 | 15.00 | 23.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.00 | 23.00 | 24.00 | Shale, gy, soft | | cm, em | | 0.00 |
| 13.00 | 24.00 | 37.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 12.00 | 37.00 | 49.00 | Shale, dk gy | | cm, em | | 0.00 |
| 14.00 | 49.00 | 63.00 | Shale, grn | | cm, em | | 0.00 |
| 8.00 | 63.00 | 71.00 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 4.00 | 71.00 | 75.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.28 | 75.00 | 75.28 | **Coal w/ bone, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.72 | 75.28 | 76.00 | Claystone, gy | | cv, ev | | 0.00 |
| 4.00 | 76.00 | 80.00 | Limestone | | ak, cs, es | y | 4.00 |
| 4.00 | 80.00 | 84.00 | Shale, grn | | cm, em | | 0.00 |
| 18.00 | 84.00 | 102.00 | Limestone, shaley | | ak, cs, es | y | 18.00 |
| 3.50 | 102.00 | 105.50 | Shale, grn, sandy | | cm, em | | 0.00 |
| 6.00 | 105.50 | 111.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.50 | 111.50 | 113.00 | Shale, red | | cm, em | | 0.00 |
| 32.00 | 113.00 | 145.00 | Limestone, shaley | | ak, cs, es | y | 32.00 |
| 3.00 | 145.00 | 148.00 | Shale, grn | | cm, em | | 0.00 |
| 69.00 | 148.00 | 217.00 | Limestone, shaley | | ak, cs, es | y | 69.00 |
| 3.50 | 217.00 | 220.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.50 | 220.50 | 223.00 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 1.50 | 223.00 | 224.50 | Claystone, gy | | cv, ev | | 0.00 |
| 3.00 | 224.50 | 227.50 | Shale, dk gy | | cm, em | | 0.00 |
| 8.50 | 227.50 | 236.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 5.00 | 236.00 | 241.00 | Shale, dk gy | | cm, em | | 0.00 |
| 3.00 | 241.00 | 244.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.00 | 244.00 | 247.00 | Shale, dk gy | | cm, em | | 0.00 |
| 1.12 | 247.00 | 248.12 | **Coal w/ bone, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.20 | 248.12 | 248.32 | **Claystone, gy** | | cv, ev | | 0.00 |
| 0.72 | 248.32 | 249.04 | **Coal w/ bone** | | ac, cv, ev | | 0.00 |
| 0.62 | 249.04 | 249.66 | Shale, dk gy | | cm, em | | 0.00 |
| 19.34 | 249.66 | 269.00 | Limestone | | ak, cs, es | y | 19.34 |
| 2.00 | 269.00 | 271.00 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 271.00 | 275.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.00 | 275.00 | 280.00 | Shale, dk gy | | cm, em | | 0.00 |
| 4.00 | 280.00 | 284.00 | Limestone | | ak, cs, es | y | 4.00 |
| 1.50 | 284.00 | 285.50 | Shale, dk gy, soft | | cm, em | | 0.00 |
| 1.50 | 285.50 | 287.00 | **Coal, REDSTONE** | | ac, cv, ev | | 0.00 |
| 4.00 | 287.00 | 291.00 | Shale, dk gy | | cm, em | | 0.00 |
| 10.00 | 291.00 | 301.00 | Limestone | | ak, cs, es | y | 10.00 |
| 4.00 | 301.00 | 305.00 | Limestone, shaley | | ak, cs, es | y | 4.00 |
| 4.50 | 305.00 | 309.50 | Shale, dk gy, soft | | cm, em | | 0.00 |
| 0.62 | 309.50 | 310.12 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.16 | 310.12 | 311.28 | **Coal, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.88 | 311.28 | 312.16 | Draw slate | | cm, em | | 0.00 |
| 0.20 | 312.16 | 312.36 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.24 | 312.36 | 314.60 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.06 | 314.60 | 314.66 | **Shale, gy** | | cm, em | | 0.00 |
| 1.54 | 314.66 | 316.20 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 316.20 | 316.22 | **Shale, gy** | | cm, em | | 0.00 |
| 1.06 | 316.22 | 317.28 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 317.28 | 317.30 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.10 | 317.30 | 317.40 | **Coal** | | ac, cv, ev | | 0.00 |
| 2.50 | 317.40 | 319.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.10 | 319.90 | 321.00 | Limestone | | ak, cs, es | y | 0.00 |
| | Total Depth | 321.00 | | | | | 160.34 |



AEC 03470

ATTACHMENT 13

## DIAMOND DRILL HOLE: Y+O-04

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **160.34**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **50%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 160.34 | 50% |
| Soft Rock: | 160.66 | 50% |
| | 321.00 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as CaCO3 (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as CaC03 (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | 271.33 | 2.63 | 2.12 | 80.68 | -190.95 |
| Coal | | | | | |
| Bottom, 10 ft. | 121.56 | 2.68 | 2.23 | 83.34 | -33.67 |

ATTACHMENT 13

# DIAMOND DRILL HOLE: CLC-2002-34

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1230
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 679100
**Easting:** 2428450
**Drilling Company:** L. J. Hughes & sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 2.90 | 25.00 | 27.90 | Sandstone, gy | Yes | cs, es | y | 2.90 |
| 6.10 | 27.90 | 34.00 | Claystone, gy | Yes | cv, ev | | 0.00 |
| 4.00 | 34.00 | 38.00 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 3.20 | 38.00 | 41.20 | Core Loss | | | | 0.00 |
| 1.80 | 41.20 | 43.00 | Claystone, dk gy | Yes | cv, ev | | 0.00 |
| 2.20 | 43.00 | 45.20 | Shale, dk gy, ls nods | Yes | ak, cm, em | | 0.00 |
| 1.20 | 45.20 | 46.40 | Shale, red | | cm, em | | 0.00 |
| 9.00 | 46.40 | 55.40 | Shale, grn, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 55.40 | 56.70 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.50 | 56.70 | 59.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 59.20 | 60.30 | Shale, red/ gy, sandy | | cm, em | | 0.00 |
| 2.00 | 60.30 | 62.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 62.30 | 64.15 | Sandstone, gy, massive | | cs, es | y | 1.85 |
| 5.05 | 64.15 | 69.20 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 69.20 | 70.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.30 | 70.90 | 73.20 | Claystone, red | | cv, ev | | 0.00 |
| 2.70 | 73.20 | 75.90 | Claystone, dk gy | | cv, ev | | 0.00 |
| 7.10 | 75.90 | 83.00 | Core Loss | | | | 0.00 |
| 19.70 | 83.00 | 102.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.70 | 102.70 | 103.40 | Shale, red/ gy, sandy | | cm, em | | 0.00 |
| 2.70 | 103.40 | 106.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.70 | 106.10 | 107.80 | Shale, red | | cm, em | | 0.00 |
| 0.55 | 107.80 | 108.35 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 108.35 | 109.40 | Shale, red | | cm, em | | 0.00 |
| 1.40 | 109.40 | 110.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 110.80 | 110.95 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.25 | 110.95 | 111.20 | Shale, dk gy | | cm, em | | 0.00 |
| 6.55 | 111.20 | 117.75 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.95 | 117.75 | 120.70 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 120.70 | 122.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.40 | 122.90 | 125.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.80 | 125.30 | 133.10 | Claystone, red | | cv, ev | | 0.00 |
| 1.35 | 133.10 | 134.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 134.45 | 135.60 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 135.60 | 138.50 | Sandstone, gy, sh stks | | cs, es | y | 2.90 |
| 4.25 | 138.50 | 142.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 142.75 | 144.10 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 144.10 | 146.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 146.55 | 148.30 | Shale, red/ gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 8.60 | 148.30 | 156.90 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.30 | 156.90 | 161.20 | Shale, dk gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 161.20 | 163.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 163.50 | 164.10 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.40 | 164.10 | 164.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 164.50 | 165.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 165.90 | 167.45 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 167.45 | 168.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.95 | 168.90 | 170.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.95 |
| 1.75 | 170.85 | 172.60 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 172.60 | 175.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 7.50 | 175.10 | 182.60 | Shale, dk gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 182.60 | 185.00 | Sandstone, gy, massive | | cs, es | y | 2.40 |
| 6.90 | 185.00 | 191.90 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 2.70 | 191.90 | 194.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.50 | 194.60 | 195.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 0.80 | 195.10 | 195.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-34

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.80 | 195.90 | 199.70 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 199.70 | 201.80 | Sandstone, gy, sh stks | | cs, es | y | 2.10 |
| 5.40 | 201.80 | 207.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.65 | 207.20 | 210.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.81 | 210.85 | 211.66 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.16 | 211.66 | 211.82 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.45 | 211.82 | 214.27 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.29 | 214.27 | 214.56 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.38 | 214.56 | 214.94 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.11 | 214.94 | 216.05 | Limestone, shaley, nodular | | ak, cs, es | y | 1.11 |
| 1.90 | 216.05 | 217.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 217.95 | 219.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.40 | 219.30 | 220.70 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 1.90 | 220.70 | 222.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.32 | 222.60 | 222.92 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.69 | 222.92 | 223.61 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.50 | 223.61 | 225.11 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.42 | 225.11 | 225.53 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.19 | 225.53 | 225.72 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 225.72 | 226.00 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.19 | 226.00 | 226.19 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 1.09 | 226.19 | 227.28 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.36 | 227.28 | 227.64 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.31 | 227.64 | 228.95 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.65 | 228.95 | 232.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.70 | 232.60 | 238.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 9.10 | 238.30 | 247.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.90 | 247.40 | 253.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 9.70 | 253.30 | 263.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 263.00 | 265.50 | Shale, dk gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 265.50 | 268.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 268.00 | 271.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 271.25 | 271.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 271.55 | 272.00 | **Bone, coal layers, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.14 | 272.00 | 272.14 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 272.14 | 272.30 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.67 | 272.30 | 272.97 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 272.97 | 273.22 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.16 | 273.22 | 273.38 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.52 | 273.38 | 273.90 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.70 | 273.90 | 274.60 | **Shale, dk gy, ls nods** | | ak, cm, em | | 0.00 |
| 0.31 | 274.60 | 274.91 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.26 | 274.91 | 275.17 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.09 | 275.17 | 275.26 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.32 | 275.26 | 275.58 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.78 | 275.58 | 276.36 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 276.36 | 276.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 276.50 | 277.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 0.70 | 277.00 | 277.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 277.70 | 278.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 278.40 | 279.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 0.85 | 279.70 | 280.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.95 | 280.55 | 286.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 286.50 | 287.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 0.75 | 287.40 | 288.15 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 0.75 |
| 6.90 | 288.15 | 295.05 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 295.05 | 296.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 296.70 | 298.50 | Limestone, nodular | | ak, cs, es | y | 1.80 |
| 2.05 | 298.50 | 300.55 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 4.60 | 300.55 | 305.15 | Shale, dk gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 305.15 | 308.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.50 | 308.00 | 309.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.90 | 309.50 | 311.40 | Limestone, shaley, nodular | | ak, cs, es | y | 1.90 |
| 1.35 | 311.40 | 312.75 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 1.15 | 312.75 | 313.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 2.70 | 313.90 | 316.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 316.60 | 317.60 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.95 | 317.60 | 318.55 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-34

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.15 | 318.55 | 319.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 319.70 | 323.30 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 323.30 | 323.75 | Sandstone, gy, sh stks | | cs, es | y | 0.45 |
| 0.85 | 323.75 | 324.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 324.60 | 326.65 | Shale, dk gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 326.65 | 328.60 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 328.60 | 331.50 | Sandstone, gy, sh stks | | cs, es | y | 2.90 |
| 6.15 | 331.50 | 337.65 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.33 | 337.65 | 337.98 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.11 | 337.98 | 338.09 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.07 | 338.09 | 338.16 | **Bone, coal layers, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.09 | 338.16 | 338.25 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.45 | 338.25 | 339.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.60 | 339.70 | 341.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 341.30 | 341.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 1.00 | 341.90 | 342.90 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 1.40 | 342.90 | 344.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 3.70 | 344.30 | 348.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 348.00 | 350.30 | Limestone, shaley, layered | | ak, cs, es | y | 2.30 |
| 1.20 | 350.30 | 351.50 | Limestone, massive | | ak, cs, es | y | 1.20 |
| 1.90 | 351.50 | 353.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 353.40 | 354.90 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.50 |
| 2.50 | 354.90 | 357.40 | Limestone, shaley, layered | | ak, cs, es | y | 2.50 |
| 0.90 | 357.40 | 358.30 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 3.30 | 358.30 | 361.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 361.60 | 362.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 0.75 | 362.35 | 363.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 363.10 | 364.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 |
| 1.85 | 364.65 | 366.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.00 | 366.50 | 371.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 2.60 | 371.50 | 374.10 | Sandstone, gy, sh stks | | cs, es | y | 2.60 |
| 1.30 | 374.10 | 375.40 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 2.55 | 375.40 | 377.95 | Sandstone, gy, massive | | cs, es | y | 2.55 |
| 2.45 | 377.95 | 380.40 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.25 | 380.40 | 382.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 382.65 | 383.80 | Limestone, nodular | | ak, cs, es | y | 1.15 |
| 1.45 | 383.80 | 385.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 385.25 | 386.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 1.85 | 386.10 | 387.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 387.95 | 388.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 1.10 | 388.80 | 389.90 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 4.70 | 389.90 | 394.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 394.60 | 397.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 2.30 | 397.00 | 399.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 399.30 | 400.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 0.80 | 400.90 | 401.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 401.70 | 404.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 1.40 | 404.80 | 406.20 | Limestone, massive | | ak, cs, es | y | 1.40 |
| 1.05 | 406.20 | 407.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 407.25 | 408.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 3.30 | 408.00 | 411.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 411.30 | 413.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 4.20 | 413.60 | 417.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 417.80 | 418.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 0.30 | 418.30 | 418.60 | Limestone, nodular | | ak, cs, es | y | 0.30 |
| 1.00 | 418.60 | 419.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 419.60 | 420.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 1.40 | 420.50 | 421.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 421.90 | 426.00 | Limestone, nodular | | ak, cs, es | y | 4.10 |
| 1.40 | 426.00 | 427.40 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 4.05 | 427.40 | 431.45 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 4.65 | 431.45 | 436.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 436.10 | 438.50 | Limestone, nodular | | ak, cs, es | y | 2.40 |
| 1.60 | 438.50 | 440.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.10 | 440.10 | 446.20 | Limestone, shaley, nodular | | ak, cs, es | y | 6.10 |
| 0.60 | 446.20 | 446.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 446.80 | 447.75 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 0.40 | 447.75 | 448.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-34

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.75 | 448.15 | 449.90 | Limestone, massive | | ak, cs, es | y | 1.75 |
| 1.30 | 449.90 | 451.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 451.20 | 452.55 | Claystone, grn | | cv, ev | | 0.00 |
| 5.45 | 452.55 | 458.00 | Limestone, nodular | | ak, cs, es | y | 5.45 |
| 0.65 | 458.00 | 458.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 458.65 | 460.15 | Limestone, layered | | ak, cs, es | y | 1.50 |
| 1.30 | 460.15 | 461.45 | Limestone, massive | | ak, cs, es | y | 1.30 |
| 0.80 | 461.45 | 462.25 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.55 | 462.25 | 463.80 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 1.40 | 463.80 | 465.20 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.55 | 465.20 | 467.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.55 |
| 4.40 | 467.75 | 472.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.40 | 472.15 | 479.55 | Limestone, nodular | | ak, cs, es | y | 7.40 |
| 1.35 | 479.55 | 480.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.06 | 480.90 | 482.96 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.21 | 482.96 | 483.17 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.45 | 483.17 | 483.62 | **Coal, bone stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.07 | 483.62 | 483.69 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.34 | 483.69 | 484.03 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.22 | 484.03 | 485.25 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.95 | 485.25 | 487.20 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.20 | 487.20 | 491.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.75 | 491.40 | 492.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 492.15 | 492.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.05 | 492.40 | 494.45 | Shale, dk gy | | cm, em | | 0.00 |
| 10.65 | 494.45 | 505.10 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 505.10 | 506.95 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.85 | 506.95 | 507.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.54 | 507.80 | 509.34 | Shale, dk gy | | cm, em | | 0.00 |
| 0.22 | 509.34 | 509.56 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.80 | 509.56 | 511.36 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.78 | 511.36 | 513.14 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.09 | 513.14 | 514.23 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.19 | 514.23 | 514.42 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.44 | 514.42 | 514.86 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 514.86 | 515.04 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.81 | 515.04 | 515.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.70 | 515.85 | 517.55 | Limestone, nodular | | ak, cs, es | y | 1.70 |
| 1.00 | 517.55 | 518.55 | Limestone, mosaic | | ak, cs, es | y | 1.00 |
| 0.40 | 518.55 | 518.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 518.95 | 520.90 | Limestone, mosaic | | ak, cs, es | y | 1.95 |
| 1.10 | 520.90 | 522.00 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 0.20 | 522.00 | 522.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 522.20 | 524.35 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 0.30 | 524.35 | 524.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 524.65 | 526.60 | Limestone, nodular | | ak, cs, es | y | 1.95 |
| 1.75 | 526.60 | 528.35 | Limestone, mosaic | | ak, cs, es | y | 1.75 |
| 1.95 | 528.35 | 530.30 | Limestone, nodular | | ak, cs, es | y | 1.95 |
| 0.60 | 530.30 | 530.90 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 530.90 | 533.30 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 0.55 | 533.30 | 533.85 | Claystone, grn | | cv, ev | | 0.00 |
| 0.65 | 533.85 | 534.50 | Limestone, massive | | ak, cs, es | y | 0.65 |
| 1.90 | 534.50 | 536.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 536.40 | 539.40 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 539.40 | 540.30 | Sandstone, gy, sh stks | | cs, es | y | 0.90 |
| 1.20 | 540.30 | 541.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.25 | 541.50 | 544.75 | Shale, dk gy | | cm, em | | 0.00 |
| 4.80 | 544.75 | 549.55 | Limestone, shaley, nodular | | ak, cs, es | y | 4.80 |
| 1.25 | 549.55 | 550.80 | Claystone, gy | | cv, ev | | 0.00 |
| 0.07 | 550.80 | 550.87 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.94 | 550.87 | 551.81 | **Coal, bone stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.39 | 551.81 | 552.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 552.20 | 552.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.70 | 552.90 | 554.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 554.60 | 555.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.55 | 555.05 | 555.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 1.70 | 555.60 | 557.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 557.30 | 558.55 | Limestone, massive | | ak, cs, es | y | 1.25 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-34

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.20 | 558.55 | 558.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 558.75 | 558.85 | Limestone, massive | | ak, cs, es | y | 0.10 |
| 0.70 | 558.85 | 559.55 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 0.90 | 559.55 | 560.45 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 0.70 | 560.45 | 561.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 6.35 | 561.15 | 567.50 | Limestone, nodular | | ak, cs, es | y | 6.35 |
| 0.50 | 567.50 | 568.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 568.00 | 568.95 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 1.65 | 568.95 | 570.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.65 |
| 0.85 | 570.60 | 571.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.65 | 571.45 | 577.10 | Claystone, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.52 | 577.10 | 578.62 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.12 | 578.62 | 578.74 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.26 | 578.74 | 579.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.94 | 579.00 | 579.94 | Claystone, tan | | cv, ev | | 0.00 |
| 0.25 | 579.94 | 580.19 | **Coal, bone stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.03 | 580.19 | 580.22 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.23 | 580.22 | 580.45 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.37 | 580.45 | 581.82 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.06 | 581.82 | 581.88 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.51 | 581.88 | 582.39 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 582.39 | 582.42 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.45 | 582.42 | 583.87 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 583.87 | 583.89 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.00 | 583.89 | 584.89 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 584.89 | 584.91 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.12 | 584.91 | 585.03 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 585.03 | 585.05 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.85 | 585.05 | 585.90 | Shale, dk gy | | cm, em | | 0.00 |
| 1.45 | 585.90 | 587.35 | Limestone, shaley, nodular | | ak, cs, es | y | 1.45 |
| 4.60 | 587.35 | 591.95 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 591.95 | 592.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.80 | 592.35 | 594.15 | Claystone, dk gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 0.40 | 594.15 | 594.55 | Shale, dk gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 594.55 | 594.85 | Claystone, dk gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 594.85 | 595.35 | Claystone, gy | | cv, ev | | 0.00 |
| 3.45 | 595.35 | 598.80 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.05 | 598.80 | 600.85 | Sandstone, gy, massive | | cs, es | y | 2.05 |
| 1.75 | 600.85 | 602.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| | Total Depth | 602.60 | | | | | 141.76 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **141.76**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **24%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 141.76 | 24% |
| Soft Rock: | 460.84 | 76% |
| | 602.60 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-35**

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1160
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 675480
**Easting:** 2416150
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 4.40 | 25.00 | 29.40 | Shale, gy, sandy | Yes | cm, em | | 0.00 |
| 3.70 | 29.40 | 33.10 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 33.10 | 33.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.70 | 33.90 | 37.60 | Claystone, gy | | cv, ev | | 0.00 |
| 2.15 | 37.60 | 39.75 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.55 | 39.75 | 40.30 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.35 | 40.30 | 40.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.80 | 40.65 | 41.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 1.30 | 41.45 | 42.75 | Claystone, red | | cv, ev | | 0.00 |
| 1.65 | 42.75 | 44.40 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.30 | 44.40 | 46.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.90 | 46.70 | 50.60 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 3.90 |
| 2.35 | 50.60 | 52.95 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 52.95 | 53.50 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.20 | 53.50 | 53.70 | Claystone, red | | cv, ev | | 0.00 |
| 0.75 | 53.70 | 54.45 | Claystone, gy | | cv, ev | | 0.00 |
| 0.35 | 54.45 | 54.80 | Claystone, red | | cv, ev | | 0.00 |
| 1.75 | 54.80 | 56.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 56.55 | 58.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.30 | 58.75 | 59.05 | Shale, gy | | cm, em | | 0.00 |
| 4.50 | 59.05 | 63.55 | Claystone, red | | cv, ev | | 0.00 |
| 1.75 | 63.55 | 65.30 | Shale, dk gy | | cm, em | | 0.00 |
| 4.70 | 65.30 | 70.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.80 | 70.00 | 72.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 12.40 | 72.80 | 85.20 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 85.20 | 85.75 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 0.55 |
| 0.85 | 85.75 | 86.60 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 4.07 | 86.60 | 90.67 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.21 | 90.67 | 90.88 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.04 | 90.88 | 91.92 | **Coal, bone stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.56 | 91.92 | 92.48 | **Coal, sh layers** | | ac, cv, ev | | 0.00 |
| 0.28 | 92.48 | 92.76 | **Claystone, dk gy** | | ak, cv, ev | | 0.00 |
| 1.13 | 92.76 | 93.89 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 3.21 | 93.89 | 97.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 10.45 | 97.10 | 107.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 107.55 | 108.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.90 | 108.65 | 110.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.95 | 110.55 | 113.50 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 2.95 |
| 4.65 | 113.50 | 118.15 | Sandstone, gy, sh stks | | cs, es | y | 4.65 |
| 9.80 | 118.15 | 127.95 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 9.80 |
| 6.50 | 127.95 | 134.45 | Sandstone, gy, sh stks | | cs, es | y | 6.50 |
| 8.60 | 134.45 | 143.05 | Sandstone, gy, massive | | cs, es | y | 8.60 |
| 18.20 | 143.05 | 161.25 | Sandstone, gy, sh stks | | cs, es | y | 18.20 |
| 7.80 | 161.25 | 169.05 | Sandstone, gy crosbeds | | cs, es | y | 7.80 |
| 3.42 | 169.05 | 172.47 | Sandstone, gy, massive | | cs, es | y | 3.42 |
| 0.49 | 172.47 | 172.96 | **Coal, pyrite, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.41 | 172.96 | 173.37 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.15 | 173.37 | 173.52 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.58 | 173.52 | 174.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.58 |
| 0.30 | 174.10 | 174.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 174.40 | 174.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 7.90 | 174.70 | 182.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 182.60 | 183.20 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.90 | 183.20 | 187.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 187.10 | 188.70 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.95 | 188.70 | 191.65 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 2.95 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-35

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.65 | 191.65 | 195.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.10 | 195.30 | 200.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 200.40 | 201.55 | Limestone, massive | | ak, cs, es | y | 1.15 |
| 0.75 | 201.55 | 202.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 202.30 | 205.45 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 205.45 | 207.65 | Sandstone, gy, crossbeds | | cs, es | y | 2.20 |
| 0.85 | 207.65 | 208.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 208.50 | 209.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 209.65 | 210.80 | Claystone, grn | | cv, ev | | 0.00 |
| 0.40 | 210.80 | 211.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 211.20 | 211.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 211.50 | 214.30 | Limestone, layered | | ak, cs, es | y | 2.80 |
| 0.35 | 214.30 | 214.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.00 | 214.65 | 216.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.96 | 216.65 | 219.61 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.27 | 219.61 | 219.88 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.14 | 219.88 | 220.02 | **Bone, coal layers, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.44 | 220.02 | 220.46 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.17 | 220.46 | 220.63 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.87 | 220.63 | 221.50 | Shale, dk gy | | cm, em | | 0.00 |
| 5.45 | 221.50 | 226.95 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.35 | 226.95 | 232.30 | Sandstone, gy, sh stks | | cs, es | y | 5.35 |
| 2.20 | 232.30 | 234.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.12 | 234.50 | 235.62 | Shale, dk gy | | cm, em | | 0.00 |
| 0.38 | 235.62 | 236.00 | **Coal, bone stks, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 1.55 | 236.00 | 237.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 237.55 | 239.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 239.00 | 240.35 | Limestone, shaley, massive | | ak, cs, es | y | 1.35 |
| 4.15 | 240.35 | 244.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 244.50 | 245.10 | Limestone, massive | | ak, cs, es | y | 0.60 |
| 2.25 | 245.10 | 247.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 247.35 | 248.60 | Limestone, massive | | ak, cs, es | y | 1.25 |
| 0.70 | 248.60 | 249.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 249.30 | 250.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.30 | 250.10 | 250.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 250.40 | 252.00 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 2.80 | 252.00 | 254.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 254.80 | 256.75 | Limestone, nodular | | ak, cs, es | y | 1.95 |
| 0.45 | 256.75 | 257.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 257.20 | 258.05 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.15 | 258.05 | 259.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.60 | 259.20 | 259.80 | Limestone, shaley, layered | | ak, cs, es | y | 0.60 |
| 4.10 | 259.80 | 263.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 263.90 | 264.55 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.35 | 264.55 | 265.90 | Limestone, shaley, layered | | ak, cs, es | y | 1.35 |
| 0.50 | 265.90 | 266.40 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.70 | 266.40 | 269.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.10 | 269.10 | 273.20 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 273.20 | 273.90 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.95 | 273.90 | 274.85 | Claystone, dk gy | | cv, ev | | 0.00 |
| 9.95 | 274.85 | 284.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.75 | 284.80 | 289.55 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 289.55 | 290.85 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 290.85 | 292.45 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 2.55 | 292.45 | 295.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 295.00 | 296.35 | Limestone, shaley, massive | | ak, cs, es | y | 1.35 |
| 3.90 | 296.35 | 300.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 300.25 | 302.65 | Limestone, massive | | ak, cs, es | y | 2.40 |
| 8.95 | 302.65 | 311.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.65 | 311.60 | 314.25 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 2.65 |
| 1.60 | 314.25 | 315.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 315.85 | 316.55 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 2.60 | 316.55 | 319.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 319.15 | 322.45 | Limestone, shaley, nodular | | ak, cs, es | y | 3.30 |
| 2.20 | 322.45 | 324.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.90 | 324.65 | 328.55 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 5.05 | 328.55 | 333.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.35 | 333.60 | 336.95 | Limestone, shaley, nodular | | ak, cs, es | y | 3.35 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-35

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.75 | 336.95 | 338.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 338.70 | 339.45 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 0.55 | 339.45 | 340.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 340.00 | 340.40 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 4.85 | 340.40 | 345.25 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 345.25 | 348.10 | Limestone, shaley, nodular | | ak, cs, es | y | 2.85 |
| 2.65 | 348.10 | 350.75 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 6.55 | 350.75 | 357.30 | Limestone, massive | | ak, cs, es | y | 6.55 |
| 0.25 | 357.30 | 357.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 357.55 | 358.55 | Limestone, layered | | ak, cs, es | y | 1.00 |
| 1.30 | 358.55 | 359.85 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 0.55 | 359.85 | 360.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 360.40 | 361.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 1.00 | 361.70 | 362.70 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 3.90 | 362.70 | 366.60 | Limestone, shaley, nodular | | ak, cs, es | y | 3.90 |
| 7.30 | 366.60 | 373.90 | Limestone, shaley, layered | | ak, cs, es | y | 7.30 |
| 0.40 | 373.90 | 374.30 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 374.30 | 374.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.46 | 374.80 | 377.26 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.11 | 377.26 | 377.37 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.12 | 377.37 | 377.49 | **Bone, coal layers, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.57 | 377.49 | 378.06 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 378.06 | 378.11 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.13 | 378.11 | 379.24 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.05 | 379.24 | 379.29 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.89 | 379.29 | 380.18 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 2.37 | 380.18 | 382.55 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 13.25 | 382.55 | 395.80 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.63 | 395.80 | 399.43 | Shale, dk gy | | cm, em | | 0.00 |
| 0.38 | 399.43 | 399.81 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.11 | 399.81 | 399.92 | Shale, dk gy | | cm, em | | 0.00 |
| 0.57 | 399.92 | 400.49 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.62 | 400.49 | 401.11 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 401.11 | 401.22 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.93 | 401.22 | 402.15 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 402.15 | 402.17 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.09 | 402.17 | 402.26 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 402.26 | 402.28 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.21 | 402.28 | 402.49 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.17 | 402.49 | 402.66 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.66 | 402.66 | 403.32 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.08 | 403.32 | 403.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.15 | 403.40 | 404.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 404.55 | 407.05 | Limestone, nodular | | ak, cs, es | y | 2.50 |
| 0.35 | 407.05 | 407.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 407.40 | 410.00 | Limestone, shaley, nodular | | ak, cs, es | y | 2.60 |
| 0.30 | 410.00 | 410.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 410.30 | 412.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.45 |
| 0.25 | 412.75 | 413.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 413.00 | 415.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.70 |
| 3.00 | 415.70 | 418.70 | Limestone, shaley, mosaic | | ak, cs, es | y | 3.00 |
| 3.60 | 418.70 | 422.30 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 422.30 | 422.95 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 11.15 | 422.95 | 434.10 | Sandstone, gy, sh stks | | cs, es | y | 11.15 |
| 0.90 | 434.10 | 435.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.45 | 435.00 | 435.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 435.45 | 437.60 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 1.90 | 437.60 | 439.50 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 1.32 | 439.50 | 440.82 | Claystone, gy | | cv, ev | | 0.00 |
| 0.07 | 440.82 | 440.89 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.05 | 440.89 | 440.94 | Shale, dk gy | | cm, em | | 0.00 |
| 0.26 | 440.94 | 441.20 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.89 | 441.20 | 442.09 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.80 | 442.09 | 443.89 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.54 | 443.89 | 444.43 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.03 | 444.43 | 444.46 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.23 | 444.46 | 444.69 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 444.69 | 445.64 | Limestone, shaley, layered | | ak, cs, es | y | 0.95 |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-35**

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.95 | 445.64 | 446.59 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 446.59 | 447.39 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 0.50 | 447.39 | 447.89 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 447.89 | 449.44 | Limestone, nodular | | ak, cs, es | y | 1.55 |
| 0.20 | 449.44 | 449.64 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.90 | 449.64 | 457.54 | Limestone, nodular | | ak, cs, es | y | 7.90 |
| 2.30 | 457.54 | 459.84 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 0.70 | 459.84 | 460.54 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 0.45 | 460.54 | 460.99 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.35 | 460.99 | 461.34 | Limestone, massive | | ak, cs, es | y | 0.35 |
| 1.30 | 461.34 | 462.64 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 462.64 | 464.44 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.65 | 464.44 | 466.09 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 466.09 | 468.19 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.15 | 468.19 | 468.34 | Claystone, tan | | cv, ev | | 0.00 |
| 2.18 | 468.34 | 470.52 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.08 | 470.52 | 470.60 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.27 | 470.60 | 470.87 | **Coal, sh stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.03 | 470.87 | 470.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.19 | 470.90 | 471.09 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.81 | 471.09 | 471.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.09 | 471.90 | 471.99 | Pyrite | | ac, cs, es | | 0.00 |
| 0.27 | 471.99 | 472.26 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.57 | 472.26 | 473.83 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.05 | 473.83 | 473.88 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.60 | 473.88 | 474.48 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 474.48 | 474.51 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 2.68 | 474.51 | 477.19 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.21 | 477.19 | 477.40 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 477.40 | 477.43 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.00 | 477.43 | 478.43 | Shale, dk gy | | cm, em | | 0.00 |
| 0.95 | 478.43 | 479.38 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 479.38 | 481.78 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 481.78 | 484.28 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.45 | 484.28 | 485.73 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 485.73 | 486.48 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 4.36 | 486.48 | 490.84 | Sandstone, gy, sh stks | | cs, es | y | 4.36 |
| | Total Depth | 490.84 | | | | | 179.36 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **179.36**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **37%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 179.36 | 37% |
| Soft Rock: | 311.48 | 63% |
| | 490.84 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | $CaCO_3$ Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| *Coal* | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-38

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1310
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 669000
**Easting:** 2419850
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 0.75 | 25.00 | 25.75 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 5.95 | 25.75 | 31.70 | Claystone, gy | | cv, ev | | 0.00 |
| 1.70 | 31.70 | 33.40 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.10 | 33.40 | 36.50 | Claystone, red | | cv, ev | | 0.00 |
| 7.90 | 36.50 | 44.40 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.95 | 44.40 | 46.35 | Shale, gy, sandy | | cm, em | | 0.00 |
| 6.20 | 46.35 | 52.55 | Shale, red | | cm, em | | 0.00 |
| 2.25 | 52.55 | 54.80 | Shale, gy | | cm, em | | 0.00 |
| 3.80 | 54.80 | 58.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.15 | 58.60 | 62.75 | Shale, red | | cm, em | | 0.00 |
| 1.75 | 62.75 | 64.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 64.50 | 64.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 |
| 3.60 | 64.80 | 68.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.60 | 68.40 | 72.00 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.90 | 72.00 | 74.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.60 | 74.90 | 82.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 82.50 | 84.10 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 3.30 | 84.10 | 87.40 | Claystone, red | | cv, ev | | 0.00 |
| 4.00 | 87.40 | 91.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 91.40 | 92.80 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 92.80 | 96.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 96.90 | 97.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.55 | 97.80 | 98.35 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.15 | 98.35 | 102.50 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.15 | 102.50 | 105.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.85 | 105.65 | 106.50 | Limestone, shaley, nodular | | ak, cs, es | y | 0.85 |
| 2.00 | 106.50 | 108.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.40 | 108.50 | 110.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.40 |
| 1.05 | 110.90 | 111.95 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 111.95 | 113.50 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.40 | 113.50 | 117.90 | Claystone, red/ ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 117.90 | 118.95 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 6.75 | 118.95 | 125.70 | Claystone, red | | cv, ev | | 0.00 |
| 2.80 | 125.70 | 128.50 | Shale, dk gy | | cm, em | | 0.00 |
| 4.90 | 128.50 | 133.40 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.50 | 133.40 | 136.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.90 | 136.90 | 139.80 | Shale, red | | cm, em | | 0.00 |
| 0.50 | 139.80 | 140.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 2.30 | 140.30 | 142.60 | Claystone, gy | | cv, ev | | 0.00 |
| 2.70 | 142.60 | 145.30 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.20 | 145.30 | 149.50 | Claystone, red | | cv, ev | | 0.00 |
| 1.15 | 149.50 | 150.65 | Shale, dk gy, sandy | | cm, em | | 0.00 |
| 7.55 | 150.65 | 158.20 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.30 | 158.20 | 161.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.50 | 161.50 | 162.00 | Shale, red | | cm, em | | 0.00 |
| 4.80 | 162.00 | 166.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.70 | 166.80 | 170.50 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 5.60 | 170.50 | 176.10 | Shale, gy | | cm, em | | 0.00 |
| 2.65 | 176.10 | 178.75 | Shale, dk gy | | cm, em | | 0.00 |
| 0.20 | 178.75 | 178.95 | **Coal, bone stks, JOLLYTOWN "A"** | | ac, cv, ev | | 0.00 |
| 0.20 | 178.95 | 179.15 | Shale, blk | | ac, cm, em | | 0.00 |
| 8.75 | 179.15 | 187.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.85 | 187.90 | 194.75 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 7.25 | 194.75 | 202.00 | Shale, red | | cm, em | | 0.00 |
| 5.00 | 202.00 | 207.00 | Shale, gy | | cm, em | | 0.00 |
| 4.80 | 207.00 | 211.80 | Sandstone, gy, massive | | cs, es | y | 4.80 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-38

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 14.00 | 211.80 | 225.80 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.30 | 225.80 | 227.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 227.10 | 230.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.30 | 230.10 | 235.40 | Claystone, red | | cv, ev | | 0.00 |
| 14.90 | 235.40 | 250.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 250.30 | 253.30 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 9.00 | 253.30 | 262.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 262.30 | 266.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 266.00 | 267.60 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 6.00 | 267.60 | 273.60 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 273.60 | 276.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.00 | 276.10 | 278.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.48 | 278.10 | 278.58 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.32 | 278.58 | 278.90 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.41 | 278.90 | 279.31 | **Coal, sh stks, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 1.04 | 279.31 | 280.35 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 280.35 | 280.55 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.87 | 280.55 | 281.42 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.74 | 281.42 | 282.16 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.20 | 282.16 | 282.36 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 7.34 | 282.36 | 289.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 289.70 | 290.80 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 290.80 | 293.50 | Sandstone, gy, sh stks | | cs, es | y | 2.70 |
| 13.40 | 293.50 | 306.90 | Sandstone, gy, massive | | cs, es | y | 13.40 |
| 2.30 | 306.90 | 309.20 | Sandstone, gy, sh stks | | cs, es | y | 2.30 |
| 4.00 | 309.20 | 313.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 313.20 | 315.10 | Sandstone, gy, sh stks | | cs, es | y | 1.90 |
| 6.40 | 315.10 | 321.50 | Sandstone, gy, massive | | cs, es | y | 6.40 |
| 8.10 | 321.50 | 329.60 | Sandstone, gy, sh stks | | cs, es | y | 8.10 |
| 2.75 | 329.60 | 332.35 | Sandstone, gy, massive | | cs, es | y | 2.75 |
| 2.65 | 332.35 | 335.00 | Sandstone, gy, sh pebbles | | cs, es | y | 2.65 |
| 3.40 | 335.00 | 338.40 | Sandstone, gy, massive | | cs, es | y | 3.40 |
| 5.55 | 338.40 | 343.95 | Sandstone, gy, sh stks | | cs, es | y | 5.55 |
| 8.65 | 343.95 | 352.60 | Sandstone, gy, massive | | cs, es | y | 8.65 |
| 6.00 | 352.60 | 358.60 | Sandstone, gy, crossbeds | | cs, es | y | 6.00 |
| 0.80 | 358.60 | 359.40 | Sandstone, gy, sh pebbles | | cs, es | y | 0.80 |
| 1.90 | 359.40 | 361.30 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 0.85 | 361.30 | 362.15 | Shale, dk gy | | cm, em | | 0.00 |
| 0.37 | 362.15 | 362.52 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.42 | 362.52 | 362.94 | **Bone, coal stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 0.54 | 362.94 | 363.48 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.14 | 363.48 | 363.62 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.18 | 363.62 | 364.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 364.80 | 365.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 365.20 | 365.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.75 |
| 2.95 | 365.95 | 368.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.50 | 368.90 | 373.40 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 373.40 | 376.30 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 10.20 | 376.30 | 386.50 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 386.50 | 388.30 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 1.80 |
| 5.70 | 388.30 | 394.00 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 394.00 | 396.10 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 396.10 | 400.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.40 | 400.30 | 401.70 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 0.70 | 401.70 | 402.40 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 5.30 | 402.40 | 407.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 5.00 | 407.70 | 412.70 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.60 | 412.70 | 413.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.20 | 413.30 | 413.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 14.50 | 413.50 | 428.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.38 | 428.00 | 429.38 | Shale, dk gy | | cm, em | | 0.00 |
| 0.35 | 429.38 | 429.73 | **Bone, coal layers, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 0.04 | 429.73 | 429.77 | Shale, dk gy | | cm, em | | 0.00 |
| 0.28 | 429.77 | 430.05 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 8.00 | 430.05 | 438.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 438.05 | 439.40 | Limestone, nodular | | ak, cs, es | y | 1.35 |
| 1.50 | 439.40 | 440.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 1.95 | 440.90 | 442.85 | Limestone, nodular | | ak, cs, es | y | 1.95 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-38

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.35 | 442.85 | 445.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 445.20 | 447.40 | Limestone, nodular | | ak, cs, es | y | 2.20 |
| 2.85 | 447.40 | 450.25 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 450.25 | 450.90 | Limestone, shaley, nodular | | ak, cs, es | y | 0.65 |
| 1.80 | 450.90 | 452.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.25 | 452.70 | 452.95 | Limestone, shaley, nodular | | ak, cs, es | y | 0.25 |
| 3.95 | 452.95 | 456.90 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.70 | 456.90 | 457.60 | Limestone, nodular | | ak, cs, es | y | 0.70 |
| 3.25 | 457.60 | 460.85 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.30 | 460.85 | 466.15 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.65 | 466.15 | 466.80 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 466.80 | 470.25 | Shale, dk gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.50 | 470.25 | 474.75 | Limestone, shaley, layered | | ak, cs, es | y | 4.50 |
| 2.45 | 474.75 | 477.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.20 | 477.20 | 481.40 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 3.50 | 481.40 | 484.90 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 484.90 | 485.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 3.70 | 485.60 | 489.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 489.30 | 490.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 4.40 | 490.00 | 494.40 | Limestone, nodular | | ak, cs, es | y | 4.40 |
| 1.45 | 494.40 | 495.85 | Limestone, massive | | ak, cs, es | y | 1.45 |
| 6.05 | 495.85 | 501.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 501.90 | 503.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 503.70 | 508.60 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.45 | 508.60 | 513.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 513.05 | 514.90 | Limestone, massive | | ak, cs, es | y | 1.85 |
| 0.95 | 514.90 | 515.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.95 |
| 3.15 | 515.85 | 519.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 519.00 | 522.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 522.70 | 525.70 | Limestone, shaley, nodular | | ak, cs, es | y | 3.00 |
| 1.75 | 525.70 | 527.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.35 | 527.45 | 530.80 | Limestone, shaley, layered | | ak, cs, es | y | 3.35 |
| 7.00 | 530.80 | 537.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 537.80 | 541.50 | Limestone, shaley, layered | | ak, cs, es | y | 3.70 |
| 2.70 | 541.50 | 544.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 544.20 | 546.40 | Limestone, massive | | ak, cs, es | y | 2.20 |
| 1.80 | 546.40 | 548.20 | Limestone, nodular | | ak, cs, es | y | 1.80 |
| 2.50 | 548.20 | 550.70 | Limestone, massive | | ak, cs, es | y | 2.50 |
| 1.45 | 550.70 | 552.15 | Limestone, layered | | ak, cs, es | y | 1.45 |
| 1.15 | 552.15 | 553.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 0.95 | 553.30 | 554.25 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.75 | 554.25 | 555.00 | Limestone, nodular | | ak, cs, es | y | 0.75 |
| 1.80 | 555.00 | 556.80 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 556.80 | 558.10 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.30 |
| 2.30 | 558.10 | 560.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 560.40 | 562.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 3.25 | 562.70 | 565.95 | Limestone, nodular | | ak, cs, es | y | 3.25 |
| 3.15 | 565.95 | 569.10 | Limestone, shaley, layered | | ak, cs, es | y | 3.15 |
| 0.90 | 569.10 | 570.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 570.00 | 570.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.70 |
| 2.37 | 570.70 | 573.07 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.15 | 573.07 | 573.22 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.51 | 573.22 | 573.73 | **Coal, sh stks, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.25 | 573.73 | 573.98 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.07 | 573.98 | 574.05 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.39 | 574.05 | 575.44 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.26 | 575.44 | 575.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.90 | 575.70 | 578.60 | Shale, dk gy | | cm, em | | 0.00 |
| 2.45 | 578.60 | 581.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 10.85 | 581.05 | 591.90 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.05 | 591.90 | 594.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.12 | 594.95 | 595.07 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.76 | 595.07 | 595.83 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.21 | 595.83 | 596.04 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.42 | 596.04 | 596.46 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.28 | 596.46 | 596.74 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.79 | 596.74 | 597.53 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 597.53 | 597.61 | **Shale, dk gy** | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-38

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.21 | 597.61 | 597.82 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.02 | 597.82 | 597.84 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.17 | 597.84 | 598.01 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.61 | 598.01 | 598.62 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.08 | 598.62 | 599.70 | Shale, dk gy | | cm, em | | 0.00 |
| 2.75 | 599.70 | 602.45 | Limestone, nodular | | ak, cs, es | y | 2.75 |
| 4.25 | 602.45 | 606.70 | Limestone, shaley, nodular | | ak, cs, es | y | 4.25 |
| 3.50 | 606.70 | 610.20 | Limestone, nodular | | ak, cs, es | y | 3.50 |
| 0.80 | 610.20 | 611.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 |
| 2.30 | 611.00 | 613.30 | Limestone, mosaic | | ak, cs, es | y | 2.30 |
| 2.70 | 613.30 | 616.00 | Limestone, massive | | ak, cs, es | y | 2.70 |
| 3.25 | 616.00 | 619.25 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 5.80 | 619.25 | 625.05 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 625.05 | 627.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 627.20 | 629.40 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 629.40 | 631.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 631.00 | 634.75 | Limestone, shaley, layered | | ak, cs, es | y | 3.75 |
| 1.05 | 634.75 | 635.80 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 0.53 | 635.80 | 636.33 | Claystone, gy | | cv, ev | | 0.00 |
| 0.25 | 636.33 | 636.58 | **Coal, sh stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.48 | 636.58 | 637.06 | **Bone, coal layers** | | ac, cv, ev | | 0.00 |
| 0.02 | 637.06 | 637.08 | **Claystone, dk gy** | | cv, ev | | 0.00 |
| 0.26 | 637.08 | 637.34 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.06 | 637.34 | 637.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.30 | 637.40 | 637.70 | Claystone, dk gy | | cv, ev | | 0.00 |
| 2.20 | 637.70 | 639.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.51 | 639.90 | 645.41 | Limestone, nodular | | ak, cs, es | y | 5.51 |
| 1.40 | 645.41 | 646.81 | Limestone, massive | | ak, cs, es | y | 1.40 |
| 1.30 | 646.81 | 648.11 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 0.90 | 648.11 | 649.01 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 649.01 | 650.06 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 0.35 | 650.06 | 650.41 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 650.41 | 652.36 | Limestone, massive | | ak, cs, es | y | 1.95 |
| 0.90 | 652.36 | 653.26 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 1.25 | 653.26 | 654.51 | Limestone, shaley, nodular | | ak, cs, es | y | 1.25 |
| 0.85 | 654.51 | 655.36 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 655.36 | 656.36 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 656.36 | 656.76 | Limestone, shaley, nodular | | ak, cs, es | y | 0.40 |
| 1.45 | 656.76 | 658.21 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 658.21 | 660.31 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.35 | 660.31 | 661.66 | Claystone, tan | | cv, ev | | 0.00 |
| 0.55 | 661.66 | 662.21 | Shale, dk gy | | cm, em | | 0.00 |
| 1.05 | 662.21 | 663.26 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.05 | 663.26 | 663.31 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.23 | 663.31 | 663.54 | Claystone, tan | | cv, ev | | 0.00 |
| 0.32 | 663.54 | 663.86 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.12 | 663.86 | 663.98 | **Coal, bone stks, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 1.15 | 663.98 | 665.13 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 665.13 | 665.18 | **Coal, sh stks, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.90 | 665.18 | 666.08 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.28 | 666.08 | 666.36 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.13 | 666.36 | 666.49 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 2.11 | 666.49 | 668.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.02 | 668.60 | 668.62 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.61 | 668.62 | 669.23 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 669.23 | 669.26 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.26 | 669.26 | 669.52 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.19 | 669.52 | 669.71 | **Coal, pyrite** | | ac, cv, ev | | 0.00 |
| 0.45 | 669.71 | 670.16 | Shale, dk gy | | cm, em | | 0.00 |
| 1.75 | 670.16 | 671.91 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 671.91 | 673.66 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 673.66 | 677.16 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 677.16 | 677.81 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 2.83 | 677.81 | 680.64 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 680.64 | 683.94 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 3.30 |
| 0.70 | 683.94 | 684.64 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 684.64 | 686.64 | Sandstone, gy, sh stks | | cs, es | y | 2.00 |
| | Total Depth | 686.64 | | | | | 171.01 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-38

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **171.01**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **25%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 171.01 | 25% |
| Soft Rock: | 515.63 | 75% |
| | 686.64 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

# DIAMOND DRILL HOLE: CLC-2002-40

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1225
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 666870
**Easting:** 2421800
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 25.00 | 0.00 | 25.00 | Casing | | | | 0.00 |
| 5.10 | 25.00 | 30.10 | Shale, gy, ss stks | Y | cm, em | | 0.00 |
| 5.20 | 30.10 | 35.30 | Claystone, gy | Y | cv, ev | | 0.00 |
| 2.50 | 35.30 | 37.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.20 | 37.80 | 39.00 | Shale, gy | | cm, em | | 0.00 |
| 4.00 | 39.00 | 43.00 | Core Loss | | | | 0.00 |
| 11.50 | 43.00 | 54.50 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.50 | 54.50 | 58.00 | Shale, red | | cm, em | | 0.00 |
| 6.50 | 58.00 | 64.50 | Shale, gy | | cm, em | | 0.00 |
| 2.30 | 64.50 | 66.80 | Shale, red | | cm, em | | 0.00 |
| 1.55 | 66.80 | 68.35 | Claystone, gy | | cv, ev | | 0.00 |
| 2.75 | 68.35 | 71.10 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 5.70 | 71.10 | 76.80 | Shale, red | | cm, em | | 0.00 |
| 4.20 | 76.80 | 81.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 81.00 | 82.30 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 82.30 | 83.00 | Core Loss | | | | 0.00 |
| 6.00 | 83.00 | 89.00 | Claystone, red | | cv, ev | | 0.00 |
| 8.35 | 89.00 | 97.35 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 1.25 | 97.35 | 98.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.70 | 98.60 | 100.30 | Sandstone, gy, sh stks | | cs, es | y | 1.70 |
| 0.90 | 100.30 | 101.20 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.10 | 101.20 | 103.30 | Shale, gy | | cm, em | | 0.00 |
| 3.30 | 103.30 | 106.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 4.40 | 106.60 | 111.00 | Sandstone, gy, crossbeds | | cs, es | y | 4.40 |
| 4.00 | 111.00 | 115.00 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.85 | 115.00 | 116.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.11 | 116.85 | 116.96 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.09 | 116.96 | 117.05 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 6.35 | 117.05 | 123.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 11.10 | 123.40 | 134.50 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 134.50 | 137.95 | Shale, red | | cm, em | | 0.00 |
| 8.15 | 137.95 | 146.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 146.10 | 147.90 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 1.80 | 147.90 | 149.70 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 149.70 | 151.10 | Sandstone, gy, calcite cement | | ak, cs, es | y | 1.40 |
| 1.80 | 151.10 | 152.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.30 | 152.90 | 158.20 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 4.10 | 158.20 | 162.30 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 3.45 | 162.30 | 165.75 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.95 | 165.75 | 167.70 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 167.70 | 170.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.75 | 170.00 | 177.75 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 7.95 | 177.75 | 185.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 185.70 | 186.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.80 | 186.40 | 190.20 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 190.20 | 192.90 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 1.60 | 192.90 | 194.50 | Shale, red/ grn | | cm, em | | 0.00 |
| 0.91 | 194.50 | 195.41 | Shale, dk gy | | cm, em | | 0.00 |
| 0.37 | 195.41 | 195.78 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.25 | 195.78 | 196.03 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 196.03 | 196.21 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.39 | 196.21 | 196.60 | Shale, dk gy | | cm, em | | 0.00 |
| 2.30 | 196.60 | 198.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.50 | 198.90 | 206.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 206.40 | 209.00 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 209.00 | 211.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.50 | 211.80 | 217.30 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-40

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.90 | 217.30 | 222.20 | Sandstone, gy, sh stks | | cs, es | y | 4.90 |
| 3.70 | 222.20 | 225.90 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.46 | 225.90 | 229.36 | Shale, dk gy | | cm, em | | 0.00 |
| 0.54 | 229.36 | 229.90 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.38 | 229.90 | 230.28 | Shale, dk gy | | cm, em | | 0.00 |
| 0.36 | 230.28 | 230.64 | **Coal, sh stks, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 2.76 | 230.64 | 233.40 | Claystone, dk gy | | cv, ev | | 0.00 |
| 10.60 | 233.40 | 244.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 11.70 | 244.00 | 255.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 5.92 | 255.70 | 261.62 | Shale, dk gy | | cm, em | | 0.00 |
| 0.30 | 261.62 | 261.92 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.35 | 261.92 | 262.27 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.28 | 262.27 | 263.55 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 263.55 | 263.70 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.69 | 263.70 | 265.39 | Shale, dk gy | | cm, em | | 0.00 |
| 1.25 | 265.39 | 266.64 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.76 | 266.64 | 267.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.12 | 267.40 | 267.52 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 1.28 | 267.52 | 268.80 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.65 | 268.80 | 269.45 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.41 | 269.45 | 269.86 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.26 | 269.86 | 270.12 | Shale, dk gy | | cm, em | | 0.00 |
| 1.18 | 270.12 | 271.30 | **Coal, sh stks, Little Washington** | | ac, cv, ev | | 0.00 |
| 0.83 | 271.30 | 272.13 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.41 | 272.13 | 272.54 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.28 | 272.54 | 272.82 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.42 | 272.82 | 273.24 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 2.06 | 273.24 | 275.30 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 4.90 | 275.30 | 280.20 | Shale, dk gy | | cm, em | | 0.00 |
| 6.50 | 280.20 | 286.70 | Shale, dk gy, ss stks | | ac, cm, em | | 0.00 |
| 1.20 | 286.70 | 287.90 | Shale, dk gy | | cm, em | | 0.00 |
| 0.11 | 287.90 | 288.01 | **Coal, bone stks, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.19 | 288.01 | 288.20 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.40 | 288.20 | 288.60 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.28 | 288.60 | 288.88 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.40 | 288.88 | 289.28 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.67 | 289.28 | 289.95 | Limestone, shaley, layered | | ak, cs, es | y | 0.67 |
| 0.35 | 289.95 | 290.30 | Shale, dk gy | | cm, em | | 0.00 |
| 0.21 | 290.30 | 290.51 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.54 | 290.51 | 291.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.90 | 291.05 | 291.95 | Shale, blk, ls nods | | cm, em | | 0.00 |
| 1.75 | 291.95 | 293.70 | Limestone, nodular | | ak, cs, es | y | 1.75 |
| 2.05 | 293.70 | 295.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.95 | 295.75 | 297.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.95 |
| 7.30 | 297.70 | 305.00 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 8.05 | 305.00 | 313.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.65 | 313.05 | 314.70 | Limestone, nodular | | ak, cs, es | y | 1.65 |
| 0.60 | 314.70 | 315.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 315.30 | 316.00 | Sandstone, gy | | cs, es | y | 0.70 |
| 4.10 | 316.00 | 320.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.00 | 320.10 | 323.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 323.10 | 324.20 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 324.20 | 325.60 | Shale, dk gy | | cm, em | | 0.00 |
| 3.65 | 325.60 | 329.25 | Limestone, shaley, layered | | ak, cs, es | y | 3.65 |
| 2.55 | 329.25 | 331.80 | Shale, dk gy | | cm, em | | 0.00 |
| 1.15 | 331.80 | 332.95 | Claystone, blk/ tan mottled | | ac, cv, ev | | 0.00 |
| 0.37 | 332.95 | 333.32 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 5.18 | 333.32 | 338.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.90 | 338.50 | 340.40 | Sandstone, gy | | cs, es | y | 1.90 |
| 2.60 | 340.40 | 343.00 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.80 | 343.00 | 343.80 | Sandstone, gy, sh stks | | cs, es | y | 0.80 |
| 2.00 | 343.80 | 345.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.50 | 345.80 | 348.30 | Shale, gy | | cm, em | | 0.00 |
| 4.50 | 348.30 | 352.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.37 | 352.80 | 354.17 | Shale, dk gy | | cm, em | | 0.00 |
| 0.38 | 354.17 | 354.55 | **Coal, sh stks, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 1.45 | 354.55 | 356.00 | Shale, dk gy | | cm, em | | 0.00 |
| 3.50 | 356.00 | 359.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-40

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.85 | 359.50 | 361.35 | Limestone, nodular | | ak, cs, es | y | 1.85 |
| 1.25 | 361.35 | 362.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 362.60 | 363.90 | Limestone, nodular | | ak, cs, es | y | 1.30 |
| 0.75 | 363.90 | 364.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 364.65 | 365.60 | Limestone, massive | | ak, cs, es | y | 0.95 |
| 1.90 | 365.60 | 367.50 | Limestone, nodular | | ak, cs, es | y | 1.90 |
| 1.60 | 367.50 | 369.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 369.10 | 371.40 | Limestone, nodular | | ak, cs, es | y | 2.30 |
| 1.20 | 371.40 | 372.60 | Limestone, layered | | ak, cs, es | y | 1.20 |
| 1.60 | 372.60 | 374.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 374.20 | 374.80 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 1.85 | 374.80 | 376.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.65 | 376.65 | 377.30 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 377.30 | 378.50 | Limestone, shaley, layered | | ak, cs, es | y | 1.20 |
| 2.90 | 378.50 | 381.40 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.75 | 381.40 | 383.15 | Claystone, red/ grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 383.15 | 383.75 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 0.75 | 383.75 | 384.50 | Shale, dk gy | | cm, em | | 0.00 |
| 7.25 | 384.50 | 391.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.10 | 391.75 | 393.85 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.40 | 393.85 | 396.25 | Limestone, shaley, layered | | ak, cs, es | y | 2.40 |
| 0.85 | 396.25 | 397.10 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.40 | 397.10 | 398.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 398.50 | 399.40 | Limestone, massive | | ak, cs, es | y | 0.90 |
| 1.50 | 399.40 | 400.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 400.90 | 401.80 | Limestone, nodular | | ak, cs, es | y | 0.90 |
| 0.95 | 401.80 | 402.75 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 2.95 | 402.75 | 405.70 | Limestone, shaley, layered | | ak, cs, es | y | 2.95 |
| 6.70 | 405.70 | 412.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 412.40 | 413.50 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 2.10 | 413.50 | 415.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 415.60 | 416.40 | Limestone, nodular | | ak, cs, es | y | 0.80 |
| 4.40 | 416.40 | 420.80 | Limestone, shaley, layered | | ak, cs, es | y | 4.40 |
| 3.00 | 420.80 | 423.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 423.80 | 425.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 1.20 | 425.20 | 426.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 426.40 | 427.30 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 1.85 | 427.30 | 429.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 429.15 | 432.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.30 | 432.60 | 438.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 438.90 | 441.70 | Limestone, shaley, nodular | | ak, cs, es | y | 2.80 |
| 6.70 | 441.70 | 448.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.10 | 448.40 | 451.50 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 1.05 | 451.50 | 452.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.55 | 452.55 | 456.10 | Limestone, nodular | | ak, cs, es | y | 3.55 |
| 7.20 | 456.10 | 463.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.90 | 463.30 | 465.20 | Limestone, shaley, nodular | | ak, cs, es | y | 1.90 |
| 1.50 | 465.20 | 466.70 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 2.90 | 466.70 | 469.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.10 | 469.60 | 475.70 | Limestone, massive | | ak, cs, es | y | 6.10 |
| 5.00 | 475.70 | 480.70 | Limestone, layered | | ak, cs, es | y | 5.00 |
| 1.15 | 480.70 | 481.85 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 481.85 | 483.70 | Limestone, nodular | | ak, cs, es | y | 1.85 |
| 1.40 | 483.70 | 485.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 0.80 | 485.10 | 485.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 485.90 | 488.70 | Limestone, nodular | | ak, cs, es | y | 2.80 |
| 2.20 | 488.70 | 490.90 | Limestone, massive | | ak, cs, es | y | 2.20 |
| 2.40 | 490.90 | 493.30 | Limestone, layered | | ak, cs, es | y | 2.40 |
| 3.90 | 493.30 | 497.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.58 | 497.20 | 498.78 | Shale, dk gy | | cm, em | | 0.00 |
| 0.22 | 498.78 | 499.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.44 | 499.00 | 499.44 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.32 | 499.44 | 499.76 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.66 | 499.76 | 500.42 | Shale, blk, ss stks | | ac, cm, em | | 0.00 |
| 0.05 | 500.42 | 500.47 | Pyrite | | ac, cm, em | | 0.00 |
| 1.69 | 500.47 | 502.16 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.14 | 502.16 | 502.30 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.60 | 502.30 | 502.90 | Shale, blk | | ac, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-40

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.90 | 502.90 | 503.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 503.80 | 504.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 2.10 | 504.70 | 506.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 506.80 | 507.80 | Claystone, dk gy | | cv, ev | | 0.00 |
| 13.10 | 507.80 | 520.90 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.43 | 520.90 | 522.33 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.61 | 522.33 | 522.94 | **Coal, sh stks, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.06 | 522.94 | 523.00 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.20 | 523.00 | 524.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.00 | 524.20 | 527.20 | Limestone, shaley, nodular | | ak, cs, es | y | 3.00 |
| 2.60 | 527.20 | 529.80 | Limestone, shaley, layered | | ak, cs, es | y | 2.60 |
| 3.20 | 529.80 | 533.00 | Limestone, massive | | ak, cs, es | y | 3.20 |
| 2.60 | 533.00 | 535.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.60 |
| 1.95 | 535.60 | 537.55 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.95 |
| 2.05 | 537.55 | 539.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.05 |
| 2.85 | 539.60 | 542.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 5.20 | 542.45 | 547.65 | Sandstone, gy | | cs, es | y | 5.20 |
| 5.80 | 547.65 | 553.45 | Shale, dk gy | | cm, em | | 0.00 |
| 2.00 | 553.45 | 555.45 | Limestone, nodular | | ak, cs, es | y | 2.00 |
| 2.00 | 555.45 | 557.45 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 557.45 | 558.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.30 | 558.20 | 558.50 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 2.25 | 558.50 | 560.75 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 1.65 | 560.75 | 562.40 | Shale, dk gy | | cm, em | | 0.00 |
| 0.90 | 562.40 | 563.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 563.30 | 565.90 | Limestone, shaley, nodular | | ak, cs, es | y | 2.60 |
| 6.50 | 565.90 | 572.40 | Limestone, nodular | | ak, cs, es | y | 6.50 |
| 1.30 | 572.40 | 573.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.15 | 573.70 | 575.85 | Limestone, nodular | | ak, cs, es | y | 2.15 |
| 0.40 | 575.85 | 576.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 576.25 | 577.20 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 2.25 | 577.20 | 579.45 | Limestone, massive | | ak, cs, es | y | 2.25 |
| 5.55 | 579.45 | 585.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 585.00 | 585.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 585.70 | 587.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.62 | 587.10 | 587.72 | Claystone, blk/ tan, ls nods | | ak, cv, ev | | 0.00 |
| 0.15 | 587.72 | 587.87 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.65 | 587.87 | 589.52 | Claystone, blk/ tan, mottled | | ac, cv, ev | | 0.00 |
| 0.13 | 589.52 | 589.65 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.17 | 589.65 | 589.82 | **Bone, coal stks, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.36 | 589.82 | 590.18 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.85 | 590.18 | 592.03 | Shale, dk gy | | cm, em | | 0.00 |
| 0.52 | 592.03 | 592.55 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.10 | 592.55 | 593.65 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 593.65 | 593.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.98 | 593.70 | 594.68 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.04 | 594.68 | 594.72 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.28 | 594.72 | 596.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 596.00 | 596.03 | **Coal, fusain** | | ac, cv, ev | | 0.00 |
| 0.21 | 596.03 | 596.24 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 596.24 | 596.28 | **Coal, fusain** | | ac, cv, ev | | 0.00 |
| 0.60 | 596.28 | 596.88 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 596.88 | 596.98 | **Pyrite** | | ac, cm, em | | 0.00 |
| 0.66 | 596.98 | 597.64 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.07 | 597.64 | 597.71 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.31 | 597.71 | 598.02 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.40 | 598.02 | 598.42 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 598.42 | 599.17 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 599.17 | 599.42 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 599.42 | 600.32 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |
| 1.15 | 600.32 | 601.47 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 601.47 | 605.57 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 605.57 | 606.37 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 7.25 | 606.37 | 613.62 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 613.62 | | | | | 129.07 |



AEC 03489

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-40

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **129.07**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **21%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 129.07 | 21% |
| Soft Rock: | 484.55 | 79% |
| | 613.62 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-41**

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1105
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 674250
**Easting:** 2423250
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 17.50 | 0.00 | 17.50 | Casing | | | | 0.00 |
| 5.45 | 17.50 | 22.95 | Shale, dk gy, ss stks | Yes | cm, em | | 0.00 |
| 0.90 | 22.95 | 23.85 | Shale, red/ gy | Yes | cm, em | | 0.00 |
| 1.10 | 23.85 | 24.95 | Shale, dk gy | Yes | cm, em | | 0.00 |
| 0.85 | 24.95 | 25.80 | Shale, gy, ls nods | Yes | ak, cm, em | | 0.00 |
| 2.90 | 25.80 | 28.70 | Claystone, dk gy | Yes | cv, ev | | 0.00 |
| 2.00 | 28.70 | 30.70 | Claystone, dk gy, ls nods | Yes | ak, cv, ev | | 0.00 |
| 2.90 | 30.70 | 33.60 | Claystone, red | Yes | cv, ev | | 0.00 |
| 3.20 | 33.60 | 36.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 36.80 | 37.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.10 | 37.65 | 38.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 38.75 | 40.05 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 0.60 | 40.05 | 40.65 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 40.65 | 43.50 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 43.50 | 47.85 | Shale, red/ gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 47.85 | 50.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 3.20 | 50.15 | 53.35 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 2.00 | 53.35 | 55.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.10 | 55.35 | 55.45 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.07 | 55.45 | 55.52 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 4.83 | 55.52 | 60.35 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 60.35 | 64.10 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.75 | 64.10 | 65.85 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 11.55 | 65.85 | 77.40 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 4.80 | 77.40 | 82.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 1.00 | 82.20 | 83.20 | Claystone, blk | | ac, cv, ev | | 0.00 |
| 1.45 | 83.20 | 84.65 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.68 | 84.65 | 85.33 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.24 | 85.33 | 85.57 | **Coal, pyrite, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.41 | 85.57 | 85.98 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.70 | 85.98 | 86.68 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.19 | 86.68 | 86.87 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.27 | 86.87 | 87.14 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 1.25 | 87.14 | 88.39 | **Coal** | | ac, cv, ev | | 0.00 |
| 12.76 | 88.39 | 101.15 | Claystone, gy | | cv, ev | | 0.00 |
| 3.70 | 101.15 | 104.85 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 4.90 | 104.85 | 109.75 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.40 | 109.75 | 113.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 5.40 | 113.15 | 118.55 | Sandstone, gy, sh stks | | cs, es | y | 5.40 |
| 7.10 | 118.55 | 125.65 | Sandstone, gy, massive | | cs, es | y | 7.10 |
| 5.15 | 125.65 | 130.80 | Sandstone, gy, crossbeds | | cs, es | y | 5.15 |
| 3.75 | 130.80 | 134.55 | Sandstone, gy, sh stks | | cs, es | y | 3.75 |
| 6.70 | 134.55 | 141.25 | Shale, dk gy | | cm, em | | 0.00 |
| 1.50 | 141.25 | 142.75 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 0.20 | 142.75 | 142.95 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.85 | 142.95 | 143.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 143.80 | 143.85 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.50 | 143.85 | 145.35 | Shale, dk gy | | cm, em | | 0.00 |
| 0.27 | 145.35 | 145.62 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.18 | 145.62 | 145.80 | **Bone, coal stks, WAYNESBURGH "A"** | | ac, cv, ev | | 0.00 |
| 0.07 | 145.80 | 145.87 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.23 | 145.87 | 146.10 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.17 | 146.10 | 146.27 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.18 | 146.27 | 146.45 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.07 | 146.45 | 146.52 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 146.52 | 146.68 | Shale, dk gy | | cm, em | | 0.00 |
| 0.19 | 146.68 | 146.87 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.13 | 146.87 | 147.00 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-41

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.65 | 147.00 | 147.65 | Shale, dk gy | | cm, em | | 0.00 |
| 2.05 | 147.65 | 149.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 149.70 | 150.80 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 150.80 | 151.20 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.16 | 151.20 | 151.36 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.41 | 151.36 | 151.77 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.78 | 151.77 | 152.55 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.25 | 152.55 | 154.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.25 |
| 0.95 | 154.80 | 155.75 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 1.85 | 155.75 | 157.60 | Claystone, dk gy | | cv, ev | | 0.00 |
| 4.95 | 157.60 | 162.55 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.00 | 162.55 | 165.55 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 165.55 | 167.05 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.10 | 167.05 | 169.15 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.45 | 169.15 | 171.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.05 | 171.60 | 172.65 | Limestone, nodular | | ak, cs, es | y | 1.05 |
| 1.30 | 172.65 | 173.95 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 173.95 | 175.55 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.35 | 175.55 | 176.90 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 1.35 |
| 1.65 | 176.90 | 178.55 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 178.55 | 181.05 | Sandstone, gy, sh stks | | cs, es | y | 2.50 |
| 0.80 | 181.05 | 181.85 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 181.85 | 182.95 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 1.10 |
| 3.35 | 182.95 | 186.30 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.85 | 186.30 | 188.15 | Shale, dk gy | | cm, em | | 0.00 |
| 3.00 | 188.15 | 191.15 | Limestone, shaley, nodular | | ak, cs, es | y | 3.00 |
| 0.80 | 191.15 | 191.95 | Limestone, shaley, layered | | ak, cs, es | y | 0.80 |
| 0.70 | 191.95 | 192.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 192.65 | 195.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 195.00 | 195.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.00 | 195.50 | 196.50 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.40 | 196.50 | 196.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.95 | 196.90 | 197.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 197.85 | 198.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 198.70 | 199.55 | Shale, dk gy | | cm, em | | 0.00 |
| 4.75 | 199.55 | 204.30 | Sandstone, gy, sh stks | | cs, es | y | 4.75 |
| 2.30 | 204.30 | 206.60 | Sandstone, gy, crossbeds | | cs, es | y | 2.30 |
| 1.60 | 206.60 | 208.20 | Sandstone, gy, sh stks | | cs, es | y | 1.60 |
| 0.90 | 208.20 | 209.10 | Shale, dk gy, interbedded ss | | cm, em | | 0.00 |
| 1.30 | 209.10 | 210.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 210.40 | 211.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.13 | 211.25 | 211.38 | **Bone, coal stks, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 3.12 | 211.38 | 214.50 | Shale, dk gy | | cm, em | | 0.00 |
| 5.10 | 214.50 | 219.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.25 | 219.60 | 219.85 | Shale, blk, ls nods | | cm, em | | 0.00 |
| 1.35 | 219.85 | 221.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 221.20 | 222.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 4.40 | 222.60 | 227.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.40 | 227.00 | 227.40 | Limestone, nodular | | ak, cs, es | y | 0.40 |
| 2.35 | 227.40 | 229.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 229.75 | 230.75 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 0.90 | 230.75 | 231.65 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 231.65 | 232.65 | Limestone, shaley, mosaic | | ak, cs, es | y | 1.00 |
| 1.60 | 232.65 | 234.25 | Limestone, mosaic | | ak, cs, es | y | 1.60 |
| 3.20 | 234.25 | 237.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 237.45 | 239.55 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 1.20 | 239.55 | 240.75 | Limestone, shaley, layered | | ak, cs, es | y | 1.20 |
| 1.40 | 240.75 | 242.15 | Claystone, gy | | cv, ev | | 0.00 |
| 4.25 | 242.15 | 246.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 246.40 | 249.30 | Limestone, shaley, layered | | ak, cs, es | y | 2.90 |
| 3.15 | 249.30 | 252.45 | Claystone, dk gy | | cv, ev | | 0.00 |
| 5.40 | 252.45 | 257.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.75 | 257.85 | 259.60 | Shale, red/ gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 259.60 | 260.15 | Limestone, shaley, nodular | | ak, cs, es | y | 0.55 |
| 1.10 | 260.15 | 261.25 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 261.25 | 262.10 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 2.05 | 262.10 | 264.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.90 | 264.15 | 265.05 | Limestone, shaley, nodular | | ak, cs, es | y | 0.90 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-41

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.10 | 265.05 | 269.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.95 | 269.15 | 270.10 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 3.75 | 270.10 | 273.85 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 273.85 | 275.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.25 | 275.15 | 276.40 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 3.30 | 276.40 | 279.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 279.70 | 280.80 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 1.00 | 280.80 | 281.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 281.80 | 282.95 | Limestone, shaley, layered | | ak, cs, es | y | 1.15 |
| 1.05 | 282.95 | 284.00 | Limestone, massive | | ak, cs, es | y | 1.05 |
| 0.95 | 284.00 | 284.95 | Limestone, nodular | | ak, cs, es | y | 0.95 |
| 0.45 | 284.95 | 285.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.55 | 285.40 | 286.95 | Limestone, massive | | ak, cs, es | y | 1.55 |
| 7.20 | 286.95 | 294.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.35 | 294.15 | 298.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.60 | 298.50 | 299.10 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 3.05 | 299.10 | 302.15 | Shale, dk gy, layered, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 302.15 | 303.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.15 | 303.15 | 304.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.15 |
| 1.80 | 304.30 | 306.10 | Limestone | | ak, cs, es | y | 1.80 |
| 3.30 | 306.10 | 309.40 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.60 | 309.40 | 310.00 | Limestone, shaley, nodular | | ak, cs, es | y | 0.60 |
| 3.30 | 310.00 | 313.30 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.80 | 313.30 | 314.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 314.10 | 314.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 3.40 | 314.60 | 318.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 318.00 | 319.20 | Limestone, nodular | | ak, cs, es | y | 1.20 |
| 1.45 | 319.20 | 320.65 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.55 | 320.65 | 324.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 324.20 | 325.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 |
| 0.90 | 325.60 | 326.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 326.50 | 328.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.30 |
| 1.25 | 328.80 | 330.05 | Limestone, nodular | | ak, cs, es | y | 1.25 |
| 0.80 | 330.05 | 330.85 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 330.85 | 331.35 | Limestone, shaley, nodular | | ak, cs, es | y | 0.50 |
| 2.00 | 331.35 | 333.35 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 333.35 | 335.05 | Limestone, massive | | ak, cs, es | y | 1.70 |
| 2.90 | 335.05 | 337.95 | Limestone, nodular | | ak, cs, es | y | 2.90 |
| 1.70 | 337.95 | 339.65 | Limestone, massive | | ak, cs, es | y | 1.70 |
| 1.90 | 339.65 | 341.55 | Limestone, shaley, layered | | ak, cs, es | y | 1.90 |
| 1.10 | 341.55 | 342.65 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 0.80 | 342.65 | 343.45 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 343.45 | 344.55 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 1.70 | 344.55 | 346.25 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 4.00 | 346.25 | 350.25 | Limestone, nodular | | ak, cs, es | y | 4.00 |
| 2.30 | 350.25 | 352.55 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.80 | 352.55 | 356.35 | Limestone, nodular | | ak, cs, es | y | 3.80 |
| 2.40 | 356.35 | 358.75 | Limestone, layered | | ak, cs, es | y | 2.40 |
| 4.85 | 358.75 | 363.60 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.95 | 363.60 | 365.55 | Claystone, dk gy | | cv, ev | | 0.00 |
| 0.15 | 365.55 | 365.70 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.89 | 365.70 | 366.59 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 0.06 | 366.59 | 366.65 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.65 | 366.65 | 367.30 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 367.30 | 367.40 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 367.40 | 367.50 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.75 | 367.50 | 369.25 | Shale, dk gy | | cm, em | | 0.00 |
| 1.15 | 369.25 | 370.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 13.80 | 370.40 | 384.20 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.85 | 384.20 | 387.05 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.84 | 387.05 | 387.89 | Shale, dk gy | | cm, em | | 0.00 |
| 0.06 | 387.89 | 387.95 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.26 | 387.95 | 389.21 | Shale, dk gy | | cm, em | | 0.00 |
| 0.41 | 389.21 | 389.62 | **Coal, sh stks, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.22 | 389.62 | 389.84 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.56 | 389.84 | 390.40 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.10 | 390.40 | 390.50 | **Bone, coal stks** | | ac, cv, ev | | 0.00 |
| 0.70 | 390.50 | 391.20 | **Claystone, dk gy** | | cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-41

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.12 | 391.20 | 391.32 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.11 | 391.32 | 391.43 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.07 | 391.43 | 391.50 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.19 | 391.50 | 391.69 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 391.69 | 391.94 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.24 | 391.94 | 392.18 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.27 | 392.18 | 392.45 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.81 | 392.45 | 393.26 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.24 | 393.26 | 394.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.10 | 394.50 | 396.60 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 1.30 | 396.60 | 397.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 397.90 | 399.00 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 1.30 | 399.00 | 400.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.30 |
| 2.00 | 400.30 | 402.30 | Limestone, nodular | | ak, cs, es | y | 2.00 |
| 0.45 | 402.30 | 402.75 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 402.75 | 403.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 403.30 | 405.10 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 2.00 | 405.10 | 407.10 | Limestone, mosaic | | ak, cs, es | y | 2.00 |
| 1.40 | 407.10 | 408.50 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 0.90 | 408.50 | 409.40 | Limestone, massive | | ak, cs, es | y | 0.90 |
| 3.30 | 409.40 | 412.70 | Limestone, shaley, nodular | | ak, cs, es | y | 3.30 |
| 4.40 | 412.70 | 417.10 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 417.10 | 419.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.45 | 419.50 | 422.95 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 0.70 | 422.95 | 423.65 | Sandstone, gy, sh stks | | cs, es | y | 0.70 |
| 1.75 | 423.65 | 425.40 | Shale, dk gy | | cm, em | | 0.00 |
| 1.30 | 425.40 | 426.70 | Limestone, shaley, layered | | ak, cs, es | y | 1.30 |
| 3.10 | 426.70 | 429.80 | Limestone, shaley, nodular | | ak, cs, es | y | 3.10 |
| 1.80 | 429.80 | 431.60 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 0.69 | 431.60 | 432.29 | Shale, dk gy | | cm, em | | 0.00 |
| 0.21 | 432.29 | 432.50 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.27 | 432.50 | 432.77 | **Coal, sh stks, REDSTONE** | | ac, cv, ev | | 0.00 |
| 0.08 | 432.77 | 432.85 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.75 | 432.85 | 433.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.85 | 433.60 | 434.45 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.40 | 434.45 | 435.85 | Limestone, nodular | | ak, cs, es | y | 1.40 |
| 1.85 | 435.85 | 437.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 437.70 | 440.60 | Limestone, nodular | | ak, cs, es | y | 2.90 |
| 4.40 | 440.60 | 445.00 | Limestone, layered | | ak, cs, es | y | 4.40 |
| 4.80 | 445.00 | 449.80 | Limestone, shaley, nodular | | ak, cs, es | y | 4.80 |
| 1.20 | 449.80 | 451.00 | Shale, dk gy, layered, ls nods | | ak, cm, em | | 0.00 |
| 3.15 | 451.00 | 454.15 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 0.50 | 454.15 | 454.65 | Claystone, grn, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 454.65 | 456.35 | Claystone, tan | | cv, ev | | 0.00 |
| 1.70 | 456.35 | 458.05 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 0.22 | 458.05 | 458.27 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 458.27 | 458.87 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.18 | 458.87 | 459.05 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.03 | 459.05 | 459.08 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.13 | 459.08 | 459.21 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.85 | 459.21 | 460.06 | Shale, dk gy | | cm, em | | 0.00 |
| 0.05 | 460.06 | 460.11 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.69 | 460.11 | 461.80 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 0.02 | 461.80 | 461.82 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 0.28 | 461.82 | 462.10 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 462.10 | 462.13 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 2.61 | 462.13 | 464.74 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.03 | 464.74 | 464.77 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.14 | 464.77 | 464.91 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.18 | 464.91 | 465.09 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.20 | 465.09 | 465.29 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.95 | 465.29 | 466.24 | Shale, dk gy | | cm, em | | 0.00 |
| 2.15 | 466.24 | 468.39 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.30 | 468.39 | 472.69 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.70 | 472.69 | 474.39 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 474.39 | 475.89 | Claystone, blk/ tan, layered | | ac, cv, ev | | 0.00 |
| 2.10 | 475.89 | 477.99 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 477.99 | | | | | 130.40 |



AEC 03494

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-41

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **130.40**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **27%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 130.40 | 27% |
| Soft Rock: | 347.59 | 73% |
| | 477.99 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-43

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1330
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 676010
**Easting:** 2427620
**Drilling Company:** Kerogen Resources

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 17.00 | 0.00 | 17.00 | Casing | | | | 0.00 |
| 5.20 | 17.00 | 22.20 | Claystone, gy, ls nods | Yes | ak, cv, ev | | 0.00 |
| 1.60 | 22.20 | 23.80 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 0.65 | 23.80 | 24.45 | Claystone, gy | Yes | cv, ev | | 0.00 |
| 2.05 | 24.45 | 26.50 | Sandstone, gy, sh stks | Yes | cs, es | y | 2.05 |
| 1.10 | 26.50 | 27.60 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 4.70 | 27.60 | 32.30 | Sandstone, gy, crossbeds | Yes | cs, es | y | 4.70 |
| 3.45 | 32.30 | 35.75 | Shale, gy, ss stks | Yes | cm, em | | 0.00 |
| 4.35 | 35.75 | 40.10 | Claystone, red | | cv, ev | | 0.00 |
| 0.35 | 40.10 | 40.45 | Shale, dk gy | | cm, em | | 0.00 |
| 0.25 | 40.45 | 40.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.75 | 40.70 | 41.45 | Limestone, shaley, nodular | Yes | ak, cs, es | y | 0.75 |
| 0.35 | 41.45 | 41.80 | Claystone, red/ gy | Yes | cv, ev | | 0.00 |
| 1.35 | 41.80 | 43.15 | Limestone, shaley, nodular | | ak, cs, es | y | 1.35 |
| 4.95 | 43.15 | 48.10 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 48.10 | 48.60 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 48.60 | 49.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.00 |
| 2.25 | 49.60 | 51.85 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.65 | 51.85 | 52.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.60 | 52.50 | 55.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.20 | 55.10 | 57.30 | Core loss | | | | 0.00 |
| 1.15 | 57.30 | 58.45 | Claystone, gy | | cv, ev | | 0.00 |
| 0.80 | 58.45 | 59.25 | Sandstone, gy, sh stks | | cs, es | y | 0.80 |
| 0.55 | 59.25 | 59.80 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 6.95 | 59.80 | 66.75 | Claystone, gy | | cv, ev | | 0.00 |
| 0.20 | 66.75 | 66.95 | Shale, red | | cm, em | | 0.00 |
| 13.85 | 66.95 | 80.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.20 | 80.80 | 84.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 14.90 | 84.00 | 98.90 | Sandstone, gy, crossbeds | | cs, es | y | 14.90 |
| 1.75 | 98.90 | 100.65 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.70 | 100.65 | 104.35 | Claystone, gy, sandy, ls nods | | ak, cv, ev | | 0.00 |
| 6.35 | 104.35 | 110.70 | Sandstone, gy, crossbeds | | cs, es | y | 6.35 |
| 5.05 | 110.70 | 115.75 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.30 | 115.75 | 116.05 | Claystone, gy | | cv, ev | | 0.00 |
| 0.65 | 116.05 | 116.70 | Claystone, red | | cv, ev | | 0.00 |
| 0.40 | 116.70 | 117.10 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.95 | 117.10 | 118.05 | Claystone, red | | cv, ev | | 0.00 |
| 0.35 | 118.05 | 118.40 | Shale, dk gy | | cm, em | | 0.00 |
| 1.35 | 118.40 | 119.75 | Claystone, red | | cv, ev | | 0.00 |
| 1.05 | 119.75 | 120.80 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 2.40 | 120.80 | 123.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 3.40 | 123.20 | 126.60 | Shale, gy | | cm, em | | 0.00 |
| 1.15 | 126.60 | 127.75 | Claystone, dk gy | | cv, ev | | 0.00 |
| 5.95 | 127.75 | 133.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 7.20 | 133.70 | 140.90 | Claystone, red | | cv, ev | | 0.00 |
| 1.05 | 140.90 | 141.95 | Claystone, gy | | cv, ev | | 0.00 |
| 3.95 | 141.95 | 145.90 | Claystone, red | | cv, ev | | 0.00 |
| 0.65 | 145.90 | 146.55 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 146.55 | 147.05 | Claystone, red | | cv, ev | | 0.00 |
| 0.25 | 147.05 | 147.30 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 1.85 | 147.30 | 149.15 | Claystone, red | | cv, ev | | 0.00 |
| 0.70 | 149.15 | 149.85 | Shale, gy | | cm, em | | 0.00 |
| 1.35 | 149.85 | 151.20 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 1.60 | 151.20 | 152.80 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.05 | 152.80 | 155.85 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.05 | 155.85 | 156.90 | Claystone, gy, sandy | | cv, ev | | 0.00 |
| 0.85 | 156.90 | 157.75 | Claystone, red | | cv, ev | | 0.00 |
| 0.45 | 157.75 | 158.20 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 158.20 | 158.70 | Claystone, red | | cv, ev | | 0.00 |
| 6.70 | 158.70 | 165.40 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.45 | 165.40 | 167.85 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 0.45 | 167.85 | 168.30 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 4.10 | 168.30 | 172.40 | Shale, gy, sandy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-43

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.85 | 172.40 | 173.25 | Claystone, gy | | cv, ev | | 0.00 |
| 1.25 | 173.25 | 174.50 | Claystone, red | | cv, ev | | 0.00 |
| 0.60 | 174.50 | 175.10 | Claystone, gy | | cv, ev | | 0.00 |
| 1.55 | 175.10 | 176.65 | Claystone, red | | cv, ev | | 0.00 |
| 1.55 | 176.65 | 178.20 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 178.20 | 178.60 | Shale, red/ gy | | cm, em | | 0.00 |
| 0.95 | 178.60 | 179.55 | Claystone, red | | cv, ev | | 0.00 |
| 1.15 | 179.55 | 180.70 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 0.20 | 180.70 | 180.90 | Shale, red | | cm, em | | 0.00 |
| 0.85 | 180.90 | 181.75 | Shale, gy | | cm, em | | 0.00 |
| 0.45 | 181.75 | 182.20 | Claystone, red | | cv, ev | | 0.00 |
| 0.90 | 182.20 | 183.10 | Shale, gy | | cm, em | | 0.00 |
| 2.80 | 183.10 | 185.90 | Claystone, red | | cv, ev | | 0.00 |
| 0.90 | 185.90 | 186.80 | Shale, red/ gy | | cm, em | | 0.00 |
| 3.80 | 186.80 | 190.60 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 4.75 | 190.60 | 195.35 | Shale, red | | cm, em | | 0.00 |
| 0.65 | 195.35 | 196.00 | Shale, dk gy | | cm, em | | 0.00 |
| 6.40 | 196.00 | 202.40 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 202.40 | 204.10 | Shale, red, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 204.10 | 205.20 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.65 | 205.20 | 205.85 | Shale, red | | cm, em | | 0.00 |
| 2.45 | 205.85 | 208.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.25 | 208.30 | 209.55 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 6.75 | 209.55 | 216.30 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.00 | 216.30 | 217.30 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 217.30 | 219.00 | Claystone, red, ls nods | | ak, cv, ev | | 0.00 |
| 3.10 | 219.00 | 222.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 222.10 | 222.60 | Claystone, red/ gy, ls nods | | ak, cv, ev | | 0.00 |
| 5.70 | 222.60 | 228.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.90 | 228.30 | 231.20 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 |
| 6.30 | 231.20 | 237.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 237.50 | 242.40 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.20 | 242.40 | 247.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 247.60 | 248.80 | Shale, red | | cm, em | | 0.00 |
| 1.90 | 248.80 | 250.70 | Claystone, red/ gy | | cv, ev | | 0.00 |
| 6.30 | 250.70 | 257.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.30 | 257.00 | 259.30 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 6.10 | 259.30 | 265.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.30 | 265.40 | 266.70 | Shale, gy, interbedded ss | | cm, em | | 0.00 |
| 4.30 | 266.70 | 271.00 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.35 | 271.00 | 273.35 | Shale, red | | cm, em | | 0.00 |
| 1.05 | 273.35 | 274.40 | Limestone, shaley, nodular | | ak, cs, es | y | 1.05 |
| 9.80 | 274.40 | 284.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 284.20 | 288.80 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.30 | 288.80 | 292.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 292.10 | 294.30 | Shale, dk gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 |
| 5.50 | 294.30 | 299.80 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 299.80 | 301.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.30 | 301.60 | 301.90 | Shale, blk | | ac, cm, em | | 0.00 |
| 4.45 | 301.90 | 306.35 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.50 | 306.35 | 306.85 | Shale, dk gy | | cm, em | | 0.00 |
| 0.55 | 306.85 | 307.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 1.05 | 307.40 | 308.45 | **Coal, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.70 | 308.45 | 309.15 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.19 | 309.15 | 309.34 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.26 | 309.34 | 309.60 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.26 | 309.60 | 309.86 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.67 | 309.86 | 310.53 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.31 | 310.53 | 310.84 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.40 | 310.84 | 311.24 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 1.96 | 311.24 | 313.20 | Claystone, dk gy | | cv, ev | | 0.00 |
| 7.40 | 313.20 | 320.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 3.50 | 320.60 | 324.10 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 11.00 | 324.10 | 335.10 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 11.00 |
| 12.50 | 335.10 | 347.60 | Sandstone, gy, sh stks | | cs, es | y | 12.50 |
| 5.40 | 347.60 | 353.00 | Sandstone, gy, crossbeds | | cs, es | y | 5.40 |
| 9.80 | 353.00 | 362.80 | Sandstone, gy, sh stks | | cs, es | y | 9.80 |
| 0.70 | 362.80 | 363.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 2.10 | 363.50 | 365.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 365.60 | 366.05 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.80 | 366.05 | 366.85 | **Coal, sh stks, WAYNESBURG "A"** | | ac, cv, ev | | 0.00 |
| 1.00 | 366.85 | 367.85 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.35 | 367.85 | 368.20 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 |
| 0.45 | 368.20 | 368.65 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: CLC-2002-43

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 0.10 | 368.65 | 368.75 | **Shale, blk** | | ac, cm, em | | 0.00 |
| 1.30 | 368.75 | 370.05 | **Coal, bone stks** | | ac, cv, ev | | 0.00 |
| 0.30 | 370.05 | 370.35 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.35 | 370.35 | 370.70 | Limestone, shaley, nodular | | ak, cs, es | y | 0.35 |
| 0.70 | 370.70 | 371.40 | Shale, blk | | ac, cm, em | | 0.00 |
| 2.20 | 371.40 | 373.60 | Limestone, shaley, nodular | | ak, cs, es | y | 2.20 |
| 0.85 | 373.60 | 374.45 | Claystone, gm, ls nods | | ak, cv, ev | | 0.00 |
| 6.15 | 374.45 | 380.60 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.65 | 380.60 | 383.25 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 |
| 5.45 | 383.25 | 388.70 | Sandstone, gy, sh stks | | cs, es | y | 5.45 |
| 4.15 | 388.70 | 392.85 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 392.85 | 394.65 | Limestone, nodular | | ak, cs, es | y | 1.80 |
| 4.40 | 394.65 | 399.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.50 | 399.05 | 401.55 | Shale, gy, ss stks | | cm, em | | 0.00 |
| 2.95 | 401.55 | 404.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 4.10 | 404.50 | 408.60 | Limestone, shaley, nodular | | ak, cs, es | y | 4.10 |
| 2.60 | 408.60 | 411.20 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 411.20 | 411.80 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.70 | 411.80 | 412.50 | Shale, dk gy | | cm, em | | 0.00 |
| 0.60 | 412.50 | 413.10 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 1.10 | 413.10 | 414.20 | Shale, dk gy | | cm, em | | 0.00 |
| 3.60 | 414.20 | 417.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 6.80 | 417.80 | 424.60 | Sandstone, gy, sh stks | | cs, es | y | 6.80 |
| 2.65 | 424.60 | 427.25 | Shale, dk gy | | cm, em | | 0.00 |
| 0.29 | 427.25 | 427.54 | Shale, blk, coal stks | | ac, cm, em | | 0.00 |
| 0.21 | 427.54 | 427.75 | **Coal, pyrite, WAYNESBURG No. 11** | | ac, cv, ev | | 0.00 |
| 6.40 | 427.75 | 434.15 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.45 | 434.15 | 434.60 | Limestone, shaley, nodular | | ak, cs, es | y | 0.45 |
| 2.20 | 434.60 | 436.80 | Limestone, shaley, layered | | ak, cs, es | y | 2.20 |
| 4.95 | 436.80 | 441.75 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 0.55 | 441.75 | 442.30 | Limestone, nodular | | ak, cs, es | y | 0.55 |
| 2.10 | 442.30 | 444.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.00 | 444.40 | 445.40 | Limestone, nodular | | ak, cs, es | y | 1.00 |
| 2.10 | 445.40 | 447.50 | Limestone, layered | | ak, cs, es | y | 2.10 |
| 1.10 | 447.50 | 448.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 |
| 2.90 | 448.60 | 451.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.50 | 451.50 | 453.00 | Limestone, nodular | | ak, cs, es | y | 1.50 |
| 6.30 | 453.00 | 459.30 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.20 | 459.30 | 461.50 | Limestone, layered | | ak, cs, es | y | 2.20 |
| 4.20 | 461.50 | 465.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 |
| 1.70 | 465.70 | 467.40 | Sandstone, gy, massive | | cs, es | y | 1.70 |
| 2.10 | 467.40 | 469.50 | Shale, dk gy, ss stks | | cm, em | | 0.00 |
| 3.90 | 469.50 | 473.40 | Shale, red/ gy | | cm, em | | 0.00 |
| 1.40 | 473.40 | 474.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 474.80 | 478.40 | Limestone, shaley, layered | | ak, cs, es | y | 3.60 |
| 2.10 | 478.40 | 480.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 480.50 | 482.10 | Limestone, nodular | | ak, cs, es | y | 1.60 |
| 2.60 | 482.10 | 484.70 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 2.25 | 484.70 | 486.95 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 0.85 | 486.95 | 487.80 | Limestone, nodular | | ak, cs, es | y | 0.85 |
| 1.10 | 487.80 | 488.90 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.10 | 488.90 | 490.00 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 6.10 | 490.00 | 496.10 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 496.10 | 498.20 | Limestone, nodular | | ak, cs, es | y | 2.10 |
| 7.40 | 498.20 | 505.60 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 505.60 | 508.00 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 5.50 | 508.00 | 513.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.40 | 513.50 | 515.90 | Limestone, nodular | | ak, cs, es | y | 2.40 |
| 1.80 | 515.90 | 517.70 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 1.10 | 517.70 | 518.80 | Limestone, nodular | | ak, cs, es | y | 1.10 |
| 4.20 | 518.80 | 523.00 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 523.00 | 524.80 | Limestone, shaley, nodular | | ak, cs, es | y | 1.80 |
| 2.60 | 524.80 | 527.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.80 | 527.40 | 530.20 | Limestone, shaley, nodular | | ak, cs, es | y | 2.80 |
| 8.50 | 530.20 | 538.70 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 1.60 | 538.70 | 540.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 |
| 1.80 | 540.30 | 542.10 | Shale, gm, ls nods | | ak, cm, em | | 0.00 |
| 5.10 | 542.10 | 547.20 | Limestone, massive | | ak, cs, es | y | 5.10 |
| 1.90 | 547.20 | 549.10 | Limestone, layered | | ak, cs, es | y | 1.90 |
| 1.50 | 549.10 | 550.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 |
| 2.00 | 550.60 | 552.60 | Limestone, shaley, layered | | ak, cs, es | y | 2.00 |
| 1.60 | 552.60 | 554.20 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 554.20 | 556.80 | Limestone, shaley, nodular | | ak, cs, es | y | 2.60 |
| 1.70 | 556.80 | 558.50 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: CLC-2002-43

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) | |
|---|---|---|---|---|---|---|---|---|
| 6.00 | 558.50 | 564.50 | Limestone, nodular | | ak, cs, es | y | 6.00 | |
| 4.60 | 564.50 | 569.10 | Limestone, layered | | ak, cs, es | y | 4.60 | |
| 0.60 | 569.10 | 569.70 | Claystone, dk gy, ls nods | | ak, cv, ev | | 0.00 | |
| 2.35 | 569.70 | 572.05 | Claystone, dk gy | | cv, ev | | 0.00 | |
| 0.40 | 572.05 | 572.45 | Shale, blk | | ac, cm, em | | 0.00 | |
| 1.90 | 572.45 | 574.35 | Claystone, dk gy | | cv, ev | | 0.00 | |
| 3.35 | 574.35 | 577.70 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 | |
| 5.20 | 577.70 | 582.90 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 | |
| 19.20 | 582.90 | 602.10 | Sandstone, gy, sh stks | | cs, es | y | 19.20 | |
| 4.10 | 602.10 | 606.20 | Shale, dk gy, ss stks | | cm, em | | 0.00 | |
| 1.95 | 606.20 | 608.15 | Shale, blk, ss stks | | ac, cm, em | | 0.00 | |
| 1.55 | 608.15 | 609.70 | Shale, dk gy, ss stks | | cm, em | | 0.00 | |
| 0.60 | 609.70 | 610.30 | **Coal, FISHPOT** | | ac, cv, ev | | 0.00 | |
| 0.25 | 610.30 | 610.55 | **Coal, sh stks** | | ac, cv, ev | | 0.00 | |
| 0.20 | 610.55 | 610.75 | **Coal, bone stks** | | ac, cv, ev | | 0.00 | |
| 0.30 | 610.75 | 611.05 | **Shale, dk gy** | | cm, em | | 0.00 | |
| 0.45 | 611.05 | 611.50 | **Coal, bone stks** | | ac, cv, ev | | 0.00 | |
| 0.70 | 611.50 | 612.20 | Shale, dk gy | | cm, em | | 0.00 | |
| 2.50 | 612.20 | 614.70 | Limestone, nodular | | ak, cs, es | y | 2.50 | |
| 2.35 | 614.70 | 617.05 | Limestone, layered | | ak, cs, es | y | 2.35 | |
| 1.55 | 617.05 | 618.60 | Limestone, shaley, nodular | | ak, cs, es | y | 1.55 | |
| 1.70 | 618.60 | 620.30 | Limestone, nodular | | ak, cs, es | y | 1.70 | |
| 4.10 | 620.30 | 624.40 | Limestone, layered | | ak, cs, es | y | 4.10 | |
| 2.90 | 624.40 | 627.30 | Limestone, nodular | | ak, cs, es | y | 2.90 | |
| 1.60 | 627.30 | 628.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.60 | |
| 1.05 | 628.90 | 629.95 | Limestone, nodular | | ak, cs, es | y | 1.05 | |
| 0.85 | 629.95 | 630.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 | |
| 1.50 | 630.80 | 632.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.50 | |
| 5.70 | 632.30 | 638.00 | Shale, dk gy, ss stks, ls nods | | ak, cm, em | | 0.00 | |
| 4.40 | 638.00 | 642.40 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 | |
| 4.60 | 642.40 | 647.00 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 | |
| 1.45 | 647.00 | 648.45 | Shale, dk gy | | cm, em | | 0.00 | |
| 0.11 | 648.45 | 648.56 | Shale, blk | | ac, cm, em | | 0.00 | |
| 0.16 | 648.56 | 648.72 | Shale, blk, coal stks | | ac, cm, em | | 0.00 | |
| 0.78 | 648.72 | 649.50 | **Coal, bone stks, REDSTONE** | | ac, cv, ev | | 0.00 | |
| 0.21 | 649.50 | 649.71 | **Coal, sh stks** | | ac, cv, ev | | 0.00 | |
| 0.24 | 649.71 | 649.95 | Shale, blk, coal stks | | ac, cm, em | | 0.00 | |
| 0.09 | 649.95 | 650.04 | Shale, blk | | ac, cm, em | | 0.00 | |
| 0.66 | 650.04 | 650.70 | Shale, dk gy | | cm, em | | 0.00 | |
| 2.10 | 650.70 | 652.80 | Shale, dk gy, ls nods | | ak, cm, em | | 0.00 | |
| 1.10 | 652.80 | 653.90 | Limestone, shaley, nodular | | ak, cs, es | y | 1.10 | |
| 10.00 | 653.90 | 663.90 | Limestone, nodular | | ak, cs, es | y | 10.00 | |
| 1.40 | 663.90 | 665.30 | Limestone, shaley, nodular | | ak, cs, es | y | 1.40 | |
| 1.75 | 665.30 | 667.05 | Shale, gy, ls nods | | ak, cm, em | | 0.00 | |
| 0.80 | 667.05 | 667.85 | Limestone, shaley, nodular | | ak, cs, es | y | 0.80 | |
| 4.50 | 667.85 | 672.35 | Claystone, gy | | cv, ev | | 0.00 | |
| 1.05 | 672.35 | 673.40 | Shale, dk gy | | cm, em | | 0.00 | |
| 0.66 | 673.40 | 674.06 | **Coal, pyrite, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 | |
| 0.05 | 674.06 | 674.11 | Pyrite | | ac, cs, es | | 0.00 | |
| 0.66 | 674.11 | 674.77 | Shale, dk gy | | cm, em | | 0.00 | |
| 0.18 | 674.77 | 674.95 | Shale, blk, coal stks | | ac, cm, em | | 0.00 | |
| 1.72 | 674.95 | 676.67 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 | |
| 0.03 | 676.67 | 676.70 | **Shale, blk, coal stks** | | ac, cm, em | | 0.00 | 5.30 |
| 0.60 | 676.70 | 677.30 | **Coal** | | ac, cv, ev | | 0.00 | |
| 0.03 | 677.30 | 677.33 | **Shale, dk gy** | | cm, em | | 0.00 | |
| 2.30 | 677.33 | 679.63 | **Coal** | | ac, cv, ev | | 0.00 | |
| 0.02 | 679.63 | 679.65 | **Shale, dk gy** | | cm, em | | 0.00 | |
| 0.40 | 679.65 | 680.05 | **Coal** | | ac, cv, ev | | 0.00 | |
| 0.20 | 680.05 | 680.25 | **Coal, bone stks** | | ac, cv, ev | | 0.00 | |
| 1.71 | 680.25 | 681.96 | Shale, dk gy | | cm, em | | 0.00 | |
| 1.60 | 681.96 | 683.56 | Shale, gy, ls nods | | ak, cm, em | | 0.00 | |
| 2.80 | 683.56 | 686.36 | Shale, gy, sandy, ls nods | | ak, cm, em | | 0.00 | |
| 2.40 | 686.36 | 688.76 | Shale, gy, interbedded ss, ls nods | | ak, cm, em | | 0.00 | |
| 1.60 | 688.76 | 690.36 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 | |
| 1.00 | 690.36 | 691.36 | Sandstone, gy, calcite cemented | | ak, cs, es | y | 1.00 | |
| 1.90 | 691.36 | 693.26 | Shale, gy, ss stks, ls nods | | ak, cm, em | | 0.00 | |
| 0.30 | 693.26 | 693.56 | Limestone, shaley, nodular | | ak, cs, es | y | 0.30 | |
| | Total Depth | 693.56 | | | | | 202.65 | |



AEC 03499

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: CLC-2002-43**

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **202.65**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **29%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 202.65 | 29% |
| Soft Rock: | 490.91 | 71% |
| | 693.56 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE:**
**N94-15**

Field Engineer: Kim Cecil
Surface Elevation: 1,199
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 675,369
Easting: 2,420,873

DRILL HOLE I Drilling Company: L J Hughs & Sons H MILLER

DRILLING FO

SURFACE ELE

ER 4 1994
ER 5 1994

LOCATION: OHIO BELMONT COUNTY

| FORMATION | STRATA THICKNESS | DEPTH FROM SURFACE | Properti |
|---|---|---|---|
| CASING | 20.00 | 20.00 | |
| RED SHALY CLAYSTONE | 16.10 | 36.10 | cv ev |
| GRAY SHALY CLAYSTONE | 9.00 | 45.10 | cv, ev |
| RED SHALY CLAYSTONE | 6.30 | 51.40 | cv, ev |
| GRAY LIMY SHALY CLAYSTONE | 8.60 | 60.00 | ak, cv, e |
| RED AND GRAY SHALY CLAYSTONE | 17.90 | 77.90 | cv, ev |
| GRAY LIMY SHALY CLAYSTONE | 16.00 | 93.90 | ak, cv, e |
| GRAY SHALE | 6.10 | 100.00 | cm, em |
| GRAY SHALY CLAYSTONE | 4.40 | 104.40 | cv, ev |
| RED SHALY CLAYSTONE | 0.80 | 105.20 | cv, ev |
| GRAY LIMESTONE | 2.50 | 107.70 | ak, cs, e |
| GRAY LIMY SHALE | 8.70 | 116.40 | ak, cm, e |
| RED SHALY CLAYSTONE | 1.30 | 117.70 | cv, ev |
| GRAY LIMY SHALE | 7.60 | 125.30 | ak, cm, e |
| RED AND GRAY SHALY CLAYSTONE | 3.50 | 128.80 | cv ev |
| GRAY SHALY CLAYSTONE | 6.00 | 134.80 | cv, ev |
| RED AND GRAY SHALY CLAYSTONE | 3.50 | 138.30 | cv, ev |
| GRAY LIMY SHALY CLAYSTONE | 5.60 | 143.90 | ak, cv, e |
| GRAY SANDSTONE | 0.80 | 144.70 | cs, es |
| GRAY SHALY CLAYSTONE | 2.20 | 146.90 | cv, ev |
| GRAY SANDSTONE | 1.00 | 147.90 | cs, es |
| GRAY SHALY CLAYSTONE | 2.60 | 150.50 | cv, ev |
| GRAY SHALY CLAYSTONE WITH COAL SPARS | 0.30 | 150.80 | ac, cv, e |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

| FORMATION | STRATA THICKNESS | 150.80 DEPTH FROM SURFACE | Proper |
|---|---|---|---|
| DARK GRAY SHALY CLAYSTONE | 5.00 | 155.80 | cv e |
| BONY COAL | 0.50 | 156.30 | ac, cv |
| COAL WITH PYRITE NODULES AND SHALE STREAKS . . . | 0.50 | 156.80 | ac, cv |
| COAL . . . . . | 1.42 Washington No. 12 | 158.22 | ac, cv |
| DARK SHALE | 0.19 | 158.41 | cm, c |
| COAL . . . . . | 0.09 | 158.50 | ac, cv, |
| DARK SHALE | 0.07 | 158.57 | cm, c |
| COAL (LOSS 0.30) . . . | 1.08 | 159.65 | ac, cv |
| GRAY SHALY CLAYSTONE | 8.05 | 167.70 | cv, cv |
| GRAY SHALY CLAYSTONE WITH SANDSTONE BANDS | 3.60 | 171.30 | cm, c |
| GRAY SANDSTONE | 48.10 | 219.40 | cs, c |
| GRAY SHALE | 1.50 | 220.90 | cm, c |
| GRAY SANDSTONE WITH SHALE STREAKS | 1.80 | 222.70 | cs, cs |
| GRAY SANDSTONE | 3.00 | 225.70 | cs, cs |
| GRAY SHALY CLAYSTONE | 0.10 | 225.80 | cv, cv |
| GRAY SANDSTONE WITH SOME SHALE STREAKS | 5.70 | 231.50 | cs, cs |
| COAL WITH PYRITE . . . | 0.15 | 231.65 | ac, cv, |
| DARK SHALY CLAYSTONE | 0.21 | 231.86 | cv, cv |
| GRAY SANDSTONE | 0.24 | 232.10 | cs, cs |
| GRAY SHALY CLAYSTONE | 0.27 | 232.37 | cv, cv |
| GRAY SANDSTONE WITH SHALE NODULES | 0.40 | 232.77 | cs, cs |
| GRAY SANDY SHALE WITH SANDSTONE STREAKS | 0.73 | 233.50 | cs, cs |
| GRAY SANDSTONE | 15.60 | 249.10 | cs, cs |
| DARK GRAY SANDY SHALE | 0.60 | 249.70 | cs, c |
| GRAY SANDSTONE WITH SHALE STREAKS | 8.40 | 258.10 | cs, c |
| GRAY SANDSTONE WITH COAL SPARS | 6.70 | 264.80 | cs, c |
| GRAY SHALY CLAYSTONE WITH LIME NODULES | 1.80 | 266.60 | ak, cm, c |
| GRAY LIMESTONE | 0.90 | 267.50 | ak, cs, c |
| GRAY LIMY SHALY CLAYSTONE | 4.30 | 271.80 | ak, cm, |
| GRAY LIMESTONE | 3.50 | 275.30 | ak, cs, c |
| DARK GRAY LIMY SHALY CLAYSTONE | 3.70 | 279.00 | ak, cm, c |
| BLACK BONY SHALE | 0.70 | 279.70 | ac, cm, c |
| GRAY SHALY CLAYSTONE | 1.20 | 280.90 | cv, cv |
| GRAY SANDY SHALE | 2.20 | 283.10 | cs, cs |
| GRAY SANDSTONE | 1.60 | 284.70 | cs, cs |
| GRAY LIMY SHALY CLAYSTONE | 2.10 | 286.80 | ak, cm, c |
| GRAY SANDSTONE | 10.00 | 296.80 | cs, cs |
| GRAY SANDY SHALE WITH SANDSTONE STREAKS | 3.45 | 300.25 | cs, cs |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

| FORMATION | STRATA THICKNESS | | 300.25 DEPTH FROM SURFACE | Prepa |
|---|---|---|---|---|
| COAL . . . . . | 0.10 | Waynesburg No. 11 | 300.35 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.50 | | 300.85 | cv,c |
| COAL WITH PYRITE . . . | 0.28 | | 301.13 | ac,cv, |
| DARK GRAY SHALY CLAYSTONE | 1.98 | | 303.11 | cv,c |
| COAL . . . . . | 0.05 | | 303.16 | ac,cv |
| GRAY SHALY CLAYSTONE | 0.90 | | 304.06 | cv,c |
| GRAY LIMESTONE | 1.34 | | 305.40 | ak,cs |
| GRAY LIMY SHALY CLAYSTONE | 7.10 | | 312.50 | ak,cm |
| GRAY LIMESTONE | 5.00 | | 317.50 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 3.60 | | 321.10 | ak,cm |
| GRAY LIMESTONE | 1.30 | | 322.40 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 7.70 | | 330.10 | ak,cm |
| GRAY LIMESTONE | 1.60 | | 331.70 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 6.00 | | 337.70 | ak,cm, |
| RED AND GRAY SHALY CLAYSTONE | 2.70 | | 340.40 | cv,cv |
| GRAY LIMY SHALY CLAYSTONE | 13.40 | | 353.80 | ak,cm |
| GRAY SANDSTONE WITH SHALE STREAKS | 2.40 | | 356.20 | cs,cs |
| GRAY SHALY CLAYSTONE | 0.90 | | 357.10 | @cm,c |
| GRAY SHALY LIMESTONE | 19.60 | | 376.70 | ak,cs, |
| GREEN LIMY SHALY CLAYSTONE | 3.20 | | 379.90 | ak,cm, |
| GRAY SANDSTONE WITH SHALE STREAKS | 0.80 | | 380.70 | cs,cs |
| GREEN SHALE | 0.70 | | 381.40 | cm,cv |
| GRAY SHALY LIMESTONE | 3.90 | | 385.30 | ak,cs, |
| GREEN SHALY LIMY CLAYSTONE | 0.90 | | 386.20 | ak,cm, |
| GRAY LIMESTONE | 4.20 | | 390.40 | ak,cs, |
| GREEN LIMY SHALY CLAYSTONE | 5.20 | | 395.60 | ak,cm, |
| GRAY LIMESTONE | 2.70 | | 398.30 | ak,cs,c |
| DARK GRAY LIMY SHALY CLAYSTONE | 1.30 | | 399.60 | ak,cm,c |
| GRAY LIMESTONE | 3.70 | | 403.30 | ak,cs,c |
| GRAY LIMY SHALE | 6.30 | | 409.60 | ak,cm, |
| GRAY LIMESTONE | 3.50 | | 413.10 | ak,cs,c |
| GRAY LIMY SHALE | 4.10 | | 417.20 | ak,cm,c |
| WHITE LIMESTONE | 5.70 | | 422.90 | ak,cs,c |
| GRAY LIMESTONE WITH GREEN LIMY SHALY CLAYSTONE | 7.90 | | 430.80 | ak,cs,c |
| GRAY GREEN LIMY SHALE | 2.80 | | 433.60 | ak,cm,c |
| GRAY LIMESTONE | 2.90 | | 436.50 | ak,cs,c |
| GRAY GREEN LIMY SHALY CLAYSTONE | 5.40 | | 441.90 | ak,cm,c |
| DARK GRAY SHALY CLAYSTONE | 1.20 | | 443.10 | cv,cv |
| GRAY LIMESTONE | 0.40 | | 443.50 | ak,cs,c |
| DARK GRAY SHALY CLAYSTONE | 1.80 | | 445.30 | cv,cv |
| DARK SHALE | 0.30 | | 445.60 | cm,cv |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

| FORMATION | STRATA THICKNESS | | 445.60 DEPTH FROM SURFACE | Prope |
|---|---|---|---|---|
| BLACK SHALE WITH COAL SPARS | 0.15 | | 445.75 | ac,cv |
| PYRITE | 0.02 | | 445.77 | ac,c |
| COAL . . . . . | 0.58 | Sewickley No. 9 | 446.35 | ac,c |
| DARK SHALE | 0.05 | | 446.40 | cm, |
| COAL . . . . . | 1.95 | | 448.35 | ac,c |
| BLACK SHALE WITH PYRITE AND COAL STREAKS | 0.10 | | 448.45 | ac,c |
| GRAY SHALY CLAYSTONE | 2.05 | | 450.50 | cv,c |
| GRAY GREEN LIMY SHALY CLAYSTONE | 16.60 | | 467.10 | ak,c |
| DARK SHALY CLAYSTONE | 0.30 | | 467.40 | cv,c |
| DARK SHALY CLAYSTONE WITH COAL SPARS | 0.12 | | 467.52 | ac,c |
| COAL . . . . . | 0.15 | | 467.67 | ac,c |
| GRAY SHALY CLAYSTONE | 0.18 | | 467.85 | cv,c |
| COAL . . . . . | 0.16 | | 468.01 | ac,c |
| BONE | 0.08 | | 468.09 | ac,c |
| COAL . . . . . | 0.08 | | 468.17 | ac,c |
| DARK SHALE | 0.26 | | 468.43 | cm,c |
| GRAY SHALE | 0.20 | | 468.63 | cm,c |
| COAL . . . . . | 1.19 | | 469.82 | ac,cv |
| GRAY SHALY CLAYSTONE | 0.20 | | 470.02 | cv,c |
| DARK SHALE | 0.88 | | 470.90 | cm,c |
| GRAY LIMESTONE WITH SOME SHALE | 19.20 | | 490.10 | ak,cs |
| GRAY GREEN SANDY SHALE WITH SANDSTONE STREAKS | 9.20 | | 499.30 | cs,c |
| DARK SHALY CLAYSTONE | 3.90 | | 503.20 | cv,c |
| DARK GRAY LIMESTONE | 3.30 | | 506.50 | ak,cs |
| GRAY GREEN SHALY CLAYSTONE | 1.80 | | 508.30 | cv,c |
| GRAY SHALY CLAYSTONE | 1.20 | | 509.50 | cv,c |
| DARK SHALY CLAYSTONE | 5.50 | | 515.00 | cv,c |
| BLACK SHALE | 0.60 | | 515.60 | ac,cm |
| DARK GRAY LIMY SHALY CLAYSTONE | 4.60 | | 520.20 | ak,cm, |
| WHITE LIMESTONE | 12.10 | | 532.30 | ak,cs,c |
| GRAY SHALY CLAYSTONE WITH LIMESTONE NODULES | 3.80 | | 536.10 | ak,cm, |
| GRAY SHALY CLAYSTONE | 1.60 | | 537.70 | cv,cv |
| DARK GRAY SHALY CLAYSTONE WITH PYRITE STREAKS | 1.10 | | 538.80 | ac,cv, |
| GRAY SHALY CLAYSTONE WITH SHALE STREAKS | 0.54 | | 539.34 | cm,cm |
| DARK SHALY CLAYSTONE | 0.33 | | 539.67 | cv,cv |
| BONY COAL | 0.05 | | 539.72 | ac,cv,c |
| COAL WITH PYRITE STREAKS . . . | 0.86 | Roof Coal | 540.58 | ac,cv,c |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-15

| FORMATION | STRATA THICKNESS | DEPTH FROM SURFACE | Prop |
|---|---|---|---|
| | | 540.58 | |
| BONE | 0.09 | 540.67 | ac,c |
| DARK SHALE | 0.12 | 540.79 | cm,c |
| GRAY SHALY CLAYSTONE | 0.67 | 541.46 | cv,c |
| DARK SHALE WITH COAL SPARS | 0.05 | 541.51 | ac,cr |
| PYRITE WITH COAL SPARS | 0.09 Pittsburgh NO. 8 | 541.60 | ac,cr |
| COAL . . . . . | 1.71 | 543.31 | ac,cv |
| GRAY CLAYSTONE | 0.03 | 543.34 | cv,e |
| COAL . . . . . | 3.01 | 546.35 | ac,cl |
| COAL WITH PYRITE NODULES . . . | 0.08 | 546.43 | ac,cl |
| COAL . . . . . | 0.18 | 546.61 | ac,cl |
| COAL WITH PYRITE NODULES AND STREAKS . . . | 0.07 | 546.68 | ac,cl |
| DARK GRAY SHALY CLAYSTONE | 0.23 | 546.91 | cv,e |
| GRAY LIMY SHALY CLAYSTONE | 8.19 | 555.10 | ak,cl |
| GRAY SANDSTONE WITH LIME | 2.00 | 557.10 | ak,cs |
| GRAY SANDSTONE | 1.60 | 558.70 | cs,e |
| GRAY SHALY CLAYSTONE | 1.90 | 560.60 | cv,e |
| GRAY SANDSTONE | 2.50 | 563.10 | cs,e |
| GRAY SANDY SHALE WITH SANDSTONE AND LIME STREAKS | 1.90 | 565.00 | ak,cs, |

TOTAL DEPTH OF HOLE = 565.00 FEET

20 BAGS CEMENT PLACED IN HOLE

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 217.88 38.5 %
Soft Rock 347.12 61.5 %
565.00 ft

ATTACHMENT 13

DIAMOND DRILL HOLE:
N94-16

Field Engineer: Kim Cecil
Surface Elevation: 1,279
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 680,939
Easting: 2,426,487

872-1111

Drilling Company: L J Hughs & Sons, Inc. H MILLER

DRILL HOLE I

DRILLING FO

SURFACE ELE

ER 6 1994
ER 11 1994

LOCATION: OHIO BELMONT COUNTY

| FORMATION | STRATA THICKNESS | DEPTH FROM SURFACE | Properti |
|---|---|---|---|
| CASING | 20.00 | 20.00 | |
| RED SHALY CLAYSTONE | 2.00 | 22.00 | cv, ev |
| GRAY SANDY SHALE | 7.50 | 29.50 | cs, es |
| GRAY SHALY CLAYSTONE | 0.80 | 30.30 | cv, ev |
| SHALY COAL . . . | 0.40 | 30.70 | ac, cv, |
| DARK GRAY SHALY CLAYSTONE | 2.00 | 32.70 | cv, ev |
| GRAY SANDY LIMESTONE | 3.00 | 35.70 | ak, cs, |
| GRAY LIMY SHALY CLAYSTONE | 2.30 | 38.00 | ak, cm, |
| GRAY LIMY SANDSTONE | 7.10 | 45.10 | ak, cs, |
| GRAY SHALY CLAYSTONE | 3.10 | 48.20 | cv, ev |
| RED SHALY CLAYSTONE | 6.30 | 54.50 | cv, ev |
| GRAY SHALY CLAYSTONE | 3.70 | 58.20 | cv, ev |
| SHALY COAL . . . | 0.20 | 58.40 | ac, cv, |
| DARK SHALE | 3.40 | 61.80 | cm, ev |
| GRAY SHALY CLAYSTONE | 0.10 | 61.90 | cv, ev |
| BLACK SHALE | 1.20 | 63.10 | ac, cm, |
| GRAY LIMY SHALY CLAYSTONE | 17.20 | 80.30 | ak, cm, |
| GRAY SHALE | 6.80 | 87.10 | cm, ev |
| RED SHALY CLAYSTONE | 3.40 | 90.50 | cv, ev |
| GRAY SHALY CLAYSTONE | 4.30 | 94.80 | cv, ev |
| RED AND GRAY SHALY CLAYSTONE | 3.20 | 98.00 | cv, ev |
| GRAY SANDSTONE | 4.10 | 102.10 | cs, es |
| RED AND GRAY SHALY CLAYSTONE | 9.20 | 111.30 | cv, ev |
| GRAY SANDY SHALE | 6.10 | 117.40 | cs, es |
| GRAY SHALY CLAYSTONE | 5.80 | 123.20 | cv, ev |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-16

| FORMATION | STRATA THICKNESS | 123.20 DEPTH FROM SURFACE | Proper |
|---|---|---|---|
| RED SHALY CLAYSTONE | 4.40 | 127.60 | cv,e |
| GRAY LIMY SHALY CLAYSTONE | 14.50 | 142.10 | ak,cv |
| RED SHALY CLAYSTONE | 9.70 | 151.80 | cv,e |
| GRAY LIMY SHALY CLAYSTONE | 9.90 | 161.70 | ak,cv |
| RED SHALY CLAYSTONE | 1.70 | 163.40 | cv,e |
| GRAY SHALE | 16.60 | 180.00 | cm,e |
| GRAY SHALY CLAYSTONE | 6.50 | 186.50 | cv,e |
| GRAY LIMESTONE | 2.40 | 188.90 | ak,cs |
| GRAY SHALY CLAYSTONE | 11.10 | 200.00 | cv,e |
| RED AND GRAY SHALY CLAYSTONE | 1.40 | 201.40 | cv,e |
| GRAY SHALE | 4.70 | 206.10 | cm,e |
| GRAY SHALY CLAYSTONE | 2.00 | 208.10 | cv,e |
| GRAY LIMY SHALY CLAYSTONE | 5.90 | 214.00 | ak,cm |
| GRAY SANDSTONE | 3.70 | 217.70 | cs,e |
| GRAY SHALY CLAYSTONE | 1.10 | 218.80 | cv,e |
| GRAY SANDSTONE WITH SHALE STREAKS | 1.80 | 220.60 | cs,e |
| GRAY SHALY CLAYSTONE | 0.60 | 221.20 | cv,e |
| BONY COAL | 0.40 | 221.60 | ac,cv, |
| GRAY LIMY SHALY CLAYSTONE | 15.70 | 237.30 | ak,cm, |
| BONY SHALE WITH GRAY SHALE STREAKS | 1.20 | 238.50 | cm,e |
| COAL . . . . . | 0.33 Washington No. 12 | 238.83 | ac,cv, |
| BONE | 0.05 | 238.88 | ac,cv |
| COAL . . . . . | 1.32 | 240.20 | ac,cv, |
| BLACK SHALE | 0.12 | 240.32 | ac,cm, |
| COAL . . . . . | 0.23 | 240.55 | ac,cv, |
| DARK GRAY SHALY CLAYSTONE | 0.33 | 240.88 | cv,e |
| BLACK SHALE | 0.05 | 240.93 | ac,cm, |
| COAL . . . . . | 1.35 | 242.28 | ac,cv, |
| GRAY SHALY CLAYSTONE | 16.12 | 258.40 | cv,e |
| GRAY SANDY SHALE | 3.00 | 261.40 | cs,e |
| GRAY SANDSTONE | 6.60 | 268.00 | cs,e |
| GRAY SANDY SHALE | 12.80 | 280.80 | cs,e |
| DARK GRAY SHALY CLAYSTONE | 0.90 | 281.70 | cv,e |
| COAL . . . . . | 0.86 | 282.56 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.14 | 282.70 | cv,e |
| COAL WITH BONE BANDS . . . | 4.53 | 287.23 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.16 | 287.39 | cv,e |
| COAL . . . . . | 0.25 | 287.64 | ac,cv, |
| BONY COAL | 0.07 | 287.71 | ac,cv, |
| COAL . . . . . | 1.00 | 288.71 | ac,cv, |
| BLACK SHALE | 0.04 | 288.75 | ac,cm, |
| GRAY LIMESTONE | 0.77 | 289.52 | ak,cs, |
| DARK SHALY CLAYSTONE WITH LIME BANDS | 0.30 | 289.82 | ak,cm, |
| BLACK SHALE | 0.60 | 290.42 | ac,cm, |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-16

| FORMATION | STRATA THICKNESS | 290.42 DEPTH FROM SURFACE | Propsc |
|---|---|---|---|
| GRAY LIMESTONE | 1.40 | 291.82 | ak,cs |
| GRAY SHALY CLAYSTONE | 0.75 | 292.57 | cv,c |
| BLACK SHALE | 0.15 | 292.72 | ac,cv |
| DARK GRAY LIMESTONE | 1.28 | 294.00 | ak,cs |
| GRAY LIMY SHALY CLAYSTONE | 2.60 | 296.60 | ak,cm |
| GRAY LIMY SANDY SHALE | 4.20 | 300.80 | ak,cs |
| GRAY SHALE | 3.10 | 303.90 | cm, |
| GRAY LIMY SHALY CLAYSTONE | 6.20 | 310.10 | ak,cm |
| GRAY SANDSTONE WITH LIME NODULES | 6.90 | 317.00 | cs,c |
| GRAY LIMY SHALY CLAYSTONE | 4.40 | 321.40 | ak,cm |
| GRAY LIMESTONE | 5.40 | 326.80 | ak,cs |
| DARK GRAY SHALY CLAYSTONE | 1.60 | 328.40 | cv,c |
| GRAY SANDY SHALE | 4.80 | 333.20 | cs,c |
| GRAY SANDSTONE | 14.70 | 347.90 | cs,c |
| DARK GRAY LIMY SHALY CLAYSTONE | 1.00 | 348.90 | ak,cm |
| DARK GRAY SHALE | 1.70 | 350.60 | cm,c |
| DARK GRAY SHALY CLAYSTONE | 2.10 | 352.70 | cv,c |
| COAL WITH PYRITE . . . | 0.30 Waynesburg No. 11 | 353.00 | ac,cv |
| GRAY SHALY CLAYSTONE | 1.40 | 354.40 | cv,c |
| GRAY SHALY LIMESTONE | 17.00 | 371.40 | ak,cs |
| GRAY LIMESTONE | 1.70 | 373.10 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 4.50 | 377.60 | ak,cm, |
| GRAY LIMESTONE | 3.20 | 380.80 | ak,cs, |
| DARK GRAY SHALY CLAYSTONE | 2.20 | 383.00 | cv,cl |
| GREEN SHALY CLAYSTONE | 2.20 | 385.20 | cv,cl |
| GRAY SANDSTONE | 5.10 | 390.30 | cs,c |
| GRAY SANDY SHALE | 1.50 | 391.80 | cs,cs |
| RED SHALY CLAYSTONE | 2.40 | 394.20 | cv,cv |
| GRAY SHALY CLAYSTONE | 1.90 | 396.10 | cv,c |
| GRAY LIMESTONE | 1.40 | 397.50 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 11.60 | 409.10 | ak,cm,c |
| GRAY SHALY LIMESTONE | 15.70 | 424.80 | ak,cs,c |
| GRAY LIMY SHALY CLAYSTONE | 21.50 | 446.30 | ak,cm, |
| GRAY LIMESTONE | 2.70 | 449.00 | ak,cs,c |
| GRAY LIMY SHALE | 13.70 | 462.70 | ak,cm,c |
| WHITE LIMESTONE | 5.70 | 468.40 | ak,cs,c |
| GRAY SHALY CLAYSTONE | 0.80 | 469.20 | cv,cv |
| GRAY SHALY LIMESTONE | 14.80 | 484.00 | ak,cs,c |
| GRAY LIMY SHALY CLAYSTONE | 7.90 | 491.90 | ak,cm,c |
| GRAY SANDY SHALE | 5.80 | 497.70 | cs,cs |
| GRAY SANDSTONE | 27.80 | 525.50 | cs,cs |
| DARK SHALE | 3.40 | 528.90 | cm,cm |
| DARK SANDSTONE | 0.20 | 529.10 | cs,cs |
| DARK SANDY SHALE WITH COAL AND SANDSTONE STREAKS AND NODULES | 0.78 | 529.88 | cm,cm |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-16

| FORMATION | STRATA THICKNESS | DEPTH FROM SURFACE | Prope |
|---|---|---|---|
| | | 529.88 | |
| GRAY SHALE | 1.26 | 531.14 | cm, c |
| COAL . . . . . | 0.20 | 531.34 | ac,cv, |
| DARK SHALE WITH PYRITE | 0.13 | 531.47 | ac, cm |
| COAL . . . . . | 0.72 | 532.19 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.29 | 532.48 | cv, e |
| COAL WITH SHALE BANDS . . . | 0.61 | 533.09 | ac,cv, |
| DARK SHALY CLAYSTONE | 0.90 | 533.99 | cv, e |
| GRAY LIMESTONE | 16.90 | 550.89 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 5.41 | 556.30 | ak,cm, |
| GRAY SANDSTONE | 3.70 | 560.00 | cs,e |
| GRAY LIMY SHALY CLAYSTONE | 4.40 | 564.40 | ak,cm, |
| GRAY LIMESTONE | 1.50 | 565.90 | ak,cs |
| GRAY SHALY CLAYSTONE | 3.00 | 568.90 | cm,c |
| BONE | 0.34 | 569.24 | ac,cs |
| PYRITE | 0.05 | 569.29 | ac,cs, |
| COAL . . . . . | 0.45 | 569.74 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.76 | 570.50 | cv,cv |
| BLACK SHALY CLAYSTONE | 0.50 | 571.00 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.90 | 571.90 | cv,cv |
| GRAY LIMY SHALE | 2.30 | 574.20 | ak,cm, |
| GRAY SHALY LIMESTONE | 11.20 | 585.40 | ak,cs, |
| GRAY LIMY SHALY CLAYSTONE | 5.60 | 591.00 | ak,cm, |
| GRAY SHALY CLAYSTONE | 1.70 | 592.70 | cv,e |
| BONE | 0.12 | 592.82 | ac,cv, |
| GRAY SHALY CLAYSTONE | 1.05 | 593.87 | cv,cv |
| BONE | 0.06 | 593.93 | ac,cv |
| BONE WITH PYRITE STREAKS | 0.05 | 593.98 | ac,cv, |
| COAL . . . . . Roof Coal | 1.47 | 595.45 | ac,cv, |
| DARK SHALE | 0.04 | 595.49 | cm,cv |
| COAL . . . . . | 0.06 | 595.55 | ac,cv, |
| DARK SHALE | 0.03 | 595.58 | cm,cv |
| COAL . . . . . | 0.09 | 595.67 | ac,cv,c |
| DARK SHALY CLAYSTONE WITH COAL SPARS | 0.10 | 595.77 | cv,cv |
| DARK GRAY SHALY CLAYSTONE | 0.36 | 596.13 | cv,cv |
| GRAY SHALE | 0.28 | 596.41 | cm,cv |
| COAL . . . . . Pittsburgh No. 8 | 5.41 | 601.82 | ac,cv,c |
| BONE WITH COAL BANDS | 0.12 | 601.94 | ac,cv, |
| COAL WITH PYRITE NODULES . . . | 0.11 | 602.05 | ac,cv,c |
| BLACK SHALE | 0.17 | 602.22 | ac,cm,c |
| DARK GRAY LIMY SHALY CLAYSTONE | 7.90 | 610.12 | ak,cm,c |
| GRAY SHALE | 2.01 | 612.13 | cm,cm |
| DARK GRAY SANDY SHALE | 0.67 | 612.80 | cs,cs |
| GRAY SANDSTONE | 2.20 | 615.00 | cs,cs |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

31 %
69 %

ATTACHMENT 13

**DIAMOND DRILL HOLE:**
**N94-17**

Field Engineer: Kim Cecil
Surface Elevation: 1,183
Drill Hole Coordinates (State Plane 1927 NA Datum) 1111
Northing: 679,526
Easting: 2,413,456

Drilling Company: L J Hughs & Sons, Inc. HILLER

DRILL HOLE NO.

DRILLING FOR:

SURFACE ELEVAT

12 1994
13 1994

LOCATION: OHIO BELMONT COUNTY

| FORMATION | STRATA THICKNESS | DEPTH FROM SURFACE | Propert |
|---|---|---|---|
| CASING | 20.00 | 20.00 | |
| GRAY AND BROWN SANDSTONE | 12.00 | 32.00 | cs,es |
| GRAY SHALY CLAYSTONE | 10.10 | 42.10 | cv,ev |
| RED AND GRAY LIMY SHALY CLAYSTONE | 10.20 | 52.30 | ak,cm, |
| GRAY LIMY SHALY CLAYSTONE | 9.80 | 62.10 | ak,cm, |
| RED AND GRAY SHALY CLAYSTONE | 5.00 | 67.10 | cv,ev |
| GRAY SHALY CLAYSTONE | 13.40 | 80.50 | cv,ev |
| GRAY LIMY SHALE | 5.20 | 85.70 | ak,cm,e |
| DARK GRAY LIMY SHALY CLAYSTONE | 6.53 | 92.23 | ak,cm, |
| BLACK SHALY CLAYSTONE | 1.25 | 93.48 | ac,cv,e |
| COAL . . . . . | 0.95 Washington No. 12 | 94.43 | ac,cv,e |
| DARK GRAY SHALY CLAYSTONE | 1.10 | 95.53 | cv,ev |
| GRAY LIMY SHALY CLAYSTONE | 12.27 | 107.80 | ak,cm,e |
| GRAY LIMY SANDSTONE | 61.30 | 169.10 | ak,cs,e |
| COAL . . . . . | 0.80 | 169.90 | ac,cv,e |
| DARK GRAY SHALY CLAYSTONE | 0.30 | 170.20 | cv,ev |
| GRAY SANDY SHALY CLAYSTONE | 11.90 | 182.10 | cm,en |
| GRAY SHALY CLAYSTONE | 3.60 | 185.70 | cv,ev |
| GRAY SANDSTONE | 7.60 | 193.30 | cs,es |
| GRAY SANDY SHALE | 3.90 | 197.20 | cs,es |
| GRAY SANDY SHALY CLAYSTONE | 3.10 | 200.30 | cm,en |
| GRAY LIMESTONE | 1.20 | 201.50 | ak,cs,e |
| GRAY SHALY CLAYSTONE | 8.00 | 209.50 | cv,ev |
| GRAY LIMESTONE | 3.00 | 212.50 | ak,cs, |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-17

| FORMATION | STRATA THICKNESS | 212.50 DEPTH FROM SURFACE | Proper |
|---|---|---|---|
| DARK GRAY SHALY CLAYSTONE | 4.50 | 217.00 | cv, c |
| GRAY SANDSTONE | 2.60 | 219.60 | cs, c |
| GRAY SANDY SHALE | 6.10 | 225.70 | cs, c |
| GRAY SANDSTONE | 4.50 | 230.20 | cs, c |
| GRAY SANDY SHALE | 1.00 | 231.20 | cs, c |
| GRAY SANDSTONE | 3.40 | 234.60 | cs, c |
| GRAY SANDY SHALE WITH SANDSTONE STREAKS | 1.00 | 235.60 | cs, c |
| GRAY SANDY SHALE | 1.00 | 236.60 | cs, c |
| GRAY SANDSTONE WITH GRAY CLAYSTONE BANDS | 0.96 | 237.56 | cs, c |
| GRAY SHALY CLAYSTONE WITH PYRITE NODULES | 0.70 | 238.26 | ac, cv |
| COAL . . . . . | 0.10 Waynesburg No. 11 | 238.36 | ac, cv, |
| GRAY CLAYSTONE | 0.15 | 238.51 | cv, c |
| COAL . . . . . | 0.25 | 238.76 | ac, cv |
| GRAY LIMY SHALY CLAYSTONE | 1.14 | 239.90 | ak, cm |
| BONY COAL | 0.10 | 240.00 | ac, cv, |
| GRAY LIMY SHALY CLAYSTONE | 9.10 | 249.10 | ak, cm, |
| GRAY LIMESTONE | 4.50 | 253.60 | ak, cs, |
| GRAY LIMY SHALY CLAYSTONE | 2.60 | 256.20 | ak, cm, |
| GRAY LIMESTONE | 2.20 | 258.40 | ak, cs, |
| GRAY GREEN LIMY SHALY CLAYSTONE | 5.90 | 264.30 | ak, cm, |
| GRAY LIMESTONE | 2.80 | 267.10 | ak, cs, c |
| GRAY GREEN LIMY SHALY CLAYSTONE | 5.20 | 272.30 | ak, cm, c |
| GRAY SANDSTONE | 2.30 | 274.60 | cs, cs |
| GRAY SHALY CLAYSTONE | 1.10 | 275.70 | cv, cv |
| RED SHALY CLAYSTONE | 1.00 | 276.70 | cv, cv |
| GRAY LIMY SHALY CLAYSTONE | 7.50 | 284.20 | ak, cm, c |
| GRAY GREEN LIMY SANDY SHALE | 9.10 | 293.30 | ak, cs, c |
| GRAY LIMESTONE | 5.70 | 299.00 | ak, cs, c |
| GRAY LIMY SHALY CLAYSTONE | 13.10 | 312.10 | ak, cm, c |
| GRAY LIMY SANDSTONE | 7.40 | 319.50 | ak, cs, c |
| GRAY LIMY SHALY CLAYSTONE | 2.10 | 321.60 | ak, cm, c |
| GRAY LIMESTONE | 4.20 | 325.80 | ak, cs, c |
| GRAY GREEN LIMY SHALY CLAYSTONE | 5.30 | 331.10 | ak, cm, c |
| GRAY LIMY SHALY CLAYSTONE | 5.50 | 336.60 | ak, cm, c |
| GRAY LIMESTONE | 2.90 | 339.50 | ak, cs, c |
| GRAY LIMY SHALY CLAYSTONE | 5.30 | 344.80 | ak, cm, c |
| GRAY LIMESTONE | 6.90 | 351.70 | ak, cs, c |
| GREEN SHALY CLAYSTONE | 1.10 | 352.80 | cv, cv |
| WHITE LIMESTONE | 5.30 | 358.10 | ak, cs, c |
| GRAY LIMESTONE WITH LIMY SHALY CLAYSTONE | 9.60 | 367.70 | ak, cs, c |
| DARK SHALY CLAYSTONE | 3.40 | 371.10 | cv, cv |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-17

| FORMATION | STRATA THICKNESS | | 371.10 DEPTH FROM SURFACE | Proper |
|---|---|---|---|---|
| GRAY LIMESTONE WITH GREEN CLAY STREAKS | 2.40 | | 373.50 | ak,cs |
| GREEN SHALE WITH LIME NODULES | 1.50 | | 375.00 | ak,cn |
| GRAY SHALY LIMESTONE | 3.30 | | 378.30 | ak,cs |
| DARK GRAY LIMY SHALY CLAYSTONE | 3.03 | | 381.33 | ak,cm |
| DARK SHALY CLAYSTONE | 1.47 | | 382.80 | cv,e |
| PYRITE WITH COAL SPARS | 0.09 | | 382.89 | ac,cm |
| COAL . . . . . | 0.25 | Sewickley No. 9 | 383.14 | ac,cv, |
| BONE | 0.02 | | 383.16 | ac,cv |
| GRAY SHALY CLAYSTONE | 0.03 | | 383.19 | cv,e |
| COAL . . . . . | 0.40 | | 383.59 | ac,cv |
| DARK GRAY SHALY CLAYSTONE | 0.05 | | 383.64 | cv,e |
| COAL . . . . . | 1.27 | | 384.91 | ac,cv |
| DARK SHALE WITH COAL SPARS | 0.15 | | 385.06 | ac,cv, |
| DARK GRAY SHALY CLAYSTONE | 0.65 | | 385.71 | cv,e |
| GRAY GREEN SHALY CLAYSTONE WITH DARK SHALE STREAKS AND BANDS | 17.01 | | 402.72 | cm,e |
| DARK GRAY SHALY CLAYSTONE | 0.57 | | 403.29 | cv,e |
| DARK SHALY CLAYSTONE WITH COAL SPARS | 0.10 | | 403.39 | ac,cv, |
| GRAY SANDY SHALE | 0.80 | | 404.19 | cs,cs |
| COAL . . . . . | 0.19 | | 404.38 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.04 | | 404.42 | cv,e |
| COAL . . . . . | 0.74 | | 405.16 | ac,cv, |
| DARK SHALE WITH PYRITE | 0.07 | | 405.23 | ac,cm, |
| COAL . . . . . | 0.04 | | 405.27 | ac,cv, |
| GRAY SHALY CLAYSTONE | 0.07 | | 405.34 | cv,ev |
| COAL . . . . . | 0.28 | | 405.62 | ac,cv, |
| GRAY SHALE | 0.05 | | 405.67 | cm,e |
| COAL . . . . . | 0.89 | | 406.56 | ac,cv, |
| DARK GRAY SHALE | 0.30 | | 406.86 | cm,e |
| COAL . . . . . | 0.30 | | 407.16 | ac,cv, |
| BLACK SHALE WITH COAL SPARS | 0.09 | | 407.25 | ac,cm, |
| COAL WITH SHALE BANDS . . . | 0.20 | | 407.45 | ac,cv, |
| BLACK SHALE | 0.04 | | 407.49 | ac,cm, |
| DARK SHALY CLAYSTONE | 0.55 | | 408.04 | cv,ev |
| GRAY LIMESTONE | 17.20 | | 425.24 | ak,cs, |
| GRAY SANDSTONE | 2.56 | | 427.80 | cs,es |
| GRAY GREEN LIMY SHALY CLAYSTONE | 7.00 | | 434.80 | ak,cm, |
| GRAY LIMESTONE | 4.90 | | 439.70 | ak,cs, |
| GRAY SHALY CLAYSTONE | 2.30 | | 442.00 | cv,ev |
| COAL . . . . . | 0.80 | | 442.80 | ac,cv, |
| DARK SHALY CLAYSTONE | 0.23 | | 443.03 | cv,ev |
| COAL . . . . . | 0.19 | | 443.22 | ac,ev, |

# LJ HUGHES & SONS, INC.

THE OHIO VALLEY COAL COMPANY
CONTINUATION OF DRILL HOLE NO. N-94-17

| FORMATION | STRATA THICKNESS | | 443.22 DEPTH FROM SURFACE | Prop |
|---|---|---|---|---|
| DARK SHALY CLAYSTONE | 0.23 | | 443.45 | cv, |
| GRAY SHALY CLAYSTONE | 2.25 | | 445.70 | cv, |
| GRAY LIMESTONE | 1.20 | | 446.90 | ak, c |
| DARK GRAY SHALY CLAYSTONE | 2.30 | | 449.20 | cv, c |
| GRAY LIMESTONE | 7.00 | | 456.20 | ak, c |
| WHITE LIMESTONE | 5.10 | | 461.30 | ak, cs |
| GRAY LIMY SHALY CLAYSTONE | 8.87 | | 470.17 | ak, cm |
| BLACK SHALY COAL WITH CLAY STREAKS | 0.13 | Roof Coal | 470.30 | ac, cv, |
| COAL WITH PYRITE . . . | 0.50 | | 470.80 | ac, cv, |
| DARK SHALY CLAYSTONE | 0.79 | | 471.59 | cv, cv |
| BONE | 0.25 | | 471.84 | ac, cv, |
| COAL . . . . . | 4.75 | Pittsburgh No. 8 | 476.59 | ac, cv, |
| PYRITE AND SHALE | 0.03 | | 476.62 | ac, cm, |
| DARK SHALE | 0.08 | | 476.70 | cm, cv |
| DARK GRAY SHALY CLAYSTONE | 2.20 | | 478.90 | cv, c |
| GRAY LIMESTONE | 2.10 | | 481.00 | ak, cs, |
| GRAY LIMY SHALY CLAYSTONE | 19.00 | | 500.00 | ak, cm, |

TOTAL DEPTH OF HOLE = 500.00 FEET

22 BAGS CEMENT PLACED IN HOLE

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 191.62 ft 38%
Soft Rock 308.38 ft 62%
500.00 ft

11/89

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole # N-94-18

*Coordinates X. 2,399,293 Y. 691,789 Surface Elevation 1242.53

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| RED & GRAY SHALY CLAYSTONE | | 2.90' | V | S |
| GRAY LIMESTONE | | 7.70' | M | S |
| RED SHALY CLAYSTONE | | 1.40' | V | S |
| GRAY SHALY CLAYSTONE | | 1.00' | V | S |
| GRAY SANDY SHALE | | 10.30' | M | S |
| GRAY SHALY CLAYSTONE | | 1.50' | V | S |
| BROWN SANDSTONE (BROKEN) | | 2.30' | S | S |
| GRAY SANDSTONE | | 3.00' | S | S |
| GRAY SHALE | | 2.80' | M | S |
| GRAY SHALY CLAYSTONE | | 3.90' | V | S |
| GRAY LIMESTONE | | 1.20' | M | S |
| GRAY SHALY CLAYSTONE | | 8.60' | V | S |
| DARK SHALE | | 1.30' | M | S |
| COAL (WASHINGTON #12) | | 0.90' | S | V |
| GRAY SHALY CLAYSTONE | | 10.50' | V | S |
| GRAY SANDY SHALE | | 4.00' | M | S |
| GRAY SANDSTONE | | 56.50 | S | S |
| COAL (WAYNESBURG "A") | | 0.20' | S | V |
| GRAY SHALY CLAYSTONE | | 5.80' | V | S |
| GRAY SANDY SHALY CLAYSTONE | | 38.10' | V | S |
| GRAY SHALY CLAYSTONE | | 3.42 | V | S |
| COAL (WAYNESBURG #11) | | 1.03 | S | V |
| DARK SHALE | | 0.04' | M | S |
| COAL (#11) | | 0.62' | S | V |
| DARK GRAY SHALE | | 0.25' | M | S |
| COAL (#11) | | 0.76' | S | V |
| DARK GRAY SHALY CLAYSTONE | | 0.25' | V | S |
| GRAY SANDY SHALE | | 0.65' | M | S |
| GRAY SHALY CLAYSTONE | | 1.80' | V | S |
| GRAY SANDY SHALE | | 1.60' | M | S |
| GRAY SANDSTONE | | 4.60' | S | S |

N-94-18 CONTINUED:

| Lithology | H2O** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| GRAY SANDY SHALE | | 5.50' | M | S |
| DARK GRAY SHALY CLAYSTONE | | 1.50' | V | S |
| COAL (UNIONTOWN #10) | | 0.10' | S | V |
| BLACK SHALY CLAYSTONE | | 0.60' | V | S |
| COAL (UNIONTOWN #10) | | 0.25' | S | V |
| GRAY LIMY SHALY CLAYSTONE | | 7.83' | V | S |
| GRAY SHALY LIMESTONE | | 10.60' | M | S |
| DARK GRAY LIMY SHALY CLAYSTONE | | 18.60' | V | S |
| RED & GRAY SHALY CLAYSTONE | | 1.40' | V | S |
| GRAY LIMY SHALY CLAYSTONE | | 8.80' | V | S |
| GRAY SANDSTONE | | 1.40' | S | S |
| GRAY SANDY SHALE | | 4.20' | M | S |
| GRAY SHALY LIMESTONE | | 10.40' | M | S |
| RED & GRAY LIMY SHALY CLAYSTONE | | 3.70' | V | S |
| GRAY SANDY SHALY CLAYSTONE | | 7.90' | V | S |
| RED & GRAY LIMY SHALY CLAYSTONE | | 1.90' | V | S |
| GRAY LIMESTONE (BROKEN) | | 1.40' | M | S |
| GRAY LIMY SANDY SHALY CLAYSTONE | | 2.00' | V | S |
| GRAY SHALY LIMESTONE | | 4.80' | M | S |
| GREEN SHALY CLAYSTONE | | 4.10' | V | S |
| GRAY SHALY LIMESTONE | | 4.50' | M | S |
| GRAY LIMESTONE | | 3.00' | M | S |
| GRAY LIMY SHALY CLAYSTONE | | 12.20' | V | S |
| WHITE LIMESTONE | | 5.00' | M | S |
| GRAY LIMY SHALY CLAYSTONE | | 10.30 | V | S |
| WHITE LIMESTONE | | 5.40' | M | S |
| GRAY LIMY SHALY CLAYSTONE | | 20.70' | V | S |
| GRAY SANDY SHALY CLAYSTONE | | 15.70' | V | S |
| DARK GRAY SHALY CLAYSTONE | | 0.28' | V | S |
| COAL W/PYRITE & SHALE STREAKS | | 0.14' | S | V |
| GRAY SHALE W/COAL & SHALE STREAKS | | 0.25' | M | S |
| COAL & SHALE (MEIGS CREEK #9) | | 0.12' | M | S |
| DARK GRAY SHALY CLAYSTONE | | 0.61' | V | S |
| DARK SANDY SHALE | | 0.38' | M | S |
| COAL (#9) | | 0.01 | S | V |
| DARK SANDY SHALE | | 0.02' | M | S |

N-94-18, CONTINUED;

| Lithology | H2O** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | ___ | _____ | | |
| Subsoil | ___ | _____ | | |
| COAL (#9) | ___ | 0.05' | S | V |
| DARK SANDY SHALE | ___ | 0.43' | M | S |
| COAL (#9) | ___ | 1.06' | S | V |
| GRAY SHALY CLAYSTONE | ___ | 0.26' | V | S |
| COAL (#9) | ___ | 0.75' | S | V |
| DARK SHALY CLAYSTONE | ___ | 0.80' | V | S |
| GRAY SHALY LIMESTONE | ___ | 9.44' | M | S |
| GRAY LIMY SHALY CLAYSTONE | ___ | 6.60' | V | S |
| GRAY LIMESTONE | ___ | 2.00' | M | S |
| GRAY LIMY SHALY CLAYSTONE | ___ | 2.90' | V | S |
| DARK SHALE | ___ | 0.10' | M | S |
| GRAY LIMY SHALY CLAYSTONE | ___ | 17.80' | V | S |
| GRAY SANDSTONE | ___ | 34.00' | S | S |
| GRAY SANDSTONE W/SHALE NODULES | ___ | 1.20' | S | S |
| GRAY SANDSTONE | ___ | 4.50' | S | S |
| DARK GRAY SANDY SHALY CLAYSTONE | ___ | 0.30' | V | S |
| GRAY SANDSTONE | ___ | 0.30' | S | S |
| DARK GRAY SHALY CLAYSTONE | ___ | 3.60' | V | S |
| DARK SHALE | ___ | 0.20' | M | S |
| DARK SHALY CLAYSTONE W/PYRITE NODULES | ___ | 0.62' | V | S |
| BLACK SHALE | ___ | 0.07' | M | S |
| PYRITE W/COAL SPARS | ___ | 0.05' | S | V |
| COAL (PITTSBURGH #8) | ___ | 0.70' | S | V |
| DARK SANDSTONE | ___ | 0.03' | S | S |
| COAL (#8) | ___ | 0.84' | S | V |
| DARK SHALE | ___ | 0.03' | M | S |
| COAL (#8) | ___ | 1.95' | S | V |
| PYRITE | ___ | 0.10' | S | V |
| COAL (#8) | ___ | 0.65' | S | V |
| DARK SHALY CLAYSTONE | ___ | 2.50' | V | S |
| GRAY LIMESTONE | ___ | 3.46' | M | S |
| GRAY LIMY SHALY CLAYSTONE | ___ | 3.50' | V | S |
| GRAY SANDY SHALE | ___ | 4.70' | M | S |

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| #8 COAL | 6.89 | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearing stratum with an asterick (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

11/89

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINES AND RECLAMATION**

**ATTACHMENT 13**
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole # N-94-19
*Coordinates X. 2,402,775 Y. 689,158 Surface Elevation 1122.03

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| GRAY SANDSTONE | | 9.0' | S | S |
| COAL (WAYNESBURG "A") | | 0.2' | S | V |
| GRAY SHALY CLAYSTONE | | 3.1' | V | S |
| GRAY SANDSTONE | | 8.7' | S | S |
| GRAY SHALY CLAYSTONE | | 9.2' | V | S |
| GRAY SANDY SHALE | | 1.1' | M | S |
| GRAY SANDSTONE | | 2.4' | S | S |
| GRAY SANDY SHALY CLAYSTONE | | 4.2' | V | S |
| GRAY SHALY CLAYSTONE | | 17.10 | V | S |
| GRAY SANDY SHALE | | 1.8' | M | S |
| GRAY SHALY CLAYSTONE | | 2.6' | V | S |
| SHALY COAL (#11) | | 0.3' | S | V |
| COAL (WAYNESBURG #11) | | 1.4' | S | V |
| GRAY SHALY CLAYSTONE | | 0.7' | V | S |
| GRAY SANDSTONE W/SHALE STREAKS | | 2.9' | S | S |
| GRAY SHALY CLAYSTONE W/SHALE BANDS | | 5.4' | V | S |
| DARK GRAY SHALE | | 9.9' | M | S |
| DARK SHALE W/COAL SPARS (#11) | | 0.3' | M | S |
| COAL (WAYNESBURG #11) | | 0.1' | S | V |
| GRAY LIME SHALY CLAYSTONE | | 36.6' | V | S |
| GRAY LIMESTONE | | 1.2' | M | S |
| GRAY LIME SHALY CLAYSTONE | | 9.8' | V | S |
| GRAY SANDSTONE | | 1.3' | S | S |
| GRAY SANDY SHALE | | 5.0' | M | S |
| DARK GRAY SHALY LIMESTONE | | 9.9' | M | S |
| DARK GRAY LIME SHALY CLAYSTONE | | 7.3' | V | S |
| GRAY SANDSTONE W.RIPPLED SHALE | | 5.9' | S | S |
| GRAY GREEN LINE SHALY CLAYSTONE | | 18.0' | V | S |
| GRAY SHALY LIMESTONE | | 10.6' | M | S |

186'

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| GREEN LIME SHALY CLAYSTONE | | 6.2' | V | S |
| WHITE LIMESTONE | | 8.4' | M | S |
| GRAY LIME SHALY CLAYSTONE | | 2.5' | V | S |
| FINE GRAIN NODULAR LIMESTONE | | 1.3' | M | S |
| GRAY LIME SHALY CLAYSTONE | | 4.2' | V | S |
| DARK GRAY LIME SHALY CLAYSTONE | | 10.8' | V | S |
| GRAY SHALE | | 3.1' | M | S |
| GRAY SHALY CLAYSTONE | | 9.65' | V | S |
| DARK SHALY CLAYSTONE W/COAL SPAR | | 0.36' | V | S |
| COAL (MEIGS CREEK #9) | | 0.07' | S | V |
| DARK SHALY CLAYSTONE W/COAL SPAR | | 0.22' | V | S |
| DARK GRAY SHALY CLAYSTONE | | 0.16' | V | S |
| PYRITE | | 0.07' | S | V |
| DARK GRAY SHALY CLAYSTONE | | 0.15' | V | S |
| BLACK SANDY SHALE W/COAL SPARS | | 1.43' | M | S |
| COAL (#9) | | 0.05' | S | V |
| PYRITE | | 0.05' | V | S |
| COAL (#9) | | 0.86' | S | V |
| DARK GRAY SHALY CLAYSTONE | | 0.21' | V | S |
| COAL (#9) | | 0.42' | S | V |
| GRAY SHALY CLAYSTONE | | 0.02' | V | S |
| COAL (#9) | | 0.30' | S | V |
| DARK GRAY SHALY CLAYSTONE | | 0.48' | V | S |
| GRAY LIMESTONE | | 3.52' | M | S |
| GREEN SANDY SHALE | | 0.48' | M | S |
| GRAY SANDSTONE | | 1.40' | S | S |
| GRAY GREEN LIME SHALY CLAYSTONE | | 1.80' | V | S |
| GRAY LINESTONE | | 1.50' | M | S |
| GRAY LIME SHALY CLAYSTONE | | 4.10' | V | S |
| DARK GRAY SHALY CLAYSTONE w/SPAR | | 0.20' | V | S |
| GRAY LIME SHALY CLAYSTONE | | 8.00' | V | S |
| FINE GRAIN NODULAR LIMESTONE | | 3.20' | M | S |
| GRAY SANDY SHALY CLAYSTONE | | 6.70' | V | S |
| GRAY SANDSTONE | | 35.60' | S | S |
| GRAY SANDSTONE W/SHALE STREAKS | | 0.36' | S | S |
| GRAY SANDSTONE | | 2.23' | S | S |
| GRAY SANDSTONE W/GR CLAY NODULES | | 1.70' | S | S |
| COAL WITH PYRITE STEAKS (#8) | | 1.16' | S | V |
| DARK SHALY CLAYSTONE | | 0.05' | V | S |

122.95

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| COAL W/PYRITE STREAKS (#8) | | 0.44' | S | V |
| PYRITE | | 0.05' | S | V |
| COAL (PITTSBURG #8) | | 2.65' | S | V |
| DARK GRAY SHALY CLAYSTONE | | 2.66' | V | S |
| GRAY LIME SHALY CLAYSTONE | | 11.00' | V | S |
| GRAY SANDY SHALE | | 6.70' | M | S |
| GRAY LIME SHALY CLAYSTONE | | 5.50' | V | S |

126.1A

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| #8 COAL | 4.85 | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearing stratum with an asterick (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

11/89

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND RECLAMATION
ATTACHMENT 13
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole# C98-1
*Coordinates X. 2,414,034 Y. 685,831 Surface Elevation 1229.09

| Lithology | H2O ** | Thickness | Physical Properties **** | |
|---|---|---|---|---|
| Topsoil | | | | |
| Subsoil | | | Compatibility | Erodibility |
| NON-CORING | | 11.00' | | |
| BRN. SHALE/INTERBEDDED SANDSTONE | * | 4.90' | M | M |
| BROWN SHALE | | 2.30' | M | M |
| CLAYSTONE, REDDISH-BROWN | | 3.90' | V | V |
| CLAYSTONE, M. GRAY, CALCAREOUS | | 1.20' | V | V |
| CLAYSTONE, RED | | 5.70' | V | V |
| CLAYSTONE, RED W/GRAY BANDS | | 8.60' | V | V |
| SHALE, M. GRAY, SANDY | | 4.20' | M | M |
| CLAYSTONE, M. GRAY | | 6.50' | V | V |
| CLAYSTONE, DRK.GRAY-BLACK | | 0.30' | V | V |
| CLAYSTONE, M. GRAY, CALCAREOUS | | 5.40' | V | V |
| SHALE, M. GRAY | | 1.60' | M | M |
| CLAYSTONE, RED W/OLIVE BANDS | | 17.20' | V | V |
| CLAYSTONE, GRAY-GREEN W/RED BANDS | | 1.60' | V | V |
| SHALE, M.GRAY, SILTY, MICAEOUS | | 19.30' | M | M |
| CLAYSTONE, M. GRAY | | 8.70' | V | V |
| LIMESTONE, LIGHT GRAY, HARD | | 1.20' | S | S |
| CLAYSTONE, GRAY-GREEN | | 1.20' | V | V |
| LIMESTONE, LIGHT GRAY, SILTY | | 1.50' | S | S |
| CLAYSTONE, M. GRAY | | 1.20' | V | V |
| CLAYSTONE, RED | | 5.40' | V | V |
| CLAYSTONE, M. GRAY | | 3.80' | V | V |
| SANDSTONE, LIGHT GRAY, SILTY | | 0.70' | S | S |
| SHALE, M. GRAY, SANDY | | 5.20' | M | M |
| SANDSTONE, LIGHT GRAY, SILTY | | 0.90' | S | S |
| SHALE, M. GRAY | | 4.10' | M | M |
| LIMESTONE, LIGHT GRAY, HARD | | 0.50' | S | S |
| CLAYSTONE, M. GRAY | | 4.50' | V | V |
| CLAYSTONE, DRK. GRAY-BLACK | | 1.00' | V | V |
| LIMESTONE, LIGHT GRAY, HARD | | 0.50' | S | S |
| SHALE, M. GRAY | | 1.00' | M | M |
| CLAYSTONE, GREEN/RED, W/LS NODULES | | 4.20' | V | V |
| SHALE, M. GRAY | | 4.80' | M | M |
| SHALE, DRK. GRAY-BLACK | | 0.60' | M | M |
| CLAYSTONE, DRK., GRAY | | 5.50' | V | V |
| SHALE, BLK. W/COAL PARTINGS | | 0.30' | M | M |
| COAL | | 0.30' | M | M |
| SHALE, BLK., CARBONACEOUS | | 1.50' | M | M |
| **COAL, WASHINGTON (NO 12)** | | 0.85' | M | M |
| CLAYSTONE, M. GRAY W/LS NODULES | | 9.95' | V | V |
| SANDSTONE, LT. GRAY W/THIN SHALE PARTINGS | | 1.00' | S | S |
| SHALE, M. GRAY, SILTY | | 0.30' | M | M |
| SANDSTONE, MANNINGTON, LT. GRAY | | 52.50' | S | S |
| SHALE, M. GRAY | | 1.40' | M | M |
| SANDSTONE, LT. GRAY, MICAEOUS | | 6.60' | S | S |
| SHALE, BLK.W/COAL PARTINGS | | 0.40' | M | M |
| **COAL, WAYNESBURG "A"** | | 0.20' | M | M |

DRILL HOLE C98-1; CONTINUED

| | | | | |
|---|---|---|---|---|
| SHALE, DRK.GRAY-BLACK | | 0.60' | M | M |
| CLAYSTONE, M. GRAY | | 0.80' | V | V |
| LIMESTONE, LIGHT GRAY, SILTY | | 0.70' | S | S |
| SHALE, M. GRAY | | 14.00' | M | M |
| SANDSTONE, LT. GRAY W/THIN SHALE PARTINGS | | 1.80' | S | S |
| SHALE, M. GRAY | | 3.80' | M | M |
| SHALE, M. GRAY, SANDY | | 3.00' | M | M |
| SHALE, M. GRAY | | 10.00' | M | M |
| SHALE, DRK. GRAY | | 0.70' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 0.50' | S | S |
| SHALE, M. GRAY | | 7.80' | M | M |
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 1.70' | S | S |
| SHALE, DRK. GRAY-BLACK | | 2.70' | M | M |
| CLAYSTONE, DK. GRAY W/LS NODULES | | 3.00' | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.30' | M | M |
| SHALE, M. GRAY, GRADES SANDY | | 4.70' | M | M |
| SANDSTONE, LT. GRAY | | 4.00' | S | S |
| SHALE, M. GRAY, SANDY | | 4.20' | M | M |
| SHALE, M. GRAY | | 3.70' | M | M |
| **COAL UNIONTOWN (NO. 10)** | | 0.45' | M | M |
| CLAYSTONE, DK. GRAY | | 1.05' | V | V |
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 3.20' | S | S |
| SHALE DK. GRAY | | 7.20' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 1.40 | S | S |
| SHALE, DK. GRAY | | 0.80' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 0.40' | S | S |
| SHALE, DK. GRAY | | 0.90' | M | M |
| SHALE, M. GRAY, CALCAREOUS | | 3.70' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 1.50' | S | S |
| CLAYSTONE, M. GRAY | | 2.70' | V | V |
| LIMESTONE, LT. GRAY, HARD | | 0.80' | S | S |
| CLAYSTONE, M. GRAY | | 1.70' | V | V |
| LIMESTONE, LT. GRAY, HARD | | 0.50' | S | S |
| CLAYSTONE, M. GRAY | | 1.30' | V | V |
| LIMESTONE, LT. GRAY, NODULAR | | 2.10' | S | S |
| CLAYSTONE, M. GRAY | | 1.80' | V | V |
| CLAYSTONE, DK. GRAY | | 0.70' | V | V |
| SHALE, M. GRAY-GREEN | | 3.60' | M | M |
| SHALE, RED | | 1.10' | M | M |
| SHALE, M. GRAY-GREEN | | 16.00 | M | M |
| LIMESTONE, LT. GRAY, HARD | | 2.90' | S | S |
| SHALE, M. GRAY-GREEN | | 2.10' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 0.80' | S | S |
| SHALE, M. GRAY-GREEN | | 1.60' | M | M |
| LIMESTONE, LT. GRAY, HARD, NODULAR | | 0.70' | S | S |
| CLAYSTONE, M. GRAY | | 0.90' | V | V |
| CLAYSTONE, DK. GRAY | | 1.10' | V | V |
| CLAYSTONE, M. GRAY-GREEN, CALCAREOUS | | 11.90' | V | V |
| SANDSTONE, LT. GRAY, THIN SHALE PARTINGS | | 0.50' | S | S |
| SHALE, M.GRAY, SILTY | | 1.60' | M | M |
| SANDSTONE, LT. GRAY, THIN SHALE PARTINGS | | 0.30' | S | S |
| SHALE, M. GRAY, SILTY | | 1.30' | M | M |
| CLAYSTONE, M. GRAY-GREEN, FLINTY | | 2.70' | V | V |
| SHALE, M. GRAY, CALCAREOUS | | 5.80' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 0.70' | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 4.50' | V | V |
| SHALE, M. GRAY, CALCEREOUS | | 5.90' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 1.60' | S | S |
| SHALE, M. GRAY, CALCEREOUS | | 11.50' | M | M |
| LIMESTONE, LT. GRAY, HARD | | 1.30' | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 1.20' | M | M |

DRILL HOLE C98-1; CONTINUED

| | | | | |
|---|---|---|---|---|
| LIMESTONE, M. GRAY, SILTY | | 5.80' | S | S |
| SHALE M. GRAY, CALCAREOUS | | 1.90' | M | M |
| LIMESTONE, M. GRAY, SILTY | | 0.90' | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 18.70' | M | M |
| SHALE, DK. GRAY | | 2.60' | M | M |
| LIMESTONE, M. GRAY, SILTY | | 0.30' | S | S |
| CLAYSTONE, DK. GRAY, CALCITE PARTINGS | | 1.50' | V | V |
| LIMESTONE, DK. GRAY, NODULAR | | 0.40' | S | S |
| CLAYSTONE, DK. GRAY, CALCITE PARTINGS | | 0.50' | V | V |
| LIMESTONE, DK. GRAY, NODULAR | | 1.20' | S | S |
| **COAL, SEWICKLEY (NO. 9)** | | 0.50' | M | M |
| SHALE, BK. W/COAL PARTINGS | | 1.00' | M | M |
| CLAYSTONE, DK. GRAY | | 1.40' | V | V |
| CLAYSTONE, M. GRAY-GREEN | | 9.00' | V | V |
| LIMESTONE, MED. GRAY, HARD | | 0.20' | S | S |
| CLAYSTONE, M. GRAY | | 2.00' | V | V |
| SHALE, M. GRAY, SILTY | | 5.40' | M | M |
| CLAYSTONE, M. GRAY | | 2.40' | V | V |
| **COAL, FISHPOT, BROKEN,** | | 0.40' | M | M |
| SHALE, BK. W/COAL PARTINGS. | | 0.30' | M | M |
| **COAL, FISHPOT, BONY** | | 0.25' | M | M |
| SHALE, M. GRAY | | 1.05' | M | M |
| LIMESTONE, M. GRAY, SILTY | | 1.70' | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 4.40' | M | M |
| LIMESTONE, LT. GRAY, SILTY | | 2.40' | S | S |
| SHALE, DK. GRAY | | 0.50' | M | M |
| LIMESTONE, LT. GRAY, SITLY | | 8.00' | S | S |
| SHALE, M. GRAY W/SS PARTINS | | 2.90' | M | M |
| SANDSTONE, LT. GRAY | | 2.30' | S | S |
| SHALE, M. GRAY | | 2.00' | M | M |
| CLAYSTONE, M. GRAY | | 4.90' | V | V |
| SHALE, M. GRAY | | 0.80' | M | M |
| LIMESTONE, M. GRAY, SILTY | | 2.40' | S | S |
| CLAYSTONE, M. GRAY | | 2.30' | V | V |
| **COAL, REDSTONE (NO. 8A) BONY** | | 1.24' | M | M |
| SHALE, DK. GRAY | | 0.26' | M | M |
| SANDSTONE, LT. GRAY, SILTY | | 1.10' | S | S |
| SHALE, DK. GRAY | | 1.80' | M | M |
| LIMESTONE, LT. GRAY, SILTY | | 3.70' | S | S |
| CLAYSTONE, M. GRAY | | 1.00' | V | V |
| LIMESTONE, LT. GRAY, HARD | | 9.70' | S | S |
| CLAYSTONE, M. GRAY | | 3.90' | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.80' | S | S |
| CLAYSTONE, M. GRAY | | 1.85' | V | V |
| SHALE, BLACK | | 0.40' | M | M |
| **COAL, ROOF COAL, W/BONE PARTINGS** | | 1.47' | M | M |
| CLAYSTONE, M. GRAY | | 0.92' | V | V |
| **COAL, PITTSBURGH (NO.8)** | | 4.90' | M | M |
| CLAYSTONE, M. GRAY, FIRM | | 0.76' | V | V |
| LIMESTONE, M. GRAY, HARD | | 0.80' | S | S |
| SHALE, M. GRAY, SLITY | | 2.30' | M | M |
| LIMESTONE, M. GRAY, HARD | | 0.50' | S | S |
| CLAYSTONE, M. GRAY W/LS NODULES | | 5.10' | V | V |

DRILL HOLE C98-1; CONTINUED

Submit the following information for the stratum above the coal Seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| Claystone | | | | | |
| #8 Coal | | | | | |
| Claystone | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearings stratum with an asterisk (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

11/89

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND RECLAMATION
ATTACHMENT 13
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole# C98-2
*Coordinates X. 2,399,500.291 Y. 684,636.627 Surface Elevation 1260.07

| Lithology | H2O ** | Thickness | Physical Properties **** | |
|---|---|---|---|---|
| Topsoil | | | | |
| Subsoil | | | Compatibility | Erodibility |
| NON-CORING | | 20.00 | | |
| CLAYSTONE,M.GRAY,FE-STAIN JOINTS 20-22.2 | * | 14.30 | V | V |
| CLAYSTONE, RED 2/GRAY BANDS | | 0.70 | V | V |
| CLAYSTONE, M. GRAY | | 1.85 | V | V |
| CLAYSTONE, RED W/GRAY BANDS | | 0.90 | V | V |
| CLAYSTONE, M.GRAY CARBONACEOUS BOTT.0.2' | | 1.45 | V | V |
| LIMESTONE, L. GRAY, NODULAR W/CS PARTING | | 0.60 | S | S |
| CLAYSTONE M. GRAY | | 1.80 | V | V |
| LIMESTONE, M. GRAY, SILTY | | 1.40 | S | S |
| SHALE, M. GRAY | | 1.00 | M | M |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 1.95 | S | S |
| CLAYSTONE, M. GRAY | | 0.70 | V | V |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 1.10 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 1.20 | V | V |
| CLAYSTONE, RED | | 3.55 | V | V |
| CLAYSTONE, M. GRAY-GREEN | | 1.60 | V | V |
| SANDSTONE, M. GRAY, SILTY | | 3.05 | S | S |
| SHALE, M. GRAY, SILTY W/SS PTGS. | | 7.95 | M | M |
| CLAYSTONE, RED W/GRAY STREAKS | | 1.05 | V | V |
| SHALE, M. GRAY | | 2.20 | M | M |
| SHALE, RED | | 1.20 | M | M |
| CLAYSTONE, M. GRAY W/LS NODULES | | 2.00 | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.85 | S | S |
| CLAYSTONE, DARK GRAY | | 0.60 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.10 | M | M |
| CLAYSTONE, M. GRAY W/OCC. LS NODULES | | 2.30 | V | V |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 0.95 | S | S |
| SHALE, BLACK, CARBONACEOUS | | 0.45 | M | M |
| CLAYSTONE, M. GRAY | | 8.05 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 1.35 | M | M |
| COAL W/BONE PTGS. WASHINGTON (NO.12) | | 0.87 | M | M |
| CLAYSTONE, M.GRAY W/OCC. RED STREAKS | | 19.93 | V | V |
| SHALE, M.GRAY W/OCC.SS PTG, GRADES SANDY | | 12.60 | M | M |
| SANDSTONE, MANNINGTON,L.,GRAY, MICACEOUS, | | 22.15 | S | S |
| MED.GRAINED TO 130 COARSE GRAIN 130-141' | | | M | M |
| SHALE, M. GRAY | | 5.45 | M | M |
| **COAL, WAYNESBURG "A"** | | 0.72 | M | M |
| CLAYSTONE, M. GRAY | | 6.38 | V | V |
| SHALE, M. GRAY, SILTY | | 6.50 | M | M |
| SANDSTONE, M. GRAY, SILTY | | 1.55 | S | S |
| SHALE, M. GRAY, SILTY | | 12.35 | M | M |
| LIMESTONE, M. GRAY, SILTY | | 0.55 | S | S |
| CLAYSTONE, M. GRAY W/OCC. LS NODULES | | 3.55 | V | V |
| SHALE, M. GRAY W/OCC. LS NODULES | | 8.60 | M | M |
| SANDSTONE, M. GRAY, SILTY | | 2.15 | S | S |
| SHALE, M. GRAY, SILTY | | 2.20 | M | M |
| SHALE, BLACK W/COAL PARTINGS | | 0.25 | M | M |
| **COAL, WAYNESBURG (NO. 11)** | | 1.45 | M | M |

DRILL HOLE C98-2; CONTINUED

| | | | | |
|---|---|---|---|---|
| SHALE, BLACK, CARBONACEOUS | | 1.00 | M | M |
| SANDSTONE, M. GRAY, SILTY | | 1.05 | S | S |
| SHALE, M. GRAY, SILTY | | 3.50 | M | M |
| SANDSTONE, M. GRAY, SILTY | | 1.20 | S | S |
| SHALE, M.GRAY W/OCC.SS PTGS.GRADES SANDY | | 12.20 | M | M |
| **COAL, LITTLE WAYNESBURG** | | 0.15 | M | M |
| SHALE, BLACK W/COAL PARTINGS | | 0.20 | M | M |
| CLAYSTONE, DARK GRAY | | 1.50 | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.40 | S | S |
| CLAYSTONE, DARK GRAY | | 0.70 | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.70 | S | S |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 2.20 | V | V |
| LIMESTONE, L.GRAY, NODULAR W/CS PARTINGS | | 3.85 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 8.30 | V | V |
| SHALE, M. GRAY-GREEN | | 6.35 | M | M |
| SHALE, BLACK, CARBONACEOUS | | 0.15 | M | M |
| COAL | | 0.47 | M | M |
| SHALE, M. GRAY | | 0.53 | M | M |
| COAL | | 0.10 | M | M |
| CLAYSTONE, M. GRAY | | 1.65 | V | V |
| SHALE, M. GRAY | | 0.15 | M | M |
| **COAL, UNIONTOWN (NO.10) W/SHALE PARTINGS** | | 1.31 | M | M |
| CLAYSTONE, M. GRAY, GRADES SANDY | | 2.59 | V | V |
| SHALE, M. GRAY, SANDY | | 1.40 | M | M |
| SHALE, M. GRAY | | 3.00 | M | M |
| SANDSTONE, L..GRAY, W/THIN SHALE PARTINGS | | 0.25 | S | S |
| SHALE, M. GRAY W/SS PARTINGS | | 0.35 | M | M |
| SHALE, M. GRAY | | 1.95 | M | M |
| SHALE, DARK GRAY-BLACK | | 0.20 | V | V |
| CLAYSTONE, M. GRAY W/LS NODULES | | 3.25 | V | V |
| CLAYSTONE, M.GRAY W/LS NODULES & RED STREAKS | | 0.90 | V | V |
| CLAYSTONE, M. GRAY W/LS NODULES | | 2.60 | V | V |
| CLAYSTONE, RED | | 0.76 | V | V |
| CLAYSTONE, M.GRAY W/LS NODULES & RED STREAKS | | 3.35 | V | V |
| SHALE, M. GRAY W/OCC. THIN SS PARTINGS | | 5.60 | M | M |
| SANDSTONE, L. GRAY CALCAREOUS | | 0.50 | S | S |
| LIMESTONE, L. GRAY, HARD | | 0.30 | S | S |
| SHALE, M. GRAY | | 1.20 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 1.00 | S | S |
| SHALE, M. GRAY | | 0.40 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 1.40 | S | S |
| SHALE, M. GRAY | | 1.00 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 3.30 | S | S |
| CLAYSTONE, M. GRAY W/LS NODULES | | 4.00 | V | V |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 2.60 | S | S |
| SHALE, M. GRAY-GREEN | | 4.40 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 1.50 | S | S |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 14.45 | V | V |
| SHALE, M-DARK GRAY | | 0.40 | M | M |
| LIMESTONE, L. GRAY, HARD | | 2.40 | S | S |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 4.95 | V | V |
| LIMESTONE, L. GRAY, HARD | | 1.70 | S | S |
| SHALE, M. GRAY | | 3.90 | M | M |
| LIMESTONE, L. GRAY, HARD | | 5.20 | S | S |
| SHALE, M. GRAY | | 0.45 | M | M |
| LIMESTONE, L. GRAY, HARD | | 2.80 | S | S |
| SHALE, M. GRAY-GREEN, CALCAREOUS | | 6.15 | M | M |
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 4.80 | S | S |
| CLAYSTONE, M. GRAY | | 1.30 | V | V |
| CLAYSTONE, DARK GRAY | | 1.00 | V | V |
| CLAYSTONE, M. GRAY | | 1.80 | V | V |

DRILL HOLE C98-2; CONTINUED

| | | | | |
|---|---|---|---|---|
| SHALE, BLACK, CARBONACEOUS | | 0.30 | M | M |
| CLAYSTONE, DARK GRAY | | 2.50 | V | V |
| CLAYSTONE, M. GRAY | | 14.60 | V | V |
| SANDSTONE, L. GRAY | | 0.40 | S | S |
| SHALE, M. GRAY, SANDY | | 4.40 | M | M |
| SANDSTONE, L. GRAY | | 0.60 | S | S |
| SHALE, M. GRAY, SANDY | | 0.95 | M | M |
| SANDSTONE, **SEWICKLEY**, L.GRAY, MICACEOUS, | | 23.35 | S | S |
| M.GRAINED TO 371', COARSE GRAINED TO 388' | | | | |
| SHALE, BLACK, CARBONACEOUS | | 0.25 | M | M |
| **COAL, SEWICKLEY (NO. 9) BONY W/PYRITE** | | 0.45 | M | M |
| CLAYSTONE, DARK GRAY | | 0.60 | V | V |
| LIMESTONE, M. GRAY-BROWN, FLINTY | | 14.40 | S | S |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 14.30 | V | V |
| CLAYSTONE, BLACK, CARBONACEOUS | | 0.70 | V | V |
| SHALE, M. GRAY-GREEN, GRADES SANDY | | 4.40 | M | M |
| SHALE, M. GRAY-GREEN W/SS PARTINGS | | 2.50 | M | M |
| SHALE, M. GRAY, SILTY | | 6.50 | M | M |
| SANDSTONE, **PITTSBURGH**, L.GRAY, MICACEOUS, | | 22.70 | S | S |
| M-COARSE GRAINED W/MASSIVE TEXTURE TO 443 | | | | |
| COARSE GRAIN W/OOC. SH & COAL PTGS. TO 454' | | | | |
| SHALE, M. GRAY | | 0.40 | M | M |
| SANDSTONE, L.GRAY, COARSE GRAINED W/COAL STKS | | 5.55 | S | S |
| SHALE, M. GRAY | | 0.40 | M | M |
| SANDSTONE, L.GRAY, COARSE GRAINED W/COAL STKS. | | 3.40 | S | S |
| SHALE, BLACK, CARBONACEOUS | | 0.10 | M | M |
| SANDSTONE, L.GRAY COARSE GRAINED W/COAL STKS. | | 1.65 | S | S |
| SANDSTONE, L.GRAY, M-CRA GRAIN, MASSIVE TEXTURE | | 6.60 | S | S |
| SHALE, M. GRAY, SILTY W/SS PTGS. | | 2.55 | M | M |
| **COAL, PITTSBURGH (NO. 8)** | | 4.00 | M | M |
| SHALE, DARK GRAY, CALCAREOUS, HARD | | 4.20 | M | M |
| LIMESTONE, M. GRAY, HARD | | 1.05 | S | S |
| CLAYSTONE, M. GRAY W/LS NODULES | | 5.70 | V | V |
| SANDSTONE, L. GRAY, MED. GRAINED | | 4.40 | S | S |
| SHALE, M. GRAY W/OCC. CLAY PTGS. | | 10.00 | M | M |
| CLAYSTONE, M. GRAY | | 0.80 | V | V |
| SHALE, M. GRAY | | 0.65 | M | M |
| CLAYSTONE, RED | | 3.35 | V | V |
| CLAYSTONE, M. GRAY | | 1.25 | V | V |
| CLAYSTONE, RED | | 0.40 | V | V |
| CLAYSTONE, DARK GRAY | | 0.40 | V | V |
| LIMESTONE, L. GRAY, HARD | | 3.00 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 1.25 | M | M |
| CLAYSTONE, M. GRAY-OLIVE W/OCC.RED STKS. | | 3.70 | V | V |
| CLAYSTONE, RED | | 6.70 | V | V |
| CLAYSTONE, M. GRAY-GREEN | | 2.50 | V | V |
| CLAYSTONE, RED | | 8.30 | V | V |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 1.40 | V | V |

DRILL HOLE C98-2; CONTINUED

Submit the following information for the stratum above the coal Seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearings stratum with an asterisk (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

11/89

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINES AND RECLAMATION
ATTACHMENT 13
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole# C98-3
*Coordinates X. 2,408,886.602 Y. 689,901.337 Surface Elevation 1246.29

| Lithology | H2O ** | Thickness | Physical Properties **** | |
|---|---|---|---|---|
| Topsoil | | | | |
| Subsoil | | | Compatibility | Erodibility |
| NON-CORING | | 20.00 | | |
| SANDSTONE,TAN & I. GRAY, MICACEOUS, MED. | * | 22.50 | S | S |
| GRAINED, AQUIFER FRACTURES @ 26.5'& 42-42.5' | | | | |
| SHALE, MEDIUM GRAY | | 4.85 | M | M |
| SANDSTONE, L. GRAY, MEDIUM GRAINED | | 4.35 | S | S |
| CLAYSTONE, M. GRAY | | 0.50 | V | V |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 0.30 | S | S |
| CLAYSTONE, MED. GRAY W/RED BANDS | | 3.80 | V | V |
| LIMESTONE, L.GRAY, HARD, NODULAR W/RED CS PT | | 2.10 | S | S |
| CLAYSTONE, RED | | 13.00 | V | V |
| CLAYSTONE, GRAY & GREEN W/LS NODULES | | 1.60 | V | V |
| LIMESTONE, L.GRAY, HARD, NODULAR W/GRAY CS P | | 2.50 | S | S |
| CLAYSTONE, GRAY & GREEN W/LS NODULES | | 3.75 | V | V |
| SANDSTONE, L. GRAY, SILTY | | 4.50 | S | S |
| SHALE, M. GRAY W/OCC., SLICKENSIDES | | 5.65 | M | M |
| CLAYSTONE, MED. GRAY W/RED BANDS | | 2.50 | V | V |
| SHALE, M. GRAY | | 6.25 | M | M |
| CLAYSTONE, MED. GRAY W/RED BANDS | | 2.70 | V | V |
| CLAYSTONE, MED. GRAY W/LS NODULES | | 3.85 | V | V |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 0.65 | S | S |
| CLAYSTONE, MED. GRAY W/LS NODULES | | 2.15 | V | V |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 1.20 | S | S |
| CLAYSTONE, MED. GRAY W/LS NODULES | | 3.00 | V | V |
| CLAYSTONE, RED | | 1.60 | V | V |
| CLAYSTONE, MED. GRAY W/LS NODULES | | 4.50 | V | V |
| SHALE, M. GRAY W/OCC, SS STKS & LS NODULES | | 9.50 | M | M |
| SHALE, DARK GRAY | | 5.20 | M | M |
| SHALE, BLACK W/COAL PARTINGS | | 0.10 | M | M |
| COAL, **WASHINGTON (NO. 12)** UPPER SPLIT | | 0.70 | M | M |
| SHALE, BLACK, CARBONACEOUS | | 0.13 | M | M |
| COAL, **WASHINGTON (NO. 12)** UPPER SPLIT | | 0.72 | M | M |
| SHALE, M. GRAY, GRADES SANDY | | 2.05 | M | M |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 0.75 | S | S |
| SHALE, DARK GRAY-BLACK | | 1.25 | M | M |
| LIMESTONE, L. GRAY, NODULAR, HARD | | 0.50 | S | S |
| CLAYSTONE, MED. GRAY W/LS NODULES | | 9.65 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.80 | M | M |
| COAL, **WASHINGTON (NO. 12)**, LOWER SPLIT | | 0.60 | M | M |
| SHALE, BLACK W/COAL PARTINGS | | 0.57 | M | M |
| COAL, **WASHINGTON (NO. 12)**, LOWER SPLIT | | 0.47 | M | M |
| CLAYSTONE, M. GRAY W/LS NODULES | | 15.76 | V | V |
| SHALE, M. GRAY-GREEN, SANDY | | 0.40 | M | M |
| SHALE, M. GRAY-GREEN | | 3.95 | M | M |
| SANDSTONE, M. GRAY, SILTY | | 0.40 | S | S |
| SHALE, M. GRAY-GREEN, SANDY | | 6.20 | M | M |
| SANDSTONE,L.GRAY-WHITE,MICAEOUS,M/OR GRAINED | | 8.60 | S | S |
| SHALE, M. GRAY-GREEN, SANDY | | 0.80 | M | M |
| SANDSTONE, L.GRAY, MICAEOUS, MED.GRAINED | | 1.40 | S | S |

DRILL HOLE C98-3; CONTINUED

| | | | | |
|---|---|---|---|---|
| SHALE, M. GRAY-GREEN, SANDY | | 0.90 | M | M |
| SANDSTONE, MANNINGTON, L. GRAY-WHITE, | | 50.70 | S | S |
| MICAEOUS, MED.-COARSE GRAINED | | | | |
| COAL, **WAYNESBURG** "A" | | 0.20 | M | M |
| SANDSTONE, L. GRAY, MED. GRAINED | | 0.40 | S | S |
| COAL, BONY **WAYNESBURG "A"** | | 0.15 | M | M |
| SANDSTONE, L. GRAY, MED.GRAINED CONGLOMERATE | | 2.35 | S | S |
| SHALE, M. GRAY, SANDY W/SS PTGS. | | 4.90 | M | M |
| SHALE, M. GRAY | | 7.60 | M | M |
| SHALE, DARK GRAY W/LS NODULES | | 0.95 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 2.00 | S | S |
| SHALE, M. GRAY | | 4.30 | M | M |
| CLAYSTONE, M. GRAY W/LS NODULES | | 4.65 | V | V |
| SHALE, M. GRAY | | 3.40 | M | M |
| SHALE, BLACK, CARBONACEOUS W/PYRITE | | 0.55 | M | M |
| COAL, **WAYNESBURG (NO. 11)** | | 1.15 | M | M |
| CLAYSTONE, M. GRAY | | 0.90 | V | V |
| SHALE, M. GRAY | | 9.70 | M | M |
| SANDSTONE, L. GRAY, MED. GRAINED | | 0.25 | S | S |
| SHALE, M. GRAY | | 3.85 | M | M |
| SHALE, DARK GRAY-BLACK | | 1.45 | M | M |
| LIMESTONE, M. GARY W/SHALE PARTINGS | | 5.45 | S | S |
| CLAYSTONE, M. GRAY | | 4.05 | V | V |
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 3.10 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 3.85 | M | M |
| CLAYSTONE, M. GRAY | | 5.20 | V | V |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 2.45 | S | S |
| CLAYSTONE, M. GRAY W/LS NODULES | | 3.20 | V | V |
| SHALE, M. GRAY, CALCAREOUS | | 9.05 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 0.60 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 3.20 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 0.40 | S | S |
| SHALE, M. GRAY, CALCAREOUS, GRADES SANDY | | 4.60 | M | M |
| SANDSTONE, L. GRAY W/THIN SHALE PTGS. | | 4.25 | S | S |
| SHALE, M. GRAY | | 2.75 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 0.95 | S | S |
| SHALE, M. GRAY | | 0.70 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 0.55 | S | S |
| SHALE, M. GRAY | | 1.65 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 0.90 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 2.55 | M | M |
| LIMESTONE, L. GRAY, HARD | | 1.50 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 0.50 | M | M |
| LIMESTONE, L. GRAY, HARD | | 1.65 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 4.25 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 1.20 | S | S |
| SHALE, M. GRAY, GRADES SANDY | | 2.80 | M | M |
| SANDSTONE, L. GRAY W/THIN SHALE PTGS. | | 0.45 | S | S |
| CLAYSTONE, M. GRAY-OLIVE | | 3.15 | V | V |
| CLAYSTONE, RED | | 0.90 | V | V |
| CLAYSTONE, M. GRAY-GREEN | | 1.60 | V | V |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 0.50 | S | S |
| SHALE, M. GRAY | | 6.60 | M | M |
| LIMESTONE, L. GRAY, HARD, NODULAR | | 0.60 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 10.30 | V | V |
| LIMESTONE, L. GRAY, HARD | | 3.80 | S | S |
| SHALE, M. GRAY | | 1.00 | M | M |
| LIMESTONE, M. GRAY, HARD, NODULAR | | 1.00 | S | S |
| SHALE, M. GRAY-GREEN | | 12.10 | M | M |
| LIMESTONE, L. GRAY, HARD | | 5.90 | S | S |
| SHALE, M. GRAY | | 0.65 | M | M |

DRILL HOLE C98-3; CONTINUED

| | | | | |
|---|---|---|---|---|
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 1.45 | S | S |
| SHALE, M. GRAY | | 0.40 | M | M |
| LIMESTONE, L. GRAY, HARD | | 1.05 | S | S |
| SHALE, M. GRAY | | 6.60 | M | M |
| LIMESTONE, L. GRAY, HARD | | 3.40 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 7.15 | M | M |
| CLAYSTONE, DARK GRAY-BLACK | | 3.10 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.25 | M | M |
| COAL, **SEWICKLEY (NO.9)** W/BONE & SHALE PT | | 2.75 | M | M |
| SHALE, BLACK W/COAL PARTINGS | | 2.00 | M | M |
| CLAYSTONE, M. GRAY | | 1.40 | V | V |
| SHALE, M. GRAY W/THIN SS PTGS UPPER 2' | | 12.80 | M | M |
| SHALE, BLACK | | 0.15 | M | M |
| CLAYSTONE, DARK GRAY | | 0.40 | V | V |
| SHALE BLACK | | 0.15 | M | M |
| SHALE, DARK GRAY | | 0.40 | V | V |
| COAL, **FISHPOT**, BROKEN | | 2.90 | M | M |
| SHALE, DARK GRAY | | 1.00 | M | M |
| LIMESTONE, M. GRAY, SILTY | | 2.00 | S | S |
| CLAYSTONE, M. GRAY | | 0.50 | V | V |
| LIMESTONE, M. GRAY, SILTY | | 5.50 | S | S |
| SHALE, DARK GRAY | | 0.50 | V | V |
| SHALE, M. GRAY, CALCAREOUS, FLINTY | | 3.90 | M | M |
| LIMESTONE, L. GRAY, HARD | | 4.65 | S | S |
| SHALE, M. GRAY | | 9.85 | M | M |
| LIMESTONE, L. GRAY, HARD | | 3.45 | S | S |
| SHALE, M. GRAY | | 0.40 | M | M |
| CLAYSTONE, M. GRAY W/LS NODULES | | 2.45 | V | V |
| SHALE, BLACK | | 0.30 | M | M |
| SHALE, M. GRAY-GREEN, CALCAREOUS | | 1.40 | M | M |
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 6.90 | S | S |
| SHALE, M. GRAY W/LS NODULES | | 2.15 | M | M |
| LIMESTONE, M. GRAY W/SHALE PARTINGS | | 7.85 | S | S |
| CLAYSTONE, M. GRAY | | 2.05 | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.50 | S | S |
| CLAYSTONE, M. GRAY | | 1.10 | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.55 | S | S |
| CLAYSTONE, M. GRAY | | 0.70 | V | V |
| LIMESTONE, M. GRAY, NODULAR, HARD | | 0.25 | S | S |
| CLAYSTONE, M. GRAY W/THIN BL SHALE PTGS | | 3.30 | V | V |
| SHALE, BLACK | | 0.17 | M | M |
| COAL, **ROOF COAL** W/BONE PARTINGS | | 0.93 | M | M |
| CLAYSTONE, M. GRAY-BROWN | | 0.90 | V | V |
| SHALE, BLACK | | 0.56 | M | M |
| COAL, **PITTSBURGH (NO. 8)** | | 5.35 | M | M |
| SHALE, M. GRAY, FIRM | | 0.46 | M | M |
| LIMESTONE, M. GRAY, HARD | | 0.50 | S | S |
| SHALE, M. GRAY, SILTY | | 1.35 | M | M |
| LIMESTONE, M. GRAY, HARD | | 1.50 | S | S |
| SHALE, M. GRAY, SILTY | | 2.90 | M | M |
| LIMESTONE, M. GRAY, HARD | | 0.60 | S | S |
| CLAYSTONE, M. GRAY | | 2.20 | V | V |

DRILL HOLE C98-3; CONTINUED

Submit the following information for the stratum above the coal Seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearings stratum with an asterisk (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

11/89

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINES AND RECLAMATION
## ATTACHMENT 13
## (GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC.
*Coordinates X. 2,417,198.406 Y. 692,676.852

Drill Hole# C98-5
Surface Elevation 1258.06

| Lithology | H2O ** | Thickness | Physical Properties **** Compatibility | Erodibility |
|---|---|---|---|---|
| Topsoil | | | | |
| Subsoil | | | | |
| NON-CORING | | 11.50 | | |
| CLAYSTONE, RED | | 1.50 | V | V |
| SANDSTONE, TAN, JOINTED W/FE-STAINS @ 13-14' | * | 11.30 | S | S |
| CLAYSTONE, M. GRAY W/FE-STAINED JOINTS | * | 1.50 | V | V |
| CLAYSTONE, RED W/GRAY BANDS | | 1.60 | V | V |
| CLAYSTONE, M. GRAY, GRADES SANDY | | 7.60 | V | V |
| SANDSTONE, L. GRAY-WHITE, W/FE-STAINED PTGS. | * | 1.80 | S | S |
| CLAYSTONE, M. GRAY | | 0.50 | V | V |
| CLAYSTONE, RED | 1218.7 | 2.00 | V | V |
| CLAYSTONE, M. GRAY | | 2.40 | V | V |
| CLAYSTONE, RED | | 1.90 | V | V |
| CLAYSTONE, M. GRAY W/RED STREAKS | | 7.30 | V | V |
| SHALE, RED | | 1.60 | M | M |
| CLAYSTONE, M.GRAY W/LS NODULES BOTTOM 1' | | 2.60 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 0.50 | S | S |
| CLAYSTONE, M. GRAY W/LS NODULES | | 1.95 | V | V |
| SHALE, M. GRAY | | 1.80 | M | M |
| SANDSTONE, L. GRAY, SILTY | | 0.45 | S | S |
| SHALE, M. GRAY | | 8.00 | M | M |
| SHALE, RED | | 1.35 | M | M |
| SHALE, M. GRAY | | 1.90 | M | M |
| LIMESTONE, M. GRAY, NODULAR | | 0.95 | S | S |
| CLAYSTONE, M. GRAY-OLIVE | | 4.85 | V | V |
| SHALE, M. GRAY, SANDY | | 17.75 | M | M |
| CLAYSTONE, DARK GRAY-OLIVE | | 0.60 | V | V |
| CLAYSTONE, M. GRAY W/OCC. LS NODULES | | 6.40 | V | V |
| CLAYSTONE, RED W/GRAY STREAKS | | 5.70 | V | V |
| CLAYSTONE, M. GRAY | | 2.20 | V | V |
| LIMESTONE, L. GRAY, NODULAR W/SHALE PTG. | | 1.75 | S | S |
| CLAYSTONE, M. GRAY | | 2.90 | V | V |
| CLAYSTONE, RED | | 7.85 | V | V |
| CLAYSTONE, M. GRAY W/LS NODULES & RED STKS. | | 2.65 | V | V |
| CLAYSTONE, M. GRAY W/RED STREAKS | | 4.00 | V | V |
| SHALE, M. GRAY | | 13.55 | M | M |
| SHALE, RED | | 0.60 | M | M |
| CLAYSTONE, M. GRAY-OLIVE | | 5.50 | V | V |
| LIMESTONE, L. GRAY, NODULAR W/CS PTGS. | | 3.80 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 5.90 | V | V |
| SHALE, M. GRAY, GRADES SANDY | | 4.35 | M | M |
| SANDSTONE,L.GRAY,MICACEOUS,MED.GRAINED,SHALY | | 1.65 | S | S |
| SHALE, M. GRAY, SILTY WITHIN SS PARTINGS | | 1.00 | M | M |
| SANDSTONE,L.GRAY, MICAEOUS W/OCC. SHALE PTGS | | 11.85 | S | S |
| SHALE, M. GRAY, SILTY WITHIN SS PARTINGS | | 2.50 | M | M |
| SANDSTONE,L.GRAY, MICACEOUS W/OCC.SHALE PTGS | | 0.50 | S | S |
| SHALE, M. GRAY, SANDY | | 1.10 | M | M |
| SHALE, M. GRAY | | 5.20 | M | M |
| SHALE, BLACK, CARBONACEOUS | | 0.65 | M | M |
| LIMESTONE, M. GRAY, NODULAR | | 0.35 | S | S |

DRILL HOLE C98-5; CONTINUED

| | | | | |
|---|---|---|---|---|
| SHALE, M. GRAY, CALCAREOUS | | 1.65 | M | M |
| CLAYSTONE, M. GRAY | | 1.65 | V | V |
| SHALE, M. GRAY, W/LS NODULES | | 6.00 | M | M |
| CLAYSTONE, M. GRAY | | 0.80 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.30 | M | M |
| CLAYSTONE, M. GRAY | | 7.65 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.70 | M | M |
| **COAL, WASHINGTON (NO. 12) W/BONE PTG.** | | 3.95 | M | M |
| CLAYSTONE, M. GRAY | | 2.35 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 1.00 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 7.50 | V | V |
| SHALE, M. GRAY-GREEN | | 3.80 | M | M |
| SANDSTONE, L.GRAY, MICACEOUS, MED GRAINED, SHALY | | 0.75 | S | S |
| SHALE, M. GRAY-GREEN | | 3.10 | M | M |
| CLAYSTONE, M. GRAY W/RED STREAKS | | 2.20 | V | V |
| CLAYSTONE, RED | | 1.70 | V | V |
| CLAYSTONE, M. GRAY W/RED STREAKS | | 1.25 | V | V |
| SHALE, M. GRAY-GREEN, SILTY | | 11.20 | M | M |
| CLAYSTONE, DARK GRAY-GREEN | | 4.00 | V | V |
| SHALE, M. GRAY-GREEN, SILTY | | 1.75 | M | M |
| CLAYSTONE, DARK GRAY | | 2.70 | V | V |
| SHALE, BLACK, CARBONACEOUS | | 0.85 | M | M |
| COAL | | 0.10 | M | M |
| SHALE, BLACK, CARBONACEOUS W/COAL PTGS. | | 1.15 | M | M |
| COAL | | 0.10 | M | M |
| SHALE, M. GRAY | | 2.10 | M | M |
| **COAL WAYNESBURG "A" BONY W/SHALE PTGS.** | | 0.80 | M | M |
| SHALE, BLACK CARBONACEOUS | | 0.15 | M | M |
| LIMESTONE, M. GRAY, NODULAR | | 0.65 | S | S |
| SHALE, DARK GRAY | | 1.05 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 1.40 | S | S |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 6.66 | V | V |
| SHALE, M. GRAY-GREEN W/LS NODULES | | 8.76 | M | M |
| SANDSTONE, L. GRAY, MED. GRAINED | | 1.50 | S | S |
| SHALE, M. GRAY-GREEN, SANDY | | 5.95 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 0.65 | S | S |
| CLAYSTONE, M. GRAY-GREEN W/LS NODULES | | 8.85 | V | V |
| SANDSTONE, L.GRAY, MED. GRAINED W/SHALE PTGS | | 15.95 | S | S |
| SHALE, BLACK WAYNESBURG (NO.11) COAL HORIZ. | | 0.40 | M | M |
| CLAYSTONE, M. GRAY | | 3.15 | V | V |
| SHALE, M. GRAY, SILTY W/SS PARTINGS | | 0.75 | M | M |
| SHALE, M. GRAY | | 10.80 | M | M |
| SHALE, BLACK, CARBONACEOUS W/COAL PTGS. | | 0.25 | M | M |
| CLAYSTONE, M. GRAY | | 2.95 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 2.50 | S | S |
| CLAYSTONE, M. GRAY | | 4.10 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 0.80 | S | S |
| CLAYSTONE, M. GRAY | | 1.70 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 1.75 | S | S |
| CLAYSTONE, M. GRAY | | 0.70 | V | V |
| LIMESTONE, L. GRAY-TAN, FLINTY | | 1.60 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 8.90 | M | M |
| CLAYSTONE, M. GRAY-GREEN | | 1.00 | V | V |
| LIMESTONE, L. GRAY, NODULAR W/CS PTGS. | | 2.90 | S | S |
| CLAYSTONE, M. GRAY | | 1.00 | V | V |
| CLAYSTONE, BLACK UNIONTOWN NO.10 HORIZ. | | 0.40 | V | V |
| SHALE, M. GRAY, SANDY | | 2.40 | M | M |
| SANDSTONE, L. GRAY, MED. GRAINED | | 0.45 | S | S |
| SHALE, M. GRAY, SANDY | | 0.25 | M | M |
| SANDSTONE, L. GRAY, MED. GRAINED | | 0.80 | S | S |
| SHALE, M. GRAY, SANDY | | 0.65 | M | M |



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DRILL HOLE C98-5; CONTINUED

| | | | | |
|---|---|---|---|---|
| SANDSTONE, L.GRAY, MED.GRAINED W/SHALE PTGS. | | 1.40 | S | S |
| CLAYSTONE, M. GRAY | | 1.30 | V | V |
| CLAYSTONE, RED | | 1.40 | V | V |
| CLAYSTONE, M. GRAY | | 0.50 | V | V |
| CLAYSTONE, GRAY-GREEN, LS NODS, GRADES SANDY | | 8.20 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 1.45 | S | S |
| SHALE, M. GRAY-GREEN | | 4.45 | M | M |
| LIMESTONE, M. GRAY, NODULAR | | 0.80 | S | S |
| SHALE, DARK GRAY | | 0.75 | V | V |
| SHALE, M. GRAY W/LS NODULES | | 6.45 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 3.30 | S | S |
| CLAYSTONE, GRAY-GREEN-OLIVE W/LS NODULES | | 6.10 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 0.90 | S | S |
| SHALE, M. GRAY-GREEN W/OCC. LS NODULES | | 13.90 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 2.50 | S | S |
| SHALE, M. GRAY | | 0.90 | M | M |
| SHALE, M. GRAY, W/LS NODULES | | 2.70 | M | M |
| SHALE, M. GRAY-GREEN, CALCAREOUS | | 8.60 | M | M |
| LIMESTONE, M. GRAY, SILTY | | 3.00 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 9.40 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 1.10 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 0.80 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 1.00 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 1.70 | V | V |
| LIMESTONE, L. GRAY-WHITE, VERY HARD | | 6.40 | S | S |
| SHALE, M. GRAY | | 0.60 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 1.50 | S | S |
| SHALE, M. GRAY-GREEN, CALCAREOUS | | 5.00 | M | M |
| LIMESTONE, BENWOOD, L. GRAY-TAN, FLINTY | | 3.10 | S | S |
| SHALE, M. GRAY-GREEN | | 2.90 | M | M |
| LIMESTONE, L.GRAY ,NODULAR W/SHALE PTGS. | | 5.65 | S | S |
| CLAYSTONE, DARK GRAY W/LS NODULES | | 4.20 | V | V |
| LIMESTONE, M. GRAY, NODULAR W/CS PTGS. | | 0.55 | S | S |
| CLAYSTONE, M. GRAY | | 1.40 | V | V |
| SHALE, BLACK | | 0.25 | M | M |
| COAL **SEWICKLEY (NO.8)** W/BONE PARTINGS | | 1.83 | M | M |
| CLAYSTONE, DARK GRAY | | 0.62 | V | V |
| CLAYSTONE, M. GRAY | | 3.80 | V | V |
| SHALE, M. GRAY | | 4.65 | M | M |
| SANDSTONE, **FISHPOT**, L. GRAY, MED.GRAINED | | 9.75 | S | S |
| SHALE, M. GRAY | | 5.45 | M | M |
| SHALE, BLACK | | 0.30 | M | M |
| COAL, **FISHPOT** | | 2.72 | M | M |
| SHALE, DARK GRAY-BLACK | | 0.53 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 6.00 | S | S |
| SHALE, DARK GRAY | | 0.20 | V | V |
| LIMESTONE, L. GAY, NODULAR | | 1.90 | S | S |
| SHALE, DARK GRAY | | 0.50 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 1.10 | S | S |
| SHALE, M. GRAY, CALCAREOUS | | 2.50 | M | M |
| LIMESTONE, L. GRAY-WHITE, VERY HARD | | 4.40 | S | S |
| SHALE, M. GRAY-GREEN | | 1.20 | M | M |
| LIMESTONE, L. GRAY, NODULAR | | 2.75 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 2.05 | V | V |
| SHALE, M. GRAY, SILTY W/SS PARTINGS | | 0.95 | M | M |
| SANDSTONE, L. GRAY, MED. GRAINED | | 0.35 | S | S |
| SHALE, M. GRAY | | 6.50 | M | M |
| LIMESTONE, M. GRAY, NODULAR | | 0.90 | S | S |
| CLAYSTONE, M. GRAY W/LS NODULES | | 4.30 | V | V |



AEC 03535

DRILL HOLE C98-5; CONTINUED

| | | | | |
|---|---|---|---|---|
| SHALE, BLACK, CARBONACEOUS W/COAL PTGS. | | 0.75 | M | M |
| COAL, **REDSTONE, (NO.8A)**, BONY | | 0.50 | M | M |
| CLAYSTONE, DARK GRAY | | 1.00 | V | V |
| LIMESTONE, M. GRAY, NODULAR | | 0.50 | S | S |
| SHALE, DARK GRAY-BLACK | | 0.90 | M | M |
| LIMESTONE, M. GRAY, NODULAR | | 1.06 | S | S |
| CLAYSTONE, DARK GRAY | | 0.35 | V | V |
| LIMESTONE, M. GRAY, NODULAR | | 1.90 | S | S |
| CLAYSTONE, DARK GRAY | | 0.35 | V | V |
| LIMESTONE, L. GARY, NODULAR | | 6.00 | S | S |
| SHALE, DARK GRAY | | 0.65 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 1.45 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 3.00 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 0.50 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 0.85 | V | V |
| LIMESTONE, L. GRAY, NODULAR | | 0.55 | S | S |
| CLAYSTONE, M. GRAY-GREEN | | 2.55 | V | V |
| COAL | | 0.05 | M | M |
| CLAYSTONE, DARK GRAY | | 1.50 | V | V |
| COAL, ROOF COAL | | 1.25 | M | M |
| CLAYSTONE, M. GRAY | | 0.75 | V | V |
| COAL **PITTSBURGH NO.8**, LOST 2' MINE VOID | | 5.10 | M | M |
| SHALE, M. GRAY, SILTY | | 1.90 | M | M |

Submit the following information for the stratum above the coal Seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearings stratum with an asterisk (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

ATTACHMENT 13

## DIAMOND DRILL HOLE: NA-87-02

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1259
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 665046
**Easting:** 2435463
**Drilling Company:** LJ Hughes & Sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.00 | 0.00 | 20.00 | Casing | | | | 0.00 |
| 39.00 | 20.00 | 59.00 | Shale, red/ grn | Y | cm, em | | 0.00 |
| 3.00 | 59.00 | 62.00 | Shale, grn, sandy | Y | cm, em | | 0.00 |
| 17.00 | 62.00 | 79.00 | Shale, grn | | cm, em | | 0.00 |
| 31.70 | 79.00 | 110.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 8.30 | 110.70 | 119.00 | Shale, grn, sandy | | cm, em | | 0.00 |
| 55.00 | 119.00 | 174.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 7.30 | 174.00 | 181.30 | Shale, grn, ls nods | | ak, cm, em | | 0.00 |
| 3.50 | 181.30 | 184.80 | Shale, red/ grn | | cm, em | | 0.00 |
| 5.00 | 184.80 | 189.80 | Shale, gy, sandy | | cm, em | | 0.00 |
| 9.20 | 189.80 | 199.00 | Shale, gy | | cm, em | | 0.00 |
| 3.60 | 199.00 | 202.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 21.00 | 202.60 | 223.60 | Shale, grn | | cm, em | | 0.00 |
| 5.10 | 223.60 | 228.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 30.30 | 228.70 | 259.00 | Shale, gy | | cm, em | | 0.00 |
| 3.70 | 259.00 | 262.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.59 | 262.70 | 263.29 | **Coal, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 0.36 | 263.29 | 263.65 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.50 | 263.65 | 265.15 | **Coal** | | ac, cv, ev | | 0.00 |
| 21.35 | 265.15 | 286.50 | Shale, gy | | cm, em | | 0.00 |
| 7.00 | 286.50 | 293.50 | Shale, red/ grn | | cm, em | | 0.00 |
| 24.70 | 293.50 | 318.20 | Shale, gy | | cm, em | | 0.00 |
| 6.14 | 318.20 | 324.34 | **Coal, sh layers, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 1.30 | 324.34 | 325.64 | Shale, gy | | cm, em | | 0.00 |
| 0.36 | 325.64 | 326.00 | Shale, dk gy | | cm, em | | 0.00 |
| 26.40 | 326.00 | 352.40 | Shale, gy | | cm, em | | 0.00 |
| 18.00 | 352.40 | 370.40 | Limestone, shaley | | ak, cs, es | y | 18.00 |
| 0.70 | 370.40 | 371.10 | **Coal, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 5.40 | 371.10 | 376.50 | Shale, gy | | cm, em | | 0.00 |
| 7.20 | 376.50 | 383.70 | Shale, gy, sandy | | cm, em | | 0.00 |
| 6.60 | 383.70 | 390.30 | Shale, gy | | cm, em | | 0.00 |
| 6.50 | 390.30 | 396.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 24.90 | 396.80 | 421.70 | Shale, gy | | cm, em | | 0.00 |
| 4.50 | 421.70 | 426.20 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.40 | 426.20 | 431.60 | Shale, gy | | cm, em | | 0.00 |
| 32.00 | 431.60 | 463.60 | Limestone, shaley | | ak, cs, es | y | 32.00 |
| 5.40 | 463.60 | 469.00 | Shale, grn | | cm, em | | 0.00 |
| 9.50 | 469.00 | 478.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 478.50 | 482.10 | Shale, red/ grn | | cm, em | | 0.00 |
| 18.20 | 482.10 | 500.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 500.30 | 502.40 | Shale, grn | | cm, em | | 0.00 |
| 7.50 | 502.40 | 509.90 | Limestone | | ak, cs, es | y | 7.50 |
| 19.10 | 509.90 | 529.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.30 | 529.00 | 532.30 | Shale, dk gy | | cm, em | | 0.00 |
| 1.10 | 532.30 | 533.40 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 6.30 | 533.40 | 539.70 | Claystone, gy | | cv, ev | | 0.00 |
| 5.50 | 539.70 | 545.20 | Shale, gy, sandy | | cm, em | | 0.00 |
| 17.10 | 545.20 | 562.30 | Shale, gy | | cm, em | | 0.00 |
| 0.16 | 562.30 | 562.46 | **Coal, pyrite, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.68 | 562.46 | 563.14 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.39 | 563.14 | 563.53 | **Shale, gy** | | cm, em | | 0.00 |
| 0.50 | 563.53 | 564.03 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.70 | 564.03 | 564.73 | Shale, gy | | cm, em | | 0.00 |
| 20.67 | 564.73 | 585.40 | Limestone, shaley | | ak, cs, es | y | 20.67 |
| 9.10 | 585.40 | 594.50 | Shale, gy | | cm, em | | 0.00 |
| 3.30 | 594.50 | 597.80 | Limestone, shaley | | ak, cs, es | y | 3.30 |
| 7.90 | 597.80 | 605.70 | Shale, gy | | cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: NA-87-02

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.80 | 605.70 | 608.50 | Limestone, shaley | | ak, cs, es | y | 2.80 |
| 8.80 | 608.50 | 617.30 | Limestone | | ak, cs, es | y | 8.80 |
| 9.80 | 617.30 | 627.10 | Shale, gy | | cm, em | | 0.00 |
| 6.03 | 627.10 | 633.13 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.04 | 633.13 | 633.17 | Shale, dk gy | | cm, em | | 0.00 |
| 7.83 | 633.17 | 641.00 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 641.00 | | | | | 93.07 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **93.07**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **15%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 93.07 | 15% |
| Soft Rock: | 547.93 | 85% |
| | 641.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |



AEC 03538

ATTACHMENT 13

DIAMOND DRILL HOLE: NA-87-06

**Field Engineer:** Kim Cecil
**Surface Elevation:** 979
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 667525
**Easting:** 2425111
**Drilling Company:** L J Hughes & Sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 15.00 | 0.00 | 15.00 | Casing | | | | 0.00 |
| 2.00 | 15.00 | 17.00 | Chipped | | | | 0.00 |
| 10.00 | 17.00 | 27.00 | Sandstone, gy, sh stks | Y | cs, es | y | 10.00 |
| 6.60 | 27.00 | 33.60 | Shale, gy | Y | cm, em | | 0.00 |
| 1.00 | 33.60 | 34.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 34.60 | 34.80 | Shale, gy, coal stks | | ac, cm, em | | 0.00 |
| 5.05 | 34.80 | 39.85 | **Coal, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 1.90 | 39.85 | 41.75 | Shale, gy, coal stks | | ac, cm, em | | 0.00 |
| 0.60 | 41.75 | 42.35 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 42.35 | 43.35 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.60 | 43.35 | 43.95 | Limestone | | ak, cs, es | y | 0.60 |
| 0.50 | 43.95 | 44.45 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 44.45 | 44.70 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.30 | 44.70 | 46.00 | Shale, gy | | cm, em | | 0.00 |
| 14.00 | 46.00 | 60.00 | Claystone, gy | | cv, ev | | 0.00 |
| 20.00 | 60.00 | 80.00 | Claystone, grn | | cv, ev | | 0.00 |
| 5.00 | 80.00 | 85.00 | Limestone | | ak, cs, es | y | 5.00 |
| 8.00 | 85.00 | 93.00 | Shale, gy | | cm, em | | 0.00 |
| 1.00 | 93.00 | 94.00 | Sandstone, gy, sh stks | | cs, es | y | 1.00 |
| 18.00 | 94.00 | 112.00 | Shale, gy | | cm, em | | 0.00 |
| 0.50 | 112.00 | 112.50 | **Coal, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 0.50 | 112.50 | 113.00 | Shale, gy | | cm, em | | 0.00 |
| 19.00 | 113.00 | 132.00 | Limestone | | ak, cs, es | y | 19.00 |
| 3.00 | 132.00 | 135.00 | Claystone, grn | | cv, ev | | 0.00 |
| 11.50 | 135.00 | 146.50 | Shale, red/ grn, ls nods | | ak, cm, em | | 0.00 |
| 10.50 | 146.50 | 157.00 | Shale, grn | | cm, em | | 0.00 |
| 7.00 | 157.00 | 164.00 | Limestone | | ak, cs, es | y | 7.00 |
| 1.00 | 164.00 | 165.00 | Claystone, grn | | cv, ev | | 0.00 |
| 23.00 | 165.00 | 188.00 | Limestone, shaley | | ak, cs, es | y | 23.00 |
| 4.00 | 188.00 | 192.00 | Claystone, grn | | cv, ev | | 0.00 |
| 10.00 | 192.00 | 202.00 | Limestone, shaley | | ak, cs, es | y | 10.00 |
| 4.00 | 202.00 | 206.00 | Claystone, grn | | cv, ev | | 0.00 |
| 52.30 | 206.00 | 258.30 | Limestone, shaley | | ak, cs, es | y | 52.30 |
| 1.80 | 258.30 | 260.10 | Claystone, gy, ls nods | | ak, cv, ev | | 0.00 |
| 0.90 | 260.10 | 261.00 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 3.50 | 261.00 | 264.50 | Claystone, gy | | cv, ev | | 0.00 |
| 5.50 | 264.50 | 270.00 | Shale, grn, sandy | | cm, em | | 0.00 |
| 15.00 | 270.00 | 285.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.00 | 285.00 | 288.00 | Shale, gy | | cm, em | | 0.00 |
| 1.90 | 288.00 | 289.90 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 1.20 | 289.90 | 291.10 | Shale, gy | | cm, em | | 0.00 |
| 18.90 | 291.10 | 310.00 | Limestone, shaley | | ak, cs, es | y | 18.90 |
| 3.00 | 310.00 | 313.00 | Shale, grn | | cm, em | | 0.00 |
| 3.20 | 313.00 | 316.20 | Sandstone, gy | | cs, es | y | 3.20 |
| 4.00 | 316.20 | 320.20 | Shale, gy | | cm, em | | 0.00 |
| 4.30 | 320.20 | 324.50 | Limestone, shaley | | ak, cs, es | y | 4.30 |
| 2.90 | 324.50 | 327.40 | Claystone, grn | | cv, ev | | 0.00 |
| 0.80 | 327.40 | 328.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 17.95 | 328.20 | 346.15 | Limestone, shaley | | ak, cs, es | y | 17.95 |
| 1.20 | 346.15 | 347.35 | Claystone, grn | | cv, ev | | 0.00 |
| 1.75 | 347.35 | 349.10 | Limestone, shaley | | ak, cs, es | y | 1.75 |
| 0.90 | 349.10 | 350.00 | Claystone, grn | | cv, ev | | 0.00 |
| 3.20 | 350.00 | 353.20 | Claystone, gy | | cv, ev | | 0.00 |
| 0.95 | 353.20 | 354.15 | Shale, blk, coal stks | | ac, cvm, em | | 0.00 |
| 0.40 | 354.15 | 354.55 | Shale, gy | | cm, em | | 0.00 |
| 0.60 | 354.55 | 355.15 | **Coal, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.40 | 355.15 | 355.55 | Shale, gy | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: NA-87-06

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 4.55 | 355.55 | 360.10 | Coal, Pittsburgh No. 8 | | ac, cv, ev | | 0.00 |
| 0.95 | 360.10 | 361.05 | Shale, gy | | cm, em | | 0.00 |
| 3.95 | 361.05 | 365.00 | Claystone, grn | | cv, ev | | 0.00 |
| 5.00 | 365.00 | 370.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| | Total Depth | 370.00 | | | | | 174.00 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **174.00**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **47%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 174.00 | 47% |
| Soft Rock: | 196.00 | 53% |
| | 370.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: NA-87_07

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1301
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 666788
**Easting:** 2429126
**Drilling Company:** LJ Hughes & Sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.00 | 0.00 | 20.00 | Casing | | | | 0.00 |
| 12.00 | 20.00 | 32.00 | Shale, brn, sandy | Y | cm, em | | 0.00 |
| 7.00 | 32.00 | 39.00 | Shale, gy | Y | cm, em | | 0.00 |
| 10.00 | 39.00 | 49.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 7.00 | 49.00 | 56.00 | Shale, grn, sandy | | cm, em | | 0.00 |
| 7.50 | 56.00 | 63.50 | Shale, grn | | cm, em | | 0.00 |
| 2.70 | 63.50 | 66.20 | Shale, grn, sandy | | cm, em | | 0.00 |
| 49.00 | 66.20 | 115.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.50 | 115.20 | 116.70 | Shale, grn, sandy | | cm, em | | 0.00 |
| 22.30 | 116.70 | 139.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 8.50 | 139.00 | 147.50 | Shale, grn, sandy | | cm, em | | 0.00 |
| 29.60 | 147.50 | 177.10 | Shale, red/ grn | | cm, em | | 0.00 |
| 1.70 | 177.10 | 178.80 | Shale, grn, sandy | | cm, em | | 0.00 |
| 6.90 | 178.80 | 185.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 7.00 | 185.70 | 192.70 | Shale, grn, sandy | | cm, em | | 0.00 |
| 6.30 | 192.70 | 199.00 | Shale, gy | | cm, em | | 0.00 |
| 22.20 | 199.00 | 221.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 6.80 | 221.20 | 228.00 | Sandstone, gy | | cs, es | y | 6.80 |
| 7.30 | 228.00 | 235.30 | Shale, grn | | cm, em | | 0.00 |
| 5.30 | 235.30 | 240.60 | Sandstone, gy | | cs, es | y | 5.30 |
| 16.40 | 240.60 | 257.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.00 | 257.00 | 259.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.80 | 259.00 | 263.80 | Sandstone, gy | | cs, es | y | 4.80 |
| 11.00 | 263.80 | 274.80 | Shale, grn | | cm, em | | 0.00 |
| 1.00 | 274.80 | 275.80 | Limestone | | ak, cs, es | y | 1.00 |
| 13.50 | 275.80 | 289.30 | Shale, grn | | cm, em | | 0.00 |
| 4.90 | 289.30 | 294.20 | Sandstone, gy | | cs, es | y | 4.90 |
| 8.80 | 294.20 | 303.00 | Shale, gy | | cm, em | | 0.00 |
| 1.40 | 303.00 | 304.40 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.35 | 304.40 | 305.75 | **Coal, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 2.60 | 305.75 | 308.35 | Shale, gy | | cm, em | | 0.00 |
| 15.35 | 308.35 | 323.70 | Shale, grn | | cm, em | | 0.00 |
| 34.20 | 323.70 | 357.90 | Sandstone, gy | | cs, es | y | 34.20 |
| 3.60 | 357.90 | 361.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.70 | 361.50 | 363.20 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 363.20 | 363.30 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.50 | 363.30 | 363.80 | Shale, dk gy | | cm, em | | 0.00 |
| 4.25 | 363.80 | 368.05 | **Coal, sh layers, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 2.35 | 368.05 | 370.40 | Shale, gy | | cm, em | | 0.00 |
| 8.60 | 370.40 | 379.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 10.00 | 379.00 | 389.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 5.60 | 389.00 | 394.60 | Sandstone, gy | | cs, es | y | 5.60 |
| 14.40 | 394.60 | 409.00 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 10.20 | 409.00 | 419.20 | Shale, gy | | cm, em | | 0.00 |
| 14.00 | 419.20 | 433.20 | Sandstone, gy, sh stks | | cs, es | y | 14.00 |
| 26.50 | 433.20 | 459.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.70 | 459.70 | 462.40 | Sandstone, gy | | cs, es | y | 2.70 |
| 10.70 | 462.40 | 473.10 | Shale, grn | | cm, em | | 0.00 |
| 0.80 | 473.10 | 473.90 | Sandstone, gy | | cs, es | y | 0.80 |
| 3.70 | 473.90 | 477.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 30.50 | 477.60 | 508.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 40.90 | 508.10 | 549.00 | Shale, gy, ls layers | | cm, em | | 0.00 |
| 6.00 | 549.00 | 555.00 | Limestone | | ak, cs, es | y | 6.00 |
| 20.70 | 555.00 | 575.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.10 | 575.70 | 577.80 | Shale, gy | | cm, em | | 0.00 |
| 1.35 | 577.80 | 579.15 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 6.50 | 579.15 | 585.65 | Claystone, gy | | cv, ev | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: NA-87_07

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 3.35 | 585.65 | 589.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 19.40 | 589.00 | 608.40 | Shale, gy | | cm, em | | 0.00 |
| 0.22 | 608.40 | 608.62 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.17 | 608.62 | 608.79 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.14 | 608.79 | 608.93 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.15 | 608.93 | 609.08 | **Shale, gy** | | cm, em | | 0.00 |
| 0.20 | 609.08 | 609.28 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 609.28 | 609.53 | **Shale, gy** | | cm, em | | 0.00 |
| 0.56 | 609.53 | 610.09 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.51 | 610.09 | 611.60 | Shale, gy | | cm, em | | 0.00 |
| 16.00 | 611.60 | 627.60 | Limestone, shaley | | ak, cs, es | y | 16.00 |
| 4.00 | 627.60 | 631.60 | Shale, gy | | cm, em | | 0.00 |
| 1.10 | 631.60 | 632.70 | Sandstone, gy | | cs, es | y | 1.10 |
| 14.30 | 632.70 | 647.00 | Limestone, shaley | | ak, cs, es | y | 14.30 |
| 7.20 | 647.00 | 654.20 | Limestone | | ak, cs, es | y | 7.20 |
| 8.20 | 654.20 | 662.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 2.60 | 662.40 | 665.00 | Shale, grn | | cm, em | | 0.00 |
| 10.30 | 665.00 | 675.30 | Shale, gy | | cm, em | | 0.00 |
| 4.65 | 675.30 | 679.95 | Shale, dk gy | | cm, em | | 0.00 |
| 0.15 | 679.95 | 680.10 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 9.20 | 680.10 | 689.30 | Shale, dk gy | | cm, em | | 0.00 |
| 2.70 | 689.30 | 692.00 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.06 | 692.00 | 692.06 | **Shale, gy** | | cm, em | | 0.00 |
| 1.20 | 692.06 | 693.26 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.74 | 693.26 | 695.00 | Shale, gy | | cm, em | | 0.00 |
| 3.10 | 695.00 | 698.10 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.90 | 698.10 | 703.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| | Total Depth | 703.00 | | | | | 124.70 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **124.70**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **18%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 124.70 | 18% |
| Soft Rock: | 578.30 | 82% |
| | 703.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaC0_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: NA-87-08

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1333
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 668666
**Easting:** 2435369
**Drilling Company:** I J Hughes & Sons

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.50 | 0.00 | 20.50 | Casing | | | | 0.00 |
| 35.30 | 20.50 | 55.80 | Sandstone, gy | Y | cs, es | y | 35.30 |
| 23.70 | 55.80 | 79.50 | Shale, gy | Y | cm, em | | 0.00 |
| 1.80 | 79.50 | 81.30 | Sandstone, gy | | cs, es | y | 1.80 |
| 8.00 | 81.30 | 89.30 | Shale, grn | | cm, em | | 0.00 |
| 19.10 | 89.30 | 108.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 9.50 | 108.40 | 117.90 | Shale, grn | | cm, em | | 0.00 |
| 31.10 | 117.90 | 149.00 | Sandstone, gy | | cs, es | y | 31.10 |
| 10.50 | 149.00 | 159.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 40.40 | 159.50 | 199.90 | Shale, red/ grn | | cm, em | | 0.00 |
| 27.40 | 199.90 | 227.30 | Shale, grn | | cm, em | | 0.00 |
| 0.30 | 227.30 | 227.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 8.90 | 227.60 | 236.50 | Claystone, gy | | cv, ev | | 0.00 |
| 23.00 | 236.50 | 259.50 | Shale, red/ grn | | cm, em | | 0.00 |
| 14.10 | 259.50 | 273.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 8.10 | 273.60 | 281.70 | Shale, gy | | cm, em | | 0.00 |
| 8.00 | 281.70 | 289.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.70 | 289.70 | 293.40 | Shale, grn, sandy | | cm, em | | 0.00 |
| 1.00 | 293.40 | 294.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 7.30 | 294.40 | 301.70 | Shale, gy | | cm, em | | 0.00 |
| 2.70 | 301.70 | 304.40 | Sandstone, gy, sh stks | | cs, es | y | 2.70 |
| 10.30 | 304.40 | 314.70 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 314.70 | 316.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 3.10 | 316.40 | 319.50 | Shale, grn | | cm, em | | 0.00 |
| 3.50 | 319.50 | 323.00 | Shale, gy, sandy | | cm, em | | 0.00 |
| 13.50 | 323.00 | 336.50 | Shale, gy | | cm, em | | 0.00 |
| 1.82 | 336.50 | 338.32 | **Coal, sh layers, Washington No. 12** | | ac, cv, ev | | 0.00 |
| 0.54 | 338.32 | 338.86 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.34 | 338.86 | 340.20 | **Coal** | | ac, cv, ev | | 0.00 |
| 7.50 | 340.20 | 347.70 | Shale, gy | | cm, em | | 0.00 |
| 16.10 | 347.70 | 363.80 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 7.60 | 363.80 | 371.40 | Shale, red | | cm, em | | 0.00 |
| 8.10 | 371.40 | 379.50 | Shale, grn | | cm, em | | 0.00 |
| 10.60 | 379.50 | 390.10 | Shale, gy | | cm, em | | 0.00 |
| 4.66 | 390.10 | 394.76 | **Coal, sh layers, Waynesburg "A"** | | ac, cv, ev | | 0.00 |
| 0.13 | 394.76 | 394.89 | **Shale, gy** | | cm, em | | 0.00 |
| 0.84 | 394.89 | 395.73 | **Coal, sh layers** | | ac, cv, ev | | 0.00 |
| 0.27 | 395.73 | 396.00 | Shale, gy | | cm, em | | 0.00 |
| 3.50 | 396.00 | 399.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 10.00 | 399.50 | 409.50 | Shale, gy | | cm, em | | 0.00 |
| 8.60 | 409.50 | 418.10 | Sandstone, gy | | cs, es | y | 8.60 |
| 5.00 | 418.10 | 423.10 | Shale, gy, sandy | | cm, em | | 0.00 |
| 15.40 | 423.10 | 438.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 4.60 | 438.50 | 443.10 | Shale, dk gy | | cm, em | | 0.00 |
| 0.50 | 443.10 | 443.60 | **Coal, Waynesburg No. 11** | | ac, cv, ev | | 0.00 |
| 0.10 | 443.60 | 443.70 | Shale, gy | | cm, em | | 0.00 |
| 2.40 | 443.70 | 446.10 | Sandstone, gy, sh stks | | cs, es | y | 2.40 |
| 13.40 | 446.10 | 459.50 | Shale, gy | | cm, em | | 0.00 |
| 23.90 | 459.50 | 483.40 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 6.70 | 483.40 | 490.10 | Shale, red/ grn | | cm, em | | 0.00 |
| 11.40 | 490.10 | 501.50 | Shale, gy, sandy | | cm, em | | 0.00 |
| 3.70 | 501.50 | 505.20 | Shale, red/ grn | | cm, em | | 0.00 |
| 33.10 | 505.20 | 538.30 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.20 | 538.30 | 539.50 | Shale, grn, sandy | | cm, em | | 0.00 |
| 3.00 | 539.50 | 542.50 | Shale, red/ grn | | cm, em | | 0.00 |
| 11.00 | 542.50 | 553.50 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 3.60 | 553.50 | 557.10 | Shale, red/ grn | | cm, em | | 0.00 |

ATTACHMENT 13

## DIAMOND DRILL HOLE: NA-87-08

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 20.60 | 557.10 | 577.70 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 8.40 | 577.70 | 586.10 | Limestone | | ak, cs, es | y | 8.40 |
| 20.10 | 586.10 | 606.20 | Shale, gy, ls nods | | ak, cm, em | | 0.00 |
| 1.80 | 606.20 | 608.00 | Shale, gy | | cm, em | | 0.00 |
| 1.50 | 608.00 | 609.50 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 19.70 | 609.50 | 629.20 | Shale, gy | | cm, em | | 0.00 |
| 8.80 | 629.20 | 638.00 | Shale, dk gy | | cm, em | | 0.00 |
| 0.18 | 638.00 | 638.18 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.09 | 638.18 | 638.27 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.74 | 638.27 | 639.01 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.19 | 639.01 | 639.20 | **Shale, gy** | | cm, em | | 0.00 |
| 0.66 | 639.20 | 639.86 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.94 | 639.86 | 640.80 | Shale, gy | | cm, em | | 0.00 |
| 19.90 | 640.80 | 660.70 | Limestone, shaley, layered | | ak, cs, es | y | 19.90 |
| 9.70 | 660.70 | 670.40 | Shale, gy | | cm, em | | 0.00 |
| 3.30 | 670.40 | 673.70 | Limestone, shaley | | ak, cs, es | y | 3.30 |
| 2.40 | 673.70 | 676.10 | Shale, gy | | cm, em | | 0.00 |
| 0.60 | 676.10 | 676.70 | Shale, dk gy | | cm, em | | 0.00 |
| 0.40 | 676.70 | 677.10 | **Coal, sh stks, Redstone** | | ac, cv, ev | | 0.00 |
| 0.90 | 677.10 | 678.00 | Shale, gy | | cm, em | | 0.00 |
| 15.50 | 678.00 | 693.50 | Limestone, shaley | | ak, cs, es | y | 15.50 |
| 6.60 | 693.50 | 700.10 | Shale, gy | | cm, em | | 0.00 |
| 0.40 | 700.10 | 700.50 | Shale, dk gy | | cm, em | | 0.00 |
| 1.10 | 700.50 | 701.60 | **Coal, pyrite, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 1.40 | 701.60 | 703.00 | Shale, dk gy | | cm, em | | 0.00 |
| 4.95 | 703.00 | 707.95 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 3.95 | 707.95 | 711.90 | Claystone, gy | | cv, ev | | 0.00 |
| 8.10 | 711.90 | 720.00 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 720.00 | | | | | 129.00 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **129.00**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **18%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 129.00 | 18% |
| Soft Rock: | 591.00 | 82% |
| | 720.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: NA-87-09**

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1329
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 670610
**Easting:** 2427723
**Drilling Company:** LJ Hughes & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 21.00 | 0.00 | 21.00 | Casing | | | | 0.00 |
| 18.00 | 21.00 | 39.00 | Shale, red | Yes | cm, em | | 0.00 |
| 6.00 | 39.00 | 45.00 | Shale, brn, broken | | cm, em | | 0.00 |
| 7.90 | 45.00 | 52.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 9.70 | 52.90 | 62.60 | Shale, gy | | cm, em | | 0.00 |
| 0.10 | 62.60 | 62.70 | **Coal, bony** | | ac, cv, ev | | 0.00 |
| 1.40 | 62.70 | 64.10 | Fireclay | | cv, ev | | 0.00 |
| 2.70 | 64.10 | 66.80 | Shale, gy, sandy | | cm, em | | 0.00 |
| 4.50 | 66.80 | 71.30 | Shale, gy | | cm, em | | 0.00 |
| 2.70 | 71.30 | 74.00 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 5.60 | 74.00 | 79.60 | Shale, gy | | cm, em | | 0.00 |
| 168.10 | 79.60 | 247.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 14.70 | 247.70 | 262.40 | Shale, grn | | cm, em | | 0.00 |
| 8.00 | 262.40 | 270.40 | Sandstone, gy | | cs, es | y | 8.00 |
| 5.90 | 270.40 | 276.30 | Shale, gy | | cm, em | | 0.00 |
| 0.80 | 276.30 | 277.10 | Shale, limey | | ak, cm, em | | 0.00 |
| 3.00 | 277.10 | 280.10 | Shale, grn | | cm, em | | 0.00 |
| 3.80 | 280.10 | 283.90 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 9.70 | 283.90 | 293.60 | Shale, red/ grn | | cm, em | | 0.00 |
| 35.30 | 293.60 | 328.90 | Shale, gy | | cm, em | | 0.00 |
| 1.70 | 328.90 | 330.60 | Shale, dk gy | | cm, em | | 0.00 |
| 0.10 | 330.60 | 330.70 | Shale, dk gy, pyrite stks | | ac, cm, em | | 0.00 |
| 0.20 | 330.70 | 330.90 | **Coal, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.08 | 330.90 | 330.98 | **Shale, dk gy** | | cm, em | | 0.00 |
| 1.11 | 330.98 | 332.09 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.06 | 332.09 | 332.15 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 0.39 | 332.15 | 332.54 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 332.54 | 332.64 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.38 | 332.64 | 333.02 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.27 | 333.02 | 333.29 | **Shale, dk gy** | | cm, em | | 0.00 |
| 0.20 | 333.29 | 333.49 | **Shale, dk gy, coal stks** | | ac, cm, em | | 0.00 |
| 1.43 | 333.49 | 334.92 | **Coal** | | ac, cv, ev | | 0.00 |
| 14.28 | 334.92 | 349.20 | Shale, gy, soft | | cm, em | | 0.00 |
| 39.40 | 349.20 | 388.60 | Sandstone, gy | | cs, es | y | 39.40 |
| 1.60 | 388.60 | 390.20 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 390.20 | 390.50 | Shale, dk gy | | cm, em | | 0.00 |
| 2.95 | 390.50 | 393.45 | **Coal, laminated, WAYNESBURGH "A"** | | ac, cv, ev | | 0.00 |
| 0.02 | 393.45 | 393.47 | **Pyrite** | | ac, cs, es | | 0.00 |
| 0.17 | 393.47 | 393.64 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.14 | 393.64 | 393.78 | **Shale, gy** | | cm, em | | 0.00 |
| 0.60 | 393.78 | 394.38 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.25 | 394.38 | 394.63 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.12 | 394.63 | 394.75 | **Claystone, gy** | | cv, ev | | 0.00 |
| 1.10 | 394.75 | 395.85 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 1.10 | 395.85 | 396.95 | Shale, gy | | cm, em | | 0.00 |
| 7.85 | 396.95 | 404.80 | Shale, limey | | ak, cm, em | | 0.00 |
| 15.40 | 404.80 | 420.20 | Shale, gy | | cm, em | | 0.00 |
| 14.30 | 420.20 | 434.50 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 5.20 | 434.50 | 439.70 | Shale, dk gy | | cm, em | | 0.00 |
| 6.90 | 439.70 | 446.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 11.70 | 446.60 | 458.30 | Shale, gy | | cm, em | | 0.00 |
| 23.50 | 458.30 | 481.80 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| 6.60 | 481.80 | 488.40 | Shale, red/ grn | | cm, em | | 0.00 |
| 12.80 | 488.40 | 501.20 | Shale, grn | | cm, em | | 0.00 |
| 29.10 | 501.20 | 530.30 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 6.70 | 530.30 | 537.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 58.10 | 537.00 | 595.10 | Shale, gy, limey | | ak, cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: NA-87-09

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 2.20 | 595.10 | 597.30 | Shale, gy | | cm, em | | 0.00 |
| 0.70 | 597.30 | 598.00 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 5.60 | 598.00 | 603.60 | Shale, gy | | cm, em | | 0.00 |
| 4.30 | 603.60 | 607.90 | Shale, gy, sandy | | cm, em | | 0.00 |
| 32.80 | 607.90 | 640.70 | Sandstone, gy | | cs, es | y | 32.80 |
| 1.60 | 640.70 | 642.30 | Shale, gy | | cm, em | | 0.00 |
| 0.22 | 642.30 | 642.52 | **Coal, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.03 | 642.52 | 642.55 | **Shale, gy** | | cm, em | | 0.00 |
| 0.20 | 642.55 | 642.75 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.80 | 642.75 | 643.55 | Shale, gy | | cm, em | | 0.00 |
| 19.95 | 643.55 | 663.50 | Limestone, shaley | | ak, cs, es | y | 19.95 |
| 9.70 | 663.50 | 673.20 | Shale, gy | | cm, em | | 0.00 |
| 4.80 | 673.20 | 678.00 | Limestone, shaley | | ak, cs, es | y | 4.80 |
| 2.10 | 678.00 | 680.10 | Shale, gy, soft | | cm, em | | 0.00 |
| 0.50 | 680.10 | 680.60 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 1.30 | 680.60 | 681.90 | **Coal, REDSTONE** | | ac, cv, ev | | 0.00 |
| 1.30 | 681.90 | 683.20 | Shale, gy | | cm, em | | 0.00 |
| 14.90 | 683.20 | 698.10 | Limestone, shaley | | ak, cs, es | y | 14.90 |
| 5.00 | 698.10 | 703.10 | Shale, gy, soft | | cm, em | | 0.00 |
| 0.47 | 703.10 | 703.57 | **Coal, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.22 | 703.57 | 703.79 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 0.57 | 703.79 | 704.36 | Shale, gy | | cm, em | | 0.00 |
| 0.25 | 704.36 | 704.61 | Shale, dk gy, coal stks | | ac, cm, em | | 0.00 |
| 4.58 | 704.61 | 709.19 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 1.20 | 709.19 | 710.39 | Fireclay, shaley | | cv, ev | | 0.00 |
| 1.80 | 710.39 | 712.19 | Shale, gy | | cm, em | | 0.00 |
| 6.90 | 712.19 | 719.09 | Shale, gy, sandy | | cm, em | | 0.00 |
| 0.91 | 719.09 | 720.00 | Shale, gy | | cm, em | | 0.00 |
| | Total Depth | 720.00 | | | | | 119.85 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **119.85**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **17%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 119.85 | 17% |
| Soft Rock: | 600.15 | 83% |
| | 720.00 | |

**ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed**

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |



AEC 03546

**ATTACHMENT 13**

**DIAMOND DRILL HOLE: NA-87-10**

**Field Engineer:** Kim Cecil
**Surface Elevation:** 1332
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 676339
**Easting:** 2426242
**Drilling Company:** LJ Hughes & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 18.00 | 0.00 | 18.00 | Casing | | | | 0.00 |
| 12.00 | 18.00 | 30.00 | Sandstone, grn | Yes | cs, es | y | 12.00 |
| 15.00 | 30.00 | 45.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 15.00 | 45.00 | 60.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 15.00 | 60.00 | 75.00 | Shale, grn | | cm, em | | 0.00 |
| 10.00 | 75.00 | 85.00 | Claystone, red | | cv, ev | | 0.00 |
| 13.40 | 85.00 | 98.40 | Shale, grn | | cm, em | | 0.00 |
| 3.60 | 98.40 | 102.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 6.00 | 102.00 | 108.00 | Shale, grn | | cm, em | | 0.00 |
| 7.00 | 108.00 | 115.00 | Sandstone, gy | | cs, es | y | 7.00 |
| 4.70 | 115.00 | 119.70 | Shale, grn | | cm, em | | 0.00 |
| 4.20 | 119.70 | 123.90 | Shale, red/ grn | | cm, em | | 0.00 |
| 5.00 | 123.90 | 128.90 | Claystone, gy | | cv, ev | | 0.00 |
| 1.10 | 128.90 | 130.00 | Shale, gy | | cm, em | | 0.00 |
| 7.00 | 130.00 | 137.00 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 3.50 | 137.00 | 140.50 | Claystone, red | | cv, ev | | 0.00 |
| 7.50 | 140.50 | 148.00 | Shale, grn | | cm, em | | 0.00 |
| 4.70 | 148.00 | 152.70 | Shale, red/ grn | | cm, em | | 0.00 |
| 2.30 | 152.70 | 155.00 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 2.90 | 155.00 | 157.90 | Sandstone, gy | | cs, es | y | 2.90 |
| 2.10 | 157.90 | 160.00 | Shale, grn | | cm, em | | 0.00 |
| 5.00 | 160.00 | 165.00 | Claystone, red | | cv, ev | | 0.00 |
| 14.00 | 165.00 | 179.00 | Shale, grn | | cm, em | | 0.00 |
| 21.00 | 179.00 | 200.00 | Shale, red | | cm, em | | 0.00 |
| 11.90 | 200.00 | 211.90 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 16.10 | 211.90 | 228.00 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 7.00 | 228.00 | 235.00 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 15.00 | 235.00 | 250.00 | Shale, grn | | cm, em | | 0.00 |
| 5.80 | 250.00 | 255.80 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 2.50 | 255.80 | 258.30 | Limestone | | ak, cs, es | y | 2.50 |
| 1.30 | 258.30 | 259.60 | Claystone, red/ grn | | cv, ev | | 0.00 |
| 5.40 | 259.60 | 265.00 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 2.00 | 265.00 | 267.00 | Shale, grn | | cm, em | | 0.00 |
| 3.90 | 267.00 | 270.90 | Sandstone, gy | | cs, es | y | 3.90 |
| 6.50 | 270.90 | 277.40 | Shale, grn | | cm, em | | 0.00 |
| 2.60 | 277.40 | 280.00 | Shale, red | | cm, em | | 0.00 |
| 25.00 | 280.00 | 305.00 | Shale, grn | | cm, em | | 0.00 |
| 6.00 | 305.00 | 311.00 | Claystone, gy | | cv, ev | | 0.00 |
| 2.10 | 311.00 | 313.10 | **Coal, WASHINGTON No. 12** | | ac, cv, ev | | 0.00 |
| 0.50 | 313.10 | 313.60 | **Shale, gy** | | cm, em | | 0.00 |
| 1.00 | 313.60 | 314.60 | **Coal** | | ac, cv, ev | | 0.00 |
| 2.90 | 314.60 | 317.50 | Claystone, gy | | cv, ev | | 0.00 |
| 10.30 | 317.50 | 327.80 | Claystone, grn | | cv, ev | | 0.00 |
| 6.60 | 327.80 | 334.40 | Claystone, red | | cv, ev | | 0.00 |
| 5.60 | 334.40 | 340.00 | Shale, grn, sandy | | cm, em | | 0.00 |
| 16.60 | 340.00 | 356.60 | Shale, gy, sandy | | cm, em | | 0.00 |
| 1.60 | 356.60 | 358.20 | Shale, grn | | cm, em | | 0.00 |
| 0.55 | 358.20 | 358.75 | **Coal, WAYNESBURGH "A"** | | ac, cv, ev | | 0.00 |
| 0.45 | 358.75 | 359.20 | **Shale, gy, pyrite** | | ac, cm, em | | 0.00 |
| 0.20 | 359.20 | 359.40 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 359.40 | 359.70 | **Shale, gy** | | cm, em | | 0.00 |
| 6.50 | 359.70 | 366.20 | **Coal, sh stks** | | ac, cv, ev | | 0.00 |
| 0.80 | 366.20 | 367.00 | Shale, gy | | cm, em | | 0.00 |
| 3.00 | 367.00 | 370.00 | Limestone, shaley | | ak, cs, es | y | 3.00 |
| 8.50 | 370.00 | 378.50 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 6.50 | 378.50 | 385.00 | Sandstone, gy | | cs, es | y | 6.50 |
| 3.80 | 385.00 | 388.80 | Shale, grn | | cm, em | | 0.00 |

ATTACHMENT 13

DIAMOND DRILL HOLE: NA-87-10

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 1.30 | 388.80 | 390.10 | Limestone | | ak, cs, es | y | 1.30 |
| 1.50 | 390.10 | 391.60 | Shale, grn, limey | | ak, cm, em | | 0.00 |
| 5.60 | 391.60 | 397.20 | Sandstone, gy | | cs, es | y | 5.60 |
| 4.90 | 397.20 | 402.10 | Shale, grn | | cm, em | | 0.00 |
| 4.50 | 402.10 | 406.60 | Limestone | | ak, cs, es | y | 4.50 |
| 3.10 | 406.60 | 409.70 | Claystone, gy | | cv, ev | | 0.00 |
| 0.50 | 409.70 | 410.20 | Shale, blk | | ac, cm, em | | 0.00 |
| 0.60 | 410.20 | 410.80 | **Coal, WAYNESBURGH No. 11** | | ac, cv, ev | | 0.00 |
| 4.20 | 410.80 | 415.00 | Shale, gy | | cm, em | | 0.00 |
| 8.20 | 415.00 | 423.20 | Sandstone, gy, sh stks | | cs, es | y | 8.20 |
| 2.50 | 423.20 | 425.70 | Shale, gy | | cm, em | | 0.00 |
| 0.30 | 425.70 | 426.00 | **Coal, LITTLE WAYNESBURG** | | ac, cv, ev | | 0.00 |
| 0.50 | 426.00 | 426.50 | Shale, gy | | cm, em | | 0.00 |
| 3.50 | 426.50 | 430.00 | Claystone, gy | | cv, ev | | 0.00 |
| 20.30 | 430.00 | 450.30 | Limestone, shaley | | ak, cs, es | y | 20.30 |
| 7.50 | 450.30 | 457.80 | Claystone, grn | | cv, ev | | 0.00 |
| 2.20 | 457.80 | 460.00 | Claystone, gy | | cv, ev | | 0.00 |
| 1.60 | 460.00 | 461.60 | Claystone, grn | | cv, ev | | 0.00 |
| 4.00 | 461.60 | 465.60 | Shale, grn | | cm, em | | 0.00 |
| 3.40 | 465.60 | 469.00 | Shale, red/ grn | | cm, em | | 0.00 |
| 24.20 | 469.00 | 493.20 | Limestone, shaley | | ak, cs, es | y | 24.20 |
| 2.00 | 493.20 | 495.20 | Claystone, gy | | cv, ev | | 0.00 |
| 5.20 | 495.20 | 500.40 | Limestone, shaley | | ak, cs, es | y | 5.20 |
| 4.10 | 500.40 | 504.50 | Claystone, grn | | cv, ev | | 0.00 |
| 10.30 | 504.50 | 514.80 | Limestone | | ak, cs, es | y | 10.30 |
| 3.60 | 514.80 | 518.40 | Shale, grn | | cm, em | | 0.00 |
| 46.60 | 518.40 | 565.00 | Limestone, shaley | | ak, cs, es | y | 46.60 |
| 2.40 | 565.00 | 567.40 | Claystone, gy | | cv, ev | | 0.00 |
| 0.30 | 567.40 | 567.70 | Shale, gy | | cm, em | | 0.00 |
| 0.20 | 567.70 | 567.90 | **Coal, SEWICKLEY No. 9** | | ac, cv, ev | | 0.00 |
| 2.00 | 567.90 | 569.90 | Shale, gy | | cm, em | | 0.00 |
| 10.10 | 569.90 | 580.00 | Shale, grn, sandy | | cm, em | | 0.00 |
| 14.00 | 580.00 | 594.00 | Sandstone, gy | | cs, es | y | 14.00 |
| 1.00 | 594.00 | 595.00 | Shale, grn, sandy | | cm, em | | 0.00 |
| 6.45 | 595.00 | 601.45 | Shale, gy | | cm, em | | 0.00 |
| 1.30 | 601.45 | 602.75 | Sandstone, gy, coal stks | | ac, cs, es | y | 1.30 |
| 0.40 | 602.75 | 603.15 | Claystone, gy | | cv, ev | | 0.00 |
| 1.20 | 603.15 | 604.35 | **Coal, FISHPOT** | | ac, cv, ev | | 0.00 |
| 0.20 | 604.35 | 604.55 | **Shale, gy** | | cm, em | | 0.00 |
| 0.60 | 604.55 | 605.15 | **Coal** | | ac, cv, ev | | 0.00 |
| 19.85 | 605.15 | 625.00 | Limestone, shaley | | ak, cs, es | y | 19.85 |
| 4.30 | 625.00 | 629.30 | Shale, grn | | cm, em | | 0.00 |
| 5.00 | 629.30 | 634.30 | Shale, gy | | cm, em | | 0.00 |
| 9.70 | 634.30 | 644.00 | Limestone | | ak, cs, es | y | 9.70 |
| 0.85 | 644.00 | 644.85 | **Coal, bony, REDSTONE** | | ac, cv, ev | | 0.00 |
| 2.50 | 644.85 | 647.35 | Shale, limey | | ak, cm, em | | 0.00 |
| 2.65 | 647.35 | 650.00 | Limestone | | ak, cs, es | y | 2.65 |
| 15.00 | 650.00 | 665.00 | Limestone, shaley | | ak, cs, es | y | 15.00 |
| 3.90 | 665.00 | 668.90 | Claystone, grn | | cv, ev | | 0.00 |
| 0.50 | 668.90 | 669.40 | Shale, gy | | cm, em | | 0.00 |
| 0.85 | 669.40 | 670.25 | **Coal, bony, PITTSBURGH No. 8 ROOF COAL** | | ac, cv, ev | | 0.00 |
| 0.85 | 670.25 | 671.10 | Shale, gy | | cm, em | | 0.00 |
| 5.05 | 671.10 | 676.15 | **Coal, PITTSBURGH No. 8** | | ac, cv, ev | | 0.00 |
| 8.85 | 676.15 | 685.00 | Shale, gy, limey | | ak, cm, em | | 0.00 |
| | Total Depth | 685.00 | | | | | 226.50 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

## DIAMOND DRILL HOLE: NA-87-10

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **226.50** |
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **33%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 226.50 | 33% |
| Soft Rock: | 458.50 | 67% |
| | 685.00 | |

### ACID/BASE ACCOUNTING for Mining Pittsburgh No. 8 Coalbed

| Stratum | Neutralization Potential, tons/1000 tons as CaCO3 | Total Sulphur % | Pyritic Sulphur % | Potential Acidity, tons /1000 tons as $CaCO_3$ (Total Sul.) | CaCO3 Deficiency, tons/1000 tons as $CaCO_3$ (Total Sul.) |
|---|---|---|---|---|---|
| Roof, 10 ft. | | | | | |
| Coal | | | | | |
| Bottom, 10 ft. | | | | | |

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Mines)

Applicant The Youghiogheny & Ohio Coal Company - Allison Mine

SECTION 1 - AREAS TO BE AFFECTED BY SURFACE DISTURBANCE

Sampling Site No. DDH-1

| Lithologic(1) Unit | Thickness | Acid (2)* Producing | Toxic (2)* Forming | Alkaline(2)* Producing | Compactible(3) | Erodible(3) |
|---|---|---|---|---|---|---|
| Topsoil | | | | | | |
| Subsoil | | | | | | |
| ↑ See attached Boring Log | | | | | | |
| ↓ | | | | | | |
| Black Slate | 4-1/4" | X | | | X | |
| Roof Coal | 11-1/4" | X | | | | |
| Draw Slate | 9-3/4" | X | | | X | |
| Pittsburgh #8 | 4'7-3/4" | X | | | | |
| Fire Clay | 4-1/4" | X | | | X | |

(1) Identify the stratum with an asterisk (*) if subsurface water will be exposed at the face up area.

(2) Identify with a (✓) mark whether the stratum is acid producing, toxic forming, or alkaline producing.

(3) Using texture and visual characteristics of the overburden, categorize the stratum as very, moderately, or slightly compactible or erodible.

*The Allison Mine has been temporarily sealed. It is not possible to extract samples for testing, therefore, an analysis of the stratum above the coal, the coal seam, and the stratum below the coal seam could not be performed. Based on the results of the one sample tested and the historical evidence of the acidity of the Pittsburgh No. 8 coal seam, the roof, floor, and coal seam in the vicinity of the Allison Mine are considered acid producing.

Drill Hole #1 - Lower Belmont - Hitchcock & Robbins Field

Hole located near center of Section 2
~~Washington~~ Wayne Township, along Piney Creek

Surface Elevation: 980

| Material | To | Thickness |
|---|---|---|
| Surface | 11' 6" | 11' 6" |
| Dark shale | 19' 0" | 7' 6" |
| Boney Coal | 19' 3" | 0' 3" |
| Limestone & Shale | 74' 0" | 54' 9" |
| Red & Green Shale | 75' 0" | 1' 0" |
| Sand rock | 83' 0" | 8' 0" |
| Limestone | 93' 0" | 10' 0" |
| Limestone & Shale | 173' 0" | 80' 0" |
| Soft dark shale | 176' 0" | 3' 0" |
| Coal - No. 9 | 179' 0" | 3' 0" |
| Shaley clay | 179' 9" | 0' 9" |
| Green Shale | 184' 0" | 4' 3" |
| Sandy Shale | 188' 0" | 4' 0" |
| Soft Green shale | 189' 6" | 1' 6" |
| Sandy shale | 193' 0" | 3' 6" |
| Green shale & soapstone | 195' 0" | 2' 0" |
| Boney coal & slate | 197' 3" | 2' 3" |
| Limestone | 217' 0" | 19' 9" |
| Lime & Shale | 228' 0" | 11' 0" |
| Slate & coal spars | 228' 8½" | 0' 8½" |
| Dark shale & lime | 230' 0" | 1' 3½" |
| Limestone | 244' 0" | 14' 0" |
| Limestone & Shale | 250' 8" | 6' 8" |
| Dark shale & soapstone | 254' 0" | 3' 4" |
| Black slate | 254' 4½" | 0' 4½" |
| Roof coal | 255' 3½" | 0' 11½" |
| Draw slate | 256' 1½" | 0' 9-3/4" |
| Coal | 256' 3½" | 0' 2" |
| Sulphur parting | 256' 3-7/8" | 0' 0-5/8" |
| Coal | 258' 0-5/8" | 1' 8-3/4" |
| Slate parting | 258' 1½" | 0' 0-7/8" |
| Coal | 259' 8-5/8" | 1' 7-1/8" |
| Slate parting | 259' 8-7/8" | 0' 0½" |
| Coal | 260' 9-1/8" | 1' 0¼" |
| Slate parting | 260' 9-7/8" | 0' 0-3/4" |
| Coal | 260' 11½" | 0' 1-5/8" |
| Fire clay | 261' 3-3/4" | 0' 4½" |
| Limestone | 262' 8" | 1' 4¾" |
| Dark shale | 263' 7" | 0' 11" |
| Limestone | 265' 0" | 1' 5" |



AEC 03551

ATTACHMENT 13

# DIAMOND DRILL HOLE: Y-40-02

**Field Engineer:** Unknown
**Surface Elevation:** 936
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 688235
**Easting:** 2422270
**Drilling Company:** B.B.R. Drilling Co.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 7.50 | 0.00 | 7.50 | Casing or Surface Material | | | | 0.00 |
| 30.00 | 7.50 | 37.50 | Shaley Layered Limestone | | ak, cs, es | Y | 30.00 |
| 2.50 | 37.50 | 40.00 | Light Gray/Green Massive Sandy Shale | | cm, em | | 0.00 |
| 3.00 | 40.00 | 43.00 | Green Shale | | cm, em | | 0.00 |
| 2.00 | 43.00 | 45.00 | Red & Green Shale | | cm, em | | 0.00 |
| 32.00 | 45.00 | 77.00 | Shaley Layered Limestone | | ak, cs, es | Y | 32.00 |
| 8.00 | 77.00 | 85.00 | Sandstone | | cs, es | Y | 8.00 |
| 4.00 | 85.00 | 89.00 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 62.00 | 89.00 | 151.00 | Shaley Layered Limestone | | ak, cs, es | Y | 62.00 |
| 3.50 | 151.00 | 154.50 | Dark Gray Shale | | cm, em | | 0.00 |
| 1.25 | 154.50 | 155.75 | **Coal W/Bone Streaks, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 4.25 | 155.75 | 160.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 20.50 | 160.00 | 180.50 | Sandstone | | cs, es | Y | 20.50 |
| 5.00 | 180.50 | 185.50 | Dark Gray Shale | | cm, em | | 0.00 |
| 1.12 | 185.50 | 186.62 | **Coal W/Bone Streaks, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.54 | 186.62 | 187.16 | **Light Gray Green Fireclay** | | cv, ev | | 0.00 |
| 1.92 | 187.16 | 189.08 | **Common Banded Coal** | | ac, cv, ev | | 0.00 |
| 0.59 | 189.08 | 189.67 | Dark Gray Shale | | cm, em | | 0.00 |
| 19.33 | 189.67 | 209.00 | Limestone | | ak, cs, es | Y | 19.33 |
| 2.50 | 209.00 | 211.50 | Green Shale | | cm, em | | 0.00 |
| 3.00 | 211.50 | 214.50 | Sandstone | | cs, es | Y | 3.00 |
| 3.00 | 214.50 | 217.50 | Green Shale | | cm, em | | 0.00 |
| 2.00 | 217.50 | 219.50 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 4.00 | 219.50 | 223.50 | Limestone | | ak, cs, es | Y | 4.00 |
| 0.50 | 223.50 | 224.00 | Dark Gray Shale | | cm, em | | 0.00 |
| 2.00 | 224.00 | 226.00 | Shaley Layered Limestone | | ak, cs, es | Y | 2.00 |
| 1.75 | 226.00 | 227.75 | Dark Gray Shale | | cm, em | | 0.00 |
| 0.21 | 227.75 | 227.96 | **Coal W/Bone Streaks, Redstone** | | ac, cv, ev | | 0.00 |
| 0.50 | 227.96 | 228.46 | Dark Gray Shale | | cm, em | | 0.00 |
| 2.04 | 228.46 | 230.50 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 13.00 | 230.50 | 243.50 | Limestone | | ak, cs, es | Y | 13.00 |
| 5.50 | 243.50 | 249.00 | Shaley Layered Limestone | | ak, cs, es | Y | 5.50 |
| 3.50 | 249.00 | 252.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.06 | 252.50 | 252.56 | Black Shale | | ac, cm, em | | 0.00 |
| 0.34 | 252.56 | 252.90 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 1.40 | 252.90 | 254.30 | **Coal, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.80 | 254.30 | 255.10 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 0.06 | 255.10 | 255.16 | **Coal W/Bone Streaks, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 1.78 | 255.16 | 256.94 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 256.94 | 256.98 | **Dark Gray Shale** | | cm, em | | 0.00 |
| 0.46 | 256.98 | 257.44 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.04 | 257.44 | 257.48 | **Dark Gray Shale** | | cm, em | | 0.00 |
| 1.06 | 257.48 | 258.54 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.08 | 258.54 | 258.62 | **Coal W/Bone Streaks** | | ac, cv, ev | | 0.00 |
| 1.26 | 258.62 | 259.88 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.32 | 259.88 | 261.20 | Dark Gray Shale | | cm, em | | 0.00 |
| 1.38 | 261.20 | 262.58 | Limestone | | ak, cs, es | Y | 1.38 |
| 2.00 | 262.58 | 264.58 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 0.92 | 264.58 | 265.50 | Limestone | | ak, cs, es | Y | 0.92 |
| | Total Depth | 265.50 | | | | | 201.63 |

ATTACHMENT 13

DIAMOND DRILL HOLE:

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **201.63**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **76%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 201.63 | 76% |
| Soft Rock: | 63.87 | 24% |
| | 265.50 | |

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Mines)

Applicant The Youghiogheny & Ohio Coal Company - Allison Mine

SECTION 1 - AREAS TO BE AFFECTED BY SURFACE DISTURBANCE

Sampling Site No. DDH-3

| Lithologic(1) Unit | Thickness | Acid (2)* Producing | Toxic (2)* Forming | Alkaline(2) Producing | *Compactible(3) | Erodible(3) |
|---|---|---|---|---|---|---|
| Topsoil | | | | | | |
| Subsoil | | | | | | |
| ↑ See attached Boring Log | | | | | | |
| ↓ | | | | | | |
| Soft Dark Shale | 2'0" | X | | | X | |
| Roof Coal | 2'7" | X | | | | |
| Draw Slate | 0" | X | | | X | |
| Pittsburgh #8 | 5'0" | X | | | | |
| Dark Shale | 1'9" | X | | | X | |

(1) Identify the stratum with an asterisk (*) if subsurface water will be exposed at the face up area.

(2) Identify with a (✓) mark whether the stratum is acid producing, toxic forming, or alkaline producing.

(3) Using texture and visual characteristics of the overburden, categorize the stratum as very, moderately, or slightly compactible or erodible.

*The Allison Mine has been temporarily sealed. It is not possible to extract samples for testing, therefore, an analysis of the stratum above the coal, the coal seam, and the stratum below the coal seam could not be performed. Based on the results of the one sample tested and the historical evidence of the acidity of the Pittsburgh No. 8 coal seam, the roof, floor, and coal seam in the vicinity of the Allison Mine are considered acid producing.

Sec 9
T 6
R 5

DH 3

Drill Hole #3 - Lower Belmont - Hitchcock & Robbins Field

Hole located on Long Run about 300 feet from westerly extremity of the above property (1921)

Sec 9 Wayne Twp

Surface Elevation: 1019.83

| Material | To | Thickness |
|---|---|---|
| Surface | 10' 6" | 10' 6" |
| Dark shale | 15' 6" | 5' 0" |
| Sandy shale | 18' 0" | 2' 6" |
| Dark shale | 21' 0" | 3' 0" |
| Boney coal | 22' 8" | 1' 8" |
| Dark shale | 25' 0" | 2' 4" |
| Dark sandy shale | 30' 0" | 5' 0" |
| Soft dark shale | 34' 6" | 4' 6" |
| Boney coal | 25' 0" | 0' 6" |
| Limestone & shale | 70' 0" | 35' 0" |
| Green shale | 75' 0" | 5' 0" |
| Red & Green shale | 77' 0" | 2' 0" |
| Shale & Lime | 85' 0" | 8' 0" |
| Sandy shale | 91' 0" | 6' 0" |
| Limestone | 91' 9" | 0' 9" |
| Dark shale | 94' 9" | 3' 0" |
| Limestone | 97' 0" | 2' 3" |
| Dark shale | 99' 0" | 2' 0" |
| Limestone | 102' 0" | 3' 0" |
| Dark shale | 105' 0" | 3' 0" |
| Lime & shale | 111' 0" | 6' 0" |
| Red & Green shale | 116' 0" | 5' 0" |
| Limestone & shale | 180' 0" | 64' 0" |
| Soft dark shale | 183' 6" | 3' 6" |
| Coal | 185' 8" | 2' 2" |
| Dark shale | 186' 8" | 1' 0" |
| Green shale & lime | 191' 0" | 4' 4" |
| Dark shale | 203' 0" | 12' 0" |
| Dark shale & coal spar | 203' 7" | 0' 7" |
| Coal | 204' 5" | 0' 10" |
| Slate & bone coal | 204' 6½" | 0' 1½" |
| Coal | 205' 7½" | 1' 1" |
| Clay parting | 205' 11½" | 0' 4" |
| Coal | 206' 7" | 0' 7½" |
| Dark shale | 206' 9" | 0' 2" |
| Limestone | 220' 0" | 13' 3" |
| Green shale & Lime | 227' 0" | 7' 0" |
| Limestone | 230' 0" | 3' 0" |
| Green shale & clay | 234' 0" | 4' 0" |
| Limestone | 249' 0" | 15' 0" |
| Green shale & Lime | 255' 0" | 6' 0" |
| Dark shale & Lime | 265' 0" | 10' 0" |
| Soft dark shale | 267' 0" | 2' 0" |
| Roof coal | 268' 9" | 1' 9" |
| Coal | 269' 5" | 0' 8" |
| Slate parting | 269' 5" | 0' 0" |



AEC 03555

| Material | To | Thickness |
|---|---|---|
| Boney coal | 269' 6" | 0' 0-3/4" |
| Slate parting & coal spars | 269' 7-1/4" | 0' 0" |
| Coal | 270' 2" | 0' 6-3/4" |
| Slate parting | 270' 2¼" | 0' 0¼" |
| Coal | 270' 4¼" | 0' 2" |
| Boney coal | 270' 5½" | 0' 1¼" |
| Slate parting | 270' 5-3/4" | 0' 0¼" |
| Coal | 272' 8" | 2' 3" |
| Slate parting | 272' 9" | 0' 0¼" |
| Coal | 273' 9¼" | 1' 0" |
| Sulphur parting | 273' 9" | 0' 0" |
| Coal | 273' 10" | 0' 1½" |
| Dark shale | 275' 7" | 1' 9" |
| Limestone | 276' 0" | 0' 4" |
| Shaley clay | 279' 0" | 3' 0" |
| Limestone | 280' 0" | 1' 0" |

5'-0"



AEC 03556

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 13
(GEOLOGY REPORT - Underground Mines)

Applicant The Youghiogheny & Ohio Coal Company - Allison Mine

SECTION 1 - AREAS TO BE AFFECTED BY SURFACE DISTURBANCE

Sampling Site No. DDH-5

| Lithologic(1) Unit | Thickness | Acid (2)* Producing | Toxic (2)* Forming | Alkaline(2) Producing | *Compactible(3) | Erodible(3) |
|---|---|---|---|---|---|---|
| Topsoil | | | | | | |
| Subsoil | | | | | | |
| See attached boring Log and Lithologic and Hydrogeologic section shown on Drawing 82-1862-E4 in Appendix A. | | | | | | |
| Dark Gray Shale | 1.8 | X | | | X | |
| of Coal | 0.1 | X | | | | |
| Draw Rock | 1.1 | X | | | X | |
| Pittsburgh #8 | 5.0 | X | | | | |
| Gray Clay Shale | 11.5 | X | | | X | |

(1) Identify the stratum with an asterisk (*) if subsurface water will be exposed at the face up area.

(2) Identify with a (✓) mark whether the stratum is acid producing, toxic forming, or alkaline producing.

(3) Using texture and visual characteristics of the overburden, categorize the stratum as very, moderately, or slightly compactible or erodible.

*The Allison Mine has been temporarily sealed. It is not possible to extract samples for testing, therefore, an analysis of the stratum above the coal, the coal seam, and the stratum below the coal seam could not be performed. Based on the results of the one sample tested and the historical evidence of the acidity of the Pittsburgh No. 8 coal seam, the roof, floor, and coal seam in the vicinity of the Allison Mine are considered acid producing.

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR Y. & O. COAL COMPANY ADDRESS Martin's Ferry, Ohio DATE 1-9-67 19

ON TWP. Wayne COUNTY Belmont STATE Ohio

HOLE NO. DDH5 SIZE HOLE 4" EL. 952.7 DRILLER HARRY MERRITT DRILL NO. 1

Page 1

| CLASSIFICATION | THICKNESS OF STRATA FEET | THICKNESS OF STRATA INS. THS. | DEPTH FROM SURFACE FEET | DEPTH FROM SURFACE INS. THS. |
|---|---|---|---|---|
| Surface, brown | 7 | 0 | 7 | 0 |
| Gray shale, clayey | 3 | 0 | 10 | 0 |
| Limestone, gray | 3 | 2 | 13 | 2 |
| Shale, gray, clayey | 8 | 10 | 22 | 0 |
| Limestone | 1 | 8 | 23 | 8 |
| Dark gray soft clay | 0 | 4 | 24 | 0 |
| Greenish gray shale | 14 | 10 | 38 | 10 |
| Soft clay | 1 | 9 | 40 | 7 |
| Gray clay shale | 27 | 11 | 68 | 6 |
| Green soft clay | 0 | 6 | 69 | 0 |
| Gray clay shale | 11 | 2 | 80 | 2 |
| Red shale with green | 2 | 5 | 82 | 7 |
| Gray clay shale | 2 | 8 | 85 | 4 |
| Limestone | 5 | 3 | 90 | 7 |
| Red soft clay shale | 3 | 0 | 93 | 7 |
| Green clay shale | 0 | 11 | 94 | 6 |
| Gray limestone with some shale | 23 | 8 | 118 | 2 |
| White limestone | 4 | 9 | 122 | 11 |
| Gray limestone with shale | 16 | 7 | 139 | 6 |
| White limestone | 0 | 11 | 140 | 5 |
| Gray limestone | 4 | 4 | 144 | 9 |
| Dark gray shale | 2 | 7 | 147 | 4 |

STARTED 1-9-67 COMPLETED 1-9-67 19 TOTAL

continued to page 2

FORM 2

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

ADDRESS [illegible] DATE 1-[illegible] 19

ON [illegible] TWP. [illegible] COUNTY [illegible] STATE [illegible]

HOLE NO. DDH5 SIZE HOLE 4" EL. DRILLER [illegible] DRILL NO. 1

| Page II CLASSIFICATION | THICKNESS OF STRATA FEET | THICKNESS OF STRATA INS. THS. | DEPTH FROM SURFACE FEET | DEPTH FROM SURFACE INS. THS. |
|---|---|---|---|---|
| COAL No. 9 | 1. | 0 | 148. | 4 |
| Dark Gray shale | 2. | 10 | 151. | 2 |
| COAL | 0. | 3 | 151. | 5 |
| Soft clay with shale | 0. | 6 | 151. | 11 |
| Gray sandstone | 20. | 1 | 172. | 0 |
| Dark gray shale | 4. | 0 | 176. | 0 |
| COAL | 0. | 1 | 176. | 1 |
| Shale binder Fishpot No. 8B | 0. | 5 | 176. | 6 |
| COAL | 1. | 10 | 178. | 4 |
| Binder | 0. | 3 | 178. | 7 |
| COAL | 0. | 7 | 179. | 2 |
| Dark gray shale | 0. | 10 | 180. | 0 |
| Limestone, gray | 19. | 10 | 199. | 10 |
| Greenish gray shale | 10. | 8 | 210. | 6 |
| Dark gray shale | 1. | 6 | 212. | 0 |
| Limestone | 1. | 0 | 213. | 0 |
| Gray shale | 5. | 0 | 218. | 0 |
| Black shale | 0. | 6 | 218. | 6 |
| Gray shale with limestone | 21. | 6 | 24. | 0 |
| Dark gray shale | 1. | 8 | 241. | 8 |
| COAL Roof Coal No. 8 R | 0. | 10 | 242. | 6 |
| Binder Draw Rock | 1. | 1 | 243. | 7 |

STARTED 1-9-67 COMPLETED 1-9-67 19 TOTAL

continued to page 3

FORM 2

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR [illegible] ADDRESS [illegible] DATE [illegible] 19__

ON [illegible] TWP. [illegible] COUNTY [illegible] STATE [illegible]

HOLE NO. DDH5 SIZE HOLE 4" EL. [illegible] DRILLER [illegible] DRILL NO. 1

Page III

| CLASSIFICATION | THICKNESS OF STRATA FEET | THICKNESS OF STRATA INS. THS. | DEPTH FROM SURFACE FEET | DEPTH FROM SURFACE INS. THS. |
|---|---|---|---|---|
| COAL Pgh #8 | 5. | 0 | 248. | 7 |
| Gray clay shale | 11. | 5 | 260. | 0 |

STARTED [illegible] COMPLETED [illegible] 19 TOTAL [illegible]

FORM 2

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767


## TEST BORING RECORD

SIZE CASING 4 " SIZE CORE _____ " SUR. EL. 943.9
SAMPLER SIZE O. D. _____ " STATION _____
CASING HAMMER WT. 300 DROP 30 " RIG No _____
SAMPLER HAMMER WT. 140 DROP 30 "
COUNTY Belmont STATE Ohio

FOR Y. & O. Coal Company
Martin's Ferry, Ohio
HOLE No. 1 (DDH6) PROJECT No. _____
JOB NAME - LOCATION ~~Powhaten Point, Ohio~~
Section 3, Wayne Township

| CLASSIFICATION | THICKNESS OF STRATA | DEPTH OF STRATA | CASING LENGTH | CASING HAMMER BLOWS |
|---|---|---|---|---|
| | Feet and | Inches | | |
| urface | 8.0 | 8.0 | 0 - 1 | |
| | | | 1 - 2 | |
| imestone, gray | 8.0 | 16.0 | 2 - 3 | |
| | | | 3 - 4 | |
| ray clay shale broken with soft seams | 4.0 | 20.0 | 4 - 5 | |
| | | | 5 - 6 | |
| andy shale, gray with soft seams | 16.6 | 36.6 | 6 - 7 | |
| | | | 7 - 8 | |
| ed clay shale | 1.0 | 37.6 | 8 - 9 | |
| | | | 9 - 10 | |
| ray clay shale | 12.6 | 50.0 | 10 - 11 | |
| | | | 11 - 12 | |
| [redacted]imestone with some sandy shale | 24.0 | 74.0 | 12 - 13 | |
| | | | 13 - 14 | |
| andstone, gray | 3.6 | 77.6 | 14 - 15 | |
| | | | 15 - 16 | |
| reenish gray clay shale | 6.0 | 83.6 | 16 - 17 | |
| | | | 17 - 18 | |
| ray limestone | 8.6 | 92.0 | 18 - 19 | |
| | | | 19 - 20 | |
| rean clay shale | 1.6 | 93.6 | 20 - 21 | |
| | | | 21 - 22 | |
| ray limestone and shale | 49.6 | 143.0 | 22 - 23 | |
| | | | 23 - 24 | |
| oft clay with shale | 2.0 | 145.0 | 24 - 25 | |
| | | | 25 - 26 | |
| oal, slate and boney | 2.0 | 147.0 | 26 - 27 | |
| | | | 27 - 28 | |
| ark gray shale | 3.6 | 150.6 | 28 - 29 | |
| | | | 29 - 30 | |
| andstone, gray | 15.6 | 166.0 | 30 - 31 | |
| | | | 31 - 32 | |
| imestone, gray | 6.0 | 172.0 | 32 - 33 | |
| | | | 33 - 34 | |
| OAL | 2.1 | 174.1 | 34 - 35 | |
| | | | 35 - 36 | |

| SAMPLER NO. | DEPTH | BLOWS ON SAMPLER 6" INTERVALS 0-6 | 6-12 | 12-18 |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |

| RUN NO. | DEPTH OF RUN | CORE REC. FT. |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

GROUND WATER DATA

| HOUR | DATE |
|---|---|
| | |
| | |

REMARKS

Forwarded to page II

STARTED 12/12/66 COMPLETED 12/27/66 TOTAL DEPTH 162 feet, actual.

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

## TEST BORING RECORD

SIZE CASING 4½" SIZE CORE ____" SUR. EL. ____
SAMPLER SIZE O. D. ____" STATION ____
CASING HAMMER WT. 300 DROP 30" RIG NO ____
SAMPLER HAMMER WT. 140 DROP 30"
COUNTY ____ STATE Ohio

FOR Y. & O. Coal Company
Martin's Ferry, Ohio
HOLE NO. 1 (DDH6) PROJECT NO ____
JOB NAME - LOCATION Powhaten Point, Ohio

| CLASSIFICATION | THICKNESS OF STRATA | DEPTH OF STRATA |
|---|---|---|
| Under | 0.3 | 174.4 |
| COAL | 0.3 | 174.7 |
| Under | 0.1 | 174.8 |
| COAL | 0.4 | 175.2 |
| Gray limestone | 21.0 | 196.0 |
| Lay shale, gray | 6.0 | 202.0 |
| Dark gray shale | 2.0 | 204.0 |
| limestone, gray | 6.0 | 210.0 |
| Dark gray carbon shale | 2.0 | 212.0 |
| Gray limestone | 15.0 | 227.0 |
| Gray clay shale, soft | 9.6 | 236.6 |
| COAL Roof Coal No.8R | 1.1 | 237.7 |
| Shale, gray Draw Rock | 1.2 | 238.9 |
| COAL Pgh #8 No.8 | 5.0 | 243.9 |
| Fire clay | 0.3 | 244.0 |
| Dark gray shale | 2.6 | 246.6 |
| Gray clay shale | 13.6 | 260.0 |

CASING LENGTH / CASING HAMMER BLOWS

| | |
|---|---|
| 0 - 1 | |
| 1 - 2 | |
| 2 - 3 | |
| 3 - 4 | |
| 4 - 5 | |
| 5 - 6 | |
| 6 - 7 | |
| 7 - 8 | |
| 8 - 9 | |
| 9 - 10 | |
| 10 - 11 | |
| 11 - 12 | |
| 12 - 13 | |
| 13 - 14 | |
| 14 - 15 | |
| 15 - 16 | |
| 16 - 17 | |
| 17 - 18 | |
| 18 - 19 | |
| 19 - 20 | |
| 20 - 21 | |
| 21 - 22 | |
| 22 - 23 | |
| 23 - 24 | |
| 24 - 25 | |
| 25 - 26 | |
| 26 - 27 | |
| 27 - 28 | |
| 28 - 29 | |
| 29 - 30 | |
| 30 - 31 | |
| 31 - 32 | |
| 32 - 33 | |
| 33 - 34 | |
| 34 - 35 | |
| 35 - 36 | |

| SAMPLER NO. | DEPTH | BLOWS ON SAMPLER 6" INTERVALS 0-6 | 6-12 | 12-18 |
|---|---|---|---|---|
| 1 | | | | |
| 2 | | | | |
| 3 | | | | |
| 4 | | | | |
| 5 | | | | |
| 6 | | | | |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |
| 10 | | | | |

| RUN NO. | DEPTH OF RUN | CORE REC. FT. |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

GROUND WATER DATA

| HOUR | DATE |
|---|---|
| | |

REMARKS

STARTED ____ COMPLETED ____ 260.0

ATTACHMENT 13

DIAMOND DRILL HOLE:
Y&O-7

T6N R5

R, INC.

NIA 15767

HETAGE
DIAMOND CORE DRILLIN

Field Engineer: Kim Cecil
Surface Elevation: 1,060
Drill Hole Coordinates (State Plane 1927 NA Datum)
Northing: 683,189
Easting: 2,415,888

FOR Y. & O. COAL
Lotta Boan Proper
ON batween twp. roa
Crabapple Creek,
HOLE NO. DDH-7

Drilling Company: Leroy G. Hetager, Inc.

DATE 2-16-67 19
nt STATE Ohi
DRILL NO. 1

| Page I CLASSIFICATION | THICKNESS OF STRATA FEET | INS. | DEPTH FROM SURFACE FEET | INS. | Proper |
|---|---|---|---|---|---|
| Surface sand and silt, soft | 5. | 0 | 5. | 0 | cvev |
| Brown sandstone coarse grained | 21. | 0 | 26. | 0 | cs,es |
| Gray sandstone, coarse grained | 26. | 10 | 52. | 10 | cs,es |
| COAL, dirty with shale Waynesburg "A" | 0. | 9 | 53. | 7 | ac,cv,e |
| Gray ~~xk~~ clay shale | 16. | 5 | 70. | 0 | cv,ev |
| Gray sandstone | 11. | 0 | 81. | 0 | cs,es |
| Green shale | 2. | 8 | 83. | 8 | cm,em |
| Gray limestone | 2. | 4 | 86. | 0 | ak,cs,e |
| Green shale | 8. | 0 | 94. | 0 | cm,em |
| Limestone | 3. | 2 | 97. | 2 | ak,cs,e |
| Shale, gray | 2. | 10 | 100. | 0 | cm,em |
| Black shale | 0. | 10 | 100. | 10 | ac,cm, |
| Gray limey shale | 9. | 2 | 110. | 0 | ak,cm,e |
| Gray sandstone | 7. | 5 | 117. | 5 | cs,es |
| Gray clayey shale | 2. | 7 | 120. | 0 | cm,em |
| Black shale | 2. | 0 | 122. | 0 | ac,cm,e |
| Gray shale & Limestone | 30. | 2 | 152. | 2 | ak,cs,e |
| Black shale | 0. | 4 | 152. | 6 | ac,cm,e |
| Green shale | 3. | 6 | 156. | 0 | cm,em |
| Red shale | 0. | 9 | 156. | 9 | cm,em |
| Gray limey shale | 10. | 0 | 166. | 9 | ak,cm,e |
| Red shale | 0. | 3 | 167. | 0 | cm,em |

STARTED 2-8-67 COMPLETED 2-14-67 19 TOTAL

continued to page 2

FORM 2

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR Y. & O. COAL COMPANY ADDRESS Martin's Ferry, Ohio DATE 2-16-67 19

ON Lotta Boan Property located between twp. road 103 and Crab-apple Creek, w. of twp. line TWP. Sec.1 Wayne Twp. COUNTY Belmont STATE Oh

HOLE NO. DDH-7 SIZE HOLE 4" EL. DRILLER HARRY MERRITT DRILL NO. 1

| Page II CLASSIFICATION | THICKNESS OF STRATA FEET | INS. THS. | DEPTH FROM SURFACE FEET | INS. THS. | Proper |
|---|---|---|---|---|---|
| Green shale | 2. | 0 | 169. | 0 | cm,e |
| Gray sandstone | 3. | 0 | 172. | 0 | cs,c |
| Green shale | 2. | 8 | 174. | 8 | cm,e |
| Gray limestone | 12. | 7 | 187. | 3 | ak,cs, |
| Green weathered shale | 1. | 3 | 188. | 6 | cm,e |
| Red shale | 1. | 6 | 190. | 0 | cm,e |
| Green shale with some red | 15. | 00 | 205. | 0 | cm,e |
| Gray limestone | 6. | 0 | 211. | 0 | ak,cs, |
| Green shale | 4. | 9 | 215. | 0 | cm,e |
| Gray limestone | 9. | 6 | 224. | 6 | ak,cs, |
| Green shale | 3. | 0 | 227. | 6 | cm,e |
| Gray limestone with some shale | 38. | 6 | 266. | 0 | ak,cs, |
| Black shale | 3. | 3 | 269. | 3 | ac,cm, |
| COAL Sewickley No. 9 | 2. | 6 | 271. | 9 | ac,cv, |
| Gray shale | 10. | 3 | 232. | 0 | cm,e |
| Gray limestone | 8. | 0 | 290. | 0 | ak,cs, |
| COAL | 1. | 8 | 291. | 8 | ac,cv, |
| Binder | 0. | 3 | 291. | 11 | cm,e |
| COAL | 0. | 7 | 292. | 6 | ac,cv, |
| Gray clayey shale | 2. | 0 | 294. | 6 | cm,e |
| Gray limestone | 5. | 0 | 299. | 6 | ak,cs, |
| Black Limestone | 0. | 6 | 300. | 0 | cm,e |

STARTED 2-8-67 COMPLETED 2-14-67 19 TOTAL

continued on page 3

FORM 2

AEC 03564

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR Y. & O. COAL CO. ADDRESS Martin's Ferry DATE 2-16-67 19

ON Latta Boan Property located between twp. road 103 and Crabapple Creek, W. of twp. line TWP. Sec. 1 Wayne Twp. COUNTY Belmont STATE Ohio

HOLE NO. DDH-7 SIZE HOLE 4" EL. DRILLER HARRY MERRITT DRILL NO. 1

| Page III CLASSIFICATION | THICKNESS OF STRATA FEET | INS. THS. | DEPTH FROM SURFACE FEET | INS. THS. | |
|---|---|---|---|---|---|
| Gray limestone | 15. | 6 | 315. | 6 | ak,cs, |
| Gray limey shale | 7. | 6 | 323. | 0 | ak,cm, |
| Gray limestone | 2. | 7 | 325. | 7 | ak,cs, |
| Gray clay shale | 2. | 6 | 328. | 1 | cm,e |
| Black shale | 0. | 6 | 328. | 7 | ac,cm, |
| COAL | 1. | 0 | 329. | 7 | ac,cr,c |
| Gray limestone | 16. | 5 | 346. | 0 | ak,cs, |
| Gray clah shale | 5. | 9 | 351. | 9 | cm,en |
| COAL Roof Coal | 1. | 2 | 352. | 11 | ac,cr |
| Binder (shale) | 1. | 0 | 353. | 11 | cm, |
| COAL PGH = 2 | 5. | 1 | 359. | 0 | acc |
| Gray shale | 3. | 0 | 362. | 0 | cm,e |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c(v-very, m-moderate,s-slight)
Erodible: e(v-very, m-moderate, s-slight)

Hard Rock 150.83 ft 41%

Soft Rock 211.17 ft 59%

362.00 Ft

| | | | | | |
|---|---|---|---|---|---|
| TOTAL | 362. | 0 | 362. | 0 | |

STARTED 2-8-67 COMPLETED 2-14-67 19

FORM 2

AEC 03565

11/89

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINES AND RECLAMATION**

**ATTACHMENT 13**
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole # M-16
*Coordinates X. 2,405,404 Y. 690,644 Surface Elevation 1080.4

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| CLAY AND WEATHERED SANDSTONE | | 5.0' | M | S |
| GRAY SANDSTONE | | 35.0' | S | S |
| GRAY SANDY SHALE | | 15.0' | M | S |
| GRAY SANDSTONE | | 7.5' | S | S |
| GRAY SHALE | | 42.5' | M | S |
| VARIGATED SHALE | | 35.0' | M | S |
| GRAY SHALE WITH LIME STREAKS | | 58.0' | M | S |
| BROWN LIMESTONE | | 7.0' | M | S |
| GRAY SHALE | | 25.0' | M | S |
| VERY DARK SHALE | | 7.0' | M | S |
| GRAY SHALE, VERY SANDY | | 10.0' | M | S |
| DARK SHALE | | 4.0' | M | S |
| COAL, SLATE, BLACK SHALE | | 4.0' | M | S |
| BROWN LIMESTONE | | 12.0' | M | S |
| GRAY & GREEN SHALE | | 27.0' | M | S |
| HARD GREEN SHALE | | 10.0' | M | S |
| DARK SANDY SHALE | | 12.0' | M | S |
| SANDSTONE | | 3.5' | S | S |
| DARK SHALE | | 5.5' | M | S |
| GRAY SANDSTONE | | 5.25' | S | S |
| SHALEY COAL (PITTSBURGH #8) | | 0.16' | S | V |
| COAL (PITTSBURGH #8) | | 4.0' | S | V |
| HARD GRAY SHALE | | 4.58' | M | S |

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| #8 COAL | 5.57 | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearing stratum with an asterick (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

11/89

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINES AND RECLAMATION

### ATTACHMENT 13
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole # M-20

*Coordinates X. 2,406,834 Y. 687,635 Surface Elevation 1140.16

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| YELLOW CLAY | | 8.0' | V | S |
| SOFT GRAY SHALE | | 6.0' | M | S |
| SOFT SHALE WITH BOULDERS | | 34.0' | M | S |
| GRAY SANDY SHALE | | 4.0' | M | S |
| GRAY SANDSTONE | | 56.0' | S | S |
| GREEN SHALE | | 4.0' | M | S |
| DARK SHALE | | 58.0' | M | S |
| GRAY SHALE | | 90.0' | M | S |
| GRAY SHALE WITH LIME STREAKS | | 18.0' | M | S |
| GREEN SHALE | | 5.0' | M | S |
| YELLOW LIMESTONE | | 6.0' | M | S |
| GRAY & GREEN SHALE | | 16.0' | M | S |
| DARK SHALE | | 4.0' | M | S |
| COAL (MEIGS CREEK #9) | | 2.5' | S | V |
| GRAY SHALE | | 8.0' | M | S |
| GRAY SANDSTONE | | 7.0' | M | S |
| DARK SHALE | | 5.5' | M | S |
| BLACK SHALE & COAL (FISHPOT) | | 4.0' | S | V |
| BROWN LIMESTONE | | 15.0' | M | S |
| GREEN SHALE | | 4.0' | M | S |
| GRAY SHALE & LIME | | 15.0' | M | S |
| GREEN & GRAY SHALE | | 25.0' | M | S |
| GRAY SANDSTONE | | 14.0' | S | S |
| DARK SHALE | | 6.16' | M | S |
| COAL (PITTSBURGH #8) | | 4.0' | S | V |
| HARD GRAY SHALE | | 3.0' | M | S |

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutralization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| #8 COAL | 4.51 | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearing stratum with an asterick (*) under the column labeled H20.

11/89

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINES AND RECLAMATION**

**ATTACHMENT 13**
(GEOLOGY REPORT - UNDERGROUND WORKINGS)

Applicant BENNOC, INC. Drill Hole # 0-1

*Coordinates X. 2,404,851 Y. 694,797 Surface Elevation 1220.5

| Lithology | H20** | Thickness | Physical Properties *** | |
|---|---|---|---|---|
| | | | Compactibility | Erodibility |
| Topsoil | | | | |
| Subsoil | | | | |
| GRAY LIMESTONE | | 8.25' | M | S |
| SOFT GRAY SHALE | | 32.0' | M | S |
| COAL (WASHINGTON #12) | | 2.25' | S | V |
| GRAY TO BROWN SHALE W/CLAY STREAK | | 72.5' | M | S |
| GRAY SANDY SHALE | | 23.0' | M | S |
| GRAY SANDSTONE | | 29.0' | M | S |
| COAL (WASHINGTON #11) | | 3.0' | S | V |
| GRAY SHALE | | 0.33' | M | S |
| GRAY SHALEY SANDSTONE | | 12.66' | S | S |
| GRAY SHALE | | 3.33' | M | S |
| COAL (UNIONTOWN #10) | | 0.33' | S | V |
| DARK LIME CLAYSTONE | | 2.5' | V | S |
| GRAY LIME CLAYSTONE | | 5.4' | V | S |
| GRAY LIMESTONE W/LIMECLAY STREAKS | | 126.4' | M | S |
| DARK SHALE | | 4.0' | M | S |
| COAL (MEIGS CREEK #9) | | 1.5' | S | V |
| DARK SHALE | | 2.33' | M | S |
| GRAY SILTSTONE | | 20.0' | M | S |
| COAL W/BINDERS (FISHPOT) | | 3.16' | S | V |
| DARK SHALE | | 1.16' | M | S |
| GRAY-WHITE LIMESTONE | | 17.25' | M | S |
| GRAY SANDSTONE | | 5.58' | S | S |
| GRAY LIMESTONE | | 24.25' | M | S |
| GRAY/GREEN LIME CLAYSTONE | | 9.5' | M | S |
| GRAY SANDSTONE | | 18.66' | S | S |
| COAL (PITTSBURG #8) | | 4.0' | S | V |
| DARK CLAY | | 1.58' | V | S |

Submit the following information for the stratum above the coal seam, the coal seam, and the stratum below the coal seam.

| Stratum | Total Sulfur | Pyrite Marcasite Sulfur | Potential Acidity | Neutral-ization Potential | CaCo3 Deficiency |
|---|---|---|---|---|---|
| #8 COAL | 3.94 | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* If other than State Plane, indicate coordinate system.
** Indicate water bearing stratum with an asterick (*) under the column labeled H20.
*** S-Slightly M-Moderately V-Very

# LEROY G. HETAGER, INC.

## DIAMOND CORE DRILLING

P. O. BOX 363, PUNXSUTAWNEY, PENNSYLVANIA 15767

DIAMOND CORE DRILL HOLE RECORD

FOR Ohio Power Company ADDRESS St. Clairsville, Ohio DATE 3-6-63 19

Ralph Carpenter property

ON Rt. 26 Captina Creek, S. New TWP. COUNTY Belmont STATE Ohio

HOLE NO. O - 5 - SIZE HOLE NX EL. 929.10 DRILLER ROBERT MITCHELL DRILL NO.

| CLASSIFICATION | THICKNESS OF STRATA FEET | THICKNESS OF STRATA INS. THS. | DEPTH FROM SURFACE FEET | DEPTH FROM SURFACE INS. THS. |
|---|---|---|---|---|
| Surface | 12 | 9 | 12 | 9 |
| Sandstone, gray | 20 | 2 | 32 | 11 |
| Boney COAL | 1 | 1 | 34 | 0 |
| Hard dark claystone | 1 | 0 | 35 | 0 |
| Limestone, gray, pink | 16 | 0 | 51 | 0 |
| Soft lime claystone, gray | 1 | 2 | 52 | 2 |
| Sandstone, gray | 1 | 10 | 54 | 0 |
| Limestone, gray with lime clay streaks | 4 | 0 | 58 | 0 |
| Soft lime clay stone gray, green | 3 | 6 | 61 | 6 |
| Dark clayey limestone | 5 | 6 | 67 | 0 |
| Red shale | 1 | 0 | 68 | 0 |
| Dark limestone | 1 | 5 | 69 | 5 |
| Soft lime claystone, gray, green | 3 | 7 | 73 | 0 |
| Hard lime claystone, gray | 11 | 6 | 84 | 6 |
| Sandstone, gray | 6 | 0 | 90 | 6 |
| Shaley claystone, dark | 1 | 1 | 91 | 7 |
| Sandstone, gray | 2 | 7 | 94 | 2 |
| Hard gray claystone | 0 | 8 | 94 | 10 |
| Sandstone, gray | 24 | 6 | 119 | 4 |
| SULPHUR COAL | 0 | 4 | 119 | 8 |
| COAL 950 − 123.7 = 826.2 $8 | 4 | 2 | 123 | 10 |
| Hard dark fire clay | 2 | 2 | 126 | 0 |
| STARTED 2-5-63 COMPLETED 3-6-63 19 TOTAL | 126 | 0 | 126 | 00 |

FORM 2

AEC 03569

ATTACHMENT 13

## DIAMOND DRILL HOLE: NMC-11

**Field Engineer:** W. P. Goddard
**Surface Elevation:** 820
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 698018
**Easting:** 2425948
**Drilling Company:** Karl K. Hetager Co.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 19.00 | 0.00 | 19.00 | Casing or Surface Material | | | | 0.00 |
| 3.00 | 19.00 | 22.00 | Sandstone | | cs, es | Y | 3.00 |
| 13.67 | 22.00 | 35.67 | Light Gray/Green Massive Sandy Shale | | cm, em | | 0.00 |
| 2.33 | 35.67 | 38.00 | Dark Gray Shale | | cm, em | | 0.00 |
| 0.42 | 38.00 | 38.42 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.33 | 38.42 | 38.75 | **Light Gray Green Fireclay** | | cv, ev | | 0.00 |
| 0.17 | 38.75 | 38.92 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.50 | 38.92 | 39.42 | **Light Gray Green Massive Shale** | | cm, em | | 0.00 |
| 0.92 | 39.42 | 40.34 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.24 | 40.34 | 40.58 | **Light Gray Green Massive Shale** | | cm, em | | 0.00 |
| 0.67 | 40.58 | 41.25 | **Coal** | | ac, cv, ev | | 0.00 |
| 19.75 | 41.25 | 61.00 | Shaley Layered Limestone | | ak, cs, es | Y | 19.75 |
| 3.00 | 61.00 | 64.00 | Sandstone | | cs, es | Y | 3.00 |
| 5.75 | 64.00 | 69.75 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 7.25 | 69.75 | 77.00 | Limestone | | ak, cs, es | Y | 7.25 |
| 2.50 | 77.00 | 79.50 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 0.08 | 79.50 | 79.58 | **Coal, Redstone** | | ac, cv, ev | | 0.00 |
| 6.92 | 79.58 | 86.50 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 8.17 | 86.50 | 94.67 | Limestone | | ak, cs, es | Y | 8.17 |
| 5.25 | 94.67 | 99.92 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 5.00 | 99.92 | 104.92 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.50 | 104.92 | 105.42 | **Coal, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.92 | 105.42 | 106.34 | Light Gray Green Shale | | cm, em | | 0.00 |
| 5.12 | 106.34 | 111.46 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 2.54 | 111.46 | 114.00 | Light Gray/Green Massive Sandy Shale | | cm, em | | 0.00 |
| | Total Depth | 114.00 | | | | | 41.17 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **41.17**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **36%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 41.17 | 36% |
| Soft Rock: | 72.83 | 64% |
| | 114.00 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE:
## NMC-20

**Field Engineer:** Leonard Sexton
**Surface Elevation:** 819
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 698109
**Easting:** 2427310
**Drilling Company:** B. H. Mott & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 9.00 | 0.00 | 9.00 | Casing or Surface Material | | | | 0.00 |
| 5.00 | 9.00 | 14.00 | Shaley Layered Limestone | | ak, cs, es | Y | 5.00 |
| 7.20 | 14.00 | 21.20 | Limestone | | ak, cs, es | Y | 7.20 |
| 2.80 | 21.20 | 24.00 | Black Shale | | ac, cm, em | | 0.00 |
| 0.10 | 24.00 | 24.10 | **Bone, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 1.30 | 24.10 | 25.40 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 25.40 | 25.60 | **Bone** | | ac, cv, ev | | 0.00 |
| 0.20 | 25.60 | 25.80 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 25.80 | 26.10 | **Coal W/Bone Streaks** | | ac, cv, ev | | 0.00 |
| 1.00 | 26.10 | 27.10 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.90 | 27.10 | 29.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 2.70 | 29.00 | 31.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 4.50 | 31.70 | 36.20 | Shaley Layered Limestone | | ak, cs, es | Y | 4.50 |
| 10.40 | 36.20 | 46.60 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.20 | 46.60 | 46.80 | Black Shale | | ac, cm, em | | 0.00 |
| 0.20 | 46.80 | 47.00 | **Bone, Fishpot** | | ac, cv, ev | | 0.00 |
| 2.00 | 47.00 | 49.00 | **Coal W/Bone Streaks** | | ac, cv, ev | | 0.00 |
| 3.00 | 49.00 | 52.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 2.00 | 52.00 | 54.00 | Light Gray Green Claystone | | cv, ev | | 0.00 |
| 6.00 | 54.00 | 60.00 | Limestone | | ak, cs, es | Y | 6.00 |
| 0.40 | 60.00 | 60.40 | Black Shale | | ac, cm, em | | 0.00 |
| 3.80 | 60.40 | 64.20 | Limestone | | ak, cs, es | Y | 3.80 |
| 0.60 | 64.20 | 64.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 6.00 | 64.80 | 70.80 | Limestone | | ak, cs, es | Y | 6.00 |
| 6.40 | 70.80 | 77.20 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 2.00 | 77.20 | 79.20 | Black Shale | | ac, cm, em | | 0.00 |
| 3.20 | 79.20 | 82.40 | Limestone | | ak, cs, es | Y | 3.20 |
| 1.00 | 82.40 | 83.40 | Black Shale | | ac, cm, em | | 0.00 |
| 2.70 | 83.40 | 86.10 | Shaley Layered Limestone | | ak, cs, es | Y | 2.70 |
| 0.80 | 86.10 | 86.90 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 0.20 | 86.90 | 87.10 | Black Shale | | ac, cm, em | | 0.00 |
| 3.00 | 87.10 | 90.10 | Shaley Layered Limestone | | ak, cs, es | Y | 3.00 |
| 2.40 | 90.10 | 92.50 | Limestone | | ak, cs, es | Y | 2.40 |
| 1.50 | 92.50 | 94.00 | Shaley Layered Limestone | | ak, cs, es | Y | 1.50 |
| 8.40 | 94.00 | 102.40 | Limestone | | ak, cs, es | Y | 8.40 |
| 8.70 | 102.40 | 111.10 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.40 | 111.10 | 111.50 | **Coal W/Bone Streaks, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 1.00 | 111.50 | 112.50 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.70 | 112.50 | 113.20 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.30 | 113.20 | 113.50 | **Coal W/Bone Streaks, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 4.95 | 113.50 | 118.45 | **Coal** | | ac, cv, ev | | 0.00 |
| 9.50 | 118.45 | 127.95 | Light Gray Green Shale | | cm, em | | 0.00 |
| | Total Depth | 127.95 | | | | | 53.70 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

DIAMOND DRILL HOLE:
NMC-20

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **53.70** |
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **42%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 53.70 | 42% |
| Soft Rock: | 74.25 | 58% |
| | 127.95 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE:
## NMC-21

**Field Engineer:** Leonard Sexton
**Surface Elevation:** 828
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 698016
**Easting:** 2427312
**Drilling Company:** B.H. Mott & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 16.00 | 0.00 | 16.00 | Casing or Surface Material | | | | 0.00 |
| 1.30 | 16.00 | 17.30 | Light Gray Green Shale | | cm, em | | 0.00 |
| 1.40 | 17.30 | 18.70 | Limestone | | ak, cs, es | Y | 1.40 |
| 2.30 | 18.70 | 21.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 7.00 | 21.00 | 28.00 | Limestone | | ak, cs, es | Y | 7.00 |
| 2.70 | 28.00 | 30.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.40 | 30.70 | 31.10 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 1.60 | 31.10 | 32.70 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 1.10 | 32.70 | 33.80 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 6.00 | 33.80 | 39.80 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 3.50 | 39.80 | 43.30 | Shaley Layered Limestone | | ak, cs, es | Y | 3.50 |
| 4.70 | 43.30 | 48.00 | Shaley Limestone | | ak, cs, es | Y | 4.70 |
| 0.30 | 48.00 | 48.30 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 11.50 | 48.30 | 59.80 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.50 | 59.80 | 60.30 | Black Shale W/Coal Streaks | | ac, cm, em | | 0.00 |
| 1.40 | 60.30 | 61.70 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 1.00 | 61.70 | 62.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 9.00 | 62.70 | 71.70 | Limestone | | ak, cs, es | Y | 9.00 |
| 0.20 | 71.70 | 71.90 | Black Shale | | ac, cm, em | | 0.00 |
| 8.90 | 71.90 | 80.80 | Limestone | | ak, cs, es | Y | 8.90 |
| 0.80 | 80.80 | 81.60 | Shaley Limestone | | ak, cs, es | Y | 0.80 |
| 0.40 | 81.60 | 82.00 | Limestone | | ak, cs, es | Y | 0.40 |
| 0.80 | 82.00 | 82.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 7.20 | 82.80 | 90.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 2.70 | 90.00 | 92.70 | Limestone | | ak, cs, es | Y | 2.70 |
| 2.40 | 92.70 | 95.10 | Shaley Layered Limestone | | ak, cs, es | Y | 2.40 |
| 1.70 | 95.10 | 96.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.20 | 96.80 | 97.00 | Black Shale | | ac, cm, em | | 0.00 |
| 1.70 | 97.00 | 98.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 4.10 | 98.70 | 102.80 | Black Shale | | ac, cm, em | | 0.00 |
| 6.40 | 102.80 | 109.20 | Limestone | | ak, cs, es | Y | 6.40 |
| 6.90 | 109.20 | 116.10 | Shaley Limestone | | ak, cs, es | Y | 6.90 |
| 3.10 | 116.10 | 119.20 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 2.40 | 119.20 | 121.60 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.50 | 121.60 | 122.10 | Black Shale | | ac, cm, em | | 0.00 |
| 0.20 | 122.10 | 122.30 | **Bone, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 1.00 | 122.30 | 123.30 | **Coal W/Bone Streaks** | | ac, cv, ev | | 0.00 |
| 0.60 | 123.30 | 123.90 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.30 | 123.90 | 124.20 | **Bone, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 5.00 | 124.20 | 129.20 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.80 | 129.20 | 130.00 | Shaley Limestone | | ak, cs, es | Y | 0.80 |
| 3.20 | 130.00 | 133.20 | Light Gray Green Shale | | cm, em | | 0.00 |
| 7.60 | 133.20 | 140.80 | Limestone | | ak, cs, es | Y | 7.60 |
| | Total Depth | 140.80 | | | | | 62.50 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

DIAMOND DRILL HOLE:
NMC-21

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **62.50** |
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **44%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 62.50 | 44% |
| Soft Rock: | 78.30 | 56% |
| | 140.80 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE:
## NMC-22

**Field Engineer:** Leonard Sexton
**Surface Elevation:** 820
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 698193
**Easting:** 2427275
**Drilling Company:** B.H. Mott & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 13.80 | 0.00 | 13.80 | Casing or Surface Material | | | | 0.00 |
| 7.40 | 13.80 | 21.20 | Limestone | | ak, cs, es | Y | 7.40 |
| 5.50 | 21.20 | 26.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.20 | 26.70 | 26.90 | **Bone, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.50 | 26.90 | 27.40 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 27.40 | 27.70 | **Bone** | | ac, cv, ev | | 0.00 |
| 1.30 | 27.70 | 29.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.00 | 29.00 | 30.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 3.90 | 30.00 | 33.90 | Limestone | | ak, cs, es | Y | 3.90 |
| 11.70 | 33.90 | 45.60 | Shaley Limestone | | ak, cs, es | Y | 11.70 |
| 2.00 | 45.60 | 47.60 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.40 | 47.60 | 48.00 | **Coal W/Bone Streaks, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.40 | 48.00 | 48.40 | **Light Gray Green Shale** | | cm, em | | 0.00 |
| 0.60 | 48.40 | 49.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.30 | 49.00 | 49.30 | **Light Gray Green Shale** | | cm, em | | 0.00 |
| 0.60 | 49.30 | 49.90 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 49.90 | 50.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 1.10 | 50.00 | 51.10 | Black Shale | | ac, cm, em | | 0.00 |
| 12.40 | 51.10 | 63.50 | Limestone | | ak, cs, es | Y | 12.40 |
| 0.50 | 63.50 | 64.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 4.00 | 64.00 | 68.00 | Limestone | | ak, cs, es | Y | 4.00 |
| 0.50 | 68.00 | 68.50 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.30 | 68.50 | 68.80 | Limestone | | ak, cs, es | Y | 0.30 |
| 5.20 | 68.80 | 74.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 3.00 | 74.00 | 77.00 | Light Gray Green Claystone | | cv, ev | | 0.00 |
| 3.50 | 77.00 | 80.50 | Light Gray Green Shale | | cm, em | | 0.00 |
| 2.00 | 80.50 | 82.50 | Shaley Limestone | | ak, cs, es | Y | 2.00 |
| 4.00 | 82.50 | 86.50 | Limestone | | ak, cs, es | Y | 4.00 |
| 7.00 | 86.50 | 93.50 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 9.00 | 93.50 | 102.50 | Limestone | | ak, cs, es | Y | 9.00 |
| 3.40 | 102.50 | 105.90 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 6.60 | 105.90 | 112.50 | Light Gray Green Shale | | cm, em | | 0.00 |
| 2.00 | 112.50 | 114.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.20 | 114.50 | 114.70 | **Bone, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 114.70 | 114.80 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.50 | 114.80 | 115.30 | **Bone** | | ac, cv, ev | | 0.00 |
| 1.00 | 115.30 | 116.30 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.90 | 116.30 | 117.20 | Light Gray Green Shale | | cm, em | | 0.00 |
| 4.30 | 117.20 | 121.50 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 10.80 | 121.50 | 132.30 | Light Gray Green Shale | | cm, em | | 0.00 |
| | Total Depth | 132.30 | | | | | 54.70 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

## DIAMOND DRILL HOLE: NMC-22

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **54.70** |
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **41%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 54.70 | 41% |
| Soft Rock: | 77.60 | 59% |
| | 132.30 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE:
NMC-23

**Field Engineer:** Leonard Sexton
**Surface Elevation:** 814
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 698289
**Easting:** 2426930
**Drilling Company:** B.H. Motts & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 5.00 | 0.00 | 5.00 | Casing or Surface Material | | | | 0.00 |
| 1.40 | 5.00 | 6.40 | Light Gray Green Shale | | cm, em | | 0.00 |
| 5.30 | 6.40 | 11.70 | Limestone | | ak, cs, es | Y | 5.30 |
| 2.60 | 11.70 | 14.30 | Light Gray Green Shale | | cm, em | | 0.00 |
| 1.00 | 14.30 | 15.30 | Black Shale | | ac, cm, em | | 0.00 |
| 3.00 | 15.30 | 18.30 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 2.00 | 18.30 | 20.30 | **Coal, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 4.20 | 20.30 | 24.50 | Light Gray Green Shale | | cm, em | | 0.00 |
| 9.50 | 24.50 | 34.00 | Light Gray/Green Massive Sandy Shale | | cm, em | | 0.00 |
| 10.00 | 34.00 | 44.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 1.50 | 44.00 | 45.50 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 1.00 | 45.50 | 46.50 | Light Gray Green Shale | | cm, em | | 0.00 |
| 12.60 | 46.50 | 59.10 | Limestone | | ak, cs, es | Y | 12.60 |
| 0.80 | 59.10 | 59.90 | Light Gray Green Shale | | cm, em | | 0.00 |
| 3.00 | 59.90 | 62.90 | Limestone | | ak, cs, es | Y | 3.00 |
| 5.00 | 62.90 | 67.90 | Light Gray Green Shale | | cm, em | | 0.00 |
| 1.60 | 67.90 | 69.50 | Light Gray/Green Massive Sandy Shale | | cm, em | | 0.00 |
| 4.50 | 69.50 | 74.00 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 6.10 | 74.00 | 80.10 | Limestone | | ak, cs, es | Y | 6.10 |
| 5.40 | 80.10 | 85.50 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 2.50 | 85.50 | 88.00 | Shaley Limestone | | ak, cs, es | Y | 2.50 |
| 2.00 | 88.00 | 90.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 7.30 | 90.00 | 97.30 | Light Gray Green Shale | | cm, em | | 0.00 |
| 5.00 | 97.30 | 102.30 | Limestone | | ak, cs, es | Y | 5.00 |
| 2.00 | 102.30 | 104.30 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.50 | 104.30 | 104.80 | **Bone, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 104.80 | 105.00 | **Light Gray Green Shale** | | cm, em | | 0.00 |
| 1.00 | 105.00 | 106.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 1.20 | 106.00 | 107.20 | Light Gray Green Shale | | cm, em | | 0.00 |
| 5.20 | 107.20 | 112.40 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.50 | 112.40 | 112.90 | Light Gray/Green Massive Sandy Shale | | cm, em | | 0.00 |
| 2.10 | 112.90 | 115.00 | Shaley Limestone | | ak, cs, es | Y | 2.10 |
| 0.80 | 115.00 | 115.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 8.10 | 115.80 | 123.90 | Limestone | | ak, cs, es | Y | 8.10 |
| | Total Depth | 123.90 | | | | | 44.70 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **44.70**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **36%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 44.70 | 36% |
| Soft Rock: | 79.20 | 64% |
| | 123.90 | |

ATTACHMENT 13

# DIAMOND DRILL HOLE: NMC-24

**Field Engineer:** Leonard Sexton
**Surface Elevation:** 861
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 694570
**Easting:** 2426633
**Drilling Company:** B.H. Mott & Sons, Inc.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 17.00 | 0.00 | 17.00 | Casing or Surface Material | | | | 0.00 |
| 3.90 | 17.00 | 20.90 | Limestone | | ak, cs, es | Y | 3.90 |
| 1.10 | 20.90 | 22.00 | Shaley Limestone | | ak, cs, es | Y | 1.10 |
| 11.80 | 22.00 | 33.80 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 1.70 | 33.80 | 35.50 | Green Shale | | cm, em | | 0.00 |
| 5.40 | 35.50 | 40.90 | Limestone | | ak, cs, es | Y | 5.40 |
| 6.10 | 40.90 | 47.00 | Shaley Limestone | | ak, cs, es | Y | 6.10 |
| 1.40 | 47.00 | 48.40 | Green Shale | | cm, em | | 0.00 |
| 1.40 | 48.40 | 49.80 | Limestone | | ak, cs, es | Y | 1.40 |
| 1.30 | 49.80 | 51.10 | Green Shale | | cm, em | | 0.00 |
| 6.50 | 51.10 | 57.60 | Black Shale | | ac, cm, em | | 0.00 |
| 9.00 | 57.60 | 66.60 | Limestone | | ak, cs, es | Y | 9.00 |
| 1.00 | 66.60 | 67.60 | Black Shale | | ac, cm, em | | 0.00 |
| 1.90 | 67.60 | 69.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.40 | 69.50 | 69.90 | **Bone, Sewickley No. 9** | | ac, cv, ev | | 0.00 |
| 0.20 | 69.90 | 70.10 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.60 | 70.10 | 70.70 | **Coal W/Bone Streaks** | | ac, cv, ev | | 0.00 |
| 4.90 | 70.70 | 75.60 | Light Gray Green Shale | | cm, em | | 0.00 |
| 14.00 | 75.60 | 89.60 | Sandstone | | cs, es | Y | 14.00 |
| 4.20 | 89.60 | 93.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 6.00 | 93.80 | 99.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.20 | 99.80 | 100.00 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.50 | 100.00 | 100.50 | **Light Gray Green Shale** | | cm, em | | 0.00 |
| 1.00 | 100.50 | 101.50 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.10 | 101.50 | 101.60 | **Light Gray Green Shale** | | cm, em | | 0.00 |
| 0.40 | 101.60 | 102.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.80 | 102.00 | 102.80 | Light Gray Green Shale | | cm, em | | 0.00 |
| 4.90 | 102.80 | 107.70 | Shaley Layered Limestone | | ak, cs, es | Y | 4.90 |
| 9.40 | 107.70 | 117.10 | Limestone | | ak, cs, es | Y | 9.40 |
| 3.40 | 117.10 | 120.50 | Limestone | | ak, cs, es | Y | 3.40 |
| 2.00 | 120.50 | 122.50 | Shaley Layered Limestone | | ak, cs, es | Y | 2.00 |
| 8.20 | 122.50 | 130.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 6.30 | 130.70 | 137.00 | Limestone | | ak, cs, es | Y | 6.30 |
| 1.20 | 137.00 | 138.20 | Light Gray Green Shale | | cm, em | | 0.00 |
| 4.00 | 138.20 | 142.20 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 1.40 | 142.20 | 143.60 | Light Gray Green Shale | | cm, em | | 0.00 |
| 10.90 | 143.60 | 154.50 | Limestone | | ak, cs, es | Y | 10.90 |
| 2.40 | 154.50 | 156.90 | Light Gray Green Shale | | cm, em | | 0.00 |
| 2.70 | 156.90 | 159.60 | Shaley Layered Limestone | | ak, cs, es | Y | 2.70 |
| 2.90 | 159.60 | 162.50 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.50 | 162.50 | 163.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.60 | 163.00 | 163.60 | Black Shale | | ac, cm, em | | 0.00 |
| 1.00 | 163.60 | 164.60 | **Coal, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 164.60 | 164.80 | **Impure Coal** | | ac, cv, ev | | 0.00 |
| 0.20 | 164.80 | 165.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.70 | 165.00 | 165.70 | Light Gray Green Shale | | cm, em | | 0.00 |
| 5.00 | 165.70 | 170.70 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 1.30 | 170.70 | 172.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 9.00 | 172.00 | 181.00 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| | Total Depth | 181.00 | | | | | 80.50 |

ATTACHMENT 13

DIAMOND DRILL HOLE:
NMC-24

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **80.50**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **44%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 80.50 | 44% |
| Soft Rock: | 100.50 | 56% |
| | 181.00 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE:
## ON-1

**Field Engineer:** Melvin Jones
**Surface Elevation:** 716
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 694530
**Easting:** 2447310
**Drilling Company:** B.B.R. Drilling Co.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 18.00 | 0.00 | 18.00 | Casing or Surface Material | | | | 0.00 |
| 1.00 | 18.00 | 19.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.67 | 19.00 | 19.67 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.83 | 19.67 | 20.50 | **Coal, Redstone** | | ac, cv, ev | | 0.00 |
| 0.42 | 20.50 | 20.92 | **Coal W/Bone Streaks** | | ac, cv, ev | | 0.00 |
| 2.83 | 20.92 | 23.75 | Limestone | | ak, cs, es | Y | 2.83 |
| 9.50 | 23.75 | 33.25 | Shaley Layered Limestone | | ak, cs, es | Y | 9.50 |
| 2.75 | 33.25 | 36.00 | Shaley Layered Limestone | | ak, cs, es | Y | 2.75 |
| 1.50 | 36.00 | 37.50 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 |
| 1.34 | 37.50 | 38.84 | Limestone | | ak, cs, es | Y | 1.34 |
| 0.32 | 38.84 | 39.16 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.59 | 39.16 | 39.75 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 3.09 | 39.75 | 42.84 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 2.08 | 42.84 | 44.92 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 1.24 | 44.92 | 46.16 | **Coal W/Shale Layers, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.59 | 46.16 | 46.75 | Shaley Nodular Limestone | | ak, cs, es | Y | 0.59 |
| 0.17 | 46.75 | 46.92 | Black Shale | | ac, cm, em | | 0.00 |
| 4.74 | 46.92 | 51.66 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.18 | 51.66 | 51.84 | Black Shale | | ac, cm, em | | 0.00 |
| 10.16 | 51.84 | 62.00 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 |
| | Total Depth | 62.00 | | | | | 17.01 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **17.01**

**Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** **27%**

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 17.01 | 27% |
| Soft Rock: | 44.99 | 73% |
| | 62.00 | |

ATTACHMENT 13

## DIAMOND DRILL HOLE: ON-2

**Field Engineer:** Melvin Jones
**Surface Elevation:** 744
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 694530
**Easting:** 2447045
**Drilling Company:** B.B.R. Drilling Co.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 6.00 | 0.00 | 6.00 | Casing or Surface Material | | | | 0.00 |
| 2.50 | 6.00 | 8.50 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 8.92 | 8.50 | 17.42 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 7.92 | 17.42 | 25.34 | Limestone | | ak, cs, es | Y | 7.92 |
| 1.66 | 25.34 | 27.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.42 | 27.00 | 27.42 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 1.00 | 27.42 | 28.42 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 5.83 | 28.42 | 34.25 | Limestone | | ak, cs, es | Y | 5.83 |
| 1.83 | 34.25 | 36.08 | Limestone | | ak, cs, es | Y | 1.83 |
| 0.50 | 36.08 | 36.58 | Light Gray Green Shale | | cm, em | | 0.00 |
| 0.67 | 36.58 | 37.25 | Sandstone | | cs, es | Y | 0.67 |
| 1.50 | 37.25 | 38.75 | Gray Sandstone w/ Shale Streaks | | cs, es | Y | 1.50 |
| 3.59 | 38.75 | 42.34 | Light Gray/Green Shale W/Limestone Nods | | ak, cm, em | | 0.00 |
| 2.50 | 42.34 | 44.84 | Limestone | | ak, cs, es | Y | 2.50 |
| 0.91 | 44.84 | 45.75 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 |
| 0.09 | 45.75 | 45.84 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 |
| 1.41 | 45.84 | 47.25 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.25 | 47.25 | 47.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.16 | 47.50 | 47.66 | Black Fireclay | | ac, cv, ev | | 0.00 |
| 1.00 | 47.66 | 48.66 | **Coal, Redstone** | | ac, cv, ev | | 0.00 |
| 0.34 | 48.66 | 49.00 | **Coal** | | ac, cv, ev | | 0.00 |
| 3.50 | 49.00 | 52.50 | Limestone | | ak, cs, es | Y | 3.50 |
| 4.34 | 52.50 | 56.84 | Limestone | | ak, cs, es | Y | 4.34 |
| 5.74 | 56.84 | 62.58 | Limestone | | ak, cs, es | Y | 5.74 |
| 2.26 | 62.58 | 64.84 | Limestone | | ak, cs, es | Y | 2.26 |
| 1.66 | 64.84 | 66.50 | Shaley Massive Limestone | | ak, cs, es | Y | 1.66 |
| 2.50 | 66.50 | 69.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 3.00 | 69.00 | 72.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.58 | 72.00 | 72.58 | Dark Gray Fireclay | | cv, ev | | 0.00 |
| 0.42 | 72.58 | 73.00 | **Coal, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.25 | 73.00 | 73.25 | **Light Gray Green Fireclay** | | cv, ev | | 0.00 |
| 0.17 | 73.25 | 73.42 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.16 | 73.42 | 73.58 | **Light Gray Green Fireclay** | | cv, ev | | 0.00 |
| 0.76 | 73.58 | 74.34 | **Coal** | | ac, cv, ev | | 0.00 |
| 0.66 | 74.34 | 75.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 5.66 | 75.00 | 80.66 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 0.92 | 80.66 | 81.58 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.50 | 81.58 | 82.08 | Limestone | | ak, cs, es | Y | 0.50 |
| 3.34 | 82.08 | 85.42 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 |
| 2.08 | 85.42 | 87.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 2.75 | 87.50 | 90.25 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.75 | 90.25 | 91.00 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 10.00 | 91.00 | 101.00 | Sandstone | | cs, es | Y | 10.00 |
| | Total Depth | 101.00 | | | | | 48.25 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

**Total Thickness of Hard Rock Overlying Mining Unit** **48.25**

ATTACHMENT 13

DIAMOND DRILL HOLE:
ON-2

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **48%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 48.25 | 48% |
| Soft Rock: | 52.75 | 52% |
| | 101.00 | |

ATTACHMENT 13

# DIAMOND DRILL HOLE: ON-3

**Field Engineer:** Walter Balcar
**Surface Elevation:** 745
**Drill Hole Coordinates** (State Plane 1927 NA Datum)
**Northing:** 694305
**Easting:** 2447020
**Drilling Company:** B.B.R. Drilling Co.

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| 10.00 | 0.00 | 10.00 | Casing or Surface Material | | | | 0.00 |
| 0.42 | 10.00 | 10.42 | Limestone | | ak, cs, es | Y | 0.42 |
| 1.00 | 10.42 | 11.42 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.25 | 11.42 | 11.67 | Dark Gray Shale | | cm, em | | 0.00 |
| 4.67 | 11.67 | 16.34 | Shaley Layered Limestone | | ak, cs, es | Y | 4.67 |
| 2.00 | 16.34 | 18.34 | **Coal, Fishpot** | | ac, cv, ev | | 0.00 |
| 0.82 | 18.34 | 19.16 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.68 | 19.16 | 19.84 | Limestone | | ak, cs, es | Y | 0.68 |
| 1.58 | 19.84 | 21.42 | Limestone | | ak, cs, es | Y | 1.58 |
| 10.33 | 21.42 | 31.75 | Limestone | | ak, cs, es | Y | 10.33 |
| 1.17 | 31.75 | 32.92 | Light Gray Green Shale | | cm, em | | 0.00 |
| 5.66 | 32.92 | 38.58 | Limestone | | ak, cs, es | Y | 5.66 |
| 1.09 | 38.58 | 39.67 | Shaley Limestone | | ak, cs, es | Y | 1.09 |
| 0.17 | 39.67 | 39.84 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 0.58 | 39.84 | 40.42 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 1.08 | 40.42 | 41.50 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 1.50 | 41.50 | 43.00 | Light Gray Green Shale | | cm, em | | 0.00 |
| 1.84 | 43.00 | 44.84 | Sandstone | | cs, es | Y | 1.84 |
| 2.58 | 44.84 | 47.42 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 1.92 | 47.42 | 49.34 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 |
| 0.58 | 49.34 | 49.92 | Limestone | | ak, cs, es | Y | 0.58 |
| 0.42 | 49.92 | 50.34 | Limestone | | ak, cs, es | Y | 0.42 |
| 1.82 | 50.34 | 52.16 | Light Gray/Green Fireclay w/ Limestone Nods | | ak, cv, ev | | 0.00 |
| 0.34 | 52.16 | 52.50 | Black Shale | | ac, cm, em | | 0.00 |
| 1.92 | 52.50 | 54.42 | **Coal W/Shale Layers, Redstone** | | ac, cv, ev | | 0.00 |
| 0.16 | 54.42 | 54.58 | Black Shale | | ac, cm, em | | 0.00 |
| 7.09 | 54.58 | 61.67 | Shaley Layered Limestone | | ak, cs, es | Y | 7.09 |
| 1.83 | 61.67 | 63.50 | Limestone | | ak, cs, es | Y | 1.83 |
| 0.50 | 63.50 | 64.00 | Dark Gray Shale | | cm, em | | 0.00 |
| 3.08 | 64.00 | 67.08 | Limestone | | ak, cs, es | Y | 3.08 |
| 1.08 | 67.08 | 68.16 | Shaley Limestone | | ak, cs, es | Y | 1.08 |
| 2.00 | 68.16 | 70.16 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 |
| 0.84 | 70.16 | 71.00 | Limestone | | ak, cs, es | Y | 0.84 |
| 1.25 | 71.00 | 72.25 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 |
| 2.50 | 72.25 | 74.75 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 3.41 | 74.75 | 78.16 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 |
| 0.42 | 78.16 | 78.58 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| 1.34 | 78.58 | 79.92 | **Coal W/Shale Layers, Pittsburgh No. 8 Roof Coal** | | ac, cv, ev | | 0.00 |
| 0.33 | 79.92 | 80.25 | Light Gray Green Massive Shale | | cm, em | | 0.00 |
| 5.42 | 80.25 | 85.67 | **Coal, Pittsburgh No. 8** | | ac, cv, ev | | 0.00 |
| 3.08 | 85.67 | 88.75 | Dark Gray Massive Shale | | cm, em | | 0.00 |
| 3.59 | 88.75 | 92.34 | Light Gray/Green Massive Shale w/ Limestone Nods | | ak, cm, em | | 0.00 |
| 4.16 | 92.34 | 96.50 | Light Gray Green Fireclay | | cv, ev | | 0.00 |
| | Total Depth | 96.50 | | | | | 41.19 |

Acid Producing: ac
Alkaline Producing: ak
Compactible: c (v-very, m-moderate, s-slight)
Erodible: e (v-very, m-moderate, s-slight)

ATTACHMENT 13

DIAMOND DRILL HOLE:
ON-3

| Thickness (ft.) | Depth From (ft.) | To (ft.) | Strata | Water Bearing | Physical Properties | HR | Thickness of Hard Rock (ft.) |
|---|---|---|---|---|---|---|---|
| **Total Thickness of Hard Rock Overlying Mining Unit** | | | | | | | **41.19** |
| **Thickness and Percentage of Hard and Soft Rock Overlying Mining Unit** | | | | | | | **43%** |

| | Thickness (Ft.) | Percent (%) |
|---|---|---|
| Hard Rock: | 41.19 | 43% |
| Soft Rock: | 55.31 | 57% |
| | 96.50 | |

(5) Submit required analyses on the Hydrologic Analyses for representative wells and developed springs. Based on the data on the Ground Water Inventory and Hydrologic Analyses, identify the seasonal variations of ground water quality and quantity.

(6) Submit Analysis of Existing Ground Water File Data from the Division of Water.
**See Addendum to Part 2, Item C(6)**

## D. SURFACE WATER INFORMATION

(1) List the name of the watershed that will receive water discharges from the proposed shadow and adjacent areas as listed in the "Gazetteer of Ohio Streams" published by the Ohio Department of Natural Resources.

**Captina Creek**

(2) Are there any perennial or intermittent streams or other surface water bodies, including public water supply sources, on the proposed shadow area and adjacent area?

Yes ☒ No ☐ If "yes," submit Surface Water Inventory and Hydrologic Analyses.

(3) Based on the quality and quantity measurements listed on Surface Water Inventory and Hydrologic Analyses, and from other information available to the applicant and submitted with this application, identify the seasonal variations in water quality and quantity for the surface water sources on this application area and adjacent areas.

**See Hydrologic Analyses**

## E. CLIMATOLOGICAL INFORMATION

If requested by the chief, subsequent to the filing of the permit application, provide the climatological information.

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## GROUND WATER DESCRIPTION

Applicant's Name **American Energy Corporation** **D-0425-12**

| Aquifer/Zone Identification | Aquifer/Zone Lithology | Aquifer/Zone Thickness | Aquifer/Zone Elev. (msl) | Aquifer/Zone Horizontal Extent | Aquifer/Zone Known Uses | Approximate Rate of Discharge of Aquifer/Zone (gpm or cps) |
|---|---|---|---|---|---|---|
| **A** | **Shale, Limestone, Sandstone** | **150'** | **1080 - 1260** | **Mid Ridge to Ridge Top** | **Domestic, Agricultural** | **<1 gpm** |
| **B** | **#12 Coal and Shale** | **60'** | **1020 - 1110** | **Ridge Base to Mid-Ridge** | **Domestic, Agricultural** | **Up to 18.8 gpm** |
| **C** | **#11 Coal, Shale, Sandstone** | **110'** | **910 - 1050** | **Regional to Ridge Base** | **Domestic Agricultural** | **Up to 6.25 gpm** |
| **D** | **#10 Coal, Shale, Limestone** | **50'** | **860 - 940** | **Regional to Ridge Base** | **Domestic, Agricultural** | **Unknown** |
| **E** | **#9 Coal, Shale, Limestone** | **110'** | **750 - 890** | **Regional** | **Domestic, Agricultural** | **Up to 3.5 gpm** |
| **F** | **#8 Coal, Shale, Limestone** | **100'** | **650 - 780** | **Regional** | **Domestic, Agricultural** | **<1 gpm** |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Part 2: Section C**



AEC 03586

Ohio Department of Natural Resources

TED STRICKLAND, GOVERNOR SEAN D. LOGAN, DIRECTOR

*Deborah F. Hoffman • Chief*

**Division of Water**

Date: December 24, 2007

## ANALYSIS OF EXISTING GROUND WATER FILE DATA

Prepared By: Bill Haiker, Hydrogeologist

Operator: American Energy Corporation

County: Belmont

Township: Washington

Section(s): 3,4,9,10,13,14,15,19,20,21,25,26,27

Number of located water well logs within 1,000 foot radius of site (copies attached): 5 Field located: 5

General description of local hydrology:

Ground water in the area is generally obtained from interbedded shale, limestone and sandstone bedrock. Well depths can range from 30 to over 150 feet with initial yields of 0 to 5 gallons per minute. Dry holes are possible.

Areas of particular concern:

Underground mining the #8 coal seam at an elevation of 685 to 645 feet MSL could adversely impact wells within the 1000-foot boundary. All wells should be located and monitored for any water quantity or quality change.

# WELL LOG AND DRILLING REPORT

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 402983

WL-5

County BELMONT Township WASHINGTON Section of Township

Owner WILLIAM FIELDING Address ALLENDONIA OHIO

Location of property 5 MILES S.W. OF ALLENDONIA CO. RD. 86

## CONSTRUCTION DETAILS

Casing diameter 6" Length of casing 60'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 4-9-75

## BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 5 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water ft.

Quality (clear, cloudy, taste, odor)

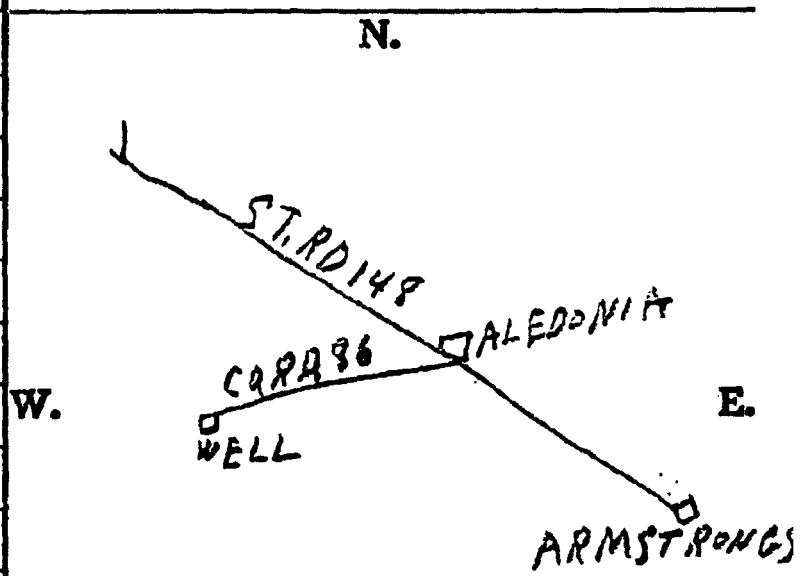
Pump installed by

## WELL LOG*

| Formations Sandstone, shale, limestone, gravel and clay | From | To |
|---|---|---|
| CLAY | 0 Feet | 10 Ft. |
| RED SHALE | 10 | 21 |
| GREY SHALE | 21 | 28 |
| RED SHALE | 28 | 35 |
| SAND STONE | 35 | 37 |
| GREY SHALE | 37 | 58 |
| | | |
| | | |
| | | |
| | | |
| | | |
| WATER AT 22' | | |
| | | |
| | | |
| | | |

## SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.




Drilling Firm KRIECHBAUM DRILLING Date 4-12-75

Address JACOBSBURG OHIO Signed LaVerne Kriechbaum

*If additional space is needed to complete well log, use next consecutive numbered form.

WL-16.00

# WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1939 Fountain Square Drive
Columbus, Ohio 43224

686833

TYPE OR USE PEN
SELF-TRANSCRIBING
PRESS HARDI

Permit Number 20

COUNTY Belmont TOWNSHIP Washington SECTION OF TOWNSHIP 21

OWNER Chris Perkins PROPERTY ADDRESS Route #1, Pugh Ridge Road, Alledonia, Ohio 43902

LOCATION OF PROPERTY 3.8 miles north of State Route 556 on the east side of Township Road 86.

## CONSTRUCTION DETAILS

**CASING**
Casing Diameter 8" I.D. in. Length of Casing 101 ft.
Type: ☐ Steel ☐ Galv. ☒ PVC ☐ Other
Joints: ☐ Threaded ☐ Welded ☒ Solvent ☐ Other

**SCREEN**
Type (wire wrapped, louvered, etc.) Perforation Material PVC
Length 60 ft. Diameter 8" I.D. in.
Set between 40 ft. and 100 ft. Slot 3/8"

**GROUT**
Material Gravel / Concrete Volume used 5000#/560#
Method of installation Poured
Depth: placed from 100' / 25' ft. to 25' / 0' ft.
☐ Rotary ☒ Cable ☐ Augered ☐ Driven ☐ Dug ☐ Other

## BAILING OR PUMPING TEST
(Specify one by circling)

**WELL TEST**
Test rate ½ gpm Duration of test 2 hrs.
(Drawdown) water level during pumping) 45'6" ft.
Measured from: ☐ top of casing ☒ ground level ☐ Other
Static Level (depth to water) 55'6" ft. Date: 8/5/88
Quality (clear, cloudy, taste, odor) Clear

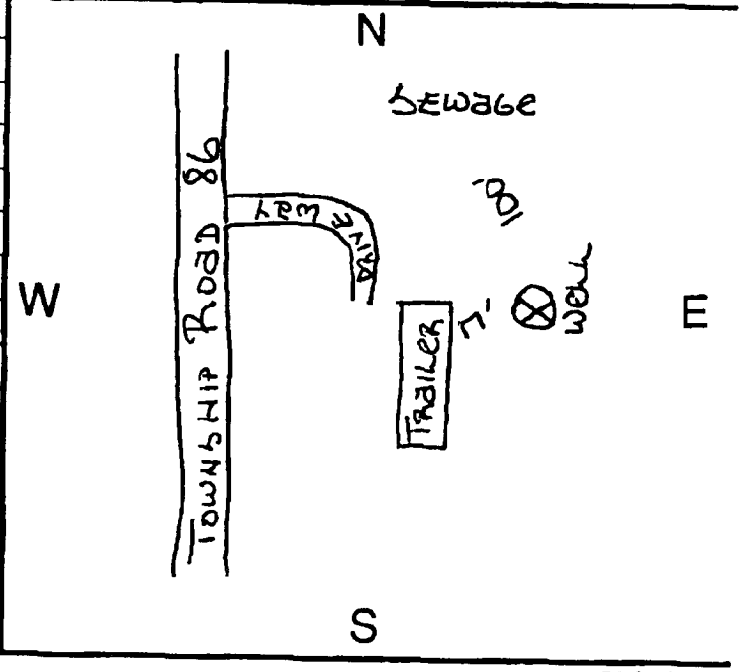
**PUMP**
Type of pump _____ Capacity _____ gpm
Pump set at _____ ft.
Pump installed by Chris Perkins (owner of well)
**Pitless Device** ☐ Adapter ☐ Preassembled unit
**Use of Well** Domestic

## WELL LOG*

| Show color, texture, hardness, and formation: sandstone, shale, limestone, gravel, clay, sand | From | To |
|---|---|---|
| Yellow clay, soft | 0 ft. | 15 ft. |
| Yellow sandstone, med. | 15' | 20' |
| Soft red shale | 20' | 25' |
| Soft blue shale | 25' | 30' |
| Soft gray shale | 30' | 35' |
| Med. yellow sandstone | 35' | 38' |
| Hard blue sandstone | 38' | 40' |
| Very hard white sand & lime | 40' | 42' |
| Hard white sand | 42' | 45' |
| Soft gray shale | 45' | 60' |
| Med. sandy gray shale | 60' | 62' |
| Med. brown sandstone | 62' | 68' |
| Hard white sand | 68' | 74' |
| Soft gray shale | 74' | 76' |
| Continued on #686834 | | |

## SKETCH SHOWING LOCATION

Show distances well lies from numbered state highways, street intersections, county roads, etc.




* If additional space is needed to complete well log, use next consecutively numbered form.

DNR 7802.88

DRILLING FIRM Wilhelm's Drilling Service SIGNED X John Wilhelm

ADDRESS 43872 Township Road 256 DATE August 9, 1988

STATE, ZIP Lewisville, Ohio 43754 ODH REGISTRATION NUMBER 1562

Completion of this form is required by 1521.05, Ohio Revised Code - file within 30 days after completion of drilling.

**ORIGINAL COPY - ODNR, DIVISION OF WATER, 1939 FOUNTAIN SQ. DRIVE, COLS., OHIO 43224**

Blue - Customer's Copy Pink - Driller's Copy Green - Local Health Dept. Copy

AEC 03589

T. Gray
Williams
740-926-9112

WL-16
686834

# WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
1939 Fountain Square Drive
Columbus, Ohio 43224

TYPE OR USE PEN
SELF-TRANSCRIBING
PRESS HARD!

Permit Number 20

Page 2 (continued)

COUNTY Belmont TOWNSHIP Washington SECTION OF TOWNSHIP 21

OWNER Chris Perkins PROPERTY ADDRESS Route #1, Pugh Ridge Road, Alledonia, Ohio 43902

LOCATION OF PROPERTY 3.8 miles north of State Route 556 on the east side of Township Road 86.

## CONSTRUCTION DETAILS

**CASING**
Casing Diameter _____ in. Length of Casing _____ ft.
Type: ☐ Steel ☐ Galv. ☐ PVC ☐ Other _____
Joints: ☐ Threaded ☐ Welded ☐ Solvent ☐ Other _____

**SCREEN**
Type (wire wrapped, louvered, etc.) _____ Material _____
Length _____ ft. Diameter _____ in.
Set between _____ ft. and _____ ft. Slot _____

**GROUT**
Material _____ Volume used _____
Method of installation _____
Depth: placed from _____ ft. to _____ ft.
☐ Rotary ☐ Cable ☐ Augered ☐ Driven ☐ Dug ☐ Other _____

## BAILING OR PUMPING TEST
(Specify one by circling)

**WELL TEST**
Test rate _____ gpm Duration of test _____ hrs.
Drawdown (water level during pumping) _____ ft.
Measured from: ☐ top of casing ☐ ground level ☐ Other _____
Static Level (depth to water) _____ ft. Date: _____
Quality (clear, cloudy, taste, odor) _____

**PUMP**
Type of pump _____ Capacity _____ gpm
Pump set at _____ ft.
Pump installed by _____
**Pitless Device** ☐ Adapter ☐ Preassembled unit
**Use of Well** _____

## WELL LOG*

| Show color, texture, hardness, and formation: sandstone, shale, limestone, gravel, clay, sand | From | To |
|---|---|---|
| Continued from #686833 | 0 ft. | ft. |
| Soft red shale | 76' | 85' |
| Soft gray shale | 85' | 95' |
| Med. sandy gray shale | 95' | 98' |
| Hard lime and gray shale | 98' | 100' |
| | | |
| NOTE: Hit first vein of water at 38 feet and the second vein of water at 62 feet. Grout used to finish well was gravel poured from 100 feet to 25 feet and concrete poured from 25 feet to ? feet. (5000# gravel & 560# concrete) | | |

## SKETCH SHOWING LOCATION

Show distances well lies from numbered state highways, street intersections, county roads, etc.

N
W
E
S

DNR 7802.

* If additional space is needed to complete well log, use next consecutively numbered form.

DRILLING FIRM Wilhelm's Drilling Service SIGNED John Wilhelm
ADDRESS 43872 Township Road 256 DATE August 9, 1988
CITY, STATE, ZIP Lewisville, Ohio 43754 ODH REGISTRATION NUMBER 1562

Completion of this form is required by 1521.05 Ohio Revised Code - file within 30 days after completion of drilling. MAY 21 2010

AEC 03590

# WELL LOG AND DRILLING REPORT

ORIGINAL

NO CARBON PAPER NECESSARY— SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
65 S. Front St., Rm. 815 Phone (614) 469-2646
Columbus, Ohio 43215

No. 402985
WL-21

County BELMONT Township WASHINGTON Section of Township

Owner KENNETH PERKINS Address ALLEDONIA OHIO

Location of property 5 MILES S.W. OF ALLEDONIA

## CONSTRUCTION DETAILS

Casing diameter 9" Length of casing 25'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 5-2-75

## BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 2 G.P.M. Duration of test hrs

Drawdown ft. Date

Static level-depth to water ft

Quality (clear) cloudy, taste, odor)

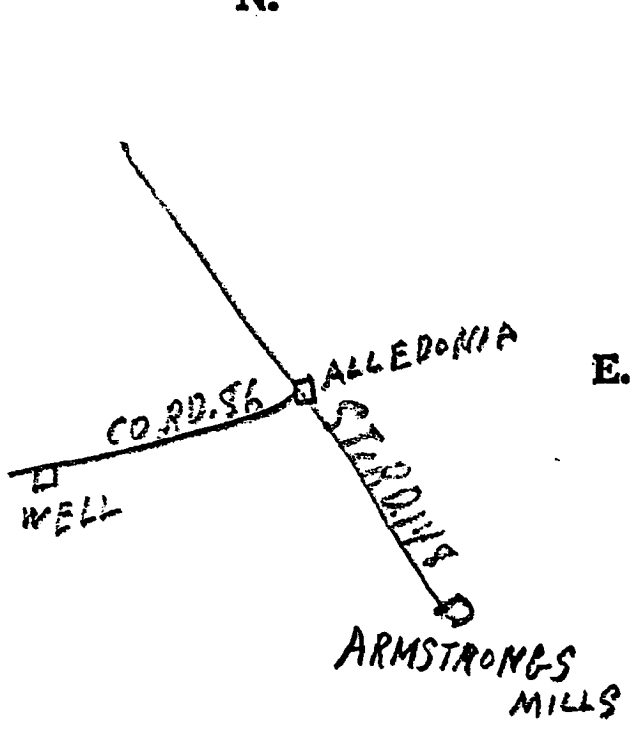
Pump installed by

## WELL LOG*

| Formations Sandstone, shale, limestone, gravel and clay | From | To |
|---|---|---|
| CLAY | 0 Feet | 2 Ft. |
| SANDSTONE | 2 | 4 |
| RED CLAY | 4 | 20 |
| SANDSTONE | 20 | 23 |
| GREY SHALE | 23 | 40 |
| SANDSTONE | 40 | 43 |
| SHALE | 43 | 60 |
| SANDSTONE | 60 | 72 |
| DARK SHALE | 72 | 84 |
| SANDSTONE | 84 | 86 |
| DARK SHALE | 86 | 90 |
| SANDSTONE | 90 | 92 |

## SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.




Drilling Firm KRIECHBAUM Date 5-5-75

Address TACORSBURG OHIO Signed

*If additional space is needed to complete well log, use next consecutive numbered form.

AEC 03591

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

## GROUND WATER INVENTORY

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12 Pg1

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Depth of Well Below Land Surface (feet)* | SWL of Well Below Land Surface (ft)* | Discharge for Spring, Under-ground Mine, etc. (gpm or cfs)* | Date Measured | Aquifer/ Water-bearing Zone ID* | Known Uses, including public water | Name of Owner |
|---|---|---|---|---|---|---|---|---|---|
| DS-1 | X 2,425,897 Y 686,875 | 1180' | -- | -- | 0.47 gpm | 9/07 | B | +Livestock | N. Moore |
| DS-3 | X 2,425,661 Y 689,875 | 1160' | -- | -- | DRY | 9/07, 12/07, 2/08 | B | None | T. Craig |
| DS-21.00 | X 2,427,033 Y 689,408 | 1230' | -- | -- | -- | 9/98-1/99,9/07, 2/08 | B | None | B. Hawthorne |
| DS-28 | X 2,425,540 Y 687,808 | 1200' | -- | -- | -- | 9/07, 2/08 | B | None | J. Thomas |
| DS-28.01 | X 2,429,693 Y 690,957 | 1200' | -- | -- | DRY | 9/07, 12/07, 2/08 | B | None | L. Lucas |
| DS-28.02 | X 2,429,717 Y 690,042 | 1250' | -- | -- | -- | 9/07, 12/07, 2/08 | A | +Livestock | L. Lucas |
| DS-30.02 | X 2,431,469 Y 692,148 | 1250' | -- | -- | DRY | 9/07, 12/07, 2/08 | A | None | Wm. Lupton |
| DS-72 | X 2,426,904 Y 688,916 | 1260' | -- | -- | -- | 9/07, 7/09 | A | +Livestock | N. Lindsey |
| DS-405 | X2,428,372 Y 684,329 | 1170 | -- | -- | -- | 9/01, 1/02, 2/02 | B | None | N & D Moore |
| WL-5 | X 2,425,970 Y 686,642 | 1215' | 58' | -- | -- | 9/07 | B | None | G. Moore |

*NOTE: If well depth, static water level,or aquifer/water-bearing zone information is unobtainable, submit as an addendum to **GROUND WATER INVENTORY** a statement giving the reasons why the information is unobtainable. Do not include SWL and discharge values if they are reported on the Hydrologic Analyses.

05/08 DNR-744-9083 **Footnote: +Used supply likely to be impacted by mining induced subsidence.**

AEC 03592

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## GROUND WATER INVENTORY

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12 Pg2

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Depth of Well Below Land Surface (feet)* | SWL of Well Below Land Surface (ft)* | Discharge for Spring, Under-ground Mine, etc. (gpm or cfs)* | Date Measured | Aquifer/ Water-bearing Zone ID* | Known Uses, including public water | Name of Owner |
|---|---|---|---|---|---|---|---|---|---|
| **W-6** | **X 2,425,201 Y 688,009** | **1255'** | **81.5'** | -- | -- | **9/07** | **B** | **None** | **J. Thomas** |
| **WL-16.00** | **X 2,396,112 Y 689,198** | **1345'** | **100'** | -- | -- | **4/10** | **A** | **+Domestic** | **Chris E. Perkins** |
| **W-19.00** | **X 2,425,756 Y 691,488** | **1240'** | **117.5'** | -- | -- | **9/07, 12/07, 2/08** | **B** | **+Domestic** | **T. Craig** |
| **W-19.02** | **X 2,425,687 Y 690,500** | **1277'** | **130' Reported** | -- | -- | **9/07,7/09** | **B** | **None** | **T. Craig** |
| **WL-21** | **X 2,427,013 Y 688,778** | **1280'** | **91'** | -- | -- | **9/07, 2/08,7/09** | **B** | **None** | **I & K Lepley** |
| **W-27.02** | **X 2,431,110 Y 693,036** | **1270'** | **77.5'** | -- | -- | **9/07, 12/07, 2/08** | **A** | **Non-potable +Domestic** | **G. Deaton** |
| **W-30.01** | **X 2,431,745 Y 692,563** | **1330'** | **110' Sealed Reported** | -- | -- | **9/07** | **A** | **None** | **Wm. Lupton** |
| **W-35.00** | **X 2,430,197 Y 690,313** | **1290'** | **62'** | -- | -- | **9/07,7/09** | **A & B** | **None** | **K. Blakely** |
| **W-38.00** | **X 2,430,659 Y 689,462** | **1250'** | **54'** | -- | -- | **9/07,12/07, 2/08** | **B** | **None** | **S. Kovacs** |
| **W-41.00** | **X 2,431,857 Y 688,215** | **1260'** | **91'** | -- | -- | **9/07, 2/08,7/09** | **B** | **None** | **J. & N. Diver** |

*NOTE: If well depth, static water level,or aquifer/water-bearing zone information is unobtainable, submit as an addendum to **GROUND WATER INVENTORY** a statement giving the reasons why the information is unobtainable. Do not include SWL and discharge values if they are reported on the Hydrologic Analyses.

05/08 DNR-744-9083 **Footnote: +Used supply likely to be impacted by mining induced subsidence.**

AEC 03593

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

## GROUND WATER INVENTORY

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12 Pg3

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Depth of Well Below Land Surface (feet)* | SWL of Well Below Land Surface (ft)* | Discharge for Spring, Under-ground Mine, etc. (gpm or cfs)* | Date Measured | Aquifer/ Water-bearing Zone ID* | Known Uses, including public water | Name of Owner |
|---|---|---|---|---|---|---|---|---|---|
| **W-41.03** | **X 2,432,177 Y 688,117** | **1262'** | **132.5'** | -- | -- | **9/07, 12/07, 2/08** | **B** | **None** | **J. & N. Diver** |
| **W-44.00** | **X 2,432,341 Y 685360** | **981'** | **60'** | -- | -- | **9/07, 12/07, 2/08** | **C** | **+Domestic** | **R. & M. Reger** |
| **W-438** | **X 2,432,801 Y 684,632** | **965'** | **27.5'** | -- | -- | **9/07, 12/07, 2/08** | **C** | **+Domestic** | **G. Macko** |
| **DW-7** | **X 2,425,148 Y 687,963** | **1260'** | **25'** | -- | -- | **9/07** | **A** | **None** | **J. Thomas** |
| **DW-19.01** | **X 2,425,979 Y 690,848** | **1260'** | **Concrete Cover** | -- | -- | **9/07** | **Unknown** | **None** | **T & M Craig** |
| **DW-20** | **X 2,426,897 Y 688,757** | **1290'** | **53'** | -- | -- | **9/07, 12/07, 2/08** | **B** | **None** | **I & K Lepley** |
| **DW-27.00** | **X 2,430,865 Y 693,378** | **1275'** | **26'** | -- | -- | **9/07, 12/07, 2/08** | **A** | **+Agriculture** | **G. Deaton** |
| **DW-28.00** | **X 2,429,607 Y 690,608** | **1290'** | **Concrete Cover** | -- | -- | **9/07** | **Unknown** | **None** | **L. Lucas** |
| **DW-29.00** | **X 2,431,093 Y 692,184** | **1265'** | **25.6'** | -- | **DRY** | **9/07, 12/07, 2/08** | **B** | **None** | **E. Butterfield** |
| **DW-30.00** | **X 2,431,519 Y 692,523** | **1310'** | **Sealed** | -- | -- | **9/07, 12/07, 2/08** | **A** | **+Domestic** | **Wm. Lupton** |

*NOTE: If well depth, static water level, or aquifer/water-bearing zone information is unobtainable, submit as an addendum to **GROUND WATER INVENTORY** a statement giving the reasons why the information is unobtainable. Do not include SWL and discharge values if they are reported on the Hydrologic Analyses.

05/08 DNR-744-9083 **Footnote: +Used supply likely to be impacted by mining induced subsidence.**

AEC 03594

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## GROUND WATER INVENTORY

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12 Pg 4

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Depth of Well Below Land Surface (feet)* | SWL of Well Below Land Surface (ft)* | Discharge for Spring, Under-ground Mine, etc. (gpm or cfs)* | Date Measured | Aquifer/ Water-bearing Zone ID* | Known Uses, including public water | Name of Owner |
|---|---|---|---|---|---|---|---|---|---|
| DW-37.00 | X 2,430,688 Y 689,843 | 1260' | 19.4' | -- | -- | 9/07,7/09 | B | None | F. Wente |
| DW-37.01 | X 2,430,658 Y 689,740 | 1260' | 19.4' | -- | -- | 9/07,7/09 | B | None | F. Wente |
| DW-41.01 | X 2,432,003 Y 688,240 | 1261' | 32' | -- | DRY | 9/07, 12/07, 2/08 | B | None | J. & N. Diver |
| DW-41.02 | X 2,432,232 Y 688,095 | 1260' | 37.5' | - | -- | 9/07,9/07 | B | None | J. & N. Diver |
| DW-41.05 | X 2,430,018 Y 687,463 | 1245' | 22' | -- | DRY | 10/07, 12/07, 2/08 | B | None | J. & N. Diver |
| DW-53.00 | X 2,436,304 Y 686,805 | 910' | 16.5' | -- | -- | 9/07 | E | +Domestic | L. Holcomb |
| DW-94.00 | X 2,427,968 Y 689,516 | 1320' | 46.5 | -- | -- | 10/07, 12/07, 2/08 | A | None | B King, Jr. |
| DW-94.01 | X 2,427,864 Y 689,524 | 1320' | 24' | -- | -- | 10/07, 7/09 | A | None | B. King, Jr. |
| | X Y | | | | | | | | |
| | | | | | | | | | |

*NOTE: If well depth, static water level,or aquifer/water-bearing zone information is unobtainable, submit as an addendum to **GROUND WATER INVENTORY** a statement giving the reasons why the information is unobtainable. Do not include SWL and discharge values if they are reported on the Hydrologic Analyses.

05/08 DNR-744-9083 **Footnote: +Used supply likely to be impacted by mining induced subsidence.**

AEC 03595

American Energy Corp.
Century Mine
D-0425-12
Addendum to Part 2, C(2) Ground Water Inventory

The ground water sites listed below could not be sampled and/or measured for the following reasons:

| | |
|---|---|
| DS-3 | Spring had no flow during seasonal observations. Could not sample/measure flow. |
| DS-28.01 | Spring had no flow during seasonal observations. Could not sample/measure flow. |
| DS-30.02 | Spring had no flow during seasonal observations. Could not sample/measure flow. |
| W-4 | Well is abandoned and buried by the owner. It is not available for sampling. |
| DW-19.01 | No access, covered with concrete pad, hand pump broken, Could not sample/measure. |
| DW-28.00 | Well is covered with a concrete pad, could not measure. |
| DW-29.00 | Well was dry during seasonal observations. Could not sample. |
| DW-30.00 | Well is sealed, no access for measurement. |
| W-30.01 | Well has sanitary seal and is disconnected. Could not sample/measure. |
| DW-41.01 | Well was dry during seasonal observations. Could not sample. |
| DW-41.05 | Well was dry during seasonal observations. Could not sample. |

There are approximately forty (40) ground water sites within the hydrologic review area. Refer to groundwater sites that cannot be sampled for reasons stated above.

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation — Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DS-21.00 | | | | | |
| 2 | Lab ID No. | 0709086 | 9808301 | 9810014 | 9811020 | 9812010 | 990105 |
| 3 | Date Measured/Sampled | 09/06/07 | 08/27/98 | 09/28/98 | 10/29/98 | 11/28/98 | 12/30/9 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | Six Month Sampling | | | | |
| 5 | Date Last Precipitation Event (if applicable) | 08/20/07 | 08/26/98 | 09/27/98 | 10/29/98 | 11/25/98 | 12/29/9 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.03 gpm | 0.47 gpm | 0.47 gpm | 0.18 gpm | 0.12 gpm | 0.16 gpm |
| 8 | pH (Standard Units) | 7.23 | 6.90 | 7.40 | 7.90 | 7.70 | 8.40 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 8.1 | 18.0 | 15.0 | 13.0 | 18.0 | 0.00 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 190 | 250.0 | 200.0 | 210.0 | 200.0 | 190.0 |
| 11 | Total Iron (mg/l) | 0.43 | <0.02 | <0.02 | <0.05 | <0.05 | <0.05 |
| 12 | Total Manganese (mg/l) | 0.710 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| 13 | Total Aluminum (mg/l) | 0.11 | -- | -- | -- | -- | -- |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <1.0 | <1.0 | <1.0 | 2.7 | 1.0 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 260 | 270.0 | 230.0 | 260.0 | 240.0 | 260.0 |
| 16 | Total Sulfates (mg/l) | 32 | 34.0 | 31.0 | 33.0 | 40.0 | 40.0 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 500 | 480.0 | 470.0 | 470.0 | 540.0 | 390.0 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD#2, Battle Run Rd.

City Triadelphia State: WV Zip: 26059

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DS-21.00 | DS-1 | WL-5 | W-6 | DW-7 | DW-53.00 |
| 2 | Lab ID No. | 9901314 | 0709264 | 0709263 | 0709307 | 0709306 | 0709198 |
| 3 | Date Measured/Sampled | 01/23/99 | 09/18/07 | 09/18/07 | 09/20/07 | 09/20/07 | 09/14/07 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | Six Month Sampling | L | SUPPLEMENTAL | | | |
| 5 | Date Last Precipitation Event (if applicable) | 01/23/99 | 09/12/07 | 09/12/07 | 09/12/07 | 09/19/07 | 09/12/07 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | 33.5' | 80.9' | 19.7' | 8.6' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 1.0 gpm | 0.47 gpm | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.8 | 7.12 | 6.96 | 7.29 | 6.76 | 6.29 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 2.8 | 8.6 | 22 | 6.7 | 6.2 | 8.4 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 130.0 | 280 | 330 | 240 | 97 | 42 |
| 11 | Total Iron (mg/l) | 0.10 | 1.0 | 0.22 | 13 | 0.44 | 0.24 |
| 12 | Total Manganese (mg/l) | <0.02 | <0.002 | <0.002 | 3.40 | 0.003 | 0.009 |
| 13 | Total Aluminum (mg/l) | -- | 0.55 | 0.18 | 1.4 | 0.27 | 0.41 |
| 14 | Total Suspended Solids (mg/l) | <1.0 | 2.0 | <0.7 | 69 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 90.0 | 360 | 470 | 230 | 150 | 60 |
| 16 | Total Sulfates (mg/l) | 1.20 | 66 | 190 | 35 | 46 | 19 |
| 17 | Specific Conductivity (umhos/cm at 25□C)** | 130.0 | 730 | 1000 | 590 | 480 | 180 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

MAY 0 3 2010

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DS-1 | DW-53.00 | W-16.00 | | | |
| 2 | Lab ID No. | 10041331 | 10041213 | 10041215 | | | |
| 3 | Date Measured/Sampled | 04-27-10 | 04-23-10 | 04-23-10 | | | |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | H | H (Supplemental) | | | | |
| 5 | Date Last Precipitation Event (if applicable) | 4/25/10 | 04-17-10 | 04-17-10 | | | |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | 12.7' | 51.5' | | | |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.18 GPM | -- | -- | | | |
| 8 | pH (Standard Units) | 8.19 | 7.45 | 8.00 | | | |
| 9 | Total Acidity (mg/l $CaCO_3$) | 6.41 | 6.98 | 6.63 | | | |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 232.93 | 44.40 | 190.53 | | | |
| 11 | Total Iron (mg/l) | 4.48 | 0.43 | 0.09 | | | |
| 12 | Total Manganese (mg/l) | 0.12 | 0.20 | <0.03 | | | |
| 13 | Total Aluminum (mg/l) | 1.93 | 0.85 | 0.10 | | | |
| 14 | Total Suspended Solids (mg/l) | 134.0 | 18.0 | 3.0 | | | |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 329.0 | 103.0 | 212.0 | | | |
| 16 | Total Sulfates (mg/l) | 61.0 | 47.0 | 14.0 | | | |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 651 | 195 | 430 | | | |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: INDUSTRIAL LAB ANALYSIS, INC

Address: 65-36th Street

City: Wheeling State: WV Zip: 26003

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

MAY 0 3 2010

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DS-28.02 | | | DS-72 | | |
| 2 | Lab ID No. | 0709084 | 0712012 | 0802186 | 0709254 | 0907332 | 1002288 |
| 3 | Date Measured/Sampled | 09/06/07 | 12/03/07 | 02/18/08 | 09/18/07 | 07/08/09 | 02/17/10 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 08/20/09 | 12/02/07 | 02/17/08 | 09/12/07 | 07/02/09 | 02/13/10 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.03 gpm | 0.23 gpm | 0.31 gpm | 0.065 gpm | 0.05 gpm | 0.24 GPM |
| 8 | pH (Standard Units) | 7.33 | 6.91 | 6.03 | 8.12 | 8.24 | 7.57 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 9.1 | 10 | 4.0 | <0.16 | 1.83 | 3.6[J] |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 320 | 170 | 150 | 210 | 211.07 | 170 |
| 11 | Total Iron (mg/l) | 0.63 | 0.14 | 0.35 | 0.07 | 0.17 | 0.03[J] |
| 12 | Total Manganese (mg/l) | 0.010 | <0.002 | 0.003 | 0.016 | 0.05 | 0.01[J] |
| 13 | Total Aluminum (mg/l) | 1.1 | 0.24 | 0.48 | 0.36 | 0.24 | 0.11 |
| 14 | Total Suspended Solids (mg/l) | 2.0 | <0.87 | <0.87 | <0.87 | 2.0 | <10 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 450 | 220 | 200 | 250 | 221.0 | 310 |
| 16 | Total Sulfates (mg/l) | 82 | 58 | 32 | 38 | 28.0 | 34.6 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 810 | 520 | 520 | 520 | 464 | 426 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | DS-405 | | | DS-405 | DS-28 | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | -- | 0201357 | 0202400 | 10041330 | 0709256 | 0802299 |
| 3 | Date Measured/Sampled | 09/06/01 | 01/24/02 | 02/26/02 | 04-27-10 | 9/18/07 | 2/25/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | H | SUPPLEMENTAL | |
| 5 | Date Last Precipitation Event (if applicable) | 09/10/01 | 01/23/02 | 02/26/02 | 4/25/10 | 09/12/07 | 2/25/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | No Flow | N/A | N/A | 0.84 GPM | <1 gpm | 1.47 gpm |
| 8 | pH (Standard Units) | 09/12/01 | 7.9 | 8.3 | 7.96 | 7.51 | 7.59 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | <1.0 | 4.5 | 4.49 | 6.2 | 1.0 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 43 | 83 | 170.11 | 220 | 120 |
| 11 | Total Iron (mg/l) | | 0.93 | 2.1 | 0.41 | 0.78 | 0.51 |
| 12 | Total Manganese (mg/l) | | <0.02 | 0.05 | <0.03 | 0.090 | 0.015 |
| 13 | Total Aluminum (mg/l) | | -- | -- | 0.09 | 1.1 | 0.74 |
| 14 | Total Suspended Solids (mg/l) | | <1.0 | 3.3 | 5.0 | 180 | 11 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 60 | 120 | 231.0 | 250 | 200 |
| 16 | Total Sulfates (mg/l) | | 27 | 25 | 49.0 | 41 | 41 |
| 17 | Specific Conductivity (umhos/cm at 25° C)** | | 150 | 220 | 494 | 540 | 390 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc./Industrial Labs

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-3)

| | STATE PLANE COORDINATES: | 2428372.5 | | | 684329.56 | LOCATION | PANEL |
|---|---|---|---|---|---|---|---|
| 1. | Identification No. Of Sampling Station From Hydrology Map | DS 405 | DS 405 | | | | |
| 2. | Lab Identification Number | 0201357 | 0202400 | | | | |
| 3. | High (H)/Low (L) Designation (if applicable) | I | H | | | | |
| 4. | Surface Elevation for Sampling Station (msl) | 1170 | 1170 | | | | |
| 5. | Depth of Well below Land Surface (msl) | NA | NA | | | | |
| 6. | Static Water Level of Well below Land Surface (feet) | NA | NA | | | | |
| 7. | Flow for Spring/Stream (gpm) | NA | NA | | | | |
| 8. | Date Above Measurements Made | 1/24/2002 | 2/26/2002 | | | | |
| 9. | Aquifer/Zone Identification for Well/Spring | B | B | | | | |
| 10. | pH(Standard Units) | 7.9 | 8.3 | | | | |
| 11. | Total Acidity (mg/l $CaCO_3$) | <1.0 | 4.5 | | | | |
| 12. | Total Alkalinity (mg/l $CaCO_3$) | 43 | 83 | | | | |
| 13. | Specific Conductivity (umhos/cm at 25 C) | 150 | 220 | | | | |
| 14. | Total Dissolved Solids (mg/l) | ND | ND | | | | |
| 15. | Total Manganese (mg/l) | <0.02 | 0.05 | | | | |
| 16. | Total Sulfates (mg/l) | 27 | 25 | | | | |
| 17. | Total Iron (mg/l) | 0.93 | 2.1 | | | | |
| 18. | Total Suspended Solids (mg/l) | <1.0 | 3.3 | | | | |
| 19. | Total Hardness (mg/l $CACO_3$) | 60 | 120 | | | | |
| 20. | Nitrates (mg/l) | 1.6 | 1.5 | | flows were unavailable | | |
| 21. | Date Sampled for Analysis | 1/24/2002 | 2/26/2002 | | | | |
| 22. | Date Last Precipitation Event Occurred | 1/23/2002 | 2/26/2002 | | | | |

Laboratory Name **Tra-Det Inc.**
Address **P.O. Box 2019 Wheeling**
State **West Virginia** Zip **26003-0219**

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | W-19.00 | | | W-19.02 | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709110 | 0712011 | 10041217 | 0709111 | 0907333 | 1002289 |
| 3 | Date Measured/Sampled | 09/10/07 | 12/03/07 | 04/23/10 | 09/13/07 | 07/08/09 | 02/17/10 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/09/07 | 12/02/07 | 04/17/10 | 09/09/07 | 07/02/09 | 02/13/10 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 96' | 98.3' | 66.2' | 57.5' | 62.3' | 68.3' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.44 | 7.26 | 7.98 | 7.20 | 8.01 | 7.42 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 6.8 | 8.7 | 11.00 | 12 | 10.73 | 19 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 240 | 250 | 221.66 | 250 | 249.73 | 240 |
| 11 | Total Iron (mg/l) | 0.14 | 0.03 | 1.16 | 0.57 | 0.16 | 4.65 |
| 12 | Total Manganese (mg/l) | <0.002 | <0.002 | 0.07 | 0.007 | <0.03 | 0.11 |
| 13 | Total Aluminum (mg/l) | 0.27 | <0.04 | 0.09 | 0.49 | 0.10 | 4.73 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <0.87 | 12.0 | <0.87 | <1.0 | 76 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 340 | 250 | 127.0 | 400 | 357.0 | 330 |
| 16 | Total Sulfates (mg/l) | 120 | 110 | 129.0 | 53 | 51.0 | 52.2 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 740 | 740 | 718 | 820 | 749 | 748 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | ID No. Of Sampling Site From Hydrology Map | WL-21 | | | W-27.02 | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709305 | 0802298 | 0907331 | 0709032 | 0712007 | 0802183 |
| 3 | Date Measured/Sampled | 09/20/07 | 2/25/08 | 07/08/09 | 09/06/07 | 12/03/07 | 02/18/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | H | I | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 2/25/08 | 7/02/09 | 08/20/07 | 12/02/07 | 02/17/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 44.9' | 34.0' | 38.4' | 24.5' | 20' | 15.3' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.05 | 6.63 | 7.40 | 6.91 | 7.08 | 7.18 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 7.4 | 2.8 | 13.29 | 7.4 | 12 | 6.0 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 380 | 92 | 146.93 | 240 | 230 | 240 |
| 11 | Total Iron (mg/l) | 0.75 | 0.17 | 0.08 | 1.8 | 0.20 | 0.38 |
| 12 | Total Manganese (mg/l) | 0.006 | <0.002 | <0.03 | 0.780 | 0.046 | 0.330 |
| 13 | Total Aluminum (mg/l) | 0.32 | 0.33 | 0.14 | 0.18 | 0.30 | <0.04 |
| 14 | Total Suspended Solids (mg/l) | 2.7 | <0.87 | <1.0 | 1.3 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 190 | 130 | 176.0 | 290 | 240 | 240 |
| 16 | Total Sulfates (mg/l) | 44 | 41 | 37.0 | 38 | 38 | 32 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 400 | 310 | 374 | 570 | 590 | 560 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | W-35.00 | | | W-38.00 | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709195 | 0907325 | 1002290 | 0709112 | 0712013 | 0802187 |
| 3 | Date Measured/Sampled | 09/13/07 | 07/08/09 | 02/17/10 | 09/06/07 | 12/03/07 | 02/18/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/09/07 | 07/02/09 | 02/10/10 | 08/20/07 | 12/02/07 | 02/17/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 16.2' | 17.0' | 13.0' | 21.3' | 34.7' | 26.2' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.22 | 8.09 | 7.51 | 6.84 | 6.78 | 7.25 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 10 | 7.06 | 4.5 | 24 | 10 | 1.8 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 110 | 116.02 | 120 | 230 | 130 | 86 |
| 11 | Total Iron (mg/l) | 0.09 | 0.10 | 0.18 | 0.51 | 1.6 | 0.75 |
| 12 | Total Manganese (mg/l) | <0.002 | <0.03 | 0.02 | 0.013 | 0.036 | 0.020 |
| 13 | Total Aluminum (mg/l) | 0.29 | 0.14 | 0.15 | 0.26 | 2.8 | 0.97 |
| 14 | Total Suspended Solids (mg/l) | 150 | 7.0 | <20 | 8.7 | 3.3 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 150 | 146.0 | 600 | 360 | 160 | 120 |
| 16 | Total Sulfates (mg/l) | 15 | 40.0 | 18.9 | 67 | 46 | 30 |
| 17 | Specific Conductivity (umhos/cm at 25 C)** | 310 | 295 | 284 | 670 | 450 | 300 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | W-41.00 | | | W-41.03 | | |
| 2 | Lab ID No. | 0709200 | 0802300 | 0907328 | 0709202 | 0712014 | 0802188 |
| 3 | Date Measured/Sampled | 09/14/07 | 2/25/08 | 07/08/09 | 09/14/07 | 12/03/07 | 02/18/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | H | I | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 2/25/08 | 07/02/09 | 09/12/07 | 12/01/07 | 02/17/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 84' | 74' | 83' | 94.8' | 99.2' | 87' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 6.85 | 7.28 | 7.96 | 7.07 | 7.14 | 7.35 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 6.1 | 3.2 | 10.56 | 11 | 7.0 | 5.7 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 240 | 220 | 229.01 | 260 | 240 | 220 |
| 11 | Total Iron (mg/l) | 0.46 | 0.17 | 0.30 | 0.01 | 0.03 | 0.05 |
| 12 | Total Manganese (mg/l) | 0.012 | 0.023 | 0.03 | <0.002 | <0.002 | 0.002 |
| 13 | Total Aluminum (mg/l) | 0.68 | 0.35 | 0.24 | 0.18 | <0.04 | 0.08 |
| 14 | Total Suspended Solids (mg/l) | 10 | <0.87 | 28.0 | <0.8 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 300 | 250 | 277.0 | 400 | 350 | 320 |
| 16 | Total Sulfates (mg/l) | 73 | 63 | 62.0 | 140 | 120 | 130 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 650 | 590 | 563 | 850 | 840 | 750 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
ONR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | W-44.00 | | | W-438 | | |
| 2 | Lab ID No. | 0709194 | 0712160 | 0802189 | 0709310 | 0712161 | 080219( |
| 3 | Date Measured/Sampled | 09/10/07 | 12/11/07 | 02/18/08 | 09/20/07 | 12/11/07 | 02/18/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/08/07 | 12/01/07 | 02/17/08 | 09/12/07 | 12/01/07 | 02/17/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 18.7' | 17.4' | 14.2' | 12.4' | 11.6' | 9.8' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.63 | 7.76 | 7.71 | 8.35 | 8.28 | 8.76 |
| 9 | Total Acidity (mg/l $CaCO_3$) | <0.16 | <0.16 | 3.5 | <0.16 | <0.16 | <0.16 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 320 | 330 | 340 | 460 | 380 | 440 |
| 11 | Total Iron (mg/l) | <0.01 | 0.01 | 0.02 | 0.04 | 0.17 | 0.05 |
| 12 | Total Manganese (mg/l) | <0.002 | <0.002 | 0.002 | 0.20 | 0.021 | 0.013 |
| 13 | Total Aluminum (mg/l) | 0.13 | <0.04 | <0.04 | 0.05 | <0.04 | <0.04 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | 0.87 | <0.87 | <0.87 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | <5.0 | <5.0 | 10 | 50 | 20 | 40 |
| 16 | Total Sulfates (mg/l) | 30 | 35 | 42 | 11 | 6.4 | 5.6 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 780 | 760 | 850 | 1000 | 830 | 970 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DW-20 | | | DW-27.00 | | |
| 2 | Lab ID No. | 00709304 | -- | 0802297 | 0709031 | 0712006 | 080218 |
| 3 | Date Measured/Sampled | 09/20/07 | -- | 02/25/08 | 09/04/07 | 12/03/07 | 02/18/0 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 12/01/07 | 02/25/08 | 09/03/07 | 12/02/07 | 02/17/0 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 50.4' | "N/S" | 46.8' | 11.0' | 10.5' | 7.6' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | Resident | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.04 | Could not | 7.63 | 6.05 | 6.83 | 6.49 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 15 | be | 1.3 | 10 | 5.3 | 3.9 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 250 | reached | 69 | 84 | 56 | 59 |
| 11 | Total Iron (mg/l) | 4.1 | at home | 0.08 | 0.03 | 0.13 | 0.10 |
| 12 | Total Manganese (mg/l) | 0.260 | for | 0.005 | <0.002 | 0.240 | 0.009 |
| 13 | Total Aluminum (mg/l) | 1.8 | Sample | 0.12 | 0.04 | 0.07 | <0.004 |
| 14 | Total Suspended Solids (mg/l) | 160 | collection | <0.87 | <0.87 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 340 | 12/03/07 | 260 | 180 | 90 | 90 |
| 16 | Total Sulfates (mg/l) | 120 | 12/11/07 | 140 | 23 | 22 | 20 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 870 | 01/09/08 | 690 | 290 | 230 | 250 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DW-30.00 | | | DW-37.00 | | |
| 2 | Lab ID No. | 0709034 | 0712008 | 0802184 | 0709196 | 0907326 | 1002291 |
| 3 | Date Measured/Sampled | 09/04/07 | 12/03/07 | 02/18/08 | 09/13/07 | 07/08/09 | 02/17/10 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/03/07 | 12/02/07 | 02/17/08 | 09/09/07 | 07/02/09 | 02/13/10 |
| 6 | Static Water Level of Well below Land Surface (feet)* | Well Sealed | | | 14.2' | 12.0' | 10.0' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 7.20 | 7.43 | 7.79 | 7.29 | 7.70 | 7.22 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 5.3 | 3.6 | 1.5 | 3.9 | 9.18 | 4.2 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 170 | 160 | 140 | 77 | 92.06 | 73 |
| 11 | Total Iron (mg/l) | 0.04 | 0.05 | 0.06 | 0.18 | 0.82 | 0.41 |
| 12 | Total Manganese (mg/l) | <0.002 | <0.002 | <0.002 | <0.002 | 0.03 | 0.03 |
| 13 | Total Aluminum (mg/l) | 0.10 | <0.04 | <0.04 | 0.39 | 0.59 | 0.39 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <0.87 | <0.87 | <0.87 | 2.0 | <10 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 240 | 180 | 160 | 130 | 173.0 | 228 |
| 16 | Total Sulfates (mg/l) | 44 | 48 | 32 | 26 | 26.0 | 30.8 |
| 17 | Specific Conductivity (umhos/cm at 25 C)** | 450 | 460 | 370 | 260 | 492 | 479 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DW-37.01 | | | DW-41.02 | | |
| 2 | Lab ID No. | 0709197 | 0907327 | 1002292 | 0709201 | 0907329 | 1002294 |
| 3 | Date Measured/Sampled | 09/13/07 | 07/08/09 | 02/17/10 | 09/14/07 | 07/08/09 | 02/17/10 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/09/07 | 07/02/09 | 02/10/10 | 09/12/07 | 07/02/09 | 02/13/10 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 16.2' | 15.8' | 16.3' | 31' | 34' | 29.8' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 6.97 | 7.97 | 7.19 | 7.37 | 6.79 | 7.53 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 9.4 | 9.97 | 11 | 1.8 | 6.45 | 6.8 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 180 | 179.56 | 170 | 64 | 48.61 | 110 |
| 11 | Total Iron (mg/l) | 0.13 | 0.16 | 0.41 | 0.09 | 0.20 | 0.04 |
| 12 | Total Manganese (mg/l) | 0.005 | <0.03 | 0.04 | <0.002 | <0.03 | 0.01 |
| 13 | Total Aluminum (mg/l) | 0.28 | 0.19 | 0.30 | 0.27 | 0.22 | ND |
| 14 | Total Suspended Solids (mg/l) | 2.7 | 18.0 | 22 | <0.87 | <1.0 | ND |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 190 | 182.0 | 239 | 90 | 87.0 | 210 |
| 16 | Total Sulfates (mg/l) | 37 | 32.0 | 39.0 | 44 | 31.0 | 81.2 |
| 17 | Specific Conductivity (umhos/cm at 25° C)** | 500 | 475 | 437 | 300 | 209 | 427 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609 ND = Not detected at PQL or MDL

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | DW-94.00 | | | DW-94.01 | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0710156 | 0712009 | 0802185 | 0710157 | 0907330 | 1002287 |
| 3 | Date Measured/Sampled | 10/08/07 | 12/03/07 | 02/18/08 | 10/08/07 | 07/08/09 | 02/17/10 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/27/07 | 12/20/07 | 02/17/08 | 09/27/07 | 07/02/09 | 02/13/10 |
| 6 | Static Water Level of Well below Land Surface (feet)* | 23.1' | 12.5' | 9.9' | 17' | 16.8' | 12.1' |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | -- | -- | -- | -- | -- |
| 8 | pH (Standard Units) | 6.52 | 6.45 | 6.14 | 6.99 | 7.14 | 7.46 |
| 9 | Total Acidity (mg/l $CaCO_3$) | <0.16 | 7.4 | 3.8 | 2.3 | 9.74 | 11 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 94 | 40 | 10 | 190 | 181.98 | 180 |
| 11 | Total Iron (mg/l) | 4.8 | 0.26 | 0.31 | 0.23 | 0.16 | 0.04 |
| 12 | Total Manganese (mg/l) | 1.20 | 0.089 | 0.011 | 0.035 | 0.24 | 0.02 |
| 13 | Total Aluminum (mg/l) | 2.4 | 0.21 | 0.33 | <0.04 | 0.11 | 0.06 |
| 14 | Total Suspended Solids (mg/l) | 81 | <0.87 | <0.87 | <0.87 | 1.0 | <10 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 130 | 60 | 40 | 230 | 206.0 | 450 |
| 16 | Total Sulfates (mg/l) | 42 | 21 | 36 | 73 | 52.0 | 61.7 |
| 17 | Specific Conductivity (umhos/cm at 25 C)** | 320 | 190 | 130 | 590 | 453 | 480 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation — Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | DW-28.00 | | | | | |
| 2 | Lab ID No. | 0709083 | | | | | |
| 3 | Date Measured/Sampled | 09/06/07 | | | | | |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | | | |
| 5 | Date Last Precipitation Event (if applicable) | 08/20/07 | | | | | |
| 6 | Static Water Level of Well below Land Surface (feet)* | Covered | | | | | |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | -- | | | | | |
| 8 | pH (Standard Units) | 6.96 | | | | | |
| 9 | Total Acidity (mg/l $CaCO_3$) | 10 | | | | | |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 240 | | | | | |
| 11 | Total Iron (mg/l) | 6.0 | | | | | |
| 12 | Total Manganese (mg/l) | 0.016 | | | | | |
| 13 | Total Aluminum (mg/l) | 0.08 | | | | | |
| 14 | Total Suspended Solids (mg/l) | <0.87 | | | | | |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 300 | | | | | |
| 16 | Total Sulfates (mg/l) | 41 | | | | | |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 610 | | | | | |
| 18 | Total Dissolved Solids (mg/l)** | -- | | | | | |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

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American Energy Corp.
Century Mine
D-0425-12
Addendum to Part 2, C(2) Ground Water Inventory

The ground water sites listed below could not be sampled and/or measured for the following reasons:

| | |
|---|---|
| DS-3 | Spring had no flow during seasonal observations. Could not sample/measure flow. |
| DS-28.01 | Spring had no flow during seasonal observations. Could not sample/measure flow. |
| DS-30.02 | Spring had no flow during seasonal observations. Could not sample/measure flow. |
| W-4 | Well is abandoned and buried by the owner. It is not available for sampling. |
| DW-19.01 | No access, covered with concrete pad, hand pump broken, Could not sample/measure. |
| DW-28.00 | Well is covered with a concrete pad, could not measure. |
| DW-29.00 | Well was dry during seasonal observations. Could not sample. |
| DW-30.00 | Well is sealed, no access for measurement. |
| W-30.01 | Well has sanitary seal and is disconnected. Could not sample/measure. |
| DW-41.01 | Well was dry during seasonal observations. Could not sample. |
| DW-41.05 | Well was dry during seasonal observations. Could not sample. |

There are approximately forty (40) ground water sites within the hydrologic review area. A total of (12) groundwater sites cannot be sampled for reasons stated above.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## SURFACE WATER INVENTORY

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12 Pg1

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Discharge* (gpm or cfs) | Date Measured | Known Uses, including public water | Type of Supply (pond, perennial or intermittent stream, etc.) | Name of Owner |
|---|---|---|---|---|---|---|---|
| D10-3 | X 2,427,943 Y 685,931 | 1060' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-4 | X 2,429,581 Y 685,640 | 1020' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-5 | X 2,431,881 Y 685,580 | 980' | -- | 9/07, 1/08, 3/08 | None | Perennial | See Map |
| D10-5A | X 2,430,098 Y 688,892 | 1105' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-5B | X 2,430,801 Y 688,028 | 1065' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-5C | X 2,430,888 Y 687,485 | 1055' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-5D | X 2,431,213 Y 687,428 | 1040' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-6 | X 2,432,257 Y 685,179 | 978' | -- | 9/07, 12/07, 3/08 | None | Intermittent | See Map |
| D-10-8 | X 2,436,184 Y 686,777 | 915' | -- | 10/07, 1/08, 3/08 | None | Perennial | See Map |

* Do not include discharge values if such measurements are reported on the Hydrologic Analyses.

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OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

## SURFACE WATER INVENTORY

Applicant's Name: American Energy Corporation

Pea Vine Southwest D-0425-12 PG2

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Discharge* (gpm or cfs) | Date Measured | Known Uses, including public water | Type of Supply (pond, perennial or intermittent stream, etc.) | Name of Owner |
|---|---|---|---|---|---|---|---|
| D-10-8A | X 2,432,413 Y 690,212 | 1060' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-8B | X 2,432,701 Y 689,816 | 1060' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-8C | X 2,433,452 Y 689,936 | 1035' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-8D | X 2,435,429 Y688,516 | 975' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-8E | X 2,435,731 Y 687,984 | 960' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-8F | X 2,435,858 Y 687,152 | 938' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-9 | X 2,437,193 Y 688,068 | 925' | -- | 9/07, 12/07, 3/08 | None | Intermittent | See Map |
| D-10-10E | X 2,437,257 Y 691,663 | 940' | -- | 10/07, 12/07,3/08 | None | Intermittent | See Map |
| D-10-10F | X 2,436,790 Y 691,963 | 950' | -- | 10/07, 12/07,3/08 | None | Intermittent | See Map |

* Do not include discharge values if such measurements are reported on the Hydrologic Analyses.

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AEC 03615

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

## SURFACE WATER INVENTORY

Applicant's Name: American Energy Corporation

Pea Vine Southwest D-0425-12 PG.3

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Discharge* (gpm or cfs) | Date Measured | Known Uses, including public water | Type of Supply (pond, perennial or intermittent stream, etc.) | Name of Owner |
|---|---|---|---|---|---|---|---|
| D-10-15 | X 2,429,036 Y 694,175 | 862' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-15A | X 2,428,617 Y 693,196 | 905' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-15B | X 2,428,783 Y 693,008 | 915' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D-10-16A | X 2,424,438 Y 690,011 | 950' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| D10-19 | X 2,432,776 Y 684,817 | 970' | -- | 9/07, 12/07, 3/08 | None | Intermittent | See Map |
| D10-23 | X 2,428,905 Y 685,502 | 1035' | -- | 9/07, 1/08, 3/08 | None | Perennial | See Map |
| D10-38 | X 2,401,247 Y 684,734 | 975' | -- | 4/10 | None | Perennial Pea Vine Creek | See Map |
| | | | | | | | |
| | | | | | | | |

* Do not include discharge values if such measurements are reported on the Hydrologic Analyses.

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AEC 03616

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

## SURFACE WATER INVENTORY

Applicant's Name: American Energy Corporation



| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Discharge* (gpm or cfs) | Date Measured | Known Uses, including public water | Type of Supply (pond, perennial or intermittent stream, etc.) | Name of Owner |
|---|---|---|---|---|---|---|---|
| U10-3 | X 2,427,243 Y 687,736 | 1140' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U10-4 | X 2,429,307 Y 687,162 | 1085' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U10-5 | X 2,429,761 Y 689,029 | 1115' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U10-6 | X 2,432,597 Y 686,338 | 1060' | -- | 9/07, 12/07,3/08 | None | Intermittent | See Map |
| U10-7 | X 2,432,897 Y 688,192 | 1100' | -- | 10/07, 12/08, 3/08 | None | Intermittent | See Map |
| U-10-8 | X 2,432,270 Y 690,5003 | 1075' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |
| U-10-8A | X 2,431,510 Y 689,711 | 1140' | -- | 10/07, 12/07, 2/08 | None | Intermittent | See Map |
| U-10-8B | X 2,431,497 Y 690,045 | 1120' | -- | 10/07, 12/07, 2/08 | None | Intermittent | See Map |
| U-10-8C | X 2,432,486 Y 692,045 | 1170' | -- | 10/07, 1/08, 3/08 | None | Intermittent | See Map |

* Do not include discharge values if such measurements are reported on the Hydrologic Analyses.

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AEC 03617

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINERAL RESOURCES MANAGEMENT

## SURFACE WATER INVENTORY

Applicant's Name: American Energy Corporation

Pea Vine Southwest D-0425-12 Pg.5

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Discharge* (gpm or cfs) | Date Measured | Known Uses, including public water | Type of Supply (pond, perennial or intermittent stream, etc.) | Name of Owner |
|---|---|---|---|---|---|---|---|
| U-10-9 | X 2,435,372 Y 691,149 | 1110' | -- | 10/07, 12/07, 3/08 | None | Intermittent | See Map |
| U-10-15A | X 2,427,017 Y 691,056 | 1040' | -- | 9/070, 1/08, 3/08 | None | Intermittent | See Map |
| U-10-15B | X 2,429,511 Y 691,340 | 1060' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U-10-15C | X 2,430,026 Y 692,724 | 1030' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U10-16 | X 2,424,908 Y 689,032 | 1060' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U-10-16A | X 2,424,908 Y 689,032 | 1000' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U10-16B | X 2,424,513 Y 689,286 | 980' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U-10-17 | X 2,425,376 Y 687,794 | 1150' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |
| U10-17A | X 2,425,370 Y 686,889 | 1080' | -- | 9/07, 1/08, 3/08 | None | Intermittent | See Map |

* Do not include discharge values if such measurements are reported on the Hydrologic Analyses.

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AEC 03618

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## SURFACE WATER INVENTORY

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12 Pg. 6

| ID No. Of Sampling Site from Hydrology Map | State Plane X-Y Coordinates | Surface Elevation (ft msl) | Discharge* (gpm or cfs) | Date Measured | Known Uses, including public water | Type of Supply (pond, perennial or intermittent stream, etc.) | Name of Owner |
|---|---|---|---|---|---|---|---|
| **U10-19** | **X 2,433,041 Y 685,097** | **1005'** | **--** | **9/07, 12/07, 3/08** | **None** | **Intermittent** | **See Map** |
| **WI-12.02** | **X 2,427,644 Y 686,587** | **1110'** | **--** | **9/07** | **None** | **Pond** | **See Map** |
| **WI-41.04** | **X 2,432,368 Y 688,509** | **1185'** | **--** | **9/07** | **None** | **Pond** | **See Map** |
| **WI-19.03** | **X 2,425,861 Y 690,272** | 1240' | **--** | 4/10 | **None** | **Pond** | **See Map** |
| | **X Y** | | | | | | |
| | **X Y** | | | | | | |
| | **X Y** | | | | | | |
| | **X Y** | | | | | | |
| | **X Y** | | | | | | |

* Do not include discharge values if such measurements are reported on the Hydrologic Analyses.

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AEC 03619

# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D10-5A | | | D10-5B | | |
| 2 | Lab ID No. | -- | 0801200 | 0803033 | -- | 0801201 | 0803035 |
| 3 | Date Measured/Sampled | 09/20/07 | 01/09/08 | 03/03/08 | 09/20/07 | 01/09/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 01/07/08 | 02/29/08 | 09/12/07 | 01/07/08 | 02/29/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | No Flow | 0.021 cfs | 0.52 cfs | No Flow | 0.030 cfs | 0.66 cfs |
| 8 | pH (Standard Units) | N/S | 8.01 | 7.68 | N/S | 8.06 | 7.68 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 1.2 | 0.99 | | 0.77 | 0.83 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 120 | 45 | | 77 | 36 |
| 11 | Total Iron (mg/l) | | 0.09 | 2.6 | | 0.02 | 1.9 |
| 12 | Total Manganese (mg/l) | | <0.002 | 0.083 | | <0.002 | 0.024 |
| 13 | Total Aluminum (mg/l) | | <0.04 | 3.0 | | <0.04 | 2.7 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 55 | | <0.89 | 24 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 140 | 70 | | 90 | 60 |
| 16 | Total Sulfates (mg/l) | | 42 | 25 | | 26 | 20 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 340 | 180 | | 230 | 130 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D10-5C | | | D10-5D | | |
| 2 | Lab ID No. | -- | 0801202 | 0803037 | -- | 0801203 | 0803039 |
| 3 | Date Measured/Sampled | 09/20/07 | 01/09/08 | 03/03/08 | 09/20/07 | 01/09/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 01/07/08 | 02/29/08 | 09/12/07 | 01/07/08 | 02/29/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | No FLow | 0.018 cfs | 0.17 cfs | No Flow | 0.055 cfs | 0.48 cfs |
| 8 | pH (Standard Units) | N/S | 7.97 | 7.72 | N/S | 8.00 | 7.76 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 1.0 | 0.73 | | <0.16 | 0.82 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 90 | 27 | | 110 | 39 |
| 11 | Total Iron (mg/l) | | 0.05 | 1.3 | | 0.05 | 1.3 |
| 12 | Total Manganese (mg/l) | | <0.002 | 0.034 | | <0.002 | 0.010 |
| 13 | Total Aluminum (mg/l) | | <0.04 | 1.5 | | <0.04 | 2.3 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 33 | | <0.87 | 17 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 100 | 60 | | 110 | 70 |
| 16 | Total Sulfates (mg/l) | | 22 | 15 | | 34 | 22 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 250 | 100 | | 330 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation — Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D10-3 | | | D-10-8A | | |
| 2 | Lab ID No. | 0709378 | 0810291 | 0803017 | -- | 0811189 | 0803359 |
| 3 | Date Measured/Sampled | 09/25/07 | 01/14/08 | 03/03/08 | 10/02/07 | 01/09/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 01/14/08 | 02/29/08 | 09/27/07 | 01/07/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.0004 cfs | 0.09 cfs | 5.62 cfs | DRY | 0.03 cfs | 0.033 cfs |
| 8 | pH (Standard Units) | 7.77 | 8.03 | 7.80 | 10/09/07 | 8.07 | 7.98 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 6.0 | 1.6 | 0.91 | | 0.96 | 0.98 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 210 | 87 | <0.13 | | 72 | 51 |
| 11 | Total Iron (mg/l) | 0.41 | 0.13 | 2.5 | | 0.17 | 0.32 |
| 12 | Total Manganese (mg/l) | 0.087 | 0.002 | 0.170 | | <0.002 | 0.002 |
| 13 | Total Aluminum (mg/l) | 0.57 | 0.12 | 2.9 | | 0.13 | 0.436 |
| 14 | Total Suspended Solids (mg/l) | 4.0 | <0.87 | 81 | | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 210 | 100 | 50 | | 80 | 60 |
| 16 | Total Sulfates (mg/l) | 12 | 23 | 20 | | 25 | 22 |
| 17 | Specific Conductivity (umhos/cm at 25i C)** | 460 | 240 | 170 | | 220 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-8B | | | D-10-8C | | |
| 2 | Lab ID No. | -- | 0801196 | 0803362 | -- | 0801194 | 0803360 |
| 3 | Date Measured/Sampled | 10/02/07 | 01/09/08 | 03/24/08 | 10/02/07 | 01/09/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 10/01/07 | 01/07/08 | 03/19/08 | 09/27/07 | 01/07/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | DRY | 0.005 cfs | 0.016 cfs | DRY | 0.008 cfs | 0.013 cfs |
| 8 | pH (Standard Units) | 10/09/07 | 7.74 | 8.08 | 10/09/07 | 8.06 | 7.87 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 0.69 | 1.3 | | <0.16 | 1.0 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 100 | 90 | | 100 | 68 |
| 11 | Total Iron (mg/l) | | 0.31 | 0.35 | | 0.03 | 0.13 |
| 12 | Total Manganese (mg/l) | | <0.002 | 0.003 | | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | | 0.44 | 0.48 | | <0.04 | <0.04 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | <0.87 | | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 130 | 100 | | 130 | 70 |
| 16 | Total Sulfates (mg/l) | | 34 | 33 | | 39 | 32 |
| 17 | Specific Conductivity (umhos/cm at 25[illegible]C)** | | 298 | 270 | | 320 | 220 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-8D | | | D-10-9 | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | -- | 0801198 | 0803358 | 0709382 | 0712285 | 0803397 |
| 3 | Date Measured/Sampled | 10/02/07 | 01/09/08 | 03/24/08 | 09/25/07 | 12/18/07 | 03/25/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/27/07 | 01/07/08 | 03/19/08 | 09/19/07 | 12/18/07 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | DRY | 0.007 cfs | 0.005 cfs | 0.0007 cfs | 0.09 cfs | 0.48 cfs |
| 8 | pH (Standard Units) | 10/09/07 | 7.80 | 8.12 | 7.54 | 8.01 | 8.07 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 0.93 | 1.2 | 7.1 | 2.0 | 0.83 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 110 | 93 | 170 | 68 | 74 |
| 11 | Total Iron (mg/l) | | 0.24 | 0.18 | 2.2 | 0.06 | 0.11 |
| 12 | Total Manganese (mg/l) | | <0.002 | <0.002 | 0.57 | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | | 0.31 | 0.23 | 1.1 | 0.22 | <0.04 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | <0.87 | <0.87 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 110 | 110 | 70 | 90 | 90 |
| 16 | Total Sulfates (mg/l) | | 41 | 32 | 44 | 32 | 30 |
| 17 | Specific Conductivity (umhos/cm at 25l C)** | | 330 | 270 | 460 | 210 | 240 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

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DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-10E | | | D-10-10F | | |
| 2 | Lab ID No. | -- | 0712278 | 0803310 | -- | 0712279 | 0803308 |
| 3 | Date Measured/Sampled | 10/09/07 | 12/18/07 | 03/19/08 | 10/09/07 | 12/18/07 | 03/19/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 10/01/07 | 12/18/07 | 03/17/08 | 10/01/07 | 12/18/07 | 03/17/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | DRY | 0.007 cfs | 0.13 cfs | DRY | 0.03 cfs | 0.11 cfs |
| 8 | pH (Standard Units) | 10/11/07 | 8.09 | 8.03 | 10/11/07 | 7.93 | 7.88 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | <0.16 | 0.86 | | <0.16 | 0.87 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 100 | 63 | | 83 | 48 |
| 11 | Total Iron (mg/l) | | 0.05 | 0.23 | | 0.20 | 0.80 |
| 12 | Total Manganese (mg/l) | | <0.002 | 0.002 | | <0.002 | 0.011 |
| 13 | Total Aluminum (mg/l) | | <0.04 | 0.22 | | 0.29 | 1.4 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 4.7 | | <0.87 | 12 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 110 | 90 | | 100 | 70 |
| 16 | Total Sulfates (mg/l) | | 40 | 25 | | 30 | 21 |
| 17 | Specific Conductivity (umhos/cm at 25□C)** | | 300 | 210 | | 240 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-15 | | | D-10-15A | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709342 | 0801011 | 0803031 | 0709344 | 0801014 | 0803029 |
| 3 | Date Measured/Sampled | 09/24/07 | 01/02/08 | 03/03/08 | 09/24/07 | 01/02/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/18/07 | 01/01/08 | 02/27/08 | 09/19/07 | 01/01/08 | 02/27/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.002 cfs | 0.833 cfs | 36.0 cfs | 0.0003 cfs | 0.266 cfs | 7.50 cfs |
| 8 | pH (Standard Units) | 8.05 | 8.35 | 7.97 | 7.68 | 8.35 | 8.05 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 6.3 | <0.16 | 0.98 | 7.0 | 0.90 | 0.73 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 210 | 120 | 63 | 190 | 99 | 50 |
| 11 | Total Iron (mg/l) | 0.08 | <0.01 | 12 | 0.25 | 0.09 | 6.9 |
| 12 | Total Manganese (mg/l) | 0.009 | <0.002 | 0.250 | <0.002 | <0.002 | 0.130 |
| 13 | Total Aluminum (mg/l) | <0.04 | <0.04 | 14 | 0.44 | <0.04 | 9.1 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <0.087 | 340 | <0.87 | <0.87 | 180 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 240 | 150 | 100 | 220 | 120 | 80 |
| 16 | Total Sulfates (mg/l) | 51 | 45 | 32 | 50 | 39 | 27 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 560 | 370 | 220 | 490 | 310 | 180 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-15B | | | D-10-16A | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709343 | 0801015 | 0803303 | -- | 0801024 | 0803352 |
| 3 | Date Measured/Sampled | 09/24/07 | 01/02/08 | 03/03/08 | 10/09/07 | 01/02/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/19/07 | 01/01/08 | 02/27/08 | 10/01/07 | 01/01/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.0007 cfs | 0.333 cfs | 3.60 cfs | DRY | 0.1 cfs | 0.19 cfs |
| 8 | pH (Standard Units) | 7.89 | 8.28 | 8.03 | 10/11/07 | 8.47 | 7.83 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 8.8 | 1.1 | 1.2 | | 3.1 | 1.3 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 210 | 140 | 69 | | 140 | 130 |
| 11 | Total Iron (mg/l) | 0.22 | 0.03 | 17 | | 0.02 | 0.44 |
| 12 | Total Manganese (mg/l) | 0.011 | <0.002 | 0.310 | | <0.002 | 0.003 |
| 13 | Total Aluminum (mg/l) | 0.33 | <0.04 | 16 | | <0.04 | 0.50 |
| 14 | Total Suspended Solids (mg/l) | 5.3 | <0.87 | 500 | | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 200 | 170 | 120 | | 170 | 160 |
| 16 | Total Sulfates (mg/l) | 54 | 54 | 32 | | 80 | 67 |
| 17 | Specific Conductivity (umhos/cm at 25□C)** | 580 | 450 | 250 | | 480 | 410 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | U10-3 | | | U10-4 | | |
| 2 | Lab ID No. | 0709376 | 0801289 | 0803316 | 0709380 | 0801293 | 0803019 |
| 3 | Date Measured/Sampled | 09/25/07 | 01/14/08 | 03/03/08 | 09/25/07 | 01/14/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 01/14/08 | 02/29/08 | 09/12/07 | 01/14/08 | 02/29/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.0003 cfs | 0.003 cfs | 0.13 cfs | 0.0013 cfs | 0.22 cfs | 1.67 cfs |
| 8 | pH (Standard Units) | 8.14 | 7.93 | 7.72 | 7.80 | 7.71 | 7.78 |
| 9 | Total Acidity (mg/l $CaCO_3$) | <0.16 | 9.5 | 0.98 | 5.3 | 1.7 | 0.95 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 240 | 90 | 51 | 220. | 65 | 41 |
| 11 | Total Iron (mg/l) | 0.05 | 0.11 | 0.56 | 3.3 | 0.455 | 2.5 |
| 12 | Total Manganese (mg/l) | 0.021 | 0.010 | 0.053 | 0.75 | 0.067 | 0.150 |
| 13 | Total Aluminum (mg/l) | <0.04 | 0.07 | 0.95 | 43.0 | 0.75 | 3.0 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <0.87 | 2.7 | 160 | <0.87 | 68 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 250 | 100 | 70 | 220 | 70 | 60 |
| 16 | Total Sulfates (mg/l) | 26 | 24 | 20 | 18 | 25 | 22 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 520 | 240 | 170 | 470 | 200 | 150 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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05/08
ONR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | U10-16 | | | | | |
| 2 | Lab ID No. | 0709255 | 0801020 | 0803349 | | | |
| 3 | Date Measured/Sampled | 09/18/07 | 01/02/08 | 03/24/08 | | | |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | | | |
| 5 | Date Last Precipitation Event (if applicable) | 09/16/07 | 01/01/08 | 02/27/08 | | | |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | | | |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.00002 cfs | 0.016 cfs | 0.07 cfs | | | |
| 8 | pH (Standard Units) | 7.75 | 8.31 | 8.08 | | | |
| 9 | Total Acidity (mg/l $CaCO_3$) | 8.3 | 0.86 | 1.3 | | | |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 180 | 130 | 110 | | | |
| 11 | Total Iron (mg/l) | 5.6 | 0.13 | 0.65 | | | |
| 12 | Total Manganese (mg/l) | 0.240 | <0.002 | 0.021 | | | |
| 13 | Total Aluminum (mg/l) | 6.4 | 0.07 | 0.66 | | | |
| 14 | Total Suspended Solids (mg/l) | 22 | <0.87 | <0.87 | | | |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 250 | 160 | 140 | | | |
| 16 | Total Sulfates (mg/l) | 52 | 47 | 38 | | | |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 550 | 430 | 360 | | | |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

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## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | U10-5 | | | U10-7 | | |
| 2 | Lab ID No. | 0709085 | 0801204 | 080332 | 0710270 | 0712109 | 0803317 |
| 3 | Date Measured/Sampled | 09/06/07 | 01/09/08 | 03/03/08 | 10/15/07 | 12/06/07 | 03/19/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 08/20/07 | 01/07/08 | 02//09/08 | 10/10/07 | 12/04/07 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.0004 cfs | 0.078 cfs | 2.40 cfs | 0.00008 cfs | 0.005 cfs | 0.30 cfs |
| 8 | pH (Standard Units) | 7.69 | 7.64 | 7.64 | 7.48 | 7.5 | 7.96 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 2.6 | <0.16 | 1.1 | 12 | 1.1 | 0.82 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 200 | 89 | 34 | 200 | 83 | 40 |
| 11 | Total Iron (mg/l) | 0.19 | 0.29 | 4.0 | 0.31 | 0.06 | 0.28 |
| 12 | Total Manganese (mg/l) | 0.110 | 0.047 | 0.085 | 0.510 | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | 0.15 | 0.17 | 4.4 | 0.06 | 0.07 | 0.33 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <0.87 | 110 | 3.3 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 220 | 120 | 70 | 210 | 100 | 50 |
| 16 | Total Sulfates (mg/l) | 27 | 38 | 222 | 32 | 34 | 20 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 470 | 300 | 160 | 500 | 270 | 150 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | U-10-8 | | | U-10-8A | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0801191 | 0803364 | 0803364 | 0710067 | 0801188 | 0803357 |
| 3 | Date Measured/Sampled | 10/02/07 | 01/09/08 | 03/24/08 | 10/02/07 | 01/09/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 10/01/07 | 01/07/08 | 03/19/08 | 10/01/07 | 01/07/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.00008 cfs | 0.293 cfs | 0.429 cfs | 0.002 cfs | 0.011 cfs | 0.047 cfs |
| 8 | pH (Standard Units) | 7.64 | 8.10 | 8.10 | 8.08 | 7.66 | 8.04 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 3.2 | <0.16 | 0.93 | 0.88 | <0.16 | 1.1 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 170 | 73 | 63 | 170 | 45 | 46 |
| 11 | Total Iron (mg/l) | 0.05 | 0.69 | 0.33 | 1.2 | 0.13 | 0.33 |
| 12 | Total Manganese (mg/l) | <0.002 | 0.029 | 0.007 | 0.038 | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | 0.08 | 1.0 | 0.56 | 1.1 | 0.01 | 0.47 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | 6.0 | 2.0 | 23 | <0.87 | <0.7 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 190 | 110 | 70 | 200 | 60 | 60 |
| 16 | Total Sulfates (mg/l) | 47 | 29 | 27 | 27 | 24 | 22 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | 460 | 240 | 200 | 400 | 160 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

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# OHIO DEPARTMENT OF NATURAL RESOURCES
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## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | U-10-8B | | | U-10-8C | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | -- | 0801192 | 0803361 | 0710069 | 0801190 | 0803363 |
| 3 | Date Measured/Sampled | 10/02/07 | 01/09/08 | 03/24/08 | 10/02/07 | 01/09/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 10/01/07 | 01/07/08 | 03/19/08 | 10/01/07 | 01/07/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | DRY | 0.117 cfs | 0.422 cfs | 0.0002 cfs | 0.011 cfs | 0.055 cfs |
| 8 | pH (Standard Units) | 10/09/07 | 7.85 | 8.11 | 7.99 | 8.13 | 8.19 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 0.27 | 0.92 | 5.2 | 0.42 | 0.96 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 72 | 48 | 170 | 110 | 79 |
| 11 | Total Iron (mg/l) | | 0.34 | 0.32 | 12 | 0.05 | 0.15 |
| 12 | Total Manganese (mg/l) | | 0.007 | <0.002 | 1.40 | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | | 0.27 | 0.44 | 7.8 | <0.04 | 0.24 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 1.3 | 350 | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 80 | 70 | 200 | 130 | 90 |
| 16 | Total Sulfates (mg/l) | | 24 | 27 | 23 | 36 | 30 |
| 17 | Specific Conductivity (umhos/cm at 25□C)** | | 230 | 170 | 400 | 320 | 240 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | U-10-9 | | | U-10-15A | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | -- | 0712286 | 0803398 | 0710184 | 0712284 | 0803312 |
| 3 | Date Measured/Sampled | 10/02/07 | 12/18/07 | 03/25/08 | 10/09/07 | 12/18/07 | 03/19/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 10/01/07 | 12/18/07 | 03/19/08 | 10/07/07 | 12/18/07 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | DRY | 0.26 cfs | 0.39 cfs | 0.0002 cfs | 1.1 cfs | 6.75 cfs |
| 8 | pH (Standard Units) | 10/09/07 | 7.72 | 8.05 | 7.78 | 8.02 | 7.91 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 1.9 | 0.93 | <0.16 | 1.8 | 0.97 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 65 | 76 | 200 | 87 | 49 |
| 11 | Total Iron (mg/l) | | 0.15 | 0.31 | 0.06 | 0.10 | 0.46 |
| 12 | Total Manganese (mg/l) | | <0.002 | <0.002 | 0.003 | <0.002 | 0.006 |
| 13 | Total Aluminum (mg/l) | | 0.18 | 0.43 | <0.04 | 0.14 | 0.72 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 2.0 | <0.87 | <0.87 | 1.3 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 70 | 90 | 180 | 130 | 70 |
| 16 | Total Sulfates (mg/l) | | 28 | 29 | 34 | 29 | 19 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 200 | 230 | 510 | 240 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | U-10-15B | | | U-10-15C | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709341 | 0801013 | 0823026 | 0709345 | 0801016 | 0803028 |
| 3 | Date Measured/Sampled | 09/24/07 | 01/02/08 | 03/03/08 | 09/24/07 | 01/02/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 01/01/08 | 02/27/08 | 09/19/07 | 01/01/08 | 02/27/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.006 cfs | 0.088 cfs | 7.20 cfs | 0.006 cfs | 0.088 cfs | 1.32 cfs |
| 8 | pH (Standard Units) | 7.89 | 8.30 | 8.01 | 8.01 | 8.46 | 8.12 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 6.3 | 1.8 | 1.25 | 4.4 | <0.16 | 1.2 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 190 | 99 | 59 | 250 | 170 | 100 |
| 11 | Total Iron (mg/l) | 0.37 | 0.03 | 11 | 0.37 | 0.06 | 21 |
| 12 | Total Manganese (mg/l) | 0.004 | <0.002 | 0.300 | 0.004 | <0.002 | 0.230 |
| 13 | Total Aluminum (mg/l) | 0.39 | <0.04 | 13 | 0.83 | <0.04 | 29 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | <0.87 | 3.80 | 4.7 | <0.87 | 690 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 240 | 130 | 100 | 260 | 200 | 160 |
| 16 | Total Sulfates (mg/l) | 42 | 37 | 29 | 56 | 57 | 38 |
| 17 | Specific Conductivity (umhos/cm at 25[illegible]C)** | 500 | 320 | 230 | 630 | 520 | 360 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | U-10-16A | | | U10-16B | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709257 | 0801023 | 0803350 | 0709260 | 0801025 | 0803351 |
| 3 | Date Measured/Sampled | 09/18/07 | 01/02/08 | 03/24/08 | 09/18/07 | 01/02/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/16/07 | 01/01/08 | 03/19/08 | 09/12/07 | 01/01/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.00008 cfs | 0.003 cfs | 0.003 cfs | 0.00002 cfs | 0.005 cfs | 0.004 cfs |
| 8 | pH (Standard Units) | 7.74 | 8.60 | 8.04 | 7.66 | 8.41 | 7.94 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 4.2 | 3.1 | 0.80 | 3.2 | 2.1 | 1.1 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 210 | 140 | 130 | 190 | 120 | 130 |
| 11 | Total Iron (mg/l) | 0.86 | <0.01 | 0.20 | 0.21 | 0.06 | 2.8 |
| 12 | Total Manganese (mg/l) | 0.048 | <0.002 | 0.003 | 0.025 | <0.002 | 0.097 |
| 13 | Total Aluminum (mg/l) | 1.3 | <0.04 | 0.11 | 0.64 | <0.04 | 2.5 |
| 14 | Total Suspended Solids (mg/l) | 20 | <0.87 | <0.87 | <0.87 | <0.87 | 30 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 230 | 150 | 140 | 210 | 150 | 140 |
| 16 | Total Sulfates (mg/l) | 30 | 25 | 26 | 43 | 39 | 28 |
| 17 | Specific Conductivity (umhos/cm at 25! 'C)** | 480 | 360 | 310 | 480 | 360 | 320 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | U-10-17 | | | U10-17A | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | 0709258 | 0801018 | 0803393 | 0709261 | 0801021 | 0803395 |
| 3 | Date Measured/Sampled | 09/18/07 | 01/02/08 | 03/25/08 | 09/18/07 | 01/02/08 | 03/25/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/15/07 | 01/01/08 | 03/19/08 | 09/12/07 | 01/01/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.0003 cfs | 0.02 cfs | 0.02 cfs | 0.001 cfs | 0.008 cfs | 0.054 cfs |
| 8 | pH (Standard Units) | 7.64 | 8.21 | 7.90 | 8.04 | 8.50 | 8.08 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 3.7 | 1.5 | 1.2 | 1.1 | 0.71 | 1.4 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 210 | 130 | 100 | 270 | 210 | 200 |
| 11 | Total Iron (mg/l) | 0.85 | 0.37 | 0.43 | 2.1 | 0.01 | 0.59 |
| 12 | Total Manganese (mg/l) | 0.008 | 0.045 | 0.010 | 0.079 | <0.002 | 0.037 |
| 13 | Total Aluminum (mg/l) | 1.3 | 0.28 | 0.50 | 2.2 | <0.04 | 0.50 |
| 14 | Total Suspended Solids (mg/l) | 91 | 11 | 1.3 | 2.7 | <0.87 | 1.3 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 240 | 130 | 130 | 300 | 250 | 220 |
| 16 | Total Sulfates (mg/l) | 45 | 35 | 38 | 39 | 51 | 43 |
| 17 | Specific Conductivity (umhos/cm at 25□C)** | 540 | 370 | 340 | 630 | 590 | 530 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | U10-6 | | | U10-19 | | |
| 2 | Lab ID No. | -- | 0712163 | 0803024 | -- | 0712167 | 0803022 |
| 3 | Date Measured/Sampled | 09/18/07 | 12/11/07 | 03/03/08 | 09/17/07 | 12/11/07 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 12/11/07 | 02/27/08 | 09/12/07 | 12/01/07 | 02/27/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | No Flow | 0.02 cfs | 0.75 cfs | No Flow | 0.008 cfs | 0.39 cfs |
| 8 | pH (Standard Units) | N/S | 7.63 | 7.40 | N/S | 7.47 | 7.83 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 1.4 | 0.88 | | 3.1 | 1.0 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 91 | 44 | | 72 | 48 |
| 11 | Total Iron (mg/l) | | 0.36 | 1.4 | | 0.88 | 1.4 |
| 12 | Total Manganese (mg/l) | | <0.002 | 0.016 | | <0.002 | 0.011 |
| 13 | Total Aluminum (mg/l) | | 0.88 | 2.3 | | 1.4 | 2.5 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 30 | | 15 | 6.7 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 120 | 70 | | 100 | 70 |
| 16 | Total Sulfates (mg/l) | | 35 | 23 | | 42 | 23 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 260 | 160 | | 250 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | WI-12.02 | WI-41.04 | WI-19.03 | | | D-10-38 |
| 2 | Lab ID No. | 0709377 | 0709203 | 10041216 | | | 10041214 |
| 3 | Date Measured/Sampled | 09/25/07 | 09/14/07 | 04-23-10 | | | 04-23-10 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | SUPPLEMENTAL | | SUPPLEMENTAL | | | SUPPLEMENTAL |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 09/12/07 | 04-17-10 | | | 04-17-10 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | | | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.003 cfs | No Flow | No Flow | | | 0.54 CFS |
| 8 | pH (Standard Units) | 7.12 | 6.40 | 7.62 | | | 8.31 |
| 9 | Total Acidity (mg/l $CaCO_3$) | 22 | 6.3 | 8.23 | | | 0.00 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | 240 | 80 | 61.91 | | | 118.78 |
| 11 | Total Iron (mg/l) | 0.45 | 0.73 | 1.26 | | | 0.07 |
| 12 | Total Manganese (mg/l) | 3.70 | 0.810 | 0.99 | | | <0.03 |
| 13 | Total Aluminum (mg/l) | 0.26 | 0.20 | 0.81 | | | 0.18 |
| 14 | Total Suspended Solids (mg/l) | <0.87 | 13 | 28.0 | | | 1.0 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | 220 | 90 | 94.0 | | | 162.0 |
| 16 | Total Sulfates (mg/l) | 5.3 | 14 | 14.0 | | | 31.0 |
| 17 | Specific Conductivity (umhos/cm at 25° C)** | 500 | 200 | 198 | | | 327 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D10-4 | | | D10-5 | | |
| 2 | Lab ID No. | -- | 0801294 | 0803020 | 0709227 | 0801199 | 0803025 |
| 3 | Date Measured/Sampled | 09/25/07 | 01/14/08 | 03/03/08 | 09/17/07 | 01/19/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 01/14/08 | 02/27/08 | 09/12/07 | 01/07/08 | 02/27/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | No Flow | 0.66 cfs | 2.0 cfs | 0.00008 cfs | 0.395 cfs | 9.74 cfs |
| 8 | pH (Standard Units) | N/S | 7.66 | 7.76 | 7.55 | 8.05 | 7.80 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 1.9 | 1.0 | 9.6 | 0.23 | 0.91 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 71 | 41 | 180 | 110 | 44 |
| 11 | Total Iron (mg/l) | | 0.29 | 3.6 | 0.06 | 0.19 | 2.6 |
| 12 | Total Manganese (mg/l) | | 0.001 | 0.190 | 0.010 | <0.002 | 0.057 |
| 13 | Total Aluminum (mg/l) | | 0.43 | 4.4 | 0.29 | 0.10 | 3.7 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 110 | <0.87 | <0.87 | 61 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 90 | 70 | 210 | 140 | 70 |
| 16 | Total Sulfates (mg/l) | | 24 | 22 | 45 | 35 | 30 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 220 | 150 | 480 | 320 | 160 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation — Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-8 | | | D10-8E | | |
| 2 | Lab ID No. | -- | 0801195 | 0803354 | -- | 0801197 | 0803356 |
| 3 | Date Measured/Sampled | 10/02/07 | 01/09/08 | 03/24/08 | 10/03/07 | 01/09/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | h |
| 5 | Date Last Precipitation Event (if applicable) | 09/29/07 | 01/07/08 | 03/19/08 | 10/01/07 | 01/06/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.00008 cfs | 1.59 cfs | 3.5 cfs | No Flow | 1.059 cfs | 0.006 cfs |
| 8 | pH (Standard Units) | N/S | 7.76 | 8.15 | N/S | 7.76 | 8.06 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | <0.16 | 0.93 | | <0.16 | 1.5 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 97 | 72 | | 97 | 110 |
| 11 | Total Iron (mg/l) | | 0.19 | 0.12 | | 0.19 | 0.06 |
| 12 | Total Manganese (mg/l) | | <0.002 | <0.002 | | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | | 0.19 | <0.04 | | 0.19 | <0.04 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | <0.87 | | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 120 | 90 | | 120 | 120 |
| 16 | Total Sulfates (mg/l) | | 38 | 30 | | 38 | 39 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 300 | 24 | | 300 | 310 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation — Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D-10-8 | | | D10-8E | | |
| 2 | Lab ID No. | -- | 0801195 | 0803354 | -- | 0801197 | 0803356 |
| 3 | Date Measured/Sampled | 10/02/07 | 01/09/08 | 03/24/08 | 10/03/07 | 01/09/08 | 03/24/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | h |
| 5 | Date Last Precipitation Event (if applicable) | 09/29/07 | 01/07/08 | 03/19/08 | 10/01/07 | 01/06/08 | 03/19/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | 0.00008 cfs | 1.59 cfs | 3.5 cfs | No Flow | 1.059 cfs | 0.006 cfs |
| 8 | pH (Standard Units) | N/S | 7.76 | 8.15 | N/S | 7.76 | 8.06 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | <0.16 | 0.93 | | <0.16 | 1.5 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 97 | 72 | | 97 | 110 |
| 11 | Total Iron (mg/l) | | 0.19 | 0.12 | | 0.19 | 0.06 |
| 12 | Total Manganese (mg/l) | | <0.002 | <0.002 | | <0.002 | <0.002 |
| 13 | Total Aluminum (mg/l) | | 0.19 | <0.04 | | 0.19 | <0.04 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | <0.87 | | <0.87 | <0.87 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 120 | 90 | | 120 | 120 |
| 16 | Total Sulfates (mg/l) | | 38 | 30 | | 38 | 39 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 300 | 24 | | 300 | 310 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Peavine South/West D-0425-12

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | ID No. Of Sampling Site From Hydrology Map | D10-8F | | | D10-19 | | |
| 2 | Lab ID No. | -- | 0801195 | 0803355 | -- | 0712166 | 0803038 |
| 3 | Date Measured/Sampled | 10/08/07 | 01/09/08 | 03/24/08 | 09/17/07 | 12/11/07 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 10/01/07 | 01/07/08 | 03/19/08 | 09/12/07 | 12/01/07 | 02/27/08 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | No Flow | 0.009 cfs | 0.2 cfs | No Flow | 0.01 cfs | 1.64 cfs |
| 8 | pH (Standard Units) | N/S | 7.87 | 8.14 | N/S | 7.55 | 7.84 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 0.89 | 0.96 | | 2.0 | 0.82 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 100 | 88 | | 61 | 38 |
| 11 | Total Iron (mg/l) | | 0.34 | 0.26 | | 0.69 | 1.8 |
| 12 | Total Manganese (mg/l) | | <0.002 | <0.002 | | <0.002 | 0.010 |
| 13 | Total Aluminum (mg/l) | | 0.60 | 0.44 | | 1.6 | 3.8 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | <0.87 | | <0.87 | 23 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 140 | 100 | | 70 | 60 |
| 16 | Total Sulfates (mg/l) | | 39 | 34 | | 33 | 19 |
| 17 | Specific Conductivity (umhos/cm at 25°C)** | | 320 | 270 | | 210 | 140 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

## HYDROLOGIC ANALYSES

Applicant's Name: American Energy Corporation Pea Vine Southwest D-0425-12

| 1 | ID No. Of Sampling Site From Hydrology Map | D10-6 | | | D10-23 | | |
|---|---|---|---|---|---|---|---|
| 2 | Lab ID No. | -- | 0712162 | 0803023 | 0709379 | 0801292 | 0803018 |
| 3 | Date Measured/Sampled | 09/20/07 | 12/11/07 | 03/03/08 | 09/25/07 | 01/14/08 | 03/03/08 |
| 4 | High (H), Low (L), Intermediate (I) (if applicable) | L | I | H | L | I | H |
| 5 | Date Last Precipitation Event (if applicable) | 09/12/07 | 12/11/07 | 02/29/08 | 09/12/07 | 01/14/08 | 02/27/09 |
| 6 | Static Water Level of Well below Land Surface (feet)* | -- | -- | -- | -- | -- | -- |
| 7 | Discharge for Spring, Stream, Pond, Mine, etc. (gpm or cfs) | DRY | 0.09 cfs | 1.6 cfs | 0.0003 cfs | 0.18 cfs | 2.18 cfs |
| 8 | pH (Standard Units) | N/S | 7.72 | 7.78 | 7.55 | 8.20 | 7.57 |
| 9 | Total Acidity (mg/l $CaCO_3$) | | 2.8 | 0.77 | 7.2 | 2.5 | 0.82 |
| 10 | Total Alkalinity (mg/l $CaCO_3$) | | 79 | 42 | 190 | 120 | 32 |
| 11 | Total Iron (mg/l) | | 0.51 | 1.6 | 0.43 | 0.04 | 0.76 |
| 12 | Total Manganese (mg/l) | | <0.002 | 0.017 | 0.020 | <0.002 | 0.012 |
| 13 | Total Aluminum (mg/l) | | 1.2 | 2.8 | 0.27 | <0.04 | 1.3 |
| 14 | Total Suspended Solids (mg/l) | | <0.87 | 24 | 2.0 | <0.87 | 8.7 |
| 15 | Total Hardness (mg/l as $CaCO_3$) | | 90 | 50 | 220 | 130 | 60 |
| 16 | Total Sulfates (mg/l) | | 38 | 22 | 48 | 31 | 20 |
| 17 | Specific Conductivity (umhos/cm at 25° C)** | | 250 | 150 | 520 | 370 | 130 |
| 18 | Total Dissolved Solids (mg/l)** | -- | -- | -- | -- | -- | -- |

Laboratory Name: Tra-Det, Inc.

Address: RD #2 Box 227A, Battle Run Road

City: Triadelphia State: OH Zip: 26059-9609

* NOTE: If information required by item 6 is unobtainable, submit as an addendum to Hydrologic Analyses a statement giving the reasons why the information is unobtainable.

** NOTE: For each sample provide data for either item 17 or item 18.

05/08
DNR-744-9024

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

## ATTACHMENT 14A
## (HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. (D-0425-1)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | DS-1 | DS-1 | DS-1 | DS-1 | DS-1 | DS-1 |
| 2 | Identification Number 98- | 07179 | 08314 | 09202 | 10108 | 11241 | 12187 |
| 3 | High (H)/Low (L) Designation (if applicable) | | SIX | MONTH | SAMPLING | | |
| 4 | Surface Elevation for Sampling Station (msl) | 1170 | 1170 | 1170 | 1170 | 1170 | 1170 |
| 5 | Depth of Well Below Land Surface (feet) | --- | --- | --- | --- | --- | --- |
| 6 | Static Water Level of Well Below Land Surface (feet) | --- | --- | --- | --- | --- | --- |
| 7 | Flow for Spring and Stream (gpm or cfs) | 0.20 GPM | 0.20 GPM | 0.20 GPM | 0.21 GPM | 0.13 GPM | 0.06 GPM |
| 8 | Date Above Measurements Made | 7-13-98 | 8-29-98 | 9-17-98 | 10-6-98 | 11-12-98 | 12-9-98 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.40 | 7.20 | 7.10 | 7.10 | 7.30 | 7.20 |
| 12 | Total Acidity (mg/l CaCO3) | 34.0 | 13.0 | 36.0 | 13.0 | 66.0 | 14.0 |
| 12 | Total Alkalinity (mg/l CaCO3) | 300.0 | 280.0 | 270.0 | 280.0 | 280.0 | 250.0 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 740.0 | 580.0 | 680.0 | 620.0 | 580.0 | 650.0 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | <0.02 | <0.02 | <0.02 | 0.02 | 0.04 | <0.02 |
| 16 | Total Sulfates (mg/l) | 89.0 | 68.0 | 41.0 | 71.0 | 69.0 | 72.0 |
| 17 | Total Iron (mg/l) | 0.90 | <0.02 | <0.02 | <0.05 | <0.05 | <0.05 |
| 18 | Total Suspended Solids (mg/l) | <1.0 | <1.0 | <1.0 | <1.0 | 8.0 | 17.0 |
| 19 | Total Hardness (mg/l as CaCO3) | 350.0 | 330.0 | 320.0 | 300.0 | 300.0 | 330.0 |
| 20 | Nitrates | 0.74 | 0.70 | 0.95 | 0.62 | 0.71 | 0.75 |
| 21 | Date Sampled for Analysis | 7-13-98 | 8-29-98 | 9-17-98 | 10-6-98 | 11-12-98 | 12-9-98 |
| 22 | Date Last Precipitation Event Occurred | 7-8-98 | 8-26-98 | 9-9-98 | 10-4-98 | 11-10-98 | 12-9-98 |

Laboratory Name TRA-DET, INC.
Address P.O. BOX 2019 City WHEELING
State WEST VIRGINIA Zip 26003-0219

NOTE: If information required by items 5, 6, and 9 is unobtainable, submit as an addendum to Attachment 14A a statement giving the reasons why the information is unobtainable.
NOTE: For each sample provide data for either item 13 or 14.

MAY 0 3 2010

# PART 3: RECLAMATION AND OPERATIONS PLAN

## A. GENERAL REQUIREMENTS

(1) Describe the type and method of coal mining procedures.

**Full coal recovery, longwall mining method. Partial Coal Recovery, room and pillar mining method. See Addendum to Part 3, Item A(1)**

(2) Describe the proposed engineering techniques to be used in this mining operation.

**See Addendum to Part 3, Item A(2)**

(3) Anticipated annual production of coal: **1,069,733** tons
Anticipated total production of coal: **5,348,665** tons

(4) List the major pieces of equipment to be used for all aspects of the operation.

**Longwall shearer, shields, face conveyor, continuous miner, roof bolters, shuttle cars, scoop cars, tail piece, crusher, and beltline.**

(5) Submit Performance Security Estimate providing an estimate of the reclamation cost on the proposed operation.

(6) Will the proposed mining operations be within 25 feet of any known oil or gas well?

☒ Yes ☐ No If yes, submit a variance request as an addendum to this item.

(7) Will the proposed operation include return of slurry or other mine waste or material into the abandoned underground workings?

Yes ☐ No ☒ If "yes," comply with provisions contained in paragraph (N) of rule 1501:13-4-14 and paragraph (Q) of 1501:13-9-04 of the Administrative Code, and submit copies of the required MSHA approvals as an addendum.

## B. RECLAMATION PLAN – GENERAL REQUIREMENTS

(1) Describe the plan for minimizing to the extent possible and using the best technology currently available disturbances and adverse impacts of the operation on fish and wildlife and related environmental values, including compliance with the Endangered Species Act, and achieving enhancement of such resources where practical.

**The proposed longwall mining operation is not expected to impact fish, wildlife, and other related environmental values. Minnows have been found in some of the larger stream segments within the application area. However, the normal annual cycle shows that during the summer and fall months, when the stream flow is minimal, the minnows swim downstream, only to return again. Observations show that stream segments that go dry**

AMERICAN ENERGY CORP.
CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 3, A(1)

## TYPE OF MINING METHODS

Mining to be conducted within the limits of the proposed adjacent area, D-0425-12, shall utilize the longwall method. Machinery and equipment used for this type of mining is listed in Part 3, Item A(4).

The Century Mine is an operation that uses the longwall method as its primary method of mining. The Room & Pillar method is used for development and access to these panel areas. While continuous miners are used for these development entries, they are not considered production sections. This mining method maximizes the recovery of the reserve by leaving coal only in the remaining pillars in the development entries (main and gate entries) and barrier pillars to protect the main entries.

The mining will progress from existing travelways in the adjacent D-0425 underground mine to this application area through main entries that will carry the ventilation air currents and contain the haulage entries. These main entries will branch down into the gate entries that will surround and outline the longwall panels. These mining units are considered part of the longwall mining to be conducted at the Century Mine. Full coal recovery (Longwall mining) methods are planned for most of the application area.

The Century mine will also use room and pillar as a production mining method in the two large areas shown as partial recovery mining on the south side of the permit shown on the application and hydrology map.

The approximate timing for the mining operations within this proposed adjacent area is shown on the Timing, Structure Contour, Coal Deed Map, Addendum to Part 4, Item B.(1). This method of permitting will allow for any changes in the mine plan which may be caused by unforeseen geologic conditions, production demand changes, or any other problems which may arise during the underground mining operations.

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PERMIT D-0425-12
ADDENDUM TO PART 3, A(2)

## ENGINEERING AND MINING TECHNIQUES

For those areas mapped as longwall areas, the engineering and mining techniques for longwall mining are as follows:

### Longwall Mining

1. Longwall mining removes long rectangular panels of coal that are 600 to 1150 ft wide and a maximum of approximately 15,000 ft. long. A longwall shearer, a double-drum machine, removes the panel by cutting slices of coal along the width of the face. The roof is temporarily supported by hydraulic supports called shields. The shields are moved forward each time that a slice is cut from the face. The coal is transported from the face by an armored, chain conveyor to the gate entry where it is transported to the main conveyor for removal from the mine.

The roof behind the shields is allowed to collapse. Surface subsidence on the order of approximately 69 percent of the mining height occurs when the roof falls.

2. The longwall face is outlined by three or four entries on each side called gate entries, on the end where the panel starts by several entries called bleeder entries, and on the panel end by the main entries or by recovery rooms (entries developed to remove the longwall mining equipment). These entries are developed using a continuous miner, shuttle cars, and roof bolters. Pillars and concrete block stoppings separate each entry from the next. These entries provide ventilation and belt haulage for the longwall mining section, with a maximum recovery of less than 50 percent of the coal. Coal pillars between the longwall panels crush after both adjacent longwall panels are extracted. Subsidence of the surface occurs over these panels and pillars during longwall mining as a result of the pillars crushing and from the extraction of both adjacent longwall panels. These areas are considered as full recovery mining areas. The development gate entries, utilizing room and pillar mining between the panels, are considered and calculated to be within the full recovery mining area acreage as they are included within the angle of draw for subsidence. This allows flexibility in adjusting the mains and gates as plans and conditions dictate. Room & pillar areas along the boundary of the shadow area where they do not border existing shadow area for longwall mining are not included in the full recovery mining area but are included in the Partial Coal Recovery Area.

### Main Entry Development - Longwall Access

3. There will be one set of main entries driven in a slightly northeasterly direction extending from the main entries of the D-0425-10 Adjacent Area. The main entries consist of approximately seven entries, driven with continuous miners and are primarily used for ventilation, transportation of men and materials, and haulage. These entries are designed for long-life with the pillars providing roof support. The maximum

recovery factor for mains and sub mains is below 50 percent and is much less if one considers the barrier blocks left in place at the approaches to butt and longwall sections. These are included in the Partial Coal Recovery Area.

There is a barrier pillar planned for the area that lies to the southwest of the southern most longwall panel, as indicated by the zero subsidence line which lies in the Partial Coal Recovery Area. Barrier pillars are a normal part of protection of the main entries, as the barrier pillar absorbs any additional loading from the longwall panel so that it does not override onto the main entry pillars.

Room and Pillar Mining

1. Room and Pillar Mining consists of making parallel cuts with cross cuts between the parallel sections. This method uses a continuous miner with a single cutting drum to cut the coal from the seam. The roof is supported by bolts into the overhead strata. The coal is transported by shuttle cars to the conveyor, at which point it is removed from the mine.

ADDENDUM TO PART 3, ITEM A.
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12

Current capacity for 5,649,747 tons of coal waste is available at the Coarse Coal Refuse site on Permit D-0425-2. D-0425-12 application will generate 2,139,466 tons of coal waste. The D-0425-12 figures were calculated using 40% reject, 3 to 1 coarse to fines, (75% coarse coal).

***D-425-12 Permit Pea Vine Mains and Gates***

| ROM Coal Tons | Clean Tons 60.00% | Total Reject | Refuse To Site |
|---|---|---|---|
| 5,348,665 | 3,209,199 | 2,139,466 | 1,604,600 |

Current capacity for 11,528,976 tons of slurry is available at the Ohio Valley Coal Company No. 2 Dam. Permit D-0425-12 application will generate 534,866 tons of slurry fines (3:1 coarse to fine ratio). The No. 2 Dam has the capacity to contain the D-0425-12 slurry fines.

***D-425-12 Permit Pea Vine Mains and Gates***

| ROM Coal Tons | Clean Tons 60.00% | Total Reject | Slurry 3:1 |
|---|---|---|---|
| 5,348,665 | 3,209,199 | 2,139,466 | 534,866 |

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CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 3, A(5)

The Performance Security Estimate (PSE) does not apply to this adjacent area because this application is for the continuation of underground mining for permit D-0425. However, the PSE for the surface operations is up to date.

AMERICAN ENERGY CORP.
CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 3, A(6)

In order to comply with O.R.C. 1563.111, the Applicant will contact the Division's Mine Safety Section requesting permission from the Chief to mine within 25' of any oil or gas well within the proposed permit limits. The wells within the permit limits are listed below and shown on the application map.

It is planned that all currently active wells to be mined through will first be plugged with the permission of the well owner. Refer to the table below for a summary of wells whose locations are recorded or indicated to be within the proposed shadow area. For the wells identified as being located, records at the Division of Mineral Resources Management will be reviewed to determine if the well was appropriately plugged per the ODNR standard well abandonment procedure. If it is found that the well was not appropriately plugged, the operator will verify the owner of the well, and subsequent to obtaining a plugging permit, appropriately plug the well with neat cement; thereafter mining will proceed. If the well cannot be located at its recorded location, and is inadvertently intercepted by mining, an honest effort will be made immediately to plug the well with neat cement.

The proposed mining operation will maintain safe operating practices in any work involving areas near encountered gas wells. Work shall be done in order to ensure the safety of people, livestock, fish and wildlife and machinery in the mine.

| SITE I.D. | TYPE | TWP | LOCATION/SECTION | FIELD LOCATED (Y/N) | MINE STATUS |
|---|---|---|---|---|---|
| 20012 | Plugged Gas Well | WASHINGTON | NW1/4 SEC. 14 | Yes | Mine Through |
| 20229 | Dry Hole | WASHINGTON | NW1/4 SEC. 14 | Yes | Mine Through |
| 61070 | Dry Hole | WASHINGTON | SE1/4 SEC. 20 | Yes | Mine Through |
| 61089 | Plugged Gas Well | WASHINGTON | SW1/4 SEC. 21 | No Indication | Mine Through |

U.S. Department of Labor

Mine Safety and Health Administration
4015 Wilson Boulevard
Arlington, Virginia 22203-1984

FEB 27 2002

In the matter of
American Energy Corporation
Century Mine
I.D. No. 33-01070

Petition for Modification

Docket No. M-2001-097-C

## PROPOSED DECISION AND ORDER

On September 25, 2001, a petition was filed seeking a modification of the application of 30 CFR 75.1700 at Petitioner's Century Mine in Belmont County, Ohio. The Petitioner alleges that the alternative method outlined in the petition will at all times guarantee no less than the same measure of protection afforded by the standard.

The alternative method proposed by the petitioner is similar to that approved under similar petitions for modification with the exception of certain terms and conditions. Specifically, the District Manager has the authority to allow mining within 300 feet without plugging, and to accept wells cleaned and plugged prior to the effective date of this Order if the plugging methods are documented and meet the terms and conditions of this Order.

MSHA personnel conducted an investigation of the petition and filed a report of their findings and recommendations with the Administrator for Coal Mine Safety and Health. After a careful review of the entire record, including the petition and MSHA's investigative report and recommendation, this Proposed Decision and Order (PDO) is issued.

## Finding of Fact and Conclusion of Law

The alternative method proposed by the Petitioner (as amended by MSHA) will at all times guarantee no less than the same measure of protection afforded the miners under 30 CFR 75.1700.

The petitioner projects that there are approximately 22 oil and gas wells to be plugged and mined through in the next five years of longwall mining. Typically, the wells are 1,800 to 2,200 feet deep. However, some oil and gas can be found at 1,200 to 1,500 feet. The Century Mine is extracting coal in the Pittsburgh No. 8 Coal Seam. There are no known old workings in the coal seams above or below the Pittsburg No. 8. The No. 6 and 6A Coal Seams are located approximately 640 feet and 570 feet respectively below the Pittsburg No. 8 Coal Seam. These seams are more than 800 feet below the surface and are more than 24 inches thick.

Generally, the Pittsburgh No. 8 Coal Seam is 200 to 250 feet from the surface depending upon the topography. The majority of the wells which will be plugged were drilled before 1930 prior to enactment of any drilling or plugging standards. Also, many of the well were abandoned before federal or state regulations became effective.

Unless the existing records show that an abandoned well was plugged using techniques equivalent to this proposed decision and order's terms and condition, and that information is submitted and accepted in accordance with Paragraph 2(s) as providing the required level of safety by the District Manager, the well shall be again cleaned, inadequate plugging materials drilled out and the well plugged in accordance with the terms and conditions of this proposed decision and order before such wells may be cut through or approached within the allowed limits. The summary information provided by the petition suggests that special attention to securing and interpreting the suite of drill logs required by Paragraph 1(a)(4) is needed to ensure that, at a minimum, the expanding cement plug extends from at least 200 feet below the lowest minable seam through 100 feet above the highest minable seam, unless the seams are separated by an interval greater than 300 feet, in which case each seam may be plugged individually.

On the basis of the petition and the findings of MSHA's investigation, American Energy Corporation is granted a modification of the application of 30 CFR 75.1700 to its Century Mine.

ORDER

Wherefore, pursuant to the authority delegated by the Secretary of Labor to the Administrator for Coal Mine Safety and Health, and pursuant to Section 101(c) of the Federal Mine Safety and Health Act of 1977, 30 U.S.C., sec. 811(c), it is ordered that American Energy Corporation's Petition for Modification of the application of 30 CFR 75.1700 at the Century Mine is hereby:

GRANTED, for mining through or near (whenever the safety barrier diameter is reduced to a distance less than the District Manager would approve pursuant to Section 75.1700) plugged oil or gas wells penetrating the Pittsburgh No. 8 Coal Seam and other minable coal seams, conditioned upon compliance with the following terms and conditions:

1. Procedures to be utilized when plugging oil or gas wells.

a. Cleaning out and preparing oil and gas wells. Prior to plugging an oil or gas well, the following procedure shall be followed:

(1) A diligent effort shall be made to clean the borehole to the original total depth. If this depth cannot be reached, the borehole shall be cleaned out to a depth which would permit the placement of at least 200 feet of expanding cement below the base of the lowest minable coal bed.

(2) When cleaning the borehole, a diligent effort shall be made to remove all the casing in the borehole. If it is not possible to remove all casing, the casing which remains shall be perforated, or ripped, at intervals spaced close enough to permit expanding cement slurry to infiltrate the annulus between the casing and the borehole wall for a distance of at least 200 feet below the base of the lowest minable coal bed.

(3) If the cleaned-out borehole produces gas, a mechanical bridge plug shall be placed in the borehole in a competent stratum at least 200 feet below the base of the lowest minable coal bed, but above the top of the uppermost hydrocarbon-producing stratum. If it is not possible to set a mechanical bridge plug, a substantial brush plug may be used in place of the mechanical bridge plug.

(4) A suite of logs shall be made consisting of a caliper survey, directional deviation survey, and log(s) suitable for determining the top and bottom of the lowest minable coal bed and potential hydrocarbon producing strata and the location for the bridge plug.

(5) If the uppermost hydrocarbon-producing stratum is within 200 feet of the base of the lowest minable coal bed, properly placed mechanical bridge plugs or a suitable brush

plug described in Subparagraph (a)(3) shall be used to isolate the hydrocarbon producing stratum from the expanding cement plug. Nevertheless, a minimum of 200 feet of expanding cement shall be placed below the lowest minable coal bed.

(6) The wellbore shall be completely filled and circulated with a gel that inhibits any flow of gas, supports the walls of the borehole, and increases the density of the expanding cement. This gel shall be pumped through open-end tubing run to a point approximately 20 feet above the bottom of the cleaned out area of the borehole or bridge plug.

b. Plugging oil or gas wells to the surface. The following procedures shall be utilized when plugging gas or oil wells to the surface:

(1) A cement plug shall be set in the wellbore by pumping an expanding cement slurry down the tubing to displace the gel and fill the borehole to the surface. (As an alternative, the cement slurry may be pumped down the tubing so that the borehole is filled with Portland cement or a Portland cement-fly ash mixture from a point approximately 100 feet above the top of the lowest minable coal bed to the surface with an expanding cement plug extending from at least 200 feet below the lowest minable coal bed to the bottom of the Portland cement.) There shall be at least 200 feet of expanding cement below the base of the lowest minable coal bed.

(2) A small quantity of steel turnings, or other small magnetic particles, shall be embedded in the top of the cement near the surface to serve as a permanent magnetic monument of the borehole.

c. Plugging oil or gas wells using the vent pipe method. The following procedures shall be utilized when using the vent pipe method for plugging oil and gas wells:

(1) A 4½-inch or larger vent pipe shall be run

into the wellbore to a depth of 100 feet below the lowest minable coal bed and swedged to a smaller diameter pipe, if desired, which will extend to a point approximately 20 feet above the bottom of the cleaned out area of the borehole or bridge plug.

(2) A cement plug shall be set in the wellbore by pumping an expanding cement slurry, Portland cement, or a Portland cement-fly ash mixture down the tubing to displace the gel so that the borehole is filled with cement. The borehole and the vent pipe shall be filled with expanding cement for a minimum of 200 feet below the base of the lowest minable coal bed. The top of the expanding cement shall extend upward to a point approximately 100 feet above the top of the lowest minable coal bed.

(3) All fluid shall be evacuated from the vent pipe to facilitate testing for gases. During the evacuation of fluid, the expanding cement shall not be disturbed.

(4) The top of the vent pipe shall be protected to prevent liquids or solids from entering the wellbore, but permit ready access to the full internal diameter of the vent pipe when necessary.

d. Plugging oil and gas wells for use as degasification boreholes. The following procedures shall be utilized when plugging oil or gas wells for subsequent use as degasification boreholes:

(1) A cement plug shall be set in the wellbore by pumping an expanding cement slurry down the tubing to displace the gel and provide at least 200 feet of expanding cement below the lowest minable coal bed. The top of the expanding cement shall extend upward to a point above the top of the coal bed being mined. This distance shall be based on the average height of the roof strata breakage for the mine.

(2) To facilitate methane drainage, degasification casing of suitable diameter, slotted or perforated throughout its lower 150 to 200 feet, shall be set in the borehole to a point 10 to 30 feet above the top of the expanding cement.

(3) The annulus between the degasification casing and the borehole wall shall be cemented from a point immediately above the slots or perforations to the surface.

(4) The degasification casing shall be cleaned out for its total length.

(5) The top of the degasification casing shall be fitted with a wellhead equipped as required by the District Manager. Such equipment may include check valves, shut-in valves, sampling port, flame arrestor equipment, and security fencing.

2. The following cut-through procedures (a-t) apply whenever the petitioner reduces the safety barrier diameter to a distance less than the District Manager would approve pursuant to Section 75.1700 or proceeds with an intent to cut through a plugged well:

a. Prior to reducing the safety barrier to a distance less than the District Manager would approve pursuant to Section 75.1700 or proceeding with an intent to cut through a plugged well, the operator shall notify the District Manager or his designee.

b. The MSHA District Manager or designee may conduct a conference prior to mining through any plugged well to review and approve the specific procedures for mining through the well. Representatives of the operator, the representative of the miners, and the appropriate State agency shall be informed, within a reasonable time prior to the conference, and be given an opportunity to attend and participate. This meeting may be called by the operator.

c. Mining in close proximity to or through a plugged well shall be done on a shift approved by the District Manager or designee.

d. The District Manager or designee, representative of the miners, and the appropriate State agency shall be notified by the operator in sufficient time prior to the mining through operation in order to have an opportunity to have representatives present.

e. When using continuous mining equipment, drivage sights shall be installed at the last open crosscut near the place to be mined to ensure intersection of the well. The drivage sites shall not be more than 50 feet from the well. When using longwall mining methods, drivage sights shall be installed on 10-foot centers for a distance of 50 feet in advance of the well bore. The drivage sights shall be installed in the headgate and tailgate.

f. Firefighting equipment, including fire extinguishers, rock dust, and sufficient fire hose to reach the working face area of the mining through shall be available when either the conventional or continuous mining method is used. The fire hose shall be located in the last open crosscut of the entry or room. All fire hoses shall be ready for operation during the mining through.

g. Sufficient supplies of roof support and ventilation materials shall be available and located at the last open crosscut. In addition, an emergency plug and/or plugs shall be available in the immediate area of the cut through.

h. The quantity of air required by the approved mine ventilation plan, but not less than 6,000 cubic feet of air per minute for scrubber equipped continuous miners or not less than 9,000 cubic feet per minute for continuous miner sections using auxiliary fans or line brattice only, shall be used to ventilate the working face during the mining through operation. The quantity of air required by the ventilation plan, but not less than 30,000 cfm, shall reach the working face of each future longwall during the mine-through operation.

i. Equipment shall be checked for permissibility and serviced on the shift prior to mining through the well.

j. The methane monitor(s) on the continuous mining machine or the longwall shear and face shall be calibrated on the shift prior to mining through the well.

k. When mining is in progress, tests for methane shall be made with a hand-held methane detector at least every 10 minutes from the time that mining with the continuous mining machine is within 30 feet of the well until the well is intersected and immediately prior to mining through. When mining with longwall mining equipment, the tests for methane shall be made at least every 10 minutes when the longwall face is within 10 feet of the well. During the actual cutting through process, no individual shall be allowed on the return side until mining through has been completed and the area has been examined and declared safe.

l. When using continuous mining methods, the working place shall be free from accumulations of coal dust and coal spillages, and rock dust shall be placed on the roof, rib and floor to within 20 feet of the face when mining through or near the well on the shift or shifts during which the cut through will occur. On longwall sections rock dusting shall be conducted and placed on the roof, rib, and floor up to both headgate and tailgate gob.

m. When the wellbore is intersected, all equipment shall be deenergized and the place thoroughly examined and determined safe before mining is resumed. Any well casing shall be removed and no open flame shall be permitted in the area until adequate ventilation has been established around the wellbore.

n. After a well has been intersected and the working place determined safe, mining shall continue inby the well a sufficient distance to permit adequate ventilation around the area of the wellbore.

o. No person shall be permitted in the area of the mining through operation except those actually engaged in the operation, company personnel, representatives of the miners, personnel from MSHA, and personnel from the appropriate State agency.

p. The mining through operation shall be under the direct supervision of a certified official. Instructions concerning the mining through operation shall be issued only by the certified official in charge.

q. MSHA personnel may interrupt or halt the mining through operation when it is necessary for the safety of the miners.

r. A copy of the petition shall be maintained at the mine and be available to the miners.

s. The Petitioner shall file a plugging affidavit setting forth the persons who participated in the work, a description of the plugging work, and a certification by the Petitioner that the well has been plugged as described.

t. Within 60 days after this PDO becomes final, the Petitioner shall submit proposed revisions for its approved 30 CFR Part 48 training plan to the Coal Mine Safety and Health District Manager. These proposed revisions shall include initial and refresher training regarding compliance with the terms and conditions stated in the PDO.

Any party to this action desiring a hearing on this matter must file in accordance with 30 CFR 44.14, within 30 days. The request for hearing must be filed with the Administrator for Coal Mine Safety and Health, 4015 Wilson Boulevard, Arlington, Virginia 22203.

If a hearing is requested, the request shall contain a concise summary of position on the issues of fact or law desired to be raised by the party requesting the hearing, including specific objections to the proposed decision. A party other than Petitioner who has requested a hearing shall also comment upon

all issues of fact or law presented in the petition, and any party to this action requesting a hearing may indicate a desired hearing site. If no request for a hearing is filed within 30 days after service thereof, the Decision and Order will become final and must be posted by the operator on the mine bulletin board at the mine.

Michael J. Lawless
Acting Administrator
for Coal Mine Safety and Health

**following subsidence have returned to near their normal flow, and will again support minnows. The larger streams will return to normal flow faster than smaller streams because more sediment is carried in larger streams and help fill any residual cracks that may be found. There are several ponds overlying the application area, and larger fish live in them. Our experience at the CENTURY MINE is that ponds are not greatly influenced by subsidence due to the amount of cover. Wildlife has never been shown to be affected by longwall mining. If surface slips are caused by mining activities, over the mining area, AMERICAN ENERGY CORPORATION will restore the land to a condition equal to its original value and reasonably forseeable use. Undeveloped springs that are found above the application area may be dewatered and usually reposition themselves downstream. American Energy Corporation will replace undeveloped springs if they are legitimately used according to our water replacement plan.**

## C. RECLAMATION PLAN-PROTECTION OF HYDROLOGIC BALANCE

(1) Based on the baseline data submitted in response to Part 2, items B, C, D and other submitted information in this application, describe the probable hydrologic consequences of this proposed underground mining operation on the hydrologic regime of the proposed shadow area and adjacent areas. The description shall include findings on each of the following items:

(a) The consequences of the proposed operation on the contents of dissolved and total suspended solids, total iron, total manganese and pH;
(b) Whether adverse impacts may occur to the hydrologic balance;
(c) The impact the proposed operation will have on:
  i) Sediment yield from the disturbed area,
  ii) Acidity, total suspended and dissolved solids and other important water quality parameters of local impact,
  iii) Flooding or stream-flow alteration, ground water and surface water availability.

**1)**

**a) The proposed longwall mining operation should have no impacts on the contents of total suspended solids, dissolved solids, acidity, or pH. Some of the wells located within the proposed permit area may exhibit increases in iron, manganese, and hardness post-mining operation. Some springs within the proposed mining permit may exhibit increased iron, manganese, and hardness post-mining. These increases are typically temporary and do not persist for a period longer than one year. The quality of the surface and ground water in the application area is not expected to be altered long term as a result of the proposed mining activities. The levels of pH, iron, manganese, total suspended solids, total suspended solids, and total dissolved solids are not expected to vary from the levels indicated in the submitted hydrologic inventory. However, these levels may temporarily be altered during and post mining.**

b) Aquifers in the proposed mining area strata normally have low yields and are less susceptible to mine subsidence fracturing. If fracturing should occur, the fractures will tend to close in response to lithologic pressures or be plugged by fine grain sediments containing clay that will swell when exposed to water. There is also vertical and horizontal variability in the rock strata. Rapid facies and hydrologic property changes limit the horizontal continuity of individual rock units. With the exception of persistent coal seams, few lithologic units are continuous across the proposed permit area. All of these factors tend to enhance the importance of localized flow systems. Most available ground water in this region is limited to the first 100' of the surface where enhanced permeability associated with rock fracturing is present. Ground water recharge in the upper ridge and ridge top areas of the site result in downward water migration within this shallow saturated zone. Due to topographic relief exceeding 100 feet between ridge tops, localized flow systems under the ridge tops are not hydrologically connected with adjacent ridge tops. Ground water under any ridge top can be considered continuous, but not across to other ridge tops. The overall hydrologic regime may be affected and some individual sources of water may be permanently disrupted and require replacement. Should a supply become affected by the mining operation, the supply will be appropriately supplemented by American Energy Corp. at the company's expense by connecting the water user to a temporary water supply such as a portable water tank until it is deduced that the original water supply has been permanently lost. If permanent loss is verified the water user will then at the company's expense be connected to a permanent source such as an available public water supply. Should a supply become affected by the mining operation, the supply will be supplemented by American Energy Corp. at the company's expense by connecting the water user to another water supply.

Some changes in general water table levels and repositioning of hillside springs may result. Static water levels of ground water users in the proposed permit area may be affected. Many ground water supplies are permanently disrupted and therefore require replacement. Based on water bearing strata located in the test holes and field observations and sampling of developed water supplies, several aquifer zones have been identified and estimated in the proposed permit area. These aquifer zones can be located in the Ground Water Description in Part 2 Section C.

c)

(i) No impact to sediment yield will occur as a result of the proposed longwall mining operation.

**(ii) The effect on acidity, total suspended and dissolved solids, and other importanat water quality parameters of local impact will not be significantly effected by longwall operations and are expected to still meet effluent limitations.**

**(iii) The proposed underground longwall mining operation will have no impact on flooding. It is expected that water flow in streams where overburden exceeds 200 feet, may be temporarily reduced, but are expected to recover with periodic storm events. Due to the local geology, as described in the geologic description in Part 2 Item B, any stream loss will not drain into the mine workings. It is our experience that any stream loss over the shadow area reappears downstream of the shadow area.**

(2) Identify the extent to which the proposed underground mining operations, including subsidence impacts, may proximately result in contamination, diminution or interruption of an underground or surface supply of water within the proposed shadow area and adjacent areas which is used for domestic, agricultural, industrial or other legitimate use. If contamination, diminution or interruption may result, provide a description of alternative sources of water which could be developed to replace existing sources including information on water availability and suitability of alternative water sources for existing pre-mining uses and approved post-mining land uses. Furthermore, address the protection of the rights of present users of surface and ground water.

**Please refer to Part 3 Item C (2) attached as an addendum to this Item.**

(3) Is the application within 1,000 feet of an Ohio Source Water Protection Area? Yes ☐ No ☒ If "yes," indicate the name of the protection area. Describe activities that are potentially harmful to public water supplies and address mitigation of, and alternatives, to such activities. Identify the protection area on the Hydrology Map.

## D. GROUND WATER AND SURFACE WATER MONITORING PLAN

Based upon the probable hydrologic consequences determination and analysis of all baseline hydrologic, geologic and other information submitted in this application, describe the plan for collection, recording and reporting of all surface and ground water quality and quantity monitoring data, including data collected for the NPDES program.

**See Addendum to Part 3, Item D**

ADDENDUM TO PART 3, ITEM C(2)
AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12

# ALTERNATIVE WATER SUPPLY INFORMATION

## 1. INTRODUCTION

AEC will comply with all legal requirements when required to effect water replacement per ORC 1513.162 AND OAC 1501:13-9-04 (P). Notwithstanding its mining rights and without waiving any of its mining rights, where such diminution or interruption results from its mining, American Energy Corporation will repair or install a replacement source in the adjacent area to a level sufficient to meet the pre-mining quantity and quality levels of a legitimate water supply which will be determined by monitoring information gathered in accordance with the Monitoring Plan.

The Probable Hydrologic Consequences (PHC) narratives contained in response to Part 3, C(1) of this application indicate a potential for diminution and/or interruption of ground water and surface water supplies in areas above and contiguous to full recovery mining operations. Past experience indicates that the majority of subsidence (that detectable with surveying equipment) is complete within about 10-14 days after the longwall passes under the area. Water losses generally occur within that time period.

No long-term contamination of such water supplies is expected; however, short-term quality impacts are possible, as addressed in the PHC narratives. Nevertheless, if the Division finds that mining has resulted in contamination of any used, legitimately water supply, it will be replaced in the manner set forth below.

## 2. NOTIFICATION OF IMPACT BY COMPLAINANT

If a water user believes that his or her underground or surface water source has been contaminated, diminished, or interrupted as a proximate result of the mine's operation, he or she should notify the Division's appropriate district office or AEC by calling (614) 926-9152. AEC will make a determination of liability no later than sixty (60) days after notification of the contamination, diminution, or interruption of a water supply as a proximate result of the mine's operation.

## 3. NOTIFICATION OF IMPACT BY OPERATOR

AEC will notify the Division of all received water complaints and detailed responses to those complaints. In particular, dates and methods of repair and/or replacement will also be provided. If AEC plugs a well, it will send the Division a copy of the sealing report filed with ODNR – Division of Water. If AEC drills a well, it will submit a copy of the drilling report filed with ODNR – Division of Water to the Division, and a completed Hydrologic Analysis from a one-time sample, and address the monitoring of this well, if applicable.

## 4. TEMPORARY WATER SUPPLY

At its own expense AEC will install an alternate water supply system to be used until repair or replacement is completed or will reimburse the water user for the reasonable cost of obtaining a water supply from the date of any such contamination, diminution, or interruption

until the supply is repaired or replaced. Work on installing a temporary alternate water supply will be complete within 48 hours after AEC learns of the contamination, diminution, or interruption to a legitimately-used water supply proximately caused by the mining operation. In cases where temporary water cannot be provided within 48 hours, AEC will immediately notify the Chief of the Division of Mineral Resources Management who will determine if the circumstances warrant an extension of the 48 hours.

5. DETERMINATION OF IMPACT

AEC will make a determination of liability no later than sixty (60) days after notification of the contamination, diminution, or interruption of a water supply as a proximate result of the mine's operation. As an option, AEC may defer to the Division to make such determination.

6. PERMANENT SUPPLY OPTIONS

AEC will provide the affected water user with no less of an available water supply than the water user had before mining, based on the pre-mining measurements and analyses. In some cases, AEC reaches pre-subsidence agreements with water users, who are normally represented by counsel and in all cases, have full opportunity to consult with counsel or anyone else of their choosing. These agreements, which are typically negotiated by AEC employees, normally cover all potential damage claims. In situations where such an agreement is reached, AEC intends to comply with the water replacement terms contained in the agreement. Such an agreement will satisfy, at a minimum, this permit and ORC 1513.162.

In repairing or replacing a water user's ground or surface water supply system used for domestic use which is damaged as a proximate result of the mine's operation, AEC's first preference is to repair the affected supply system. If that is neither effective nor feasible, AEC's second preference is to replace the affected supply system with a like supply system.

As stated in the previously-referenced PHC narratives, the elevation of alternative water sources is unpredictable until the water system in the area again attains equilibrium after mining. Therefore, the alternative water supplies to be developed will be selected on a case-by-case, site-specific basis from among the options in the following list when the need arises:

1. Repair damaged cisterns after AEC has determined that subsidence is complete by grouting the cistern or by replacing it;

2. On a site-specific basis, re-drill existing wells, drill new wells, or connect the water user to public water supplies. Switzer Water Association has existing water lines on CR86 and part of Twp Roads 104 and 108 within the application area and is currently serving approximately 17 occupied structures therein. There are less than ten occupied structures within the application area that are not on the system but could be connected to the existing public water system for interim or permanent water replacement. Ohio Valley Coal Company and AEC have drilled a number of successful replacement wells over the years for both domestic and

agricultural replacements. Some of AEC's replacements are listed in the attached Addendum.

3. On a site specific basis, developed springs will be replaced by a farm pond built according to accepted engineering practices, drilling of a new well, development of another spring in close proximity to the original spring, if viable, or connect the water user to public water.

4. Repair damaged farm ponds so as to be comparable to their pre-mining conditions This has been successfully accomplished on Warner Moore's property that had an abandoned gas well in the pond. When the mining went through, it drained the pond. OVCC put clay in the bottom of the pond and stopped the leak. There was a pond that was repaired in the 30 West panel that was also successfully repaired.

5. Install an interim water supply until affected water supplies are replaced. Interim supplies may include hauled water or a tap to public water. AEC will only install temporary, replacement water using a public water supply if it can be connected within 48 hours. AEC routinely uses a certified water hauler to haul county water for temporary replacement supplies. This practice is expected to continue. The local fire department can haul water within a matter of hours after receiving a request. Temporary tanks and water troughs for livestock are kept in stock to facilitate quick installations. AEC will pay for interim water bills.

6. Such other proven, cost effective, and reasonable techniques as AEC may now, or in the future, deem appropriate.

Permanent replacement, repair or the installation of a replacement water supply for an affected water supply shall be completed after it has been determined that the supply has been contaminated, diminished, or interrupted as a proximate result of the operator's mining operation.
Those supplies may include, but not be limited to, re-development of an existing well, spring, or pond, or replacement of the source with the County Water System. Other supplies include wells or springs. AEC has drilled wells and developed springs over longwall-mined areas successfully.

7. PAYMENT

If contamination, diminution, or interruption of a legitimately-used ground or surface water supply occurs as a proximate result of the mine's operation, AEC will repair such water supply or install a replacement supply at its own expense. This pertains to both interim and permanent water supply replacement.

AEC, in the past, has always attempted to consult and negotiate with the affected water user concerning the selection of the type of water replacement system and its site. This is done at the request of water users who prefer this procedure to that of AEC making unilateral decisions about replacement supplies and sites.

8. APPEALS

In any situation where AEC determines that the contamination, diminution, or interruption of a legitimate water supply was not proximately caused by the mining operation, based on evidence such as the proximity of the supply to the mining operation, site specific geologic and surface conditions, or climatological conditions, AEC will provide the water user and the Division of Mineral Resources Management with notice of its determination and the proof in support of that determination to allow the Division of Mineral Resources Management to issue a Chief's Order deciding the issue. This Chief's Order is then appealable in accordance with O.R.C. §1513.13. The water user's water supply system will continue in operation during the time AEC seeks review of this matter pursuant to O.R.C. §1513.13, unless the Reclamation Commission grants temporary relief. Furthermore, AEC will provide a temporary water supply pending an appeal filed by the complainant in response to a determination that mining did not cause the adverse impact to the water supply.

**ADDENDUM TO Part 3 C(2)**
**Alternative Water Supply - Supporting Documentation**

**Applicants Name:** American Energy Corporation D-0425-12

| SURFACE OWNER | COUNTY | TOWNSHIP | Operator | SMA Permit | REPLACEMENT | COMMENT | LOG # |
|---|---|---|---|---|---|---|---|
| Butler, Charles | Belmont | Wayne | AEC | D-0425 | Well | Replace well for domestic use | 2008050 |
| Crooks, Roger | Belmont | Sunsbury | AEC | D-0425 | Well | Replace Agricultural Supply | 2014868 |
| Vest, Walter (Buckthorn Club) | Belmont | Washington | AEC | D-0425 | Well | Replace well for domestic use | 2001884 |
| Butler, Charles | Belmont | Wayne | AEC | D-0425 | Well | Replace Agricultural Supply | 2009586 |
| Davis, Judith | Belmont | Washington | AEC | D-0425 | Well | Replace well for domestic use | 2010789 |
| Dornan, Don | Belmont | Sunsbury | AEC | D-0425 | Well | Replace Agricultural Supply | 2018645 |
| Elrod, Dave | Belmont | Washington | AEC | D-0425 | Well | Replace well for domestic use | 2013154 |
| Bondy, John | Belmont | Washington | AEC | D-0425 | Well | Replace well for domestic use | 2003706 |
| Cox, Jeff | Belmont | Sunsbury | AEC | D-0425 | Well | Replace well for domestic use | 2018644 |
| Boan, Lucy | Belmont | Wayne | AEC | D-0425 | Well | Replace well for domestic use | 2001883 |
| Bondy, Clyde | Belmont | Washington | AEC | D-0425 | Well | Replace well for domestic use | 2003703 |
| Crooks, Roger | Belmont | Sunsbury | AEC | D-0425 | Pond | Replace Agricultural Supply | NA |
| | | | | | | | |
| | | | | | | | |

AMERICAN ENERGY CORPORATION
CENTURY MINE
D-0425-12
ADDENDUM TO PART 3, ITEM D

## GROUND AND SURFACE WATER MONITORING

### 1. Ground Water Monitoring Plan

All legitimately used ground water and surface water supplies have been identified in the Ground Water and Surface Water Inventories, respectively. These used supplies will be monitored quarterly for quality and monthly for quantity for at least one year prior to full recovery mining, and at least one year subsequent to mining contingent upon review by the Division of Mineral Resources Management, unless access is denied by the land owner. Quarterly Monitoring Reports and Daily precipitation data will be submitted to the appropriate District office no later than 14 days after the end of the quarter.

### 2. Surface Water Monitoring Plan

Stream stations upstream and downstream of the shadow area as depicted on the application/hydrology map will be sampled monthly for flow and quarterly for quality. The quality requirements of OAC 1501:13-4-13(E)(2) and the other QMR parameters as stated on the Underground Mining–Shadow Area–Water Monitoring Report (see attached addendum to this item) will apply to the surface water analysis. Each surface monitoring station will be monitored for at least one year prior to, and continuing for one year after underground mining. At a minimum, the following stream stations will be monitored: U-10-15A, D-10-15A, U-10-15B, D-10-15B, U-10-8C, D-10-8, U10-3, and D-10-38. Any used ponds will be monitored in the manner as described for ground water supplies.

Ground and Surface water supplies and stream sampling stations located within 500 feet (measured horizontally) of the perimeter of the active longwall panel will be monitored as if they were located on the panel. Monitoring will be continued for at least one year subsequent to full recovery mining contingent upon review by the Division of Mineral Resources Management. Daily precipitation data will be submitted quarterly to evaluate spring, stream, and pond flow.

If pre-mining condition is not restored naturally by the end of the five year monitoring period mitigation/remediation efforts will begin subsequent to the approval of an ARP submitted for this express purpose.

With each quarterly monitoring report of ground and surface water, a map depicting the progression of the longwall face will be attached to indicate the sampling points in the full recovery areas. Notes will be submitted indicating the position relative to the longwall face, with "-" indicating the station is in advance of the face and a "+" indicating a position behind the face. An attempt will be made to monitor and sample as outlined above; however, some sources may not be accessible. These locations, if encountered, will be documented in the quarterly reports. If a required monitoring site cannot be sampled and/or measured on the first attempt within the Quarter, a second

attempt will be made. All samples will be taken as outlined to the extent that existing well construction allows. Any samples that are unobtainable will be documented as such in the quarterly report.

All developed supplies have been identified and have been indicated on the application/hydrology map and the Ground Water and Surface Water Inventories.

Addendum to Part 3 Item D

1/93

OHIO DEPARTMENT OF NATURAL RESOURCES - DIVISION OF RECLAMATION
UNDERGROUND MINING - REQUEST TO CEASE MONITORING

PERMITTEE_____ PERMIT NO. _____

DATE MONITORING TO BE CEASED _____

| SITE ID | DATE UNDERMINED | UTILIZED SUPPLY | IMPACTED | RECOVERED | COMMENTS | DOR APPROVAL |
|---|---|---|---|---|---|---|
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Date Received _____ Date Reviewed _____ Division Hydrologist _____

TO THE OPERATOR: THE SITES MARKED "YES" IN THE DOR APPROVAL COLUMN NO LONGER NEED TO BE MONITORED. ANY REMAINING SITES MUST CONTINUE TO BE MONITORED FOR AN ADDITIONAL TWELVE (12) MONTHS. THIS DECISION IS SUBJECT TO REVIEW PURSUANT TO ORC 1513.13.

AEC 03672

OHIO DEPARTMENT OF NATURAL RES. :ES - DIVISION OF RECLAMATION
UNDERGROUND MINING - SHADOW AREA - WATER MONITORING REPORT

PERMITTEE_____PERMIT NO._____SITE I.D._____ SURF. ELEV._____QUARTER (1-4) __
YEAR____ DATE UNDERMINED_____ COAL ELEV._____ WELL DEPTH(ELEV.)_____

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dated Measured | | | | | | | | | | | | | |
| Static Water Level (Elev.) | | | | | | | | | | | | | |
| Stream/Spring Discharge (CFS or GPM) | | | | | | | | | | | | | |
| Face Location (Advancing -, Retreating +) | | | | | | | | | | | | | |
| Site Location* | | | | | | | | | | | | | |
| Total Acidity (mg/l $CaCo_3$) | | | | | | | | | | | | | |
| Total Iron (mg/l) | | | | | | | | | | | | | |
| Total Manganese (mg/l) | | | | | | | | | | | | | |
| Total Suspended Solids (mg/l) | | | | | | | | | | | | | |
| Total Hardness (mg/l $CaCo_3$) | | | | | | | | | | | | | |
| Total Sulfates (mg/l) | | | | | | | | | | | | | |
| Specific Conductance (at 25°C in umhos/cm) | | | | | | | | | | | | | |
| Total Dissolved Solids (mg/l) | | | | | | | | | | | | | |
| pH (Standard Units) | | | | | | | | | | | | | |
| Total Alkalinity (mg/l $CaCO_3$) | | | | | | | | | | | | | |
| Nitrate - $No_3$ (mg/l) | | | | | | | | | | | | | |

*PAN = ABOVE PANEL GTE = ABOVE GATE ADJ = WITHIN 500' OF PANEL

PERMITTEE'S SIGNATURE_____ Date _____
LABORATORY NAME _____
ANALYST'S SIGNATURE _____ DATE _____ PAGE NO._____

AEC 03673

## E. COAL MINING NEAR UNDERGROUND MINES

(1) Will mining operations within this application area be conducted within five hundred feet of an active underground mine or known abandoned underground mine?
Yes ☒ No ☐ If "yes", MSHA approval is required.

(2) If "yes" to item E (1), will the mining operations result in improved resource recovery, abatement of water pollution or elimination of hazards to the health and safety of the public?
Yes ☒ No ☐ If "yes," check appropriate blank.

☒ Resource recovery
☐ Abatement of water pollution
☐ Elimination of hazards

(3) Provide documentation that the remaining barrier will be sufficient to prevent failure with respect to the level of flooding in the adjacent underground mine.

DAN KYAN

Addendum Part 3, E(1)

JUN 30 2009

Mr. Ronald O. Van Horne
Manager of Safety
American Energy Corp
43521 Mayhugh Hill Road
Beallsville, Ohio 43716

Dear Mr. Van Horne:

The Mine Safety and Health Administration has reviewed the State of Ohio Application Number D-425-10 from the Ohio Department of Natural Resources, Division of Mineral Resources Management and concurs with this surface application. The coal mining application for your Century Mine, MSHA I.D. No. 33-01070, indicates the proposed mining operations will be within 500 feet of an underground mine. The Mine Safety and Health Administration reviews these applications with the Ohio Department of Natural Resources under Public Law 95-87 Surface Mining Control and Reclamation Act of 1977. Additionally, MSHA has regulations in place which handles underground mining within 500 feet of underground abandoned or active mines (30 CFR 75.1200 & 75.388). Based on submission of 75.1200 maps, additional information may be required in the appropriate ventilation or roof control plans for the Century Mine.

Any surface mining activity will require the submittal and acknowledgement of a ground-control plan. The safety precautions associated with mining within 500 feet of the abandoned or active underground mine workings along with mining close to gas wells and gas lines will need to be addressed in the plan. If appropriate please revise as necessary and re-submit the application.

If you have any questions, please contact the Impoundment Group at 304-225-6855.

Sincerely,

Bob E. Cornett
District Manager

cc: Ohio Department of Natural Resources,
Division of Mineral Resources Management

Mr. Ronald O. Van Horne
Manager of Safety
American Energy Corp
43521 Mayhugh Hill Road
Beallsville, Ohio 43716

Dear Mr. Van Horne:

The Mine Safety and Health Administration has reviewed the State of Ohio Application Number D-425-12 from the Ohio Department of Natural Resources, Division of Mineral Resources Management and concurs with this surface application. The coal mining application for your Century Mine, MSHA I.D. No. 33-01070, indicates the proposed mining operations will be within 500 feet of an underground mine. The Mine Safety and Health Administration reviews these applications with the Ohio Department of Natural Resources under Public Law 95-87, Surface Mining Control and Reclamation Act of 1977. Additionally, MSHA has regulations in place which handles underground mining within 500 feet of underground abandoned or active mines (30 CFR 75.1200 & 75.388). Based on submission of 75.1200 maps, additional information may be required in the appropriate ventilation or roof control plans for the Century Mine.

Any surface mining activity will require the submittal and acknowledgement of a ground-control plan. The safety precautions associated with mining within 500 feet of the abandoned or active underground mine workings along with mining close to gas wells and gas lines will need to be addressed in the plan. If appropriate please revise as necessary and re-submit the application.

If you have any questions, please contact the Impoundment Group at 304-225-6855.

Sincerely,

Bob E. Cornett
District Manager

cc: Ohio Department of Natural Resources,
Division of Mineral Resources Management

WILLIAM J. SIPLIVY, P.E., INC.

Mining Engineer and Geologist

ODNR Revision Request
AAA D-0425-12
American Energy Corporation
23 May 2010

Addendum to Part 3, E(3)

a. Show that the barrier pillar width will sustain hydrostatic pressure, not just loading.
b. Revise the reference to the Ashley or Mine Inspectors' formula within the SME Engineering Handbook. The Volume and page numbers are incorrect according to the Second Addition.

c. An engineer must sign, seal and date the calculation.

**Response:**

a. **A 200 foot wide barrier pillar is projected to separate the D-0425-12 Application area from the adjacent north Powhatan No. 6 mine. The potential hydraulic head is approximately 50 feet. This occurs from the No. 1 portal shaft at elevation 705 feet, msl to its lowest elevation of 655 feet along the northern boundary of D-0425-12. The maximum cover in the study area is 665 feet.**

**The 200 foot wide barrier pillar is used here to comply with MSHA regulation 75.1701 for mining adjacent to abandoned mines.**

**A calculation is made using the Ashley or Mine Inspectors' formula to further test the adequacy of the projected 200 foot wide barrier pillar. The results are as follows:**

**$W = 20 + 4T + 0.1D$**

**Where: T = coal thickness. Use 5.2 feet.**
**D = thickness of overburden or, if water is involved, the height of the hydrostatic head possible if it is greater than the vertical thickness of the overburden. Since the hydrostatic head (50 feet) is less than the overburden thickness (665 feet), use 665 feet.**

**Required barrier pillar width:**

**$W = 20 + 4(5.2) + 0.1(665) =$ <u>107.3 feet.</u>**

**This analysis shows the projected 200 foot wide barrier pillar is nearly twice the width needed for the given conditions.**

4667 Turnberry Trail • Stow, Ohio 44224 • 330-678-0027 • siplivy@sbcglobal.net

b. The Ashley or Mine Inspectors' formula was developed in 1930 for coal mining applications in Pennsylvania. Reportedly, the formula has been widely used with success. The formula is found in numerous mining engineering publications, and textbooks. Two references are: (1) C. T. Holland. Mine Pillar Design. SME Mining Engineering Handbook, AIME, New York, 1973, Vol. 1, p. 13-105, and (2) S. S. Peng, Coal Mine Ground Control, John Wiley & Sons, New York, 1978, p. 192.

   The referenced volume and page number previously cited were correct. It is possible, however, that subsequent editions of the SME Mining Engineering Handbook have a different presentation order.

c. The above calculation is signed, sealed and dated by an engineer licensed in the State of Ohio.

William J. Siplivy

23 May 2010

# PART 4: UNDERGROUND MINING PLAN

## A. SUBSIDENCE CONTROL SURVEY

(1) Is this a full coal recovery operation?

Yes ☒ No ☐ If "yes," complete Pre-Subsidence Inventory and items B (2) and (3).

(2) Does the shadow area contain any of the structures or facilities listed in 1501:13-12-03(J)(1-3)?

Yes ☒ No ☐ If "yes," complete Subsidence Control - Protection of Specific Structures, and specifically identify the structures or facilities on the application map.

(3) Are any aquifers or bodies of water that serve as a significant water source for any public water supply system present in the shadow area?

Yes ☐ No ☒ If "yes," complete Subsidence Control - Protection of Specific Structures, and specifically identify the areas on the application map.

## B. SUBSIDENCE CONTROL PLAN

(1) Describe the method of coal removal, and indicates the size, sequence, and timing of the development of the underground workings.

**Longwall mining and Room and Pillar mining; see Addendum to Part 4, B(1) Structure Contour, Timing, Coal Parcel map.**

(2) Utilizing the application map, specifically indicate areas where planned subsidence mining methods (i.e. longwall or pillar extraction) will be used.

(3) Utilizing the application map, specifically indicate room-and-pillar mining areas where subsidence will be prevented or minimized.

(4) For those areas mapped as room-and-pillar mining, provide the following information:

(a) The maximum and average overburden thickness.

**Maximum = 680 ft; Average = 520 ft,**
**See Addendum to Part 4, Item B(4)(a-h)**

(b) The projected maximum extraction ratios for mains, submains, and butt sections, as well as the existing ranges of values for the same areas.

**40%; See Addendum to Part 4, Item B(4)(a-h)**

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## SUBSIDENCE CONTROL – PROTECTION OF SPECIFIC STRUCTURES

Applicant's Name: **American Energy Corp.** **D-0425-12**

1. List the specific structures, facilities or features to be protected and the corresponding map location key.

   **Public Roads (CR 86, Twp Rd 104 & 108) and associated culverts within Right-of-Way SEE ADDENDUM TO PART 4, B(5)(d) "Anticipated Effects - Surface Structures: Roads"**

2. Is a subsidence control plan being submitted, and does the plan demonstrate that subsidence will not cause material damage or reduce the reasonable foreseeable use of such structures, facilities or features? ☒ Yes, ☐ No

   If "yes," submit the proposed subsidence control plan.

   If "no," answer questions 3 – 7 below.

   Submit documentation the proposed subsidence control plan, or the documentation required by answering questions 3-7 below, has been provided to the public authority responsible for the protected structures, facilities or features. Submit copies of all comments received from the public authority on the required submittal or responses.

3. What is the dimension of the safety zone on the surface that extends beyond the structure to be protected? feet

4. Is the ground surface slope within the protected area greater than 14% or 8 degrees in any direction? ☐ Yes, ☐ No

   If "yes," describe the increased size of the protected area on the downslope side necessary to compensate for this slope.

5. Describe the method for determining the size of the pillar support area at mine level.

6. Indicate the maximum extraction ratio and the minimum safety factor of the coal pillars within the proposed pillar support area.

7. Indicate the long-term strength of the mine roof and the mine floor relative to the strength of the coal seam.

**American Energy Corporation**

43521 Mayhugh Hill Road
Twp. Hwy. 88
Beallsville, OH 43716
740-926-9152
740-926-9138

May 24, 2010

Clerk, Washington Township
58005 Armstrong/Centerville Rd.
Jacobsburg, OH 43933
Attn: Sam Milhoan

RE: D-0425-12 Proposed Adjacent Permit Area – Subsidence Control Plan

Sir:
Please find enclosed a copy of the proposed permit application map. This shows the extents of proposed underground mining activity. This is to notify you that your agency has jurisdictional public facilities, Twp Roads 104 and 108, within the proposed area and are shown on the map.

As you may know from experience, longwall mining can cause subsidence of the ground surface. American Energy Corp. (AEC) anticipates little to no impact on these roads. AEC posts bonds for all roads to be undermined. The effect of mining on public roads is typically limited to minor cracking of the pavement or road surface from tension and in a few instances, humping of the surface due to compression. In all instances, the roads have never been closed and repairs have been made by the governing authority and reimbursed by AEC. Roads are inspected frequently during subsidence, and AEC works closely with the governing authority throughout the mining and subsidence.

AEC will notify the appropriate the Township at least six months prior to undermining its roads. AEC will inspect the areas around roads located on steep areas that could be subject to slippage and will repair surface cracks in these areas immediately if necessary to keep water from causing the soil to slip. In the event that roadways are permanently damaged by subsidence, AEC, at the request of the road authority, will pay to repair the road surface to its pre-mining condition.

If your agency has any comments or concerns in this regard, please forward them to my attention at your earliest convenience. If you have any questions or require additional information, please do not hesitate to contact me at 740/926-1351x396 or 740/310-2989.

Sincerely,

Greg Williams
Permitting Engineer

Enclosures

CC: file

**American Energy Corporation**

43521 Mayhugh Hill Road
Twp. Hwy. 88
Beallsville, OH 43716
740-926-9152
740-926-9138

May 24, 2010

Belmont County Engineer's Dept.
101 west Main Street
St. Clairsville, OH 43950
Attn: Fred F. Bennett, PE PS

RE: D-0425-12 Proposed Adjacent Permit Area – Subsidence Control Plan

Sir:
Please find enclosed a copy of the proposed permit application map. This shows the extents of proposed underground mining activity. This is to notify you that your agency has jurisdictional public facilities, CR86, within the proposed area and are shown on the map.

As you may know from experience, longwall mining can cause subsidence of the ground surface. American Energy Corp. (AEC) anticipates little to no impact on these roads. AEC posts bonds for all roads to be undermined. The effect of mining on public roads is typically limited to minor cracking of the pavement or road surface from tension and in a few instances, humping of the surface due to compression. In all instances, the roads have never been closed and repairs have been made by the governing authority and reimbursed by AEC. Roads are inspected frequently during subsidence, and AEC works closely with the governing authority throughout the mining and subsidence.

AEC will notify the appropriate the County Road Dept. at least six months prior to undermining its roads. AEC will inspect the areas around roads located on steep areas that could be subject to slippage and will repair surface cracks in these areas immediately if necessary to keep water from causing the soil to slip. In the event that roadways are permanently damaged by subsidence, AEC, at the request of the road authority, will pay to repair the road surface to its pre-mining condition.

If your agency has any comments or concerns in this regard, please forward them to my attention at your earliest convenience. If you have any questions or require additional information, please do not hesitate to contact me at 740/926-1351x396 or 740/310-2989.

Sincerely,

Greg Williams
Permitting Engineer

Enclosures

CC: file

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## SUBSIDENCE CONTROL – PROTECTION OF SPECIFIC STRUCTURES

Applicant's Name: **American Energy Corp. D-0425-12**

1. List the specific structures, facilities or features to be protected and the corresponding map location key.

   **Public Water Lnes (within CR 86, Twp Rd 104 & 108 Right-of-Way) SEE ADDENDUM TO PART 4, B(5)(d) "Anticipated Effects - Surface Structures: Utility Installations"**

2. Is a subsidence control plan being submitted, and does the plan demonstrate that subsidence will not cause material damage or reduce the reasonable foreseeable use of such structures, facilities or features? ☒ Yes, ☐ No

   If "yes," submit the proposed subsidence control plan.

   If "no," answer questions 3 – 7 below.

   Submit documentation the proposed subsidence control plan, or the documentation required by answering questions 3-7 below, has been provided to the public authority responsible for the protected structures, facilities or features. Submit copies of all comments received from the public authority on the required submittal or responses.

3. What is the dimension of the safety zone on the surface that extends beyond the structure to be protected? feet

4. Is the ground surface slope within the protected area greater than 14% or 8 degrees in any direction? ☐ Yes, ☐ No

   If "yes," describe the increased size of the protected area on the downslope side necessary to compensate for this slope.

5. Describe the method for determining the size of the pillar support area at mine level.

6. Indicate the maximum extraction ratio and the minimum safety factor of the coal pillars within the proposed pillar support area.

7. Indicate the long-term strength of the mine roof and the mine floor relative to the strength of the coal seam.

**American Energy Corporation**

43521 Mayhugh Hill Road
Twp. Hwy. 88
Beallsville, OH 43716
740-926-9152
740-926-9138

May 24, 2010

Switzer Water Association
50190 Gibbs Rd,
Clarington, OH 43915
Attn: Starling Zink

RE: D-0425-12 Proposed Adjacent Permit Area – Subsidence Control Plan

Sir:
Please find enclosed a copy of the proposed permit application map. This shows the extents of proposed underground mining activity. This is to notify you that your agency has jurisdictional public facilities within the proposed area and are shown on the map.

As you may know from experience, longwall mining can cause subsidence of the ground surface. American Energy Corp. (AEC) anticipates little to no impact on the utility installations over the proposed application area. Utility lines (water, electric, etc.), typically undergo little or no damage due to subsidence over the underground mining area. The utility lines that are typically damaged are public water lines made of asbestos concrete. Other construction materials typically withstand subsidence well.

AEC will notify Switzer Water Association at least six months prior to undermining the lines. In the event that the pipelines are damaged by subsidence, AEC, at the request of the public water line authority, will pay to repair the pipeline to its pre-mining conditions. Over the years, AEC and its sister mine, Ohio Valley Coal Company's Powhatan No. 6, have mined under more than 30 miles of public water lines by longwall mining since January 1990. During that time, many types of water lines have been undermined, including asbestos-concrete lines, HDPE lines, and PVC lines. During this time period, only one (1) break occurred, and it was located at the start of a longwall panel. This pipe was an asbestos-concrete line, and the construction was such that the end of the pipe broke off when subjected to subsidence forces. To our knowledge, there are no asbestos-concrete pipes located within this application area. Should damage occur, however unlikely, Switzer Water Association will repairs its own lines and AEC shall reimburses them.

If your agency has any comments or concerns in this regard, please forward them to my attention at your earliest convenience. If you have any questions or require additional information, please do not hesitate to contact me at 740/926-1351x396 or 740/310-2989.

Sincerely,

Greg Williams
Permitting Engineer

Enclosures

CC: file

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PRE-SUBSIDENCE INVENTORY**

**Applicants Name:** American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| | | | | | |
| Ira O. & Katherine L. Lepley | Belmont | Washington 20, 26 | C.R. 86 | Garage | **10-12** |
| " " | " | " | Wells | Barn | DW-20, WL-21 |
| " " | " | " | Pasture | 2-Sheds | |
| " " | " | " | Woodland | 12" Culvert(2) | |
| " " | " | " | | | |
| | | | | | |
| John F. & Johanna F. Thomas | Belmont | Washington 26 | Woodland | None | **10-14** |
| | | | | | |
| Brian L & Kimberly Hawthorne | Belmont | Washington 20, 26 | C.R. 86 | House | **10-15** |
| " " | " | " | Twp. Rd. 104 | Garage | |
| " " | " | " | Residential | Shed | |
| " " | " | " | | Public Water (Switzer) | |
| " " | " | " | | 12" Culvert | |
| | | | | | |
| Chris E Perkins | Belmont | Washington 26 | C.R. 86 | House Trailer | **10-16** |
| " " | " | " | Residential | Public Water (Switzer) | |
| " " | " | " | Well | WL-16.00 | |
| | | | | | |
| Nelson G Lindsey | Belmont | Washington 26 | C.R. 86 | 12" Culvert(3) | **10-17** |
| " " | " | " | Twp. Rd. 104 | | |
| " " | " | " | Dev. Spring/Stream | | DS-72 |
| " " | " | " | Woodlands | | |
| " " | " | " | Pasture | | |
| " " | " | " | Stream | | DS-21.00 |



AEC 03685

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PRE-SUBSIDENCE INVENTORY**

**Applicants Name:** American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| | | | | | |
| David A & Judith Crooks | Belmont | Washington 26 | Twp. Rd. 104 | House | **10-18** |
| " " | " | " | Stream | Barn | U-10-16 |
| " " | " | " | Pasture | 7 Sheds | |
| " " | " | " | Woodlands | 12" Culvert | |
| " " | " | " | Residential | Public Water (Switzer) | |
| | | | | | |
| Terry & Mickey Craig | Belmont | Washington 26, 27 | | 1-Vacant House | **10-19** |
| " " | " | " | Well | 4-Sheds | W-19.02 |
| " " | " | " | Dev. Spring | 12" Culvert | DS-3 |
| " " | " | " | Stream | Public Water (Switzer) | U-10-15A |
| " " | " | " | Woodlands | | |
| " " | " | " | Crop Land | | |
| " " | " | " | Residential | | |
| " " | " | " | Pond | | WI-19.03 |
| " " | " | " | Undev. Spring | | |
| | | | | | |
| Brian L & Kimberly Hawthorne | Belmont | Washington 20, 26 | | None | **10-21** |
| " " | " | " | Dev. Spring\Stream | | DS-21.00 |
| " " | " | " | Woodland | | |
| | | | | | |
| Nelson G Lindsey | Belmont | Washington 21, 27 | | None | **10-22** |
| " " | " | " | Stream | | D-10-15A |
| " " | " | " | Pasture | | |
| " " | " | " | Woodland | | |



AEC 03686

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PRE-SUBSIDENCE INVENTORY**

**Applicants Name:** American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| | | | | | |
| Martin H Mitchell | Belmont | Washington 21 | Woodland | | **10-24** |
| | | | | | |
| Leroy Lucas | Belmont | Washington 20, 21 | C.R. 86 | House | **10-28** |
| " " | " | " | Well | 2-Barns | DW-28.00 |
| " " | " | " | Dev. Springs | 2-Sheds | DS-28.01, DS-28.02 |
| " " | " | " | Streams | Silo | U-10-5, D-10-15B, |
| " " | " | " | Crop Land | 12" culvert(4) | U-10-15C, U-10-15B |
| " " | " | " | Woodland | Public Water (Switzer) | |
| " " | " | " | Pasture | | |
| " " | " | " | Twp. Rd. 108 | | |
| " " | " | " | Residential | | |
| " " | " | " | Undev. Springs(3) | | |
| | | | | | |
| Eric R Butterfield | Belmont | Washington 21 | C.R. 86 | Cabin (unused) | **10-29** |
| " " | " | " | Well | Public Water (Switzer) | DW-29.00 |
| " " | " | " | Woodland | | |
| " " | " | " | Undev. Spring | | |
| | | | | | |
| William L Lupton | Belmont | Washington 21 | | | **10-30** |
| " " | " | " | Spring | None | DS-30.02 |
| " " | " | " | Stream | | U-10-8C |
| " " | " | " | Woodland | | |
| " " | " | " | Cropland | | |
| | | | | | |

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PRE-SUBSIDENCE INVENTORY**

**Applicants Name**: American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| Lloyd E & Carol A Baker | Belmont | Washington 21 | C.R. 86 | House | **10-31** |
| " " | " | " | Residential | Garage | |
| " " | " | " | | Shed | |
| " " | " | " | | Public Water (Switzer) | |
| | | | | | |
| Vincent L III & Melanie A. Thompson | Belmont | Washington 15, 21 | | None | **10-32** |
| " " | " | " | Stream | | U-10-8, U-10-8B |
| " " | " | " | Woodland | | |
| | | | | | |
| Eric R Butterfield | Belmont | Washington 21 | C.R. 86 | Foundation Ruins | **10-33** |
| " " | " | " | Woodland | | |
| | | | | | |
| Trevor H & Dawnell L Moore | Belmont | Washington 21 | C.R. 86 | House | **10-34** |
| " " | " | " | Woodland | Garage | |
| " " | " | " | Residential | Barn | |
| " " | " | " | Undev. Spring | 5-Sheds | |
| " " | " | " | | Privy | |
| " " | " | " | | Public Water (Switzer) | |
| | | | | | |
| Kenneth E & Virginia Blakely | Belmont | Washington 21 | Twp. Rd. 108 | House | **10-35** |
| " " | " | " | Well | 2-Sheds | W-35.00 |
| " " | " | " | Residential | Public Water (Switzer) | |
| | | | | | |
| Charlotte Kovacs | Belmont | Washington 20 | Twp. Rd. 108 | 12" Culvert(2) | **10-36** |
| " " | " | " | Pasture | | |



AEC 03688

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

**PRE-SUBSIDENCE INVENTORY**

**Applicants Name:** American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| | | | | | |
| Fred & Cheryl Wente | Belmont | Washington 20 | Twp. Rd. 108 | House | **10-37** |
| " " | " | " | Wells | Barn | DW-37.00, DW-37.01 |
| " " | " | " | Residential | Privy | |
| " " | " | " | Undev. Spring | 12" Culvert | |
| " " | " | " | | Public Water (Switzer) | |
| | | | | | |
| Steven & Charlotte Kovacs | Belmont | Washington 20 | Twp. Rd. 108 | House | **10-38** |
| " " | " | " | Well | 12" Culvert | W-38.00 |
| " " | " | " | Stream | Public Water (Switzer) | U-10-8A |
| " " | " | " | Woodland | | |
| " " | " | " | Cropland | | |
| " " | " | " | Residential | | |
| | | | | | |
| Terry L & Yolanda M Hess | Belmont | Washington 20 | Twp. Rd. 108 | House (Camper) | **10-39** |
| " " | " | " | Stream | Public Water (Switzer) | D-10-8A |
| " " | " | " | Woodland | | |
| " " | " | " | Residential | | |
| | | | | | |
| Ed & Debra Palmer | Belmont | Washington 20 | Twp. Rd. 108 | HouseTrailer | **10-40** |
| " " | " | " | Residential | House (Ruins) | |
| " " | " | " | | 5-House Tlr. (Ruins) | |
| " " | " | " | | Public Water (Switzer) | |
| " " | " | " | | (2-Taps) | |
| | | | | | |



AEC 03689

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**

## PRE-SUBSIDENCE INVENTORY

**Applicants Name**: American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| John E & Norma J Diver | Belmont | Washington 14, 20 | Twp. Rd. 108 | House | **10-41** |
| " " | " | " | Wells | Barn | W-41.00, DW-41.01 |
| " " | " | " | Wells | 3-Sheds | DW-41.02,DW-41.05 |
| " " | " | " | Pond | Silo | W-41.03, |
| " " | " | " | Woodland | 12" Culvert | WI-41.04 |
| " " | " | " | Pasture | 15" Culvert | D-10-5D, D-10-8B, |
| " " | " | " | Streams | 18" Culvert | U-10-6, U-10-7 |
| " " | " | " | Residential | Public Water (Switzer) | D-10-8C, ,D-10-5C |
| | | | Undev. Spring(5) | | |
| | | | | | |
| Scott M Sanders | Belmont | Washington 20 | Twp. Rd. 108 | None | **10-42** |
| " " | " | " | Stream | | D-10-5B |
| " " | " | " | Woodland | | |
| " " | " | " | Crop Land | | |
| " " | " | " | Undev. Spring | | |
| | | | | | |
| John S & Diane E Brezo | Belmont | Washington 20 | Twp. Rd. 108 | 12" Culverts(3) | **10-43** |
| " " | " | " | Woodland | | |
| " " | " | " | Stream | | U10-5 |
| | | | | | |
| William E Oros | Belmont | Washington 20 | Twp. Rd. 108 | Business | **10-43A** |
| " | | " | Pasture\woodland | Shed(2) | |
| " | | " | Commercial | Camper | |
| " | | " | Stream | 12" Culvert | D10-5A |
| " | | " | Undev. Spring | Public Water (Switzer) | |



AEC 03690

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF MINERAL RESOURCES MANAGEMENT

### PRE-SUBSIDENCE INVENTORY

**Applicants Name**: American Energy Corporation

D-0425-12

| Surface Owner | County | Township/Section | Renewable Resources | Structures-Use | MAP LOC. KEY (Structures) |
|---|---|---|---|---|---|
| | | | | | |
| Ronald R, Sr. & Sara Reger | Belmont | Washington 14, 20 | Twp. Rd. 108 | | **10-44** |
| " " | " | " | Well | 15" Culvert(3) | W-44.00 |
| " " | " | " | Stream | | D-10-5, |
| " " | " | " | Woodland | | |
| | | | | | |
| Roy R & Mary M Miller | Belmont | Washington 14 | Twp. Rd. 106 | None | **10-54** |
| " " | " | " | Stream | | D-10-7 |
| " " | " | " | Woodland | | |
| " " | " | " | Peavine Creek | | |
| | | | | | |
| Vincent L III & Melabie A Thompson | Belmont | Washington 15 | Twp. Rd. 121 | None | **10-58** |
| " " | " | " | Streams | | U-10-9, D-10-8C |
| " " | " | " | Woodland | | Undev. Spring |
| " " | " | " | Undev. Spring | | |
| | | | | | |
| King, Jr., Bobby | Belmont | Washington 20 | C.R. 86 | House | **10-94** |
| " " | " | " | Wells | | DW-94.00, DW-94.01 |
| " " | " | " | Stream | 2-Barns | U-10-4 |
| " " | " | " | Woodland | 5-Sheds | 2-Cisterns |
| " " | " | " | Pasture | Barn (Ruins) | |
| " " | " | " | Residential | Shed (Ruins) | |
| " " | " | " | Undev. Spring | 6" Culvert | |
| " " | " | " | | 12" Culvert | |

(c) Projected maximum width of entries and cross cuts throughout the mine, as well as the existing ranges of values for the same areas.

**Maximum width of entries and crosscuts = 18 ft, and range typically from 16 to 18 ft.; headgate belt entry maximum 20 ft. wide, See Addendum to Part 4, Item B(4)(a-h)**

(d) The center spacing for entries and cross cuts.

**Minimum Gate Entry = 68 ft. O.C.; Min. Crosscut = 57 ft. O.C.; See Addendum to Part 4, Item B(4)(a-h)**

(e) Minimum pillar dimensions for mains, submains, and butt sections, as well as the existing ranges of values for these areas.

**Minimum main, gate entry and gate neck pillars = 47 ft x 40 ft; See Addendum to Part 4, Item B(4)(a-h)**

(f) The barrier pillar width between butt sections, as well as the existing ranges of values for the same areas.

**There are no butt sections in this application area**

(g) The engineering properties of the clay/shale, or other soft rock material in the roof and floor of the mine under both saturated and natural moisture conditions.

**See Addendum to Part 4, Item B(4)(a-h)**

(h) Measures to be taken on the surface to prevent damage or lessening of the value or reasonably foreseeable use of the surface, if any.

**See Addendum to Part 4, Item B(4)(a-h)**

(i) The minimum pillar safety factor, for protected structures, based upon coal strength and load.

**>1.5 stable for long-term life; See Addendum to Part 4, Item B(4)(a-h)**

(j) Methods and calculations used to determine the long-term safety factor.

**A modified Holland Formula; See Addendum to Part 4, Item B(4)(a-h)**

(k) Provide the minimum long-term subsidence control safety factor recommended by the method's author or the literature supporting this method.

**The Factor of Safety has been determined and fine tuned by years of actual experience in the local geology and coal seam, previously by North American Coal Co. and subsequently Ohio Valley Coal Co. in the Powhatan No. 6 Mine and American Energy Corp. in the Century Mine.**

AMERICAN ENEFGY CORPORATION
CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 4, B(4)(a-h)

## ENGINEERING PROPERTIES FOR DEVELOPMENT ENTRIES

Room-and-pillar mining is used to surround panels for the longwall panels. Engineering properties are presented for the gate entries planned for this application area. The maximum overburden is 650 ft. and the average is 520 ft. The projected maximum extraction ratio is 40 percent. Gate entries are to be driven a maximum of 18 ft. wide (headgate belt entry maximum 20 ft. wide) with minimum entry centers projected to be 65 ft and minimum crosscut centers projected to be 57 ft. Pillar dimensions will be approximately 39 ft x 50 ft. The extraction ratio for the gates is 40 percent, and the stability factor is 1.8.

For the main pillars and gate neck pillars, the depth of cover is 480 ft. They are mined 18 ft wide, and are on a minimum of 58 ft x 65 ft centers (40 ft x 47 ft pillar dimensions) for main pillars, and for gate neck pillars, they are mined on a minimum of 58 ft x 65 ft centers (40 ft x 47 ft pillar dimensions), resulting in stability factors of 1.9 and 1.9, respectively. The mining height ranges 6.5 - 7.0 ft.

The structural contour map with this application indicates the coal elevation (bottom) in the application area to be 655 to 680 ft. (msl). The strength of the coal is 850 psi. The floor primarily consists of shale or calcareous shale, with an occasional thin bed of claystone. In compressive strength tests for nearby Ohio Valley Coal applications D-0360-12 and -13, the compressive strength of the shale was found to be 5,034 to 9,453 psi and for the calcareous shale, 9,444 to 12,590 psi. These shale units frequently contain limestone nodules. Since the strength of the coal is much less than the strength of the floor rock, the stability factor for the coal will determine the stability of the mine.

The compressive strength of the coal is generally accepted to be 4,330±600 psi. The strength of the Pittsburgh (No. 8) coal in this area was determined by Professor Charles Holland years ago with the use of 3 in. cube specimens. The design strength was found to be 4330 psi. Professor Holland and others have found that, due to the cleavage planes and other natural seam defects, the in-situ compressive strength for a 6½ ft. seam is 850 psi.

There will be no measures taken on the surface to prevent damage or lessening of the value or reasonably foreseeable use of the surface since extraction ratios will be low. No surface damage is anticipated.

In mains, a minimum safety factor of 2.0 is used. The following data was used to design the pillars in the application area:



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| | |
|---|---|
| Coal Constant (K) | 7,500 |
| Coal specimen size | 3 in. cube |
| Anticipated Maximum Mining Height (H) | 6.5 ft. |
| Worst case safety factor | |
| Mains | 1.9 |
| Maximum Depth (D) | 530 ft. |

Pillar design at the Century Mine is performed with the use of computer software. This program makes use of a modified Holland formula with data input that is specific for the Century Mine. No actual calculations are performed by hand because they are long and complicated with much room for error. The Holland formulae shown in the guidelines for Attachment 32 may be used to determine the pillar strength, load on the pillar, and the safety factor. These formulae are shown below.

$$\text{Pillar Strength} = P_s = \frac{KL^{1/2}}{H}$$

$$\text{Pillar Load} = P_l = \frac{A_t}{A_p} = \frac{RD}{144}$$

$$\text{Safety Factor} = SF = \frac{P_s}{P_l}$$

Where K = coal constant for the 3 in. cube, L = least dimension of the pillar, H = thickness (height of the pillar), $A_t$ = tributary area, $A_p$ = pillar area, R=overburden weight/ft, D= thickness of overburden.

The Century Mine is an extremely dry mine, with nearly all of the water that is found underground resulting from the mining process. There is no water pumped outside from the active mining areas of the Century Mine, although some water is pumped from the bottom of airshafts. This water is essentially ground water collected behind the lining of the shaft. Therefore, water is not expected to impact the roof, floor, or coal strata. This condition is expected to continue indefinitely. If water does inundate the mine at some time in the future, it is not expected to cause ground control problems due to the large size of the pillars that will remain. Past problems with unplanned subsidence resulted from small pillar size and large quantities of water around very soft bottom rock. If the mine becomes flooded and inundates the roof rock, the immediate roof members will swell and collapse into the mine void. However, the falls of immediate roof does not adversely affect the surface. Above the immediate roof is the Redstone Limestone averaging 15 ft. in thickness. This member consists of multiple beds of



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limestone separated by shale and claystone partings. The limestone beds are hard, fairly massive in texture (without stratification) ranging in thickness from 2 to 11 ft. each. The partings are commonly 3 to 13 in. thick, with some reaching 24 in. The partings occur randomly throughout the application area. This member will provide long term support if the immediate roof should collapse into the mine void. The coal is not affected by the presence of water.



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**This has resulted in the following range: <1.3 unstable, 1.3 to 1.5 marginal, >1.5 stable for long-term life; See Addendum to Part 4, Item B(4)(a-h)**

(l) Indicate how coal strength was determined if the assumed coal compressive strength exceeds 900 psi.

**Not applicable, the coal strength used was 850 psi.**

(m) Describe any prior unplanned subsidence events, pillar or floor failure experienced by the applicant. Indicate the seam mined and relevant facts.

**There have been no unplanned subsidence events, pillar or floor failure experienced by the American Energy Corporation's century Mine.**

(5) For those areas mapped as full coal recovery mining, provide the following information:

(a) For each method to be employed (i.e. longwall or pillar extraction), provide the following:

i) Rate and direction of dip for the coal seam.

**0.5% S 30 deg. E**

ii) Dimensions of panels or butt sections.

**Width = 1150'; Lengths = 2489', 4142', 2890', 8683', 8289', 7431'**

iii) Thickness of coal to be extracted (mining height).

**6.5 ft.**

iv) Maximum angle of draw.

**Maximum 24 degrees. This angle of draw limit is indicated on the Application Map as the Zero Subsidence line and is contained within the permit boundary. The southeast boundary with D-0425-10 is intended to overlap with a small portion of a shared longwall panel extending into that exisitng permit area. An Arp will be applied before for that overlapping angle of draw into D-0425-10.**

v) Maximum anticipated subsidence.

**4.16 ft. (64% of 6.5 ft.)**

vi) Width of barrier pillars or chain pillars between sections or panels.

**535 ft. barrier (between mains/panels); 47 ft. (chain pillars between panels)**

vii) The maximum extraction ratio within a pillaring section.

**See Addendum to Part 4, Item B(5)(a)(vii)**

(b) The anticipated effects of planned subsidence upon the land and water resources identified in the subsidence control survey and survey of ground and surface water resources.

**See Addendum to Part 4, Item B(5)(b)**

(c) The measures to be taken to mitigate the anticipated effects of planned subsidence to the land and water resources.

**See Addendum to Part 4, Item B(5)(c)**

(d) The anticipated effects of planned subsidence upon the structures identified in the subsidence control survey.

**See Addendum to Part 4, Item B(5)(d)**

(e) The proposed measures to be taken to mitigate anticipated effects to structures.

**See Addendum to Part 4, Item B(5)(e)**

(f) The proposed measures to determine the extent of mining related damages including a pre-subsidence survey with an indication of the timing of the survey.

**See Addendum to Part 4, Item B(5)(f)**

(g) The provisions for repair and/or compensation for damages to structures.

**See Addendum to Part 4, Item B(5)(g)**

(h) Describe the monitoring, if any, needed to determine the commencement and degree of subsidence so that, when appropriate, other measures can be taken to prevent, reduce, or correct material damage in accordance with rule 1501:13-12-03 of the Administrative Code.

**See Addendum to Part 4, Item B(5)(h)**

(6) Will planned subsidence operations be conducted within the angle of draw of urbanized areas, cities, towns, communities, industrial or commercial buildings, major impoundments, or perennial streams?

Yes ☒ No ☐ If "yes," describe any measures or activities that will prevent a condition or practice that could result in an imminent danger to the health or safety of the public.

**AEC proposes that during subsidence of perennial streams, the area of the**

**stream to be undermined will be inspected daily to assure that there are no conditions that could result in an imminent danger to the health or safety of the public. Should such a condition be found, signs will be posted to alert persons that an imminent danger exists. Furthermore, the area where such conditions exist will be cordoned off to prevent the public from accessing the site**

(7) Will planned subsidence operations be conducted within the angle of draw of transmission pipelines?

Yes ☐ No ☒ If "yes," describe the procedural plan to avoid the creation of a situation of imminent danger to the health and safety of the public.

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ADDENDUM TO PART 4, B(5)(b)

## ANTICIPATED EFFECTS OF PLANNED SUBSIDENCE – SURFACE LANDS AND WATER RESOURCES

Tension cracking of the ground surface may occur. These cracks in the surface may vary in width from hairline, up to several inches wide. AEC believes that there will be no effect on the crop production as a result of mining. This fact is supported by a paper written by Dr. Frank L. Himes, Ph.D., entitled "Agronomic Evaluation of the Land in the Southern Ohio Coal Company Area", June, 1983. A copy is included in previous applications available to the Chief.

### Slip-Prone Soils

A search of the Belmont County Soils Maps revealed several potential slide/slip areas within the following soil types: BsD, BsE, LeE, LoE, LoF, RcE, and RsE.

These areas have been mapped on the enclosed map showing the limits of the application area and slip prone soils. Please note - the Soil Survey of Belmont County does not describe subsidence as a source of potential slippage. Rather, it notes soil types that are slip prone for construction sites. Of the types of slip-prone soils identified, only LpF (Lowell-Westmoreland silt loam) has been known to be slip prone during longwall mining-induced subsidence in some areas. Other soil types have been undermined before without slippage occurring.

During the pre-subsidence survey, areas known to be slip prone during subsidence, as well as other similar sites that may have a significant impact to existing structures, may be inspected. Should conditions dictate, site-specific measures, not limited to but including installation of cut-off trenches, drainage systems, and retaining walls, may be taken to minimize adverse effects.

### Other Observations

In the event that horizontal movement occurs, it is expected to be in steeply sloping ground where slips have been shown to historically occur. These previously occurring slips were mainly in slip-prone soils, and this is to be expected with any future slipping. Near the center of the panel, the ground moved upwards in several small areas after subsidence as the compressive strain caused the soils to heave upward. Surface cracking up to about 6 inches wide have been shown to occur during the time the areas were put under tension. This surface cracking should be limited to only a few small isolated areas where they generally close due to compressive forces and to rainfall. Most cracks if they occur are expected to be less than 1 inch wide. In the event cracks in the soil are found that are wide enough to be considered hazardous, they will be repaired immediately by American Energy Corporation.

Water Resources

The effect of subsidence on water resources varies greatly. The effect on wells, springs, streams, and other surface water each differ in the type and duration of effects. Each will be discussed below.

Wells

Depending upon the depth of the well, its location within the longwall subsidence area, and its surface elevation compared to the elevation of the coal, the effect of subsidence on wells may vary from complete de- watering to some de-watering to no de-watering. Generally as the subsidence opens new places for the ground water to go, the elevation of the water decreases. The ground water is still present, but at a lower elevation. Aquicludes prevent further downward migration of water into the mine. In addition, the soft rock, particularly the clay stones in the strata, tend to swell, erode, and fill voids, causing some recovery in the elevation of the water. Wells may become completely dry temporarily, may hold less water, or as has been experienced in some instances, may not be affected. In some cases, the water level actually increases temporarily. This effect is caused by the strata being placed in compression and closing some of the joints, cracks, or bedding planes (secondary porosity features) that hold the water. However, as a general rule, the water level in wells decreases. As new surfaces are opened that water begins to flow over, the quality of the water also varies, usually temporarily. Normally, some increase in suspended solids, iron, manganese, and sulfates has been observed. These effects usually return to near normal after the water "washes" out the new chemicals.

Springs

Springs, given the fact that they are located on the surface, generally decrease in flow and usually dry completely with little or no recovery. The water stops flowing because it is no longer at the elevation of the surface installation. The water begins to flow horizontally through different bedding planes and can be developed successfully into a spring at a lower elevation, as witnessed in past experience. Water quality varies as with wells. However, because of the increased porosity of the strata, springs developed over longwall panels, generally have higher flow.

Effect on Streams Containing Fish

Several streams containing fish (minnows primarily) have been undermined by the longwall at the Century Mine. In some cases, the streams are un-affected by subsidence. In other cases, the stream goes dry temporarily, usually until the next major storm. In all cases, normal stream flow returned. No fish have been killed as a result of

the stream going dry temporarily. Streams normally go dry or nearly dry for a portion of the year and fish that live there migrate downstream, only to return during the wet season.

Streams

Impacts to streams vary according to many factors, including depth of cover, the order (drainage area size) of the stream, topography, rainfall for a period following undermining, etc. Generally, streams are temporarily affected by subsidence, decreasing in flow as cracks open in the stream bed. However, because the streams contain a high concentration of sediment during rains, the cracks fill quickly and the effect is short lived. The water re-establishes itself within several years.

It is believed that streams are impacted through two mechanisms: Fracturing of bedrock and disruption of stream gradient. When the longwall mines through an area, subsidence occurs. The land subsides immediately after the longwall advances past a point. Monitoring performed by The Ohio Valley Coal Company shows that subsidence is complete within five to ten days after mining is complete. As the ground subsides, it experiences tensile and compressive forces such that existing cracks may be opened or closed, and new cracks form due to the tensile forces. In general, the additional cracking that occurs from the subsidence "wave" may cause a stream to go dry temporarily.

Subsidence occurs more in the middle of a longwall panel, compared to the sides or ends. This "differential subsidence" disrupts the gradient of the stream to where water can be observed flowing and then it disappears when the downstream bed is higher than the upstream segment. It is not uncommon to have water pool upstream of gate entries. In a few locations, the middle of the panel moves upward as the ground around it is put into compression, causing a localized "high spot." During high-flow periods, the gradient is re-established naturally.

Generally, streams are temporarily affected by subsidence, decreasing in flow as cracks open in the stream bed. However, because the streams contain a high concentration of sediment during rains, the cracks fill quickly and the effect is short lived. The water re-establishes itself within several years. Streams in this area begin as undeveloped from developed springs near the head of hollows and are fed throughout their length by springs and surface runoff. Streams that are fed by springs near the head of hollows continue to receive this groundwater, but at a lower elevation. Since rainfall is unaffected by subsidence, runoff continues to supply the water for streams.

Other Surface Water Features

Ponds are the other surface water features in this area. Prior experience has been that ponds are not substantially affected by subsidence in this area. As subsidence proceeds through a pond, the edge of the pond that first subsides will be lower than the

remainder of the pond until subsidence is complete. Some water could drain from the pond if the dam is subsided first, but as the remainder of the pond is subsided, this situation will end and the pond will function as before subsidence occurred. There have been no instances of ponds being dewatered as a result of subsidence. Several ponds have been undermined with no other visible effects. Cisterns, catch basins, etc. have been unaffected to date.

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ADDENDUM TO PART 4, B(5)(c)

## MEASURES TO MITIGATE ANTICIPATED EFFECTS TO LAND AND WATER

### Damage Repairs - Wetlands

In the event of a wetland being damaged by subsidence AEC will take the proper steps to mitigate the damage. If surface cracking occurs in a wetland, the cracks will be excavated below the extents of the hydric soils, grouted or sealed with a material suitable for preventing any water loss into the cracking, and regraded or blended to conform to the rest of the wetland. If a wetland is affected by loss of either all or a portion of an existing ground water source, a portion of the wetland's hydric soils will be graded in a manner to create pooling from surface water runoff. AEC will take proper steps to minimize and avoid as much of the undamaged wetlands as possible during remediation, and native wetland vegetation will be planted in the disturbed areas graded with hydric soils. To date, AEC is currently unaware of any damage of wetlands from subsidence related to this mine or any of the adjacent mines in the #8 coal seam, and none is anticipated.

### Damage Repairs – Streams Containing Fish

Streams containing fish are generally higher order streams (perennial) in nature, and as such no subsidence is planned under perennial streams with less than 200 ft of cover to prevent stream loss. There are no perennial streams in the application area outside that range. AEC will monitor all streams as outlined in the Addendum to Part 3, Item D. In the event that a stream's flow is reduced or diminished due to longwall subsidence, AEC will notify the Division of Mineral Resource Management. AEC will also monitor the stream bed monthly up to a five year period to check for natural restoration, with all findings being reported to DMRM on a quarterly basis. If normal flow is not re-established in this five year time frame, AEC will, mitigate the subsidence damage and restore normal flow to the stream. The mitigation efforts will take place immediately after the five year monitoring period has shown no recovery from the flow loss. The type of flow interruption will first be identified to determine if it is loss do to change in grade of the stream bed or fracturing of the rock strata below the stream. For grade change the stream channel will be regarded to allow the flow an uninterrupted path and connecting the pools that typically form with grade change from subsidence. In the event the flow is lost due to surface cracks in the channel diverting the water into the ground, the cracks will be grouted with a material suitable for filling the void allowing water to continue with normal flow. Monitoring will continue during mitigation operations to ensure that proper flow has been restored. To date, no repairs have been required for streams containing fish. None are anticipated.

### Damage Repairs - Streams

It is believed that streams are impacted through two mechanisms: Fracturing of bedrock and disruption of stream gradient. When the longwall mines through an area,

subsidence occurs. The land subsides immediately after the longwall advances past a point. AEC's monitoring shows that subsidence is complete within five to ten days. As the ground subsides, it experiences tensile and compressive forces such that existing cracks may be opened or closed, and new cracks form due to the tensile forces. In general, the additional cracking that occurs from the subsidence "wave" may cause a stream to go dry temporarily. After several months, and following several significant rainfall events, naturally occurring sediment fills the cracks and the streams tend to heal themselves following subsidence. Since the streams are located at low elevations, the naturally occurring confining pressures from the surrounding hillsides tend to close the cracks as well. Flow is re-established after several months when sufficient rainfall has occurred to fill any cracks and to replenish the water table to allow water to rise into the streambed.

Subsidence occurs more in the middle of a longwall panel, compared to the sides or ends. This "differential subsidence" disrupts the gradient of the stream to where water can be observed flowing and then it disappears when the downstream bed is higher than the upstream segment. It is not uncommon to have water pool upstream of gate entries, requiring some minor re-grading of the stream to re-establish the gradient for the entire length of the stream. In a few locations, the middle of the panel moves upward as the ground around it is put into compression, causing a localized "high spot." During high-flow periods, the gradient is re-established naturally. Occasionally, some fieldwork is necessary so the process occurs faster.

Recently, The Ohio Valley Coal Company (OVCC) has conducted a study of streams (all types – perennial, intermittent, ephemeral) undermined by the OVCC Powhatan #6 longwall operations. In the last several years, The Powhatan No. 6 Mine has undermined several streams. We concentrated our efforts on main streams that were undermined within the last six years. We discovered that approximately 89 percent of the nearly 50,000 ft of streams were flowing. The remaining 11 percent are located in remote areas requiring some gradient work to re-establish flow for the entire length of the stream. This evaluation was performed in September 2006 when flow conditions were low. There had been no rain for several days, so we believe that the conditions were appropriate for this evaluation. Table 1 shows the results of the field evaluation.

**Table 1 Stream Recovery 1999 – 2005**

| Mined From | Mined To | Total Length (ft) | Non-Flowing Length (ft) | Flowing Length (ft) | Percent Flowing |
|---|---|---|---|---|---|
| Sep-05 | Sep-06 | 1121 | | 1121 | 100% |
| Sep-04 | Sep-05 | 6555 | | 6555 | 100% |
| Sep-03 | Sep-04 | 19172 | -3094 | 16078 | 84% |
| Sep-02 | Sep-03 | 10112 | -388 | 9724 | 96% |
| Sep-01 | Sep-02 | 4968 | -1337 | 3631 | 73% |

| | | | | | |
|---|---|---|---|---|---|
| Sep-00 | Sep-01 | 5430 | -554 | 4876 | 90% |
| Sep-99 | Sep-00 | 2501 | | 2501 | 100% |
| SINCE SEP-99 | Totals | 49859 | -5373 | 44486 | 89% |

Stream flow appears to be independent of time, and appears to be more dependent on establishing the proper flow gradient. Streams undermined only one or two years before the study date (September 2006) were flowing for their entire length, as were streams undermined seven years before the study date. However, there were streams undermined only four years before the study date, where only 73 percent of the stream length was flowing. These latter streams had little re-grading work done to date. If these streams do not recover naturally, OVCC plans to re-establish the gradient of the stream.

As is typical for Southeast Ohio headwaters a large percentage of the streams in the area are intermittent, meaning that there is no detectable flow during the dry seasons of the year. In it's adaptation to the climate in the area, the local wildlife tends to migrate as these streams experience changes in flow throughout the year. The perennial streams, streams generally of higher order flowing year round, in the area are not planned to be subsided where there is less than 200 ft of cover to prevent stream loss.

AEC will monitor all streams as outlined in the Addendum to Part 3, Item D. In the event that a stream's flow is reduced or diminished due to longwall subsidence, AEC will notify the Division of Mineral Resource Management. AEC will also monitor the stream bed monthly up to a five year period to check for natural restoration, with all findings being reported to DMRM on a quarterly basis. If normal flow is not re-established in this five year time frame, AEC will, mitigate the subsidence damage and restore normal flow to the stream. The mitigation efforts will take place immediately after the five year monitoring period has shown no recovery from the flow loss. The type of flow interruption will first be identified to determine if it is loss do to change in grade of the stream bed or fracturing of the rock strata below the stream. For grade change the stream channel will be regarded to allow the flow an uninterrupted path and connecting the pools that typically form with grade change from subsidence. In the event the flow is lost due to surface cracks in the channel diverting the water into the ground, the cracks will be grouted with a material suitable for filling the void allowing water to continue with normal flow. Monitoring will continue during mitigation operations to ensure that proper flow has been restored.

Damage Repairs – Cisterns

To date, no repairs have been required for cisterns. If repairs were needed, it would include either replacement of the cistern with a new or used cistern, or could include patching the existing cistern with grout.

Damage Repairs – Wells

Water levels in wells may decrease due to subsidence, reducing the capacity of the well. To remedy this situation, wells may be deepened to restore the reservoir. Dug wells may be grouted to allow them to hold water.

Damage Repairs – Ponds

Pond repairs have not been required to date. If a pond begins to leak after subsidence, clay could be used to seal the leaks. If the dam is damaged, it could be excavated and re-compacted to restore its use. If the decant pipe is damaged, it could be repaired or replaced.

Damage Repairs - Springs

Springs have not required repairs to date. If the spring collection system (i.e., tile) is damaged, it could be repaired or replaced to permit the spring to collect water. If the watering trough is damaged, it could be repaired or replaced. If the drain pipe from the watering trough is damaged, it could be repaired or replaced.

Damage Repairs - Surface Lands

If subsidence due to mining operations causes slippage which reduces the value or reasonably foreseeable use of the surface land, AEC will restore the land to a condition capable of supporting uses it was capable of supporting before subsidence. If slips are triggered by mining activities, these areas would be stabilized in accordance with accepted site specific procedures for such work if technologically and economically feasible. If not feasible, AEC will arrange alternative measures to mitigate the damage.

1. Notwithstanding its mining rights and without waiving nor releasing any of its rights, AEC will make repairs of damage caused to surface lands by AEC's mining operations if the damage reduces the foreseeable use or value of the surface lands. If such damages occur, AEC will submit to the Chief within thirty days after the damage occurs:

a.) Site specific plans for the repair or mitigation of the damage, including a time schedule for performance of the remedial action.

b.) A request for more time to prepare such plans; or

c.) Written notification that AEC believes that repair or restoration measures are not technologically feasible, in which case other measures will be described; or if repair or restoration measures are not desired by the owner.

2. Damage to surface lands will be repaired by local contractors. As surface damage occurs, the landowner will be notified and permission to repair the damage will be requested. Surface cracks will usually be repaired by the following method. After the length of the subsidence crack has been determined, a trench will be made in the crack. During the excavation topsoil will be segregated from subsoil and rock. Upon completion of the excavation, the material will be compacted using the track of the bulldozer or the wheel of the backhoe. Once the soil material has been replaced, the area will be seeded as a hayfield, pasture field, or yard.

AEC will employ a program to monitor surface cracking and settling resulting from subsidence. Areas being mined will be inspected at various intervals, ranging from daily to weekly. These areas will be visually inspected for the subsidence related problems. If a problem is found, the landowner will be notified immediately.

In most cases, surface cracks are expected to open and close in a relatively short period of time, however, some cracks may take weeks to close. For this reason, most cracks will not be repaired until AEC determines that the cracks are not going to close themselves. If the surface cracks are in an area that is commonly traveled by man or livestock, the cracks will be repaired immediately. Surface cracking that is found in areas not commonly traveled, may be marked with brightly colored tape. This tape will alert anyone in the area of the depression or opening. If the cracks do not close within the period of time AEC determines is adequate, a contractor will repair the cracks.

Monitoring of these areas will continue for up to six months after mining, and if the cracks reopen, they will once again be repaired. Monitoring of panel areas before mining consists of visual inspection or aerial photo review. AEC's subsidence control program will adequately assure that the value and reasonably foreseeable use of the surface land is maintained.

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# ANTICIPATED EFFECTS - SURFACE STRUCTURES

## Structures

Structures situated over a panel or within the angle of draw may be damaged due to subsidence. Structures are defined as houses, barns, sheds, garages, silos, when the longwall passes directly under a structure, the structure experiences first moderate tensile stress, then moderate compressive stress. As the structure subsides, the end that was undermined first subsides first, causing some tilting away from the advancing face. As the surface over the panel subsides, it takes on the shape of a trough, with the edges remaining in tension and the center in compression. Because the AEC Century face moves quickly, damage to structures from this type of movement is minimized.

The damage that may be expected may involve cracking of plaster, cracking of concrete block or brick, cracking of dirt and cement floors, cracking along mortar joints, and separation of existing cracks. Cracks may close partially or completely after subsidence is complete. Additions to houses may separate away from the original structure. Cracks that occur during separation may close partially or completely after subsidence is complete.

## Roads

There are several public roads crossing the mining area, being Belmont County Road 86 and Township Roads 104 and 108. AEC posts bonds for all roads to be undermined. The effect of mining on public roads is limited to minor cracking of the pavement or road surface from tension and in a few instances, humping of the surface due to compression. In all instances, the roads have never been closed and repairs have been made by the governing authority and reimbursed by AEC. Roads are inspected frequently during subsidence, and AEC works closely with the governing authority throughout the mining and subsidence.

## Utility Installations

AEC anticipates little to no impact on the utility installations over the proposed application area. Utility lines (water, electric, etc.), undergo little or no damage due to subsidence over the underground mining area. The utility lines that are typically damaged are county water lines made of asbestos concrete. No such construction is found in the application area. Other construction materials withstand subsidence well.

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ADDENDUM TO PART 4, B(5)(e)

## MITIGATING MEASURES
## ANTICIPATED EFFECTS TO SURFACE STRUCTURES

### Damage to Buildings (houses, barns, sheds, garages, etc.)

AEC will notify the owners of the buildings at least six months prior to undermining the buildings. In the event that the buildings are permanently damaged as a result of subsidence, AEC, at the request of the owner, will pay to repair the buildings to their pre-mining conditions.

### Damage to Public Roads

AEC will notify the appropriate road authority at least six months prior to undermining the road. AEC will inspect the areas around roads located on steep areas that could be subject to slippage and will repair surface cracks in these areas immediately if necessary to keep water from causing the soil to slip. In the event that roadways are permanently damaged by subsidence, AEC, at the request of the road authority, will pay to repair the road surface to its pre-mining condition.

### Damage to Public Water Lines

AEC will notify the owner of public water lines at least six months prior to undermining the lines. In the event that the pipelines are damaged by subsidence, AEC, at the request of the public water line authority, will pay to repair the pipeline to its pre-mining conditions. As of May 2003, there have been 32.5 miles of public water lines undermined by longwall mining since January 1990 for the sister mine Powhatan No. 6. During that time, many types of water lines have been undermined, including asbestos-concrete lines, HDPE lines, and PVC lines. During this time period, only one (1) break occurred, and it was located at the start of a longwall panel. This pipe was an asbestos-concrete line, and the construction was such that the end of the pipe broke off when subjected to subsidence forces. There are no asbestos-concrete pipes located within the application area. Should damage occur, however unlikely, the County repairs its own lines and AEC reimburses them.

### Damage to Other Utility Lines

AEC will notify the owner of other utility lines (electric lines and sub-stations) at least six months prior to beginning work at the proposed permit area and will take measures to protect the lines that traverse the proposed permit area. At least six months prior to undermining the lines is given to allow the utility owners to take measures deemed necessary and proper to protect their property and the public health and safety. In the event that the utilities are damaged by subsidence, AEC, at the request of the utility owner, will pay to repair the affected utility to its pre-mining conditions.

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Notice of Mining

AEC will mail written notice to owners and occupants of surface property or structures of AEC's intent to mine under such property or structures at least six months prior to any mining by AEC under their property.

Pre-Subsidence Survey

A pre-subsidence survey of all structures to be undermined will be conducted by AEC personnel or by someone contracted to do this work and will be used to determine the condition of the structures and facilities prior to the mining unless a private agreement exists between AEC and the landowner. This survey may include, but not limited to: still and video photography; land surveying; making various measurements; interviewing landowners, tenants, or other individuals; and making various drawings. This survey will be performed in accordance with Underground PPD 90-3. Refusal of the landowner to allow a pre-subsidence survey will result in the amount of damage caused by subsidence to be indeterminate. In such cases, AEC will enforce the terms of its deed language, which deeds represent valid agreements between the coal owner and the owner of the surface estates and address all damage that may occur due to the removal of all coal. Such agreements vary from tract to tract, but are shown in the Addendum to Part 1, Item C (8)(b).

AMERICAN ENERGY CORPORATION
CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 4, B(5)(g)

After mining, structures will be repaired or replaced as required by law or the owner will be compensated for the diminution in value to the extent required by law. A private agreement may be used to satisfy the requirements of OAC 1501: 13-12-03. If repaired, structures will be returned to their pre-mining condition.

Repair of and compensation for damage under the terms and conditions of OAC 1501: 13-12-03(F) and (H) can be determined only after review and analysis of the damage in each particular situation. AEC will comply with all legal requirements if subsidence damages occurs.

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CENTURY MINE
PERMIT D-0425-12
ADDENDUM TO PART 4, B(5)(h)

After American Energy Corporation (AEC) has completed its pre-subsidence survey, AEC will notify the Division of Mineral Resource Management if a private agreement (pursuant to OAC 1501: 13-12-03(E) between AEC and the landowner exists. If no agreement exists, the Division of Mineral Resource Management, after discussions with AEC, will decide the need for any monitoring of the structure(s). If monitoring is required, AEC will submit a plan for the monitoring. If, prior to subsidence, a private agreement is reached, AEC shall be released from any and all monitoring requirements.

WILLIAM J. SIPLIVY, P.E., INC.

Mining Engineer and Geologist

23 May 2010

Mr. Dennis Dubiel
Environmental Engineer
American Energy Corporation
43521 Mayhugh Hill Road
Beallsville, Ohio 43716

RE: Pillar Stability Analysis, ODNR Application D-0425-12

Dear Mr. Dubiel:

At your request, a coal pillar stability analysis was made for development mining proposed in Application D-0425-12 for American Energy Corporation's Century mine. The mining plan considered consists of gate and main entry development shown in the six possible projections on Figure 1. All entries are to be driven 18 feet wide, maximum, on 65 foot centers. Cross-cuts are to be driven 18 feet wide, maximum, on 150 foot centers, turned at 45, 60 or 90 degree angles. Mining height is 7.0 feet. Maximum overburden thickness is 680 feet.

Gate Entries

There are three gate entry projections being considered (Projections A, B and C). All are three entry systems. Projections A, B and C have cross-cuts turned on 45, 60 and 90 degree angles, respectively. The corresponding extraction rates are 40, 38 and 36 percent.

Main Entries

There are three main entry projections being considered (Projections D, E and F). All are six entry systems. Projections D, E and F have cross-cuts turned on 45, 60 and 90 degree angles, respectively. The corresponding extraction rates are 40, 38 and 36 percent.

4667 Turnberry Trail • Stow, Ohio 44224 • 330-678-0027 • siplivy@sbcglobal.net

Stability Analysis

The stability analysis was made using the NIOSH, ARMPS 5.0.43 program. A compressive strength of 900 psi was used for the Pittsburgh No. 8 coalbed, per the recommendation of MSHA, District 3, Morgantown, West Virginia.

The calculated ARMPS stability factors are summarized in Table 1. The results are as follows: Projections A and D had a stability factor of 2.69; Projections B and E had a stability factor of 2.80; and Projections C and F had a stability factor of 2.87. Calculation sheets are attached.

Stable pillars are expected for all six mining projections analyzed due to the stability factor being greater than 2 and a mining extraction rate, in each case, of less than 50 percent.

Please let me know if there are any questions.

Respectfully submitted,

William J. Siplivy, P.E., Inc.

William J. Siplivy, P.E., C.P.G.
President

23 MAY 2010

Table 1
Pillar Stability Analyses Summary
American Energy Corporation - Century Mine
ODNR Application : D-0425-12
23 May 2010

| Projection | Mining Designation | Number of Entries | Entry Width (ft.) | Entry Centers (ft.) | Cross-cut Centers (ft.) | Cross-cut Angle (deg.) | ARMPS Stability Factor |
|---|---|---|---|---|---|---|---|
| A | Gates | 3 | 18 | 65 | 150 | 45 | 2.69 |
| B | Gates | 3 | 18 | 65 | 150 | 60 | 2.80 |
| C | Gates | 3 | 18 | 65 | 150 | 90 | 2.87 |
| D | Mains | 6 | 18 | 65 | 150 | 45 | 2.69 |
| E | Mains | 6 | 18 | 65 | 150 | 60 | 2.80 |
| F | Mains | 6 | 18 | 65 | 150 | 90 | 2.87 |

Notes: Maximum overburden thickness 680 feet.

ARMPS module build: 5.0.43
Project File: UnTitled
Input Units: (ft) (psi)

[PROJECT TITLE]
-12 Pillar Stability

[PROJECT DESCRIPTION]
Analysis of 45 degrees - 3 entry gate

[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....7 (ft)
Depth of Cover.....680 (ft)
Crosscut Angle.....45 (deg)
Entry Width.....18 (ft)
Number of Entries.....3
Crosscut Spacing.....150 (ft)
Center to Center Distance #1.....65 (ft)
Center to Center Distance #2.....65 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....130 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....DEVELOPMENT

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....2.69

[DATA ABOUT THE ACTIVE MINING ZONE (AMZ)]

AMZ Width.....130.0 (ft)
AMZ Breadth.....130.0 (ft)
AMZ Area.....16900.0 (ft)*(ft)
Extraction Ratio Within AMZ.....0.40
Development Load on AMZ.....9.31E+05 (tons)

TOTAL LOADINGS ON AMZ, INCLUDING TRANSFER FROM BARRIERS

| LOAD CONDITION | ABUTMENT LOAD (tons) | LTRANSBAR (tons) | LTRANSREM (tons) | TOTAL (tons) |
|---|---|---|---|---|
| DEVELOPMENT | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.31E+05 |

R-Factor for front abutment is the percent of the total front abutment load that is applied to the AMZ.

R-Factor for side abutment is the percent of the total side abutment load that is applied to the barrier pillar (the remainder is applied to the AMZ).

LTRANBAR is the load transferred to the AMZ from the barrier pillar between the side and active gob if the barrier's SF is less than 1.5.

LTRANSREM is the load transferred to the AMZ from the remnant barrier between the side and active gob if the remnant's SF is less than 1.5.

[PILLAR PARAMETERS]

| PILLAR | ENTRY CENTER (ft) | MINIMUM DIMENSION (ft) | MAXIMUM DIMENSION (ft) |
|---|---|---|---|
| 1 | 65.00 | 47.00 | 124.54 |
| 2 | 65.00 | 47.00 | 124.54 |

| PILLAR | AREA (ft)*(ft) | STRENGTH (psi) | LOAD-BEARING CAPACITY (tons) |
|---|---|---|---|
| 1 | 5.85E+03 | 3.43E+03 | 1.45E+06 |
| 2 | 5.85E+03 | 3.43E+03 | 1.45E+06 |

TOTAL LOAD-BEARING CAPACITY OF PILLARS WITHIN AMZ: 2.50E+06 (tons)

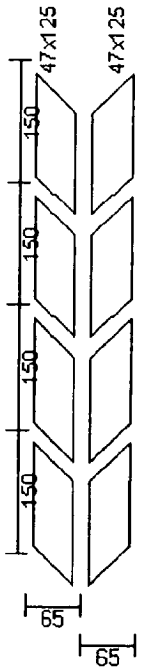
To view the distribution of Pillar Load Bearing Capacity
select 'View Plots->Settings->Pillar Load Bearing Capacity'

[BARRIER PILLAR PARAMETERS]
***none***

[STRESS ON INDIVIDUAL PILLARS WITHIN THE AMZ]

DEVELOPMENT STRESSES.....1274 (psi)

PROJECTION A



ARMPS module build: 5.0.43
Project File: UnTitled
Input Units: (ft) (psi)

[PROJECT TITLE]
-12 Pillar Stability

[PROJECT DESCRIPTION]
Analysis of 60 degrees - 3 entry gate

[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....7 (ft)
Depth of Cover.....680 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....18 (ft)
Number of Entries.....3
Crosscut Spacing.....150 (ft)
Center to Center Distance #1.....65 (ft)
Center to Center Distance #2.....65 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....130 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....DEVELOPMENT

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....2.80

[DATA ABOUT THE ACTIVE MINING ZONE (AMZ)]

AMZ Width.....130.0 (ft)
AMZ Breadth.....130.0 (ft)
AMZ Area.....16900.0 (ft)*(ft)
Extraction Ratio Within AMZ.....0.38
Development Load on AMZ.....9.31E+05 (tons)

TOTAL LOADINGS ON AMZ, INCLUDING TRANSFER FROM BARRIERS

| LOAD CONDITION | ABUTMENT LOAD (tons) | LTRANSBAR (tons) | LTRANSREM (tons) | TOTAL (tons) |
|---|---|---|---|---|
| DEVELOPMENT | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.31E+05 |

R-Factor for front abutment is the percent of the total front abutment load that is applied to the AMZ.

R-Factor for side abutment is the percent of the total side abutment load that is applied to the barrier pillar (the remainder is applied to the AMZ).

LTRANBAR is the load transferred to the AMZ from the barrier pillar between the side and active gob if the barrier's SF is less than 1.5.

LTRANSREM is the load transferred to the AMZ from the remnant barrier between the side and active gob if the remnant's SF is less than 1.5.

[PILLAR PARAMETERS]

| PILLAR | ENTRY CENTER (ft) | MINIMUM DIMENSION (ft) | MAXIMUM DIMENSION (ft) |
|---|---|---|---|
| 1 | 65.00 | 47.00 | 129.22 |
| 2 | 65.00 | 47.00 | 129.22 |

| PILLAR | AREA (ft)*(ft) | STRENGTH (psi) | LOAD-BEARING CAPACITY (tons) |
|---|---|---|---|
| 1 | 6.07E+03 | 3.44E+03 | 1.51E+06 |
| 2 | 6.07E+03 | 3.44E+03 | 1.51E+06 |

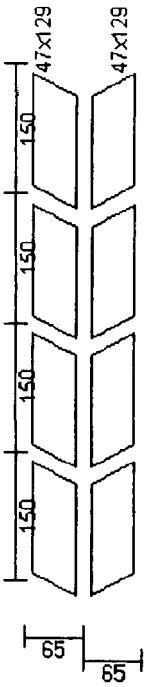
TOTAL LOAD-BEARING CAPACITY OF PILLARS WITHIN AMZ: 2.61E+06 (tons)

To view the distribution of Pillar Load Bearing Capacity
select 'View Plots->Settings->Pillar Load Bearing Capacity'

[BARRIER PILLAR PARAMETERS]
***none***

[STRESS ON INDIVIDUAL PILLARS WITHIN THE AMZ]

DEVELOPMENT STRESSES.....1228 (psi)


47x129
47x129
150
150
150
150
65
65

ARMPS module build: 5.0.43
Project File: UnTitled
Input Units: (ft) (psi)

[PROJECT TITLE]
-12 Pillar Stability

[PROJECT DESCRIPTION]
Analysis of 90 degrees - 3 entry gate

[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....7 (ft)
Depth of Cover.....680 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....18 (ft)
Number of Entries.....3
Crosscut Spacing.....150 (ft)
Center to Center Distance #1.....65 (ft)
Center to Center Distance #2.....65 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....130 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....DEVELOPMENT

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....2.87

[DATA ABOUT THE ACTIVE MINING ZONE (AMZ)]

AMZ Width.....130.0 (ft)
AMZ Breadth.....130.0 (ft)
AMZ Area.....16900.0 (ft)*(ft)
Extraction Ratio Within AMZ.....0.36
Development Load on AMZ.....9.31E+05 (tons)

TOTAL LOADINGS ON AMZ, INCLUDING TRANSFER FROM BARRIERS

| LOAD CONDITION | ABUTMENT LOAD (tons) | LTRANSBAR (tons) | LTRANSREM (tons) | TOTAL (tons) |
|---|---|---|---|---|
| DEVELOPMENT | 0.00E+00 | 0.00E+00 | 0.00E+00 | 9.31E+05 |

R-Factor for front abutment is the percent of the total front abutment load that is applied to the AMZ.

R-Factor for side abutment is the percent of the total side abutment load that is applied to the barrier pillar (the remainder is applied to the AMZ).

LTRANBAR is the load transferred to the AMZ from the barrier pillar between the side and active gob if the barrier's SF is less than 1.5.

LTRANSREM is the load transferred to the AMZ from the remnant barrier between the side and active gob if the remnant's SF is less than 1.5.

[PILLAR PARAMETERS]

| PILLAR | ENTRY CENTER (ft) | MINIMUM DIMENSION (ft) | MAXIMUM DIMENSION (ft) |
|---|---|---|---|
| 1 | 65.00 | 47.00 | 132.00 |
| 2 | 65.00 | 47.00 | 132.00 |

| PILLAR | AREA (ft)*(ft) | STRENGTH (psi) | LOAD-BEARING CAPACITY (tons) |
|---|---|---|---|
| 1 | 6.20E+03 | 3.45E+03 | 1.54E+06 |
| 2 | 6.20E+03 | 3.45E+03 | 1.54E+06 |

TOTAL LOAD-BEARING CAPACITY OF PILLARS WITHIN AMZ: 2.67E+06 (tons)

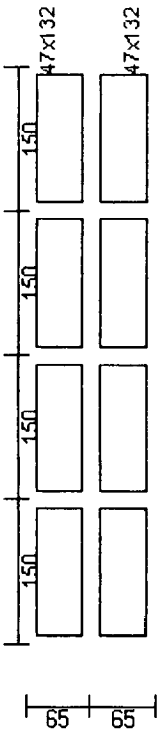
To view the distribution of Pillar Load Bearing Capacity
select 'View Plots->Settings->Pillar Load Bearing Capacity'

[BARRIER PILLAR PARAMETERS]
***none***

[STRESS ON INDIVIDUAL PILLARS WITHIN THE AMZ]

DEVELOPMENT STRESSES.....1202 (psi)

PROJECTION C



ARMPS module build: 5.0.43
Project File: UnTitled
Input Units: (ft) (psi)

[PROJECT TITLE]
-12 Pillar Stability

[PROJECT DESCRIPTION]
Analysis of 45 degrees - 6 entry mains

[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....7 (ft)
Depth of Cover.....680 (ft)
Crosscut Angle.....45 (deg)
Entry Width.....18 (ft)
Number of Entries.....6
Crosscut Spacing.....150 (ft)
Center to Center Distance #1.....65 (ft)
Center to Center Distance #2.....65 (ft)
Center to Center Distance #3.....65 (ft)
Center to Center Distance #4.....65 (ft)
Center to Center Distance #5.....65 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....130 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....DEVELOPMENT

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....2.69

[DATA ABOUT THE ACTIVE MINING ZONE (AMZ)]

AMZ Width.....325.0 (ft)
AMZ Breadth.....130.0 (ft)
AMZ Area.....42250.0 (ft)*(ft)
Extraction Ratio Within AMZ.....0.40
Development Load on AMZ.....2.33E+06 (tons)

TOTAL LOADINGS ON AMZ, INCLUDING TRANSFER FROM BARRIERS

| LOAD CONDITION | ABUTMENT LOAD (tons) | LTRANSBAR (tons) | LTRANSREM (tons) | TOTAL (tons) |
|---|---|---|---|---|
| DEVELOPMENT | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.33E+06 |

R-Factor for front abutment is the percent of the total front abutment load that is applied to the AMZ.

R-Factor for side abutment is the percent of the total side abutment load that is applied to the barrier pillar (the remainder is applied to the AMZ).

LTRANBAR is the load transferred to the AMZ from the barrier pillar between the side and active gob if the barrier's SF is less than 1.5.

LTRANSREM is the load transferred to the AMZ from the remnant barrier between the side and active gob if the remnant's SF is less than 1.5.

[PILLAR PARAMETERS]

| PILLAR | ENTRY CENTER (ft) | MINIMUM DIMENSION (ft) | MAXIMUM DIMENSION (ft) |
|---|---|---|---|
| 1 | 65.00 | 47.00 | 124.54 |
| 2 | 65.00 | 47.00 | 124.54 |
| 3 | 65.00 | 47.00 | 124.54 |
| 4 | 65.00 | 47.00 | 124.54 |
| 5 | 65.00 | 47.00 | 124.54 |

| PILLAR | AREA (ft)*(ft) | STRENGTH (psi) | LOAD-BEARING CAPACITY (tons) |
|---|---|---|---|
| 1 | 5.85E+03 | 3.43E+03 | 1.45E+06 |
| 2 | 5.85E+03 | 3.43E+03 | 1.45E+06 |
| 3 | 5.85E+03 | 3.43E+03 | 1.45E+06 |
| 4 | 5.85E+03 | 3.43E+03 | 1.45E+06 |
| 5 | 5.85E+03 | 3.43E+03 | 1.45E+06 |

TOTAL LOAD-BEARING CAPACITY OF PILLARS WITHIN AMZ: 6.26E+06 (tons)

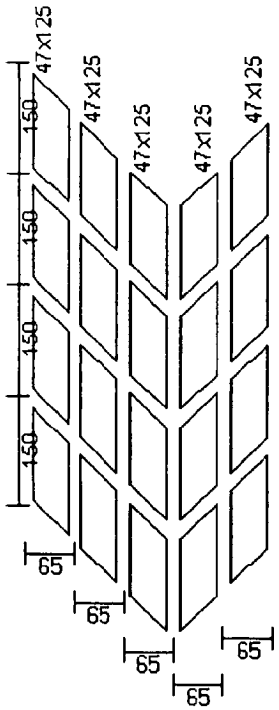
To view the distribution of Pillar Load Bearing Capacity
select 'View Plots->Settings->Pillar Load Bearing Capacity'

[BARRIER PILLAR PARAMETERS]
***none***

[STRESS ON INDIVIDUAL PILLARS WITHIN THE AMZ]

DEVELOPMENT STRESSES.....1274 (psi)

Projection D



ARMPS module build: 5.0.43
Project File: UnTitled
Input Units: (ft) (psi)

[PROJECT TITLE]
-12 Pillar Stability

[PROJECT DESCRIPTION]
Analysis of 60 degrees - 6 entry mains

[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....7 (ft)
Depth of Cover.....680 (ft)
Crosscut Angle.....60 (deg)
Entry Width.....18 (ft)
Number of Entries.....6
Crosscut Spacing.....150 (ft)
Center to Center Distance #1.....65 (ft)
Center to Center Distance #2.....65 (ft)
Center to Center Distance #3.....65 (ft)
Center to Center Distance #4.....65 (ft)
Center to Center Distance #5.....65 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....130 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....DEVELOPMENT

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....2.80

[DATA ABOUT THE ACTIVE MINING ZONE (AMZ)]

AMZ Width.....325.0 (ft)
AMZ Breadth.....130.0 (ft)
AMZ Area.....42250.0 (ft)*(ft)
Extraction Ratio Within AMZ.....0.38
Development Load on AMZ.....2.33E+06 (tons)

TOTAL LOADINGS ON AMZ, INCLUDING TRANSFER FROM BARRIERS

| LOAD CONDITION | ABUTMENT LOAD (tons) | LTRANSBAR (tons) | LTRANSREM (tons) | TOTAL (tons) |
|---|---|---|---|---|
| DEVELOPMENT | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.33E+06 |

R-Factor for front abutment is the percent of the total front abutment load that is applied to the AMZ.

R-Factor for side abutment is the percent of the total side abutment load that is applied to the barrier pillar (the remainder is applied to the AMZ).

LTRANBAR is the load transferred to the AMZ from the barrier pillar between the side and active gob if the barrier's SF is less than 1.5.

LTRANSREM is the load transferred to the AMZ from the remnant barrier between the side and active gob if the remnant's SF is less than 1.5.

[PILLAR PARAMETERS]

| PILLAR | ENTRY CENTER (ft) | MINIMUM DIMENSION (ft) | MAXIMUM DIMENSION (ft) |
|---|---|---|---|
| 1 | 65.00 | 47.00 | 129.22 |
| 2 | 65.00 | 47.00 | 129.22 |
| 3 | 65.00 | 47.00 | 129.22 |
| 4 | 65.00 | 47.00 | 129.22 |
| 5 | 65.00 | 47.00 | 129.22 |

| PILLAR | AREA (ft)*(ft) | STRENGTH (psi) | LOAD-BEARING CAPACITY (tons) |
|---|---|---|---|
| 1 | 6.07E+03 | 3.44E+03 | 1.51E+06 |
| 2 | 6.07E+03 | 3.44E+03 | 1.51E+06 |
| 3 | 6.07E+03 | 3.44E+03 | 1.51E+06 |
| 4 | 6.07E+03 | 3.44E+03 | 1.51E+06 |
| 5 | 6.07E+03 | 3.44E+03 | 1.51E+06 |

TOTAL LOAD-BEARING CAPACITY OF PILLARS WITHIN AMZ: 6.52E+06 (tons)

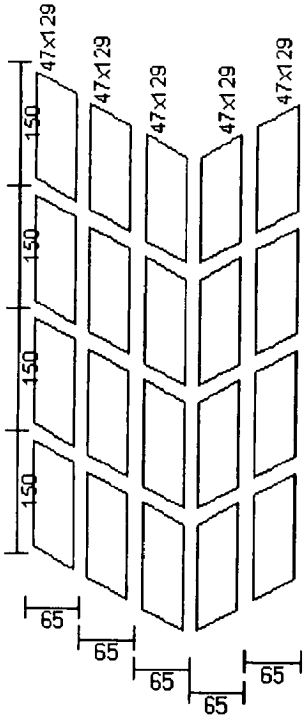
To view the distribution of Pillar Load Bearing Capacity
select 'View Plots->Settings->Pillar Load Bearing Capacity'

[BARRIER PILLAR PARAMETERS]
***none***

[STRESS ON INDIVIDUAL PILLARS WITHIN THE AMZ]

DEVELOPMENT STRESSES.....1228 (psi)

PROJECTION E



ARMPS module build: 5.0.43
Project File: UnTitled
Input Units: (ft) (psi)

[PROJECT TITLE]
-12 Pillar Stability

[PROJECT DESCRIPTION]
Analysis of 90 degrees - 6 entry mains

[DEVELOPMENT GEOMETRY PARAMETERS]
Entry Height.....7 (ft)
Depth of Cover.....680 (ft)
Crosscut Angle.....90 (deg)
Entry Width.....18 (ft)
Number of Entries.....6
Crosscut Spacing.....150 (ft)
Center to Center Distance #1.....65 (ft)
Center to Center Distance #2.....65 (ft)
Center to Center Distance #3.....65 (ft)
Center to Center Distance #4.....65 (ft)
Center to Center Distance #5.....65 (ft)

[DEFAULT PARAMETERS]
In Situ Coal Strength.....900 (psi)
Unit Weight of Overburden.....162 (pcf)
Breadth of AMZ.....130 (ft)
AMZ set automatically

[RETREAT MINING PARAMETERS]
Loading Condition.....DEVELOPMENT

[ARMPS STABILITY FACTORS]

DEVELOPMENT.....2.87

[DATA ABOUT THE ACTIVE MINING ZONE (AMZ)]

AMZ Width.....325.0 (ft)
AMZ Breadth.....130.0 (ft)
AMZ Area.....42250.0 (ft)*(ft)
Extraction Ratio Within AMZ.....0.36
Development Load on AMZ.....2.33E+06 (tons)

TOTAL LOADINGS ON AMZ, INCLUDING TRANSFER FROM BARRIERS

| LOAD CONDITION | ABUTMENT LOAD (tons) | LTRANSBAR (tons) | LTRANSREM (tons) | TOTAL (tons) |
|---|---|---|---|---|
| DEVELOPMENT | 0.00E+00 | 0.00E+00 | 0.00E+00 | 2.33E+06 |

R-Factor for front abutment is the percent of the total front abutment load that is applied to the AMZ.

R-Factor for side abutment is the percent of the total side abutment load that is applied to the barrier pillar (the remainder is applied to the AMZ).

LTRANBAR is the load transferred to the AMZ from the barrier pillar between the side and active gob if the barrier's SF is less than 1.5.

LTRANSREM is the load transferred to the AMZ from the remnant barrier between the side and active gob if the remnant's SF is less than 1.5.

[PILLAR PARAMETERS]

| PILLAR | ENTRY CENTER (ft) | MINIMUM DIMENSION (ft) | MAXIMUM DIMENSION (ft) |
|---|---|---|---|
| 1 | 65.00 | 47.00 | 132.00 |
| 2 | 65.00 | 47.00 | 132.00 |
| 3 | 65.00 | 47.00 | 132.00 |
| 4 | 65.00 | 47.00 | 132.00 |
| 5 | 65.00 | 47.00 | 132.00 |

| PILLAR | AREA (ft)*(ft) | STRENGTH (psi) | LOAD-BEARING CAPACITY (tons) |
|---|---|---|---|
| 1 | 6.20E+03 | 3.45E+03 | 1.54E+06 |
| 2 | 6.20E+03 | 3.45E+03 | 1.54E+06 |
| 3 | 6.20E+03 | 3.45E+03 | 1.54E+06 |
| 4 | 6.20E+03 | 3.45E+03 | 1.54E+06 |
| 5 | 6.20E+03 | 3.45E+03 | 1.54E+06 |

TOTAL LOAD-BEARING CAPACITY OF PILLARS WITHIN AMZ: 6.68E+06 (tons)

To view the distribution of Pillar Load Bearing Capacity
select 'View Plots->Settings->Pillar Load Bearing Capacity'

[BARRIER PILLAR PARAMETERS]
***none***

[STRESS ON INDIVIDUAL PILLARS WITHIN THE AMZ]

DEVELOPMENT STRESSES.....1202 (psi)

PROJECTION F

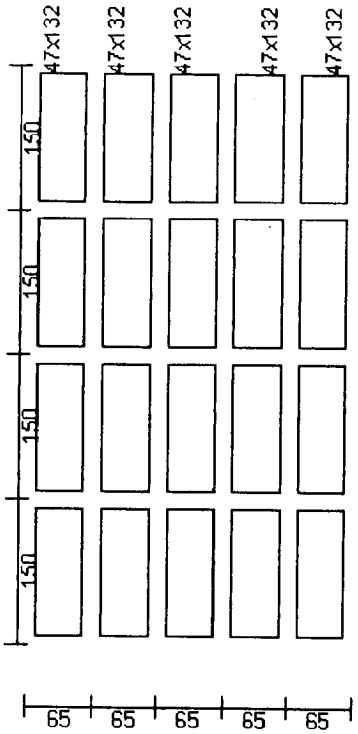
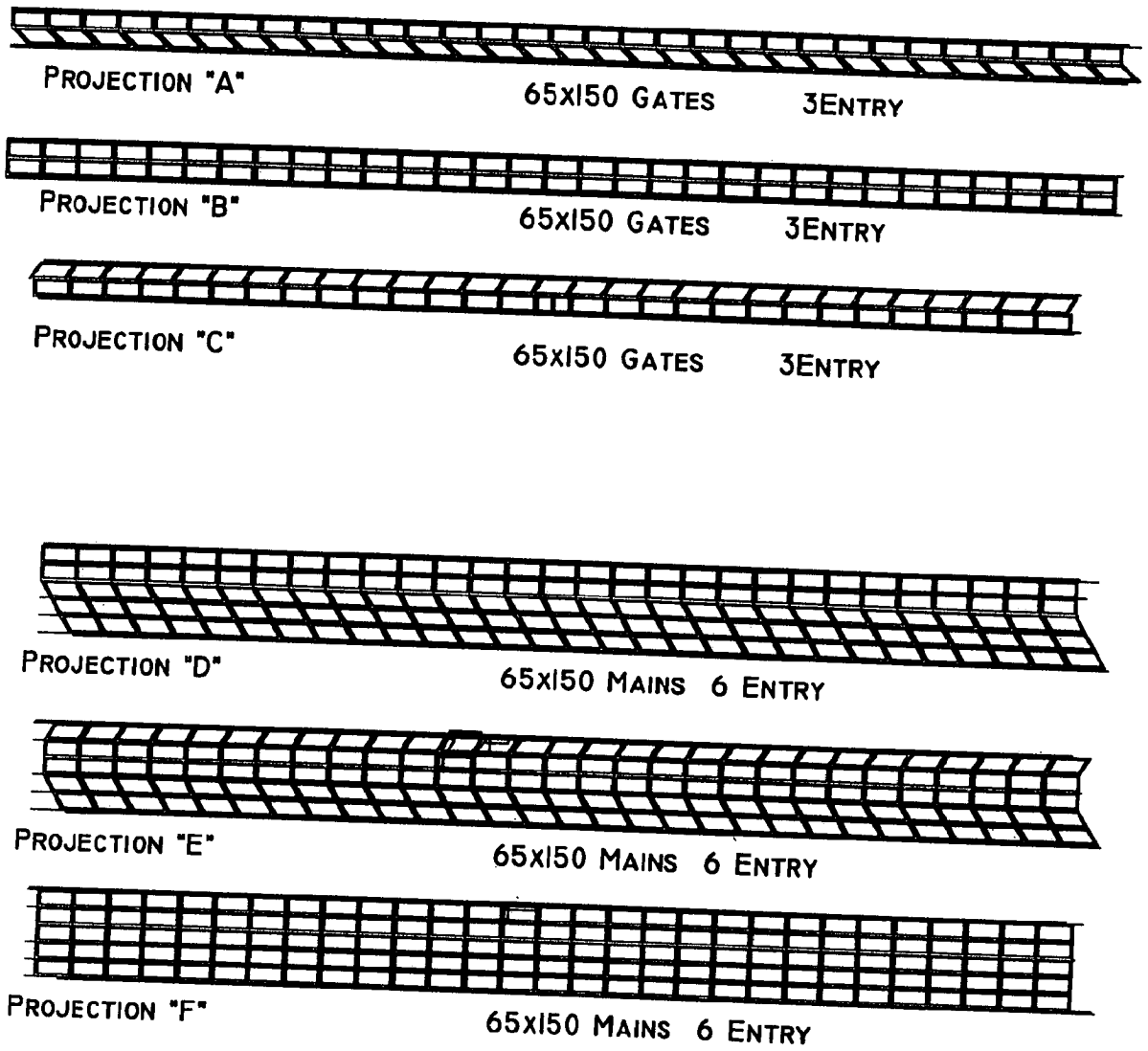


FIGURE 1
PROJECTIONS A THRU F
APPLICATION: D-0425-12



## PART 5: FORMAT AND CONTENT

### A. FILING OF ADDENDA

If an addendum is needed to present the information required by the items in the permit application, the addendum is to be submitted with the permit application and each page, map, plan or other document in the addendum should include the applicant's name and indicate to what item the addendum applies. For example, "Addendum to Part 3, item A (11)(c)Zebco Coal Company."

B. Provide the information requested below for all technical data submitted in the application.

| Identification of Technical Data * | Person/Organization that Collected Data and Date | Methodology for Collecting Data | Person/Organization that Collected Data and Date | Methodology Used to Analyze Data |
|---|---|---|---|---|
| **Hydrologic Analyses** | **Fred Blackman, Quality Environmental Services** | **Grab Samples and Interviews** | **Richard Whitt/Tra-Det Inc., Sept. 2007 thru March 2008** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **L.J. Hughes & Sons, Inc., 1950, 1987, 1994, 2000, 2001, 2002** | **Core Drill** | **Unknown/Tra-Det 1987, 1994, 2000, 2001, 2002; Paul N. Brown/ Morgantown Coal Testing Laboratory, 1950** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **Jay Little Drilling Co. 2001** | **Core Drill** | **Unknown/Tra-Det, 2001** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **Kerogen Resources 2001, 2002** | **Core Drill** | **Unknown/Tra-Det, 2001, 2002** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **West Virginia Resources, Inc., 2008** | **Core Drill** | **Luther Hendricks/Tra-Det, 2008** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **McKee Drilling, 2008** | **Core Drill** | **Luther Hendricks/Tra-Det, 2008** | **Analyze as necessary for parameters** |
| **Drilling Report** | **Pennsylvania Drilling Co., 1956** | **Core Drill** | **Lawrence K. Jones/Pittsburgh Testing Laboratory, 1956** | **Analyze as necessary for parameters** |



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| **Drilling Report** | **Leroy G. Hetager, Inc., 1967, 1968, 1998** | **Core Drill** | **Unknown** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **B.B.R. Drilling Co.** | **Core Drill** | **Unknown** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **Karl K. Hetager Co.** | **Core Drill** | **Unknown** | **Analyze as necessary for parameters** |
| **Drilling Report Attachment 13** | **B.H. Mott & Sons, Inc.** | **Core Drill** | **Unknown** | **Analyze as necessary for parameters** |

* The technical data is to be identified by referencing the particular item in the application for which the data was used in preparing the response (e.g. Part 2, B (1); Hydrologic Analyses; Part 4, A.



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C. Provide the following information for each private or academic research organization or governmental agency contacted in the preparation of the application for information on land uses, soils, geology, vegetation, fish and wildlife, water quantity and quality, air quality, and archeological, cultural, and historic features.

| Name and Address of Agency/Organization | Name, Position and Phone Number of Contact Person | Type of Information (e.g. Geology) |
|---|---|---|
| **ODNR, Division of Water<br>2045 Morse Road, Bldg. B-3<br>Columbus, Ohio 43229-6693** | **B. Haiker, Hydrogeologist<br>(614) 265-6690** | **Hydrology** |
| **Tra-Det Inc.<br>P.O. Box 2019<br>Wheeling, WV 26003** | **R. Whitt, Analyst<br>(304) 547-9094** | **Water Sample Analysis** |
| **Geological Records Center<br>4283 Fountain Square Court<br>Columbus, Ohio 43224** | **ODNR, Division of Geological Survey<br>(614) 265-6860** | **Oil/Gas Well Data** |
| **William J. Siplivy, P.E., Inc.<br>4667 Turnberry Trail<br>Stow, Ohio 44224** | **William J. Siplivy, P.E., C. P.G., President<br>(330) 678-0027** | **Pillar Stability Analysis** |
| **Natural Resource Conservation Service<br>1119 East Main Street<br>Barnesville, OH 43713** | **Mr. Jeff Bettinger<br>(740) 425-1100 x102** | **Slip Prone Soils<br>Part 4, Item B5(b)** |
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