# APPROVED SURFACE
# COAL MINING PERMIT APPLICATION

## Applicant:

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

**Application** D-0425-2
**Number of acres to be** 154.4
**Number of acres to be affected first mining** 5.0
**The quarterly water monitoring plan for this permit**

**Quality:** Refer to application page 26, F(3) and the Hydrogeologic Investigation Report Section 6.0
**Quantity:** Refer to application page 26, F(3) and the Hydrogeologic Investigation Report Section 6.0

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

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:** Michael G Sponsler by [illegible] **Date:** 10/7/02

F51 Rev: 07/01/2001

# COAL MINING AND RECLAMATION PERMIT

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

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

**Permit Number:** D-425
**Application Number:** D-0425-2
**Acreage:** 154.4

**Effective:** 12/17/2002
**Expires:** 10/21/2004

**Type of Operation:** Coal Waste

## LOCATION OF PERMIT

| NAME OF LANDOWNERS | T | R | SECTION | LOTS | TOWNSHIP | COUNTY |
|---|---|---|---|---|---|---|
| American Energy Corporation | 6 | 5 | 4 | | WAYNE | BELMONT |
| | 6 | 5 | 3 | | WAYNE | BELMONT |

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:** Refer to application page 26, F(3) and the Hydrogeologic Investigation Report Section 6.0
**Quantity:** Refer to application page 26, F(3) and the Hydrogeologic Investigation Report Section 6.0

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

**Signature:** Michael V. Sponsler by [illegible] **Date:** 12/17/2002
Chief, Mineral Resources Management

D0425

AEC 11248

9/88

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION
## ADJACENT AREA COAL MINING PERMIT APPLICATION

1. Applicant AMERICAN ENERGY CORPORATION
   Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88
   City BEALLSVILLE State OHIO Zip 43716
   Telephone No. (740) 926-9152

2. Original Permit No. D-0425

3. Date Original Permit Issued OCTOBER 22, 1984

4. Number of adjacent area applications for the D-permit which were previously:

   a. Submitted 1 b. Issued 1

5. Number of acres in this permit application. 154.4 Acres

6. Number of acres in this permit application that are to be affected during the balance of the current mining year of the original permit identified in item 2. above. 5.0

7. 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 Robert D. Moore ; Date _____

   Signature _____ ; Title PRESIDENT

   Sworn before me and subscribed in my presence this 27th day of November, 2001.

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

   Barbara L. Rush
   Notary Public

8. For Revision Review Only. This item is to be completed after revisions, if any, have been made to the permit application.

   I, the undersigned 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 Robert D. Moore ; Date 07-10-02

   Signature _____ ; Title President

   Sworn before me and subscribed in my presence this 10th day of July, 2002.

   KATHY J. ROE
   NOTARY PUBLIC, STATE OF OHIO
   MY COMMISSION EXPIRES 12-15-04

   Kathy J. Roe
   Notary Public

OPERATOR

AEC 11249

8. For Revision Review Only. This item is to be completed after revisions, if any, have been made to the permit application.

I, the undersigned 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 Robert D. Moore ; Date _____

Signature _____ ; Title President

Sworn before me and subscribed in my presence this 9th day of August, 20 02.

Barbara L. Rush
Notary Public

NOTARIAL SEAL STATE OF OHIO

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

F. 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 Robert D. Moore Title President

Signature _____ Date 9-11-02

Sworn before me and subscribed in my presence this

11th day of September 2002.

Barbara L. Rush
Notary Public

NOTARIAL SEAL STATE OF OHIO

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

9. Did a person other than an employee of the applicant prepare this application? X Yes, _____ No. If "yes" provide:

Preparer's Name JACK A. HAMILTON & ASSOCIATES, INC.
Address P.O. BOX 471, 342 HIGH STREET
City FLUSHING State OHIO Zip 43977
Telephone No. (740) 968-4947

10. Provide the following information for all surface and subsurface owners of record within this proposed permit area indicating the type of ownership and permit area location information.

Name AMERICAN ENERGY CORPORATION
Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88
City BEALLSVILLE State OHIO Zip 43716
Surface X, Coal X #11 & #12), Non Coal X
County BELMONT Township WAYNE
Section 3 & 4 LOT _____, T- 6 R- 5

Name CONSOLIDATED LAND COMPANY
Address BOX 505, 34208 AURORA ROAD
City SOLON State OHIO Zip 44139
Surface _____, Coal X (#8), Non Coal _____
County BELMONT Township WAYNE
Section 3 & 4 LOT _____, T- 6 R- 5

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____, Coal _____, Non Coal _____
County _____ Township _____
Section _____ LOT _____, T- _____ R- _____

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____, Coal _____, Non Coal _____
County _____ Township _____
Section _____ LOT _____, T- _____ R- _____

Name _____
Address _____
City _____ State _____ Zip _____
Surface _____, Coal _____, Non Coal _____
County _____ Township _____
Section _____ LOT _____, T- _____ R- _____

(If more space is required, submit an addendum identifying owners in the same format)

11. Submit any required right of entry documentation unless previously submitted and filed with the division and valid for this adjacent area application.

SEE PREVIOUSLY APPROVED PERMIT TRANSFER AND ADDENDA

12. In the space below, provide the name and address of the public office where a complete copy of this adjacent area permit application and the approved application for the original permit are to be filed. (Note: if previous adjacent area permits have been issued, they must also be on file.)

RECORDER'S OFFICE
BELMONT COUNTY COURTHOUSE
ST. CLAIRSVILLE, OHIO 43950

13. In the space below, list the complete 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 the proposed permit area once a week for four (4) consecutive weeks. The advertisement is to provide the information required by rule 1501: 13-5-01 (A)(1) of the Administrative Code.

THE TIMES LEADER
200 SOUTH FOURTH STREET
MARTINS FERRY, OHIO 43938

*PROOF OF PUBLICATION*

**The State of Ohio**
**County of Belmont, ss:**

MAR 12 2002

**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 except Saturday 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:**

Feb. 15, 22,
Mar 1, 8 2002
Audrey Blanco

Subscribed by Affiant and sworn to before me, this 8th day of Mar, A.D. 2002.

Rebecca L Anderson
Notary Public

NOTARIAL SEAL STATE OF OHIO

**REBECCA L. ANDERSON**
Notary Public, State of Ohio
My Commission Expires Nov. 25, 2006

PUBLIC NOTICE

American Energy Corporation, 43521 Mayhugh Hill Road, Twp. Highway 88, Beallsville, Ohio 43716 has submitted a Coal Mining and Reclamation Permit Application numbered D-0425-2 to the Ohio Department of Natural Resources, Division of Mineral Resources Management. The proposed mining and reclamation operation will be in Sections 3 and 4, Township 6, Range 5, Wayne Township, Belmont County, Ohio. The proposed permit area encompasses 154.4 acres and is located on the Hulner 7 1/2 Minute USGS Quadrangle Map approximately 3.2 miles north of Beallsville, Ohio, and south of Township Road 74 and east of Township Road 87. The activity planned for the proposed application will consist of a coal refuse disposal facility.

This application is on file at the Belmont County Courthouse, Recorder's Office, St. Clairsville, Ohio 43950. Written comments or requests for an informal conference may be sent to: Chief, Ohio Department of Natural Resources, Division of Mineral Resources Management, 1855 Fountain Square Court, Columbus, Ohio 43224, within (30) thirty days of the last date of publication of this notice.

TL - ADV. - FEB. 15, 22, MARCH 1, 8 - 4 FRI.

**I hereby certify that this is a true copy of the original.**

Ellen M. Gruer

2006

Printer's Fee $200.20

Notary's Fee $_____

The Times Leader
Martins Ferry, Ohio

AEC 11254

14. Address any additional information that must be included in this adjacent area application when all items from the approved permit application have been considered. Application items must be addressed when following situations are applicable:

    a "no" response in the approved permit application becomes a "yes" when applied to the adjacent area and/or

    additional information is required to make a response complete when applied to the adjacent area.

    Provide the required information submitting either of the following:

    * a) the appropriate page of the permit application identifying the application items that must be included in this adjacent area application after all items from the issued permit application have been considered or

    b) an addendum specifically identifying by application page and item number any additional information that must be included in this adjacent area application after all items from the issued permit application have been considered.

    Submit the revised response and any required Attachments, documents, or addenda.

*SUBMITTING ONLY THE PERMIT APPLICATION PAGES RELEVANT TO THE PROPOSED ADJACENT AREA APPLICATION. ITEMS LEFT BLANK ON SUBMITTED PERMIT PAGES WERE EITHER COVERED IN THE ORIGINAL PERMIT, SUBSEQUENT APPROVED A.R.P.'S, OR ARE NOT APPLICABLE TO THIS APPLICATION.

11/90

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**UNDERGROUND COAL MINING AND RECLAMATION**
**PERMIT APPLICATION**

Applicant: AMERICAN ENERGY CORPORATION

A. Type of Operation (check, appropriate space(s)):*

_____ Shaft, _____ Slope, _____ Drift,
_____ Room and Pillar, _____ Pillar Extraction,
_____ Longwall, _____ Combined Surface and Underground

B. Type of Application (check appropriate space (s)):*

(1) _____ New
(2) _____ Initial Underground Workings to Existing Permit
(3) _____ Additional Underground Workings
***ADDITIONAL SURFACE AREA FOR COAL REFUSE DISPOSAL**

C. Address the following if applicable:

(1) Permit Number D-0425
(2) Date Issued 10-22-84

D. Did a person other than an employee of the applicant prepare this application? X Yes, _____ No. If "yes," provide:

Preparer's Name JACK A. HAMILTON & ASSOCIATES, INC.

Address P.O. BOX 471, 342 HIGH STREET

City FLUSHING State OHIO Zip 43977

Telephone 740 - 968 - 4947

E. 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 Robert D. Moore Date _____

Signature _____ Title President

Sworn before me and subscribed in my presence this 27th day of November, 2001.

NOTARIAL SEAL STATE OF OHIO

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

Barbara L. Rush
Notary Public

F. 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 Robert D. Moore Title President

Signature _____ Date 07-10-02

Sworn before me and subscribed in my presence this 10th day of July, 20 02.

KATHY J. ROE
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 12-15-02

Kathy J. Roe
Notary Public

PART 1 LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

A. IDENTIFICATION OF INTERESTS

(1) Applicant's Name AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88

City BEALLSVILLE State OHIO Zip 43716

Telephone 740 - 926 - 9152

Employer Identification No. (EIN) 31-1550443 or

Social Security No. (SSN) , _____

(2) Indicate business structure of entity and additional information:

____ Single Proprietorship,
____ Partnership (registration no. and date obtained)
_____,
X Corporation (charter no. and date incorporated)
00842695 4-12-1993,
____ Association, ____ Other, specify _____

(3) If the entity is a single proprietorship, provide the following:

Owner's Name _____

Address _____

City _____ State _____ Zip _____

Telephone ____ - ____ - ____

EIN _____ , or SSN _____

Beginning date of ownership _____

F. 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 Robert D. Moore Title President

Signature _____ Date 8-09-02

Sworn before me and subscribed in my presence this

9th day of August, 20 02.

Barbara L. Rush
Notary Public

NOTARIAL SEAL STATE OF OHIO

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

F. 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 Robert D. Moore Title President

Signature _____ Date 9-11-02

Sworn before me and subscribed in my presence this

11th day of September, 20 02 .

Barbara L. Rush
Notary Public

NOTARIAL SEAL STATE OF OHIO

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

A. (4) If the applicant is a business entity other than a single proprietorship, provide the following for the applicant's statutory agent and submit Attachment 1.

Agent's Name AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88

City BEALLSVILLE State OHIO Zip 43716

Telephone (740) - 926 - 9152

(5) Is the operator of the mine to be a person different from the applicant? _____ Yes, _____ No. If "Yes," provide the operator's name and submit Attachment 17. (Note: if more than one operator, indicate operator's name and submit a separate attachment for each).

Operator's Name _____

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

Name AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88

City BEALLSVILLE State OHIO Zip 43716

Telephone (740) 926 - 9152

EIN 31-1550443 , or SSN (optional) _____

(7) 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: [ X ]. If any person listed is a business entity and not an individual, also complete Attachment 1 for that person.

Name _____

Address _____

City _____ State _____ Zip _____

Telephone ____ - _____ - _____

EIN _____ , or SSN (optional) _____

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

_____ / _____

Submit and identify additional pages necessary to complete response.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 1**
**(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, 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. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity American Energy Corporation

Name Robert D. Moore
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity President & Treasurer
Date position assumed/ended (if applicable) 6-25-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure President & Treasurer

Name Bruce Hill
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity Director
Date position assumed/ended (if applicable) 7-02-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Director

Name Michael O. McKown
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity Secretary
Date position assumed/ended (if applicable) 11-01-99 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Secretary

Submit and identify additional pages necessary to complete response.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 1**
**(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, 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. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity American Energy Corporation

Name Clyde Borrell
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity Director
Date position assumed/ended (if applicable) 11-01-99 / 7-02-01
Percent of ownership 0% Date of ownership N/A
Location in organizational structure N/A

Name Coal Resources Inc.
Street address 29325 Chagrin Blvd.
City Pepper Pike State OH Zip 44122
EIN 31-1586390, or SSN
Title of position within entity Sole Shareholder
Date position assumed/ended (if applicable) 11-1-99 / 2-23-01
Percent of ownership 100% Date of ownership N/A
Location in organizational structure N/A

Name Murray Energy Corporation
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity Sole Shareholder
Date position assumed/ended (if applicable) N/A /
Percent of ownership 100% Date of ownership 2-23-01
Location in organizational structure Sole Shareholder

Submit and identify additional pages necessary to complete response.

11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 1**
**(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, 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. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity Murray Energy Corporation

Name Robert E. Murray
Street address 29325 Chagrin Blvd., Suit 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity President, CEO, Shareholder
Date position assumed/ended (if applicable) N/A /
Percent of ownership 100% Date of ownership 2-23-01
Location in organizational structure President, CEO, Shareholder

Name Michael D. Loiacono
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity Treasurer
Date position assumed/ended (if applicable) 2-23-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Treasurer

Name Michael O. McKown
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity Secretary
Date position assumed/ended (if applicable) 2-23-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Secretary

Submit and identify additional pages necessary to complete response. 1 of 1

(8) 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 Attachment 1 for that person.

Name _____

Address _____

City _____ State _____ Zip _____

Telephone _____ - _____ - _____

EIN _____ , or SSN _____

O & C relationship to entity _____

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

_____ / _____

Submit and identify additional pages necessary to complete response.

(9) 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.

ROBERT D. MOORE

(10) Has the applicant, any person listed under items A(3), (7), and (8), or any person listed on Attachment 1 who "owned or controlled" or "owns or controls" as defined in 1501: 13-4-03(A), held a coal mining permit in the United States within the five years preceding the date of the application? __X__ Yes, _____ No. If "yes," submit Attachment 5. **SEE ATTACHMENT 5'S**

(11) Does the applicant, any person listed under items A(3), (7), and (8), or any person listed on Attachment 1 have a pending coal mining application in any state of the United States? __X__ Yes, _____ No. Is "yes," submit Attachment 23. **SEE ATTACHMENT 23'S**

(12) Indicate name of mine _____

(13) List below the MSHA identification numbers for the mine and for all mine-associated structures requiring MSHA approval on the proposed permit area.

33-61070

(14) Submit Attachment 22, Certificate of Liability Insurance.

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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**
City **Beallsville** State **Ohio** Zip **43716**
Telephone **740 - 926 - 9152**
EIN **31-1550443** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued | |
|---|---|---|---|---|
| D-0425 | OHIO | ODNR, DMR | 33-61070 | 10-22-84 |
| D-1159 | OHIO | ODNR, DMR | 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:

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 Company**
Address **P.O. Box 146**
City **Powhatan Point** State **Ohio** Zip **43942**
Telephone **714 - 795 - 5200**
EIN **31-1536602** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued | |
|---|---|---|---|---|
| D-1020 | OHIO | ODNR, DMRM | 33-04397 | 07-31-97 |
| D-0241 | OHIO | ODNR, DMRM | 33-03048 | 07-02-93 |
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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%

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **Bentleyville** State **PA** Zip **15314**
Telephone **724** - **258** - **2056**
EIN **25-1755305** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued | |
|---|---|---|---|---|
| 63841302 | PA | DEP | 36-00970 | 06-30-95 |
| 63733706 | PA | DEP | 36-00970 | 06-30-95 |
| 63723707 | PA | DEP | 36-00970 | 06-30-95 |
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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

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **P.O. Box 135 - 1060 Ohio Ave.**
City **Glassport** State **PA** Zip **15045**
Telephone **412 - 673 - 1500**
EIN **25-1490495** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| 02851602 | PA | DEP | 36-08678 06-08-95 |
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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

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 Oklahoma Coal Company**
Address **29325 Chagrin Blvd., Suite 300**
City **Pepper Pike** State **OH** Zip **44122**
Telephone **216 - 765 - 1240**
EIN **34-1673480** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| D-0230 | OH | DMRM | No MSHA number |
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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

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 Ohio Valley Coal Company**
Address **56854 Pleasant Ridge Road**
City **Alledonia** State **OH** Zip **43902**
Telephone **740** - **926** - **1351**
EIN **34-1041310** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| D-0360 | OH | DMRM | 33-01159 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 - Director

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **Bentleyville** State **PA** Zip **15314**
Telephone **724** - **258** - **2056**
EIN **52-1615668** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| 63921301 | PA | DEP | 36-08375 06-08-94 |
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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

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **P.O. Box 187**
City **St.Clairsville** State **OH** Zip **43950**
Telephone **435 - 613 - 0393**
EIN **34-1874726** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| ACT/007/013 | UT | DOGM | Horse Canyon Mine 42-00100 12/24/78, Lila Canyon Mine 42-02241 4/15/99 |
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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 - Director

11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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-0425-2 | O.D.N.R., DMRM | OHIO |
| D-0425-3 | O.D.N.R., DMRM | OHIO |
| D-0425-4 | O.D.N.R., DMRM | OHIO |
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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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 BELMONT COAL COMPANY, INC.

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| 10168 | O.D.N.R., DMRM | OHIO |
| 1473 | O.D.N.R., DMRM | OHIO |
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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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.

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| 63921301 | PA DEP | PA |
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11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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-0360-12 | ODNR, DMRM | OH |
| D-0360-13 | ODNR, DMRM | OH |
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# OHIO DEPARTMENT OF NATURAL RESOURCES
# DIVISION OF RECLAMATION

## ATTACHMENT 22
## (CERTIFICATE OF LIABILITY 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 paragraph (B) of rule 1501:13-7-07 of the Administrative Code stated below.

**Name of Insurer** Federal Insurance Company
**Policy Number** 37104410
**Policy Period** 6/1/02 to 6/1/03
**Name of Underwriting Agent** Karen Williams
**Address of Underwriting Agent** % Reschini Agency, Inc. 922 Phil St., Indiana, PA
**Telephone Number 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 Reclamation
Foundation Square
Columbus, OH 43224

6-17-02
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 Reclamation. 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, inluding 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.

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 date of submission of this application? _____ Yes, __X__ No. If "yes," submit Attachment 6.

(b) Forfeited a mining bond or similar security deposited in lieu of bond? _____ Yes, __X__ No. If "yes," submit Attachment 6.

(2) Has the applicant been issued a notice of violation (NOV) 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 these rules, or of any federal or state law, rule, or regulation pertaining to air or water environmental protection? _____ Yes, __X__ No. If "yes," submit Attachment 7A.

(3) Have any unabated federal or state cessation orders (COs) and unabated air and water quality notices of violation (NOV's) 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, __X__ No. If "yes," submit Attachment 7B.

C. RIGHT OF ENTRY INFORMATION

(1)(a) Provide the following information for every legal or equitable owner of record, surface and mineral, of the property to be mined on the permit area (i.e. areas affected by surface operations and facilities), indicating whether the ownership is of surface, coal, or noncoal mineral.

Name AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88

City BEALLSVILLE State OHIO Zip 43716

Surface X , Coal X (#11&12) , Noncoal X

Deed Parcel No. 2-5-44, 2-13-41, 2-13-63, 2-13-64

Name CONSOLIDATED LAND COMPANY

Address BOX 505, 34208 AURORA ROAD

City SOLON State OHIO Zip 44139

Surface _____ , Coal X (#8) , Noncoal _____

Deed Parcel No. 2-5-44, 2-13-41, 2-13-63, 2-13-64

Name _____

Address _____

City _____ State _____ Zip _____

Surface _____ , Coal _____ , Noncoal _____

Deed Parcel No. _____

Name _____

Address _____

City _____ State _____ Zip _____

Surface _____ , Coal _____ , Noncoal _____

Deed Parcel No. _____

C. (2) Provide the following information for the holders of record of any leasehold interest in the coal to be mined or property to be affected by surface operations or facilities, indicating whether the held interest is of surface, coal, or noncoal rights. **N/A**

Name _____

Address _____

City _____ State _____ Zip _____

Surface _____ , Coal _____ , Noncoal _____

Name _____

Address _____

City _____ State _____ Zip _____

Surface _____ , Coal _____ , Noncoal _____

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 or property to be affected by surface operations and facilities?
_____ Yes, _____ No. If "yes," submit Attachment 2.

(4) Is any owner, holder, or purchaser listed in items C(1)(a and b), (2), or (3) respectively, a business entity other than a single proprietorship?
__X__ Yes, _____ No. If "yes," submit Attachment 3.

SEE ATTACHMENT 3'S

(5) Is any part of the proposed permit area adjacent to any lands which are not owned by those persons identified in item C(1)(a)? __X__ Yes, _____ No. If "yes," submit Attachment 4.

(6) Does the applicant hold lands, interests in lands, options, or pending bids on interests in lands which are contiguous to the property to be mined?
_____ Yes, __X__ No. If "yes," provide a description of the lands.

(7) Is it anticipated that individual mining permits will be sought for any of those lands described in item C(6) above? _____ Yes, __X__ No. If "yes," submit as an addendum and identify those lands to include the size, sequence, and timing of future mining permits, utilizing a map pursuant to 1501:13-4-13(J)(29), Ohio Administrative Code.

11/92

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

**ATTACHMENT 3**
**(IDENTIFICATION OF OTHER BUSINESS ENTITIES)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C.(4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity American Energy Corporation

Statutory agent American Energy Corporation

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name Robert D. Moore Position PRES./ TREAS.

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name Michael O. McKown Position Secretary

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name Bruce Hill Position Director

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name _____ Position _____

Street Address _____

City _____ State _____ Zip _____

11/92

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

**ATTACHMENT 3**
**(IDENTIFICATION OF OTHER BUSINESS ENTITIES)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C.(4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity Murray Energy Corporation

Statutory agent Murray Energy Corporation

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name Robert E. Murray Position PRES., CEO, Shareholder

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name Michael D. Loiacono Position Treasurer

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name Michael O. McKown Position Secretary

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name _____ Position _____

Street Address _____

City _____ State _____ Zip _____

11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 3**
**(IDENTIFICATION OF OTHER BUSINESS ENTITIES)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C. (4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity CONSOLIDATED LAND COMPANY

Statutory agent A.H. STATUTORY SERVICE CORP. #842696

Street Address 925 EUCLID AVENUE, SUITE 1100

City CLEVELAND State OHIO Zip 44115

Person's Name PETER VULJANIC Position PRESIDENT

Street Address BOX 505, 34208 AURORA ROAD

City SOLON State OHIO Zip 44139

Person's Name DOMINIC M. DAMORE Position SECRETARY

Street Address BOX 505, 34208 AURORA ROAD

City SOLON State OHIO Zip 44139

Person's Name PETER VULJANIC Position TREASURER

Street Address BOX 505, 34208 AURORA ROAD

City SOLON State OHIO Zip 44139

Person's Name _____ Position _____

Street Address _____

City _____ State _____ Zip _____

11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 4**
**(ADJACENT OWNERS)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C.(5) in Part 1 of the permit application is "yes".

Name of owner Wyoming Pocahontas Land Company

Address 39 Robin Place

City Beckley State West Virginia Zip 25810

X Surface, X Mineral

Name of owner D.F. White, et al

Address 39795 Old State Route 147

City Bethesda State Ohio Zip 43719

X Surface, X Mineral

Name of owner _____

Address _____

City _____ State _____ Zip _____

_____ Surface, _____ Mineral

Name _____

Address _____

City _____ State _____ Zip _____

_____ Surface, _____ Mineral

Name _____

Address _____

City _____ State _____ Zip _____

_____ Surface, _____ Mineral

C. (8)(a) Provide either of the following to allow for coal mining operations on the permit area.

(i) A copy of the documents, or
(ii) An affidavit wherein the documents are described.

**See approved Permit D-0425 Transfer, Page 6, Item 20 and approved A.R.P. R-0425-5.**

AFFIDAVIT

State of Ohio, _____ County, ss. _____ 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 _____

Execution Date _____

Expiration Date _____

Parties: From _____ To _____

Description of land: No. Acres _____

County _____ Township _____

Sections _____ Lots _____

Parcel # _____

Explanation of legal rights claimed _____

_____

_____

Pending litigation _____ Yes, _____ No.

_____ _____
Signature of Affiant Date

_____
Position

Sworn to before me and subscribed in my presence this

_____ day of _____ , 20 _____.

_____
Notary Public

C. (9)(a) List below the following information for each surface owner of land within the proposed permit area.

| OWNER NAME | COUNTY | TOWNSHIP | SEC./LOT | T- ,R- |
|---|---|---|---|---|
| American Energy Corp. | Belmont | Wayne | 3 & 4 | 6 , 5 |

D. AREAS WHERE MINING IS PROHIBITED OR LIMITED **Permit Area**

(1) Does the permit area included in this permit application include any area dedicated as a nature preserve pursuant to Chapter 1517., Ohio Revised Code? ____ Yes, __X__ No. If "yes," submit proof of valid existing right.

(2) Does the permit area included in this permit application include any area within one-thousand feet of the waterlines of any wild, scenic, or recreational river dedicated pursuant to Chapter 1501., Ohio Revised Code? _____ Yes, __X__ No. If "yes," submit proof of valid existing right.

(3) Does the permit area included in this permit application include any area within the boundaries of the following systems: national park, national wildlife refuge, national trails, national wilderness preservation, national recreational areas, or wild and scenic rivers or river corridors, including those rivers under study? _____ Yes, __X__ No. If "yes," submit proof of valid existing right.

(4) Does the permit area included in this permit application include any federal lands within the boundaries of any national forest? _____ Yes, __X__ No. If "yes," submit approval of U.S. Secretary of Interior or proof of valid existing right.

(5) Will operations in the permit area conducted under this permit adversely affect any publicly owned park or places listed on the National Register of Historic Places? _____ Yes, __X__ No. If "yes," submit joint approval from the chief and the federal, state, or local agency with jurisdiction over the park or places or proof of valid existing right.

(6) Will operations in the permit area conducted under this permit affect land within one hundred feet of the outside right-of-way of a public highway? __X__ Yes, _____ No. If "yes," list the highway(s) in the space below and submit Attachment 9 or proof of valid existing right.

**SEE APPROVED 12.0 AC. I.B.R. FOR PROOF OF VALID EXISTING RIGHT**

D. (7) Will operations in the permit area conducted under this permit affect land within three hundred feet of any occupied dwelling? _____ Yes, __X__ No. If "yes," list the name of the owner(s) in the space below and submit Attachment 10 or proof of valid existing right.

(8) Will operations in the permit area conducted under this permit, affect land within three hundred feet of any public building, school, church, community or institutional building, or public park? _____ Yes, __X__ No. If "yes," submit proof of valid existing right.

(9) Will operations in the permit area conducted under this permit, affect land within one hundred feet of a cemetery? _____ Yes, __X__ No. If "yes," submit proof of valid existing right or appropriate authorization to relocate the cemetery.

**N/A** (10) Will operations conducted during this permit result in the extension of any part of the pit within fifty feet of horizontal distance to any adjacent land or water in which the applicant does not own either the surface or mineral rights? _____ Yes, _____ No. If "yes," list below the names of the adjacent owners and submit Attachment 11.

E. Areas Where Mining is Prohibited or Limited-**Permit And Shadow Area**

Are there areas within the proposed permit area, shadow area, or adjacent areas designated unsuitable for coal mining operations under rule 1501:13-3-07 of the Administrative Code or under study for designation in an administrative proceeding under this rule? _____ Yes, __X__ No.

(1) If "yes" to the item above, did the applicant make substantial legal and financial commitments in the proposed areas prior to January 4, 1977? _____ Yes, _____ No.

(2) If "yes" to item (1) above, submit as an addendum to the permit application information supporting the assertions that the commitments were made prior to January 4, 1977.

F. PERMIT TERM AND EXTENT-**Permit and Underground Workings**

(1) Anticipated/actual date for:

(a) Starting mining operations UPON PERMIT ISSUANCE
(b) Terminating mining operations TO EXHAUSTION OF COAL RESERVES

(2) Does the applicant propose a permit term in excess of five (5) years? _____ Yes, __X__ No. If "yes," submit an addendum with the information required by 1501:13-4-03 (E) (3), Ohio Administrative Code.

(3) Indicate the following acreage figures:

(a) Total Acres __154.4__ (Permit Area)
(b) Total Acres __0*__ (Underground Workings)

(4) Horizontal extent of underground workings over life of permit in acres:

(a) Full Coal Recovery __N/A*__
(b) Room and Pillar __N/A*__

G. PUBLIC NOTICE-**Permit and Shadow Area**

(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.

**SEE PAGE 3 OF ADJACENT AREA APPLICATION ITEM 12**

(2) In the space below, list the name and address of the newspaper and submit an addendum providing the text of the advertisement that is to be published in a newspaper of general circulation in the locality of the proposed operation. Note: the advertisement is to provide the information required by paragraph (A) of rule 1501:13-5-01 of the Administrative Code.

**SEE PAGE 3 OF ADJACENT AREA APPLICATION ITEM 13**

***N/A, SURFACE DISTURBANCE FOR REFUSE DISPOSAL ONLY**

*PROOF OF PUBLICATION*

The State of Ohio
County of Belmont, ss:

MAR 12 2002

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 except Saturday 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:

Feb. 15, 22,
Mar 1, 8 2002
Audrey Blanco

Subscribed by Affiant and sworn to before me, this 8th day of Mar, A.D. 2002.

Rebecca L Anderson
Notary Public

NOTARIAL SEAL STATE OF OHIO

**REBECCA L. ANDERSON**
Notary Public, State of Ohio
My Commission Expires Nov. 25, 2006

Printer's Fee $200.20

Notary's Fee $_____

The Times Leader
Martins Ferry, Ohio

PUBLIC NOTICE

American Energy Corporation, 43521 Mayhugh Hill Road, Twp. Highway 88, Beallsville, Ohio 43716 has submitted a Coal Mining and Reclamation Permit Application numbered D-0425-2 to the Ohio Department of Natural Resources, Division of Mineral Resources Management. The proposed mining and reclamation operation will be in Sections 3 and 4, Township 6 Range 5, Wayne Township, Belmont County, Ohio. The proposed permit area encompasses 154.4 acres and is located on the Hutner 7 1/2 Minute USGS Quadrangle Map approximately 3.2 miles north of Beallsville, Ohio, and south of Township Road 74 and east of Township Road 87. The activity planned for the proposed application will consist of a coal refuse disposal facility.

This application is on file at the Belmont County Courthouse, Recorder's Office, St. Clairsville, Ohio 43950. Written comments or requests for an informal conference may be sent to: Chief, Ohio Department of Natural Resources, Division of Mineral Resources Management, 1855 Fountain Square Court, Columbus, Ohio 43224, within (30) thirty days of the last date of publication of this notice.

TL - ADV. - FEB. 15, 22, MARCH 1, 8 - 4 FRI.

AEC 11290

PART 2 ENVIRONMENTAL RESOURCES INFORMATION

A. CULTURAL, HISTORIC, AND ARCHEOLOGICAL INFORMATION-**Permit and Planned Subsidence Area**

(1) Are there any cultural or historic resources or structures listed or eligible for listing on the National Register of Historic Places within the proposed permit or planned subsidence area? _____ Yes, __X__ No. If "yes," submit an addendum describing the resources and structures including the location and submit Attachment 27 or 27A as appropriate.

**SEE ATTACHMENT 27**

(2) Are there any known archeological sites within the proposed permit or planned subsidence area? _____ Yes, __X__ No. If "yes," submit an addendum describing the site including the location and submit Attachment 27 or 27A as appropriate.

(3) If applicable, based upon the review of the proposed planned subsidence areas and the completed Attachment 27A for the initial six months of projected mining, have any properties listed or eligible for listing on the National Register of Historic Places been identified? _____ Yes, _____ No. If "yes," submit an addendum listing each property identified. **N/A**

(4) Submit an addendum indicating the method to be used to identify historic properties on planned subsidence areas as mining progresses. **N/A**

B. GEOLOGY DESCRIPTION-**Permit and Shadow Area**

(1) Submit an addendum describing the geology within the proposed permit area and shadow area down to and including 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 permit and shadow area 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.

SEE ORIGINAL PERMIT D-0425 AND PA25 ADDENDUM, AND HYDROGEOLOGIC INVESTIGATION REPORT, SECTION 2.4 & 5.1

(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 per paragraph (C) of rule 1501:13-4-13 of the Administrative Code.

SEE ORIGINAL PERMIT D-0425 AND PA25 ADDENDUM, AND HYDROGEOLOGIC INVESTIGATION REPORT, SECTION 2.4 & 5.1

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**SURFACE MINING OPERATIONS**
**ATTACHMENT 27**
**(HISTORIC AND PREHISTORIC PROPERTIES)**

1. Applicant's Name: AMERICAN ENERGY CORP.

   Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88

   City BEALLSVILLE State OHIO Zip 43716

2. Contact Person JACK A. HAMILTON Phone 740-968-4947
   P.O. BOX 471, 342 HIGH STREET, FLUSHING, OHIO 43977

3. Location and Acreage Information

   County BELMONT Township WAYNE

   Section(s) 3 & 4 T- 6 R- 5

   USGS Quadrangle HUNTER Acreage 154.4

4. Application Map Attached: (area described in 3. above is to be outlined on the map)

5. Previous Disturbance:

   X present; _____ absent within permit area only
   (Note: previous disturbance is any type of natural or human made disturbance to the topsoil and subsoil in the permit area prior to permit application. Examples include but are not limited to, slides, severe erosion, previous mining activities, clear cut logging, recreational activities, etc., but not agricultural plowing and disking.)

   If previous disturbance is present, list below and clearly delineate the extent of each type of disturbance on the application map to be sent to the SHPO by the Division. Attach addendum, if necessary.

| Type of Disturbance | Date Occurred | Percent of Permit Area | Map Symbol |
|---|---|---|---|
| SURFACE FACILITIES | 1984 | 26% | |
| FOR UG MINE OPERATIONS | | | |
| | | | |
| | | | |
| | | | |
| | | | |

6. Current Land Use: (describe land use and percent of land in that use)

Agricultural: 28% (CROPLAND)

Residential: 0%

Mining: 26% (DISTURBED BY UNDERGROUND MINE SURFACE FACILITIES)

Pasture: 0%

Secondary Forest Growth:

Has area been clear cut logged? Yes _____, No __X__.
If "yes", indicate approximate date(s) of logging _____.

Other: UNDEVELOPED - 46%

7. Historic and Prehistoric Structures:

Definitions

A historic or prehistoric structure is a work made up of 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, mounds, rockshelters, etc.

List all known historic and prehistoric structures below and locate each one on the application map to be sent to the SHPO including corresponding labeled black and white, front and rear photographs of each structure. Attach addendum, if necessary.

| Structure Type | Construction Date | Map Reference | Photo # Front | Photo # Rear |
|---|---|---|---|---|
| NONE | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

8. Previous Historic and/or Archeological Surveys: (describe any surveys known to applicant on the permit or adjacent areas)

   Permit area: D-1159-1

   Adjacent areas: NONE

9. SHPO please send this form to:

   Dr. Jeffrey C. Reichwein
   Division of Reclamation
   Fountain Square, B-3
   Columbus, Ohio 43224

---

**FOR USE BY THE STATE HISTORIC PRESERVATION OFFICE ONLY**

A. (check the appropriate space)

_____ This is a recommendation for an archeological survey of the proposed permit area 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 permit 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 7. and 8. above.

Listed and Eligible National Register Sites

| Site Name (#) | Type | Proposed Area | Adjacent Area |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

Known Historic and Prehistoric Sites

| Site Name (#) | Type | Proposed Area | Adjacent Area |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

B. _____A SHPO review of the area shown on the application map and information contained in this attachment 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 proposed application area changes.

State Historic Preservation Officer _____

SHPO # _____

Date _____

B. (3) For those areas to be affected by underground mining surface operations where removal of the overburden down to the level of the coal seam will occur, submit Attachment 12(s) as required by paragraphs (C)(2)(a) and (c) of rule 1501:13-4-13 of the Administrative Code. **N/A**

(4) For those areas within the shadow area where the stratum above the coal seam to be mined will not be removed, submit Attachment 13(s) as required by paragraphs (C)(2)(d) and (e) of rule 1501:13-4-13 of the Administrative Code. **N/A**

C. GROUND WATER INFORMATION-**Permit, Shadow Area, and Adjacent Area**

(1) Submit an Attachment 14B which describes the ground water hydrology of the proposed permit area, shadow area, and adjacent area. The Attachment 14B is to include information on each waterbearing stratum or zone as required by paragraph (D) of rule 1501:13-4-13 of the Administrative Code, including the first waterbearing stratum below the coal to be mined.

**SEE HYDROGEOLOGIC INVESTIGATION REPORT, SECTION 2.7, 3.0, & 5.2, ATTACHMENT 14B, AND ADDENDA TO PART 2, ITEM C(1).**

(2) Are there any wells on the proposed permit area, shadow area, and adjacent areas? __X__ Yes, _____ No. If "yes," submit Attachment 14C.

(3) Are there any springs on the proposed permit area, or developed springs on the shadow area and adjacent area? __X__ Yes, _____ No. If "yes," submit Attachment 14C.

(4) Are there any public water supply sources on the proposed permit area, shadow area, and adjacent area? _____ Yes, __X__ No. If "yes," submit Attachment 14A, Attachment 14D, and show location on the hydrology map.

(5) Submit Attachment 14A for representative wells and developed springs as required by paragraph (D)(4) of rule 1501:13-4-13. Based on this data identify the seasonal variations of ground water quality and quantity.

D. SURFACE WATER INFORMATION-**Permit, Shadow Area, and Adjacent Area**

(1) List the name of the watershed that will receive water discharges from the proposed permit, 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 on the proposed permit, shadow area, and adjacent area? __X__ Yes, _____ No. If "yes," submit Attachment 14A and Attachment 14D and show location on application and hydrology map.

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14B**
**(GROUND WATER HYDROLOGY DESCRIPTION)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Aquifer/Zone Identification | Aquifer/Zone Lithology | Aquifer/Zone Thickness | Aquifer/Zone Elev. (msl) | Aquifer/Zone Horizontal Extent | Aquifer/Zone Known Uses | Approx. Rate of Discharge/Usage of Aquifer/Zone (gpm or cfs) |
|---|---|---|---|---|---|---|
| C | SANDSTONE, SHALE | 58' | 1180' TO 1122' | UPPER RIDGE OUTCROP TO OUTCROP | NONE, DRILLED WELL, UNDEVELOPED SPRINGS | NONE, UP TO 0.38 GPM |
| B | SHALE, #12 COAL | 36' | 1096' TO 1060' | MID-RIDGE OUTCROP TO OUTCROP | NONE, (1) DEVELOPED AND UNDEVELOPED SPRINGS | NONE, UP TO 1.7 GPM |
| A | SANDSTONE, LIMESTONE, SHALE, #11 COAL (WHERE PRESENT) | 118' | 995' TO 877' | LOWER RIDGE OUTCROP TO OUTCROP | NONE, UNDEVELOPED SPRING | NONE, .69 GPM |
| | | | | | | |
| | | | | | | |

Please note that Zones C and A are reversed in order as compared to the original permit D-0425 and Permit D-1159. This attachment is site specific to Application D-0425-2. Inconsistencies regarding Zone A are due to the Hyrogeologic Investigation Report Zone A being based on specifics of the new monitoring wells, while the revised 14B includes a broader range and/or greater vertical extent to include undeveloped springs and the #11 coal seam within the proposed permit area.

# Ohio Department of Natural Resources

BOB TAFT, GOVERNOR SAMUEL W. SPECK, DIRECTOR

Date: June 27, 2001

## ANALYSIS OF EXISTING GROUND WATER FILE DATA

Prepared By: Bill Haiker, Hydrogeologist

Operator: American Energy Corporation

County: Belmont

Township: Wayne and Washington

Section(s): 3, 4 and 33, 34

Number of water well logs within 2,000 foot radius of site (copies attached) 2: Field located: 0

General description of local hydrology:

Ground water is obtained from interbedded shale, sandstone and limestone bedrock. Well depths are generally less than 150 feet with yields of less than two gallons per minute.

Areas of Particular concern:

Proposed coal refuse disposal facility.

Date: 6/27/2001 Time : 01:00:14 PM

# WELL LOG AND DRILLING REPORT

OUTSIDE 1000' AREA

602687

NO CARBON PAPER NECESSARY– SELF-TRANSCRIBING

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

COUNTY BELMONT TOWNSHIP WAYNE SECTION OF TOWNSHIP

OWNER KEN ROBERTS ADDRESS 40561 WILLIAMSON RD

LOCATION OF PROPERTY TWP RD 74 OFF CO RD 92 BEALLSVILLE, OHIO 43716

## CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 71'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 5/13/88

## BAILING OR PUMPING TEST
(specify one by circling)

Test rate 1 gpm Duration of test 8 hrs

Drawdown ft Date 5/13/88

Static level (depth to water) 22' ft

Quality (clear, cloudy, taste, odor) CLEAR

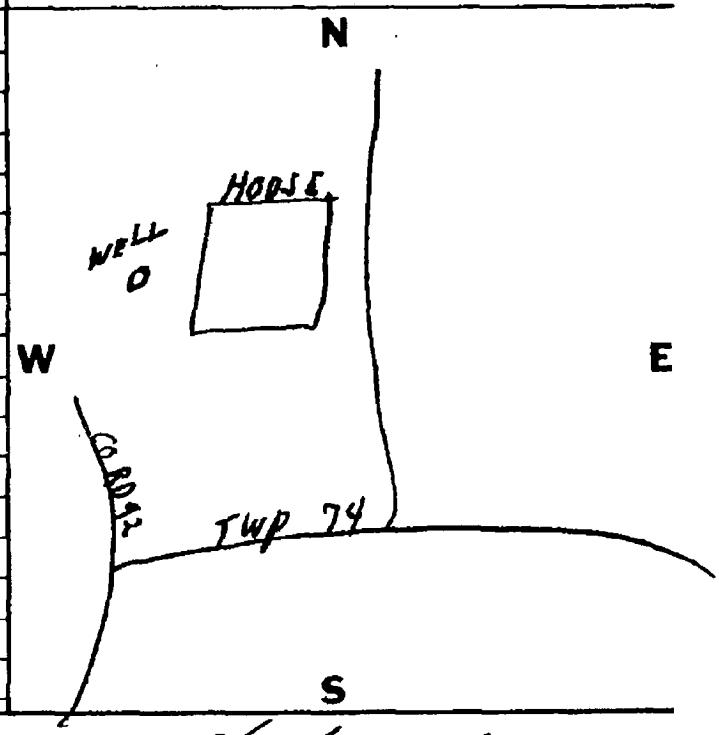
Pump installed by OWNER

## WELL LOG*

| Formations: sandstone, shale, limestone, gravel, clay | From | To |
|---|---|---|
| TOP | 0 ft | 3 ft |
| SANDSTONE | 3 | 35 |
| SHALE | 35 | 40 |
| LIME | 40 | 60 |
| SHALE | 60 | 69 |
| LIME | 69 | 70 TD |
| | | |
| | | |
| WATER | | |
| 34 - 45 | | |

## SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.




DRILLING FIRM VESS DRILLING DATE 5/13/88

ADDRESS BOX 63 WARNER, OHIO SIGNED Gerry L. Vess

*If additional space is needed to complete well log, use next consecutive numbered form.

ORIGINAL COPY - ODNR, DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

Title: 602687

AEC 11299

Date: 6/27/2001 Time : 01:04:08 PM

# 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

OUTSIDE 1000' AREA
No. 413061

County BELMONT Township ~~BROWN~~ Wayne Section of Township 26

Owner GEORGE FINCH Address BARNESVILLE, OHIO

Location of property ON ST RT 148

## CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 17

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 10-9-70

## BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate ...../..... G.P.M. Duration of test ..... hrs.

Drawdown ft. Date

Static level-depth to water 13 ft.

Quality (clear, cloudy, taste, odor)

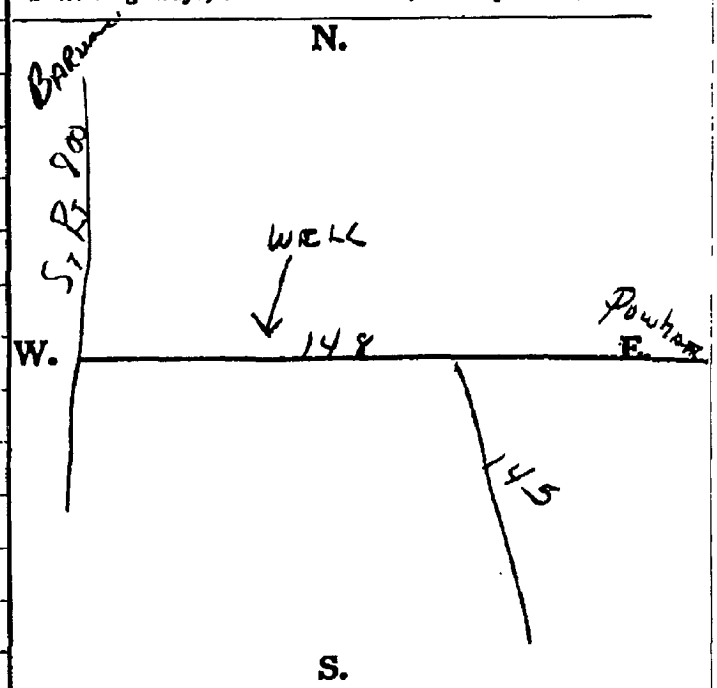
Pump installed by

## WELL LOG*

| Formations Sandstone, shale, limestone, gravel and clay | From | To |
|---|---|---|
| SOIL | 0 Feet | 11 Ft. |
| GRAVEL | 11 | 12 |
| SANDSTONE | 12 | 16 |
| LIMESTONE | 16 | 51 |
| GRAY SHALE | 51 | 75 |
| WATER 51 | | |

## SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.




Drilling Firm BILLMAN DRILLING Date 10-9-70

Address WOODSFIELD Signed H. H. Billman

*If additional space is needed to complete well log, use next consecutive numbered form.

Title: 413061

AEC 11300

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14C**
**(WELL/SPRING INVENTORY)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Well/Spring Identification Number | Name of Owner of Well/Spring | Surface Elevation of Well/Spring | Depth of Well in Feet Below Land Surface | Static Water Level of Well in Feet Below Land Surface | Lithology of Supplying Aquifer/ Waterbearing Zone | Known Uses of Well/Spring (if spring give discharge rate) |
|---|---|---|---|---|---|---|
| CMS-1 | AMERICAN ENERGY CORP. | 995 | N/A | N/A | A | NONE, .69 GPM |
| CMS-2 | D.F. WHITE | 1095 | N/A | N/A | B | NONE, .23 GPM |
| CMS-3 | AMERICAN ENERGY CORP. | 1095 | N/A | N/A | B | NONE, 1.6 GPM |
| CMS-4 | AMERICAN ENERGY CORP. | 1095 | N/A | N/A | B | NONE, .72 GPM |
| CMS-5 | AMERICAN ENERGY CORP. | 1095 | N/A | N/A | B | NONE, 1.7 GPM |
| CMS-6 | AMERICAN ENERGY CORP. | 1096 | N/A | N/A | B | NONE, .35 GPM |
| CMS-7 | AMERICAN ENERGY CORP. | 1070 | N/A | N/A | B | NONE, .19 GPM |
| CMS-8 | AMERICAN ENERGY CORP. | 1130 | N/A | N/A | C | NONE, .22 GPM |
| CMS-9 | AMERICAN ENERGY CORP. | 1130 | N/A | N/A | C | NONE, .29 GPM |
| CMS-10 | AMERICAN ENERGY CORP. | 1132 | N/A | N/A | C | NONE, .38 GPM |

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14C**
**(WELL/SPRING INVENTORY)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Well/Spring Identification Number | Name of Owner of Well/Spring | Surface Elevation of Well/Spring | Depth of Well in Feet Below Land Surface | Static Water Level of Well in Feet Below Land Surface | Lithology of Supplying Aquifer/ Waterbearing Zone | Known Uses of Well/Spring (if spring give discharge rate) |
|---|---|---|---|---|---|---|
| CMS-11 | AMERICAN ENERGY CORP. | 1080 | N/A | N/A | B | NONE, .19 GPM |
| CMS-12 | WYOMING POCAHONTAS LAND CO. | 1080 | N/A | N/A | B | NONE, .34 GPM |
| CMS-13 | AMERICAN ENERGY CORP. | 1080 | N/A | N/A | B | NONE, .13 GPM |
| CMDS-1 | AMERICAN ENERGY CORP. | 1080 | N/A | N/A | B | NONE, .13 GPM |
| CMW-2 | D.F. WHITE | 1190 | 21' | 12' TO 16' | C | NONE |
| CG-01-1A | AMERICAN ENERGY CORP. | *974.92 | **50' | **46.55' to 49' | A | MONITORING WELL |
| CG-01-2A | AMERICAN ENERGY CORP. | *940.33 | **25.03' | **13.28' to 16' | A | MONITORING WELL |
| CG-01-3A | AMERICAN ENERGY CORP. | *1163.04 | **285.95' | **150' to 209.68' | A | MONITORING WELL |
| CG-01-3B | AMERICAN ENERGY CORP. | *1163.22 | **90.3' | **84.5' to 86' | B | MONITORING WELL |
| CG-01-3C | AMERICAN ENERGY CORP. | *1162.35 | **27.2' | **20.15' to 21' | C | MONITORING WELL |

* Top of well casing elevation. ** Measured from top of casing.

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

**ATTACHMENT 14C**
**(WELL/SPRING INVENTORY)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Well/Spring Identification Number | Name of Owner of Well/Spring | Surface Elevation of Well/Spring | Depth of Well in Feet Below Land Surface | Static Water Level of Well in Feet Below Land Surface | Lithology of Supplying Aquifer/ Waterbearing Zone | Known Uses of Well/Spring (if spring give discharge rate) |
|---|---|---|---|---|---|---|
| CG-01-4A | AMERICAN ENERGY CORP. | *1154.06 | **259.0' | **121' to 258' | A | MONITORING WELL |
| CG-01-4B | AMERICAN ENERGY CORP. | *1153.58 | **58.60' | **53' to 57.5' | B | MONITORING WELL |
| CG-01-4C | AMERICAN ENERGY CORP. | *1153.26 | **25.8' | **5.65' to 9.5' | C | MONITORING WELL |
| CG-01-5A | AMERICAN ENERGY CORP. | *1161.07 | **267.0' | **51.5' to 208' | A | MONITORING WELL |
| CG-01-5B | AMERICAN ENERGY CORP. | *1160.16 | **84.86' | **77.0' to 77.5' | B | MONITORING WELL |
| CG-01-5C | AMERICAN ENERGY CORP. | *1160.86 | **25.66' | **7.24' to 7.5' | C | MONITORING WELL |
| CG-01-6B | AMERICAN ENERGY CORP. | *1166.70 | **81.22' | **74.64' to 77.5' | B | MONITORING WELL |
| CG-01-6C | AMERICAN ENERGY CORP. | *1167.01 | **44.83' | **27.0' to 40' | C | MONITORING WELL |
| | | | | | | |

Note: State Plane Coordinates for all monitoring wells are shown on the Monitoring Well Installation Logs in the Hydrogeologic Investigation Report.
* Top of well casing elevation. ** Measured from top of casing.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-07-414 | 01-07-415 | 01-07-416 | 01-07-417 | 01-07-418 | 01-07-419 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .69 GPM | .23 GPM | 1.6 GPM | .72 GPM | 1.7 GPM | .35 GPM |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.86 | 8.06 | 7.58 | 7.57 | 7.98 | 6.60 |
| | Total Acidity (mg/l CaCO3) | 6.80 | 7.80 | 6.20 | 16.20 | 10.20 | 55.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | 149.00 | 254.00 | 106.40 | 261.40 | 290.80 | 191.60 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 772.00 | 633.00 | 245.00 | 585.00 | 951.00 | 1470.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.24 | 0.06 | 0.13 | 0.04 | 0.03 | 8.20 |
| 16 | Total Sulfates (mg/l) | 235.00 | 57.00 | <10.00 | 29.00 | 201.00 | 548.00 |
| 17 | Total Iron (mg/l) | 0.15 | 0.21 | 0.20 | 0.08 | 0.11 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 17 | 58 | 53 | 34 | 26 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 396.00 | 320.00 | 116.00 | 300.00 | 400.00 | 800.00 |
| 20 | Nitrates | | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | 01-07-498 | 01-07-499 | 01-07-500 | 01-07-501 | 01-07-502 | 01-07-503 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | .19 GPM | .22 GPM | .29 GPM | .38 GPM | .19 GPM | .34 GPM |
| 8 | Date Above Measurements Made | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | 3.20 | 7.98 | 7.54 | 7.98 | 8.23 | 8.09 |
| 11 | Total Acidity (mg/l CaCO3) | 112.00 | 5.80 | 7.40 | 4.20 | 3.40 | 6.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 0.00 | 220.80 | 112.00 | 123.00 | 224.00 | 207.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1559.00 | 1215.00 | 279.00 | 292.00 | 527.00 | 667.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 10.60 | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 |
| 16 | Total Sulfates (mg/l) | 660.00 | 51.00 | 17.00 | 18.00 | 42.00 | 94.00 |
| 17 | Total Iron (mg/l) | 12.40 | 0.10 | 0.24 | <0.04 | 0.05 | 0.04 |
| 18 | Total Suspended Solids (mg/l) | 22 | 10 | 11 | 4 | 3 | 3 |
| 19 | Total Hardness (mg/l as CaCO3) | 660.00 | 228.00 | 124.00 | 136.00 | 276.00 | 320.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-13 | CMDS-1 | CMW-2 | CMW-2 | CMW-2 | CMD-1 |
| 2 | Identification Number | 01-07-504 | 01-07-413 | 00-03268 | 01-07-373 | -- | 01-07-371 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | H | I | L | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1060 | 1080 | 1190 | 1190 | 1190 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | 21' | 21' | 21' | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | 12' | 16' | DRY | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | .13 GPM | 1.8 GPM | -- | -- | -- | 28.6 CFS |
| 8 | Date Above Measurements Made | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | 10-19-01 | 7-6-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | B | C | C | C | -- |
| 10 | pH (Standard Units) | 8.25 | 8.26 | 6.70 | 7.33 | | 8.33 |
| 11 | Total Acidity (mg/l CaCO3) | 2.20 | 5.00 | 7.10 | 5.00 | | 0.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 227.00 | 212.60 | 22.0 | 57.80 | | 132.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 653.00 | 459.00 | 160.00 | 137.00 | | 426.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | | --- |
| 15 | Total Manganese (mg/l) | 0.02 | 0.10 | <0.02 | <0.02 | | <0.02 |
| 16 | Total Sulfates (mg/l) | 106.00 | 20.00 | 42.00 | <10.00 | | 48.00 |
| 17 | Total Iron (mg/l) | 0.41 | 0.10 | 0.23 | 0.42 | | 0.09 |
| 18 | Total Suspended Solids (mg/l) | 4 | 60 | <1 | 9 | | 7 |
| 19 | Total Hardness (mg/l as CaCO3) | 324.00 | 228.00 | 60.00 | 64.00 | | 188.00 |
| 20 | Nitrates | --- | --- | 0.09 | --- | | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | | 7-6-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-5-01 | 3-14-99 | 7-5-01 | 10-16-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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NOTE: For each sample provide data for either item 13 or 14.

**0.OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMD-2 | CMD2-A | CMD-4 | CMD-5 | CMD-6 | |
| 2 | Identification Number | 01-07-400 | 01-07-401 | 01-07-403 | 01-07-404 | 01-07-505 | |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | |
| 4 | Surface Elevation for Sampling Station (msl) | 930 | 930 | 985 | 935 | 938 | |
| 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) | 5.25 CFS | .69 CFS | .03 CFS | .01 CFS | .01 CFS | |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | |
| 10 | pH (Standard Units) | 8.34 | 7.95 | 8.20 | 8.33 | 7.93 | |
| | Total Acidity (mg/l CaCO3) | 0.00 | 3.20 | 4.00 | 0.00 | 4.20 | |
| 12 | Total Alkalinity (mg/l CaCO3) | 51.20 | 105.80 | 172.20 | 194.60 | 102.00 | |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 384.00 | 278.00 | 463.00 | 650.00 | 847.00 | |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | |
| 15 | Total Manganese (mg/l) | 0.07 | 0.08 | 0.03 | 0.04 | 0.07 | |
| 16 | Total Sulfates (mg/l) | 54.00 | 21.00 | 54.00 | 117.00 | 283.00 | |
| 17 | Total Iron (mg/l) | 0.20 | 0.34 | 0.15 | 0.05 | 0.10 | |
| 18 | Total Suspended Solids (mg/l) | 3 | 4 | 2 | 6 | 3 | |
| 19 | Total Hardness (mg/l as CaCO3) | 160.00 | 124.00 | 224.00 | 260.00 | 326.00 | |
| 20 | Nitrates | --- | --- | --- | --- | --- | |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMD-7 | CMU-1 | CMU-2 | CMU-2A | CMU-5 | CMU-6 |
| 2 | Identification Number | 01-07-405 | 01-07-372 | 01-07-407 | 01-07-408 | 01-07-410 | 01-07-494 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 938 | 855 | 959 | 938 | 1135 | 1138 |
| 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) | .01 CFS | 25.8 CFS | .64 CFS | 1.93 CFS | .0007 CFS | .004 CFS |
| 8 | Date Above Measurements Made | 7-7-01 | 7-6-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-11-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 8.12 | 8.28 | 7.81 | 7.91 | 7.53 | 7.99 |
| | Total Acidity (mg/l CaCO3) | 6.40 | 5.60 | 4.80 | 4.00 | 8.00 | 5.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 191.00 | 129.80 | 114.00 | 86.60 | 116.80 | 140.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 798.00 | 449.00 | 309.00 | 266.00 | 284.00 | 346.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.06 | <0.02 | 0.10 | 0.07 | 0.04 | <0.02 |
| 16 | Total Sulfates (mg/l) | 197.00 | 54.00 | 23.00 | 19.00 | 15.00 | 22.00 |
| 17 | Total Iron (mg/l) | 0.59 | 0.04 | 0.08 | 0.04 | 0.10 | 0.27 |
| 18 | Total Suspended Solids (mg/l) | 3 | 2 | 2 | <2 | 72 | 4 |
| 19 | Total Hardness (mg/l as CaCO3) | 310.00 | 188.00 | 140.00 | 112.00 | 132.00 | 152.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-6-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-11-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-8-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMU-6A | CMU-6B | CMU-6C | CMU-7 | CMWI-1 | |
| 2 | Identification Number | 01-07-495 | 01-07-496 | 01-07-497 | 01-07-411 | 01-07-373 | |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | SUPPLE. | |
| 4 | Surface Elevation for Sampling Station (msl) | 1138 | 1140 | 1120 | 1098 | 1155 | |
| 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) | .001 CFS | .38 CFS | .001 CFS | .0005 CFS | -- | |
| 8 | Date Above Measurements Made | 7-11-01 | 7-11-01 | 7-11-01 | 7-7-01 | 7-6-01 | |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | |
| 10 | pH (Standard Units) | 7.09 | 7.97 | 7.72 | 6.44 | 7.33 | |
| | Total Acidity (mg/l CaCO3) | 11.20 | 8.20 | 6.80 | 31.20 | 5.00 | |
| 12 | Total Alkalinity (mg/l CaCO3) | 91.60 | 174.40 | 114.80 | 70.40 | 57.80 | |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 258.00 | 395.00 | 291.00 | 973.00 | 137.00 | |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | |
| 15 | Total Manganese (mg/l) | <0.02 | 0.02 | 0.02 | 1.11 | <0.02 | |
| 16 | Total Sulfates (mg/l) | 27.00 | 20.00 | 21.00 | 425.00 | <10.0 | |
| 17 | Total Iron (mg/l) | 0.10 | 0.10 | 0.07 | 0.29 | 0.42 | |
| 18 | Total Suspended Solids (mg/l) | 2 | 4 | 6 | 5 | 9 | |
| 19 | Total Hardness (mg/l as CaCO3) | 116.00 | 180.00 | 124.00 | 500.00 | 64.00 | |
| 20 | Nitrates | --- | --- | --- | --- | --- | |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-11-01 | 7-11-01 | 7-7-01 | 7-6-01 | |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-8-01 | 7-8-01 | 7-5-01 | 7-5-01 | |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-10-705 | | 01-10-709 | | 01-10-713 | 01-10-696 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .02 GPM | DRY | .09 GPM | DRY | .75 GPM | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.37 | | 7.80 | | 7.14 | 7.33 |
| 11 | Total Acidity (mg/l CaCO3) | 10.80 | | 13.60 | | 14.00 | 40.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 18.60 | | 207.80 | | 273.80 | 356.20 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1259 | | 450.00 | | 945.00 | 1320.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | | --- | | --- | --- |
| 15 | Total Manganese (mg/l) | 2.66 | | 0.02 | | <0.02 | 0.09 |
| 16 | Total Sulfates (mg/l) | 526.00 | | 17.00 | | 188.00 | 261.00 |
| 17 | Total Iron (mg/l) | 0.65 | | 0.11 | | <0.04 | 0.44 |
| 18 | Total Suspended Solids (mg/l) | 60 | | 92 | | 3 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 640.00 | | 220.00 | | 400.00 | 440.00 |
| 20 | Nitrates | --- | | --- | | --- | --- |
| 21 | Date Sampled for Analysis | 10-19-01 | | 10-19-01 | | 10-19-01 | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-1 |
| 2 | Identification Number | | 01-10-697 | | | | 01-10-72 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | DRY | .05 GPM | DRY | DRY | DRY | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-0 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | | 7.53 | | | | 8.12 |
| 11 | Total Acidity (mg/l CaCO3) | | 8.40 | | | | 13.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | | 57.20 | | | | 240.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | | 1176 | | | | 756 |
| 14 | Total Dissolved Solids (mg/l) | | --- | | | | --- |
| 15 | Total Manganese (mg/l) | | 2.16 | | | | <0.02 |
| 16 | Total Sulfates (mg/l) | | 529.0 | | | | 122.00 |
| 17 | Total Iron (mg/l) | | 0.05 | | | | 0.33 |
| 18 | Total Suspended Solids (mg/l) | | <2.0 | | | | 4 |
| 19 | Total Hardness (mg/l as CaCO3) | | 560 | | | | 370.00 |
| 20 | Nitrates | | --- | | | | --- |
| 21 | Date Sampled for Analysis | | 10-19-01 | | | | 10-19-0 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-0 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-13 | CMDS-1 | CMD-1 | CMD-2 | CMD2-A | CMD-4 |
| 2 | Identification Number | -- | 01-10-708 | 01-10-701 | 01-10-714 | 01-10-704 | 01-10-706 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 1060 | 1080 | 850 | 930 | 930 | 985 |
| 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) | DRY | 0.52 GPM | 9.1 CFS | 2.93 CFS | .39 CFS | .002 CFS |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | B | -- | -- | -- | -- |
| 10 | pH (Standard Units) | | 7.97 | 8.27 | 8.05 | 7.90 | 7.97 |
| | Total Acidity (mg/l CaCO3) | | 12.40 | 6.00 | 6.60 | 7.60 | 12.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | | 219.80 | 152.80 | 118.40 | 113.20 | 223.00 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | | 488 | 511 | 430.00 | 320.00 | 651.00 |
| 14 | Total Dissolved Solids (mg/l) | | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | | <0.02 | <0.02 | <0.02 | <0.02 | 0.04 |
| 16 | Total Sulfates (mg/l) | | 19.00 | 42.00 | 56.00 | 23.00 | 89.00 |
| 17 | Total Iron (mg/l) | | <0.04 | <0.04 | 0.07 | 0.07 | 0.23 |
| 18 | Total Suspended Solids (mg/l) | | 13 | <2.0 | 2 | 2 | 5 |
| 19 | Total Hardness (mg/l as CaCO3) | | 236.00 | 204.00 | 164.00 | 136.00 | 312.00 |
| 20 | Nitrates | | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMD-5 | CMD-6 | CMD-7 | CMU-1 | CMU-2 | CMU-2A |
| 2 | Identification Number | 01-10-712 | 01-10-682 | 01-10-716 | 01-10-700 | 01-10-707 | 01-10-702 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 935 | 938 | 938 | 855 | 959 | 938 |
| 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) | .002 CFS | .002 CFS | .004 CFS | 9.0 CFS | .35 CFS | 1.21 CFS |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 7.91 | 7.70 | 8.16 | 8.21 | 7.64 | 7.79 |
| | Total Acidity (mg/l CaCO3) | 14.40 | 7.00 | 10.40 | 8.00 | 8.80 | 7.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 234.80 | 67.80 | 234.40 | 149.00 | 123.60 | 97.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 843.00 | 1192.00 | 919.00 | 512.00 | 363.00 | 303.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | <0.02 | 0.22 | 0.02 | <0.02 | 0.04 | <0.02 |
| 16 | Total Sulfates (mg/l) | 158.00 | 429.00 | 192.00 | 46.00 | 35.00 | 17.00 |
| 17 | Total Iron (mg/l) | <2.0 | 0.53 | 0.27 | <0.04 | <0.04 | <0.04 |
| 18 | Total Suspended Solids (mg/l) | <2.0 | 15 | 4 | 2 | <2 | 3 |
| 19 | Total Hardness (mg/l as CaCO3) | 300.00 | 300.00 | 310.00 | 200.00 | 156.00 | 120.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMU-5 | CMU-6 | CMU-6A | CMU-6B | CMU-6C | CMU-7 |
| 2 | Identification Number | -- | -- | -- | -- | -- | 01-10-695 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 1135 | 1138 | 1138 | 1140 | 1120 | 1098 |
| 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) | DRY | DRY | DRY | DRY | DRY | .0002 CFS |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | | | | | | 7.68 |
| | Total Acidity (mg/l CaCO3) | | | | | | 19.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | | | | | | 255.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | | | | | | 888 |
| 14 | Total Dissolved Solids (mg/l) | | | | | | --- |
| 15 | Total Manganese (mg/l) | | | | | | 0.03 |
| 16 | Total Sulfates (mg/l) | | | | | | 162.0 |
| 17 | Total Iron (mg/l) | | | | | | 0.34 |
| 18 | Total Suspended Solids (mg/l) | | | | | | 4 |
| 19 | Total Hardness (mg/l as CaCO3) | | | | | | 355.00 |
| 20 | Nitrates | | | | | | --- |
| 21 | Date Sampled for Analysis | | | | | | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-5 | CMS-6 | CMS-8 |
| 2 | Identification Number | 02-02-833 | 02-02-846 | 02-02-837 | 02-02-838 | 02-02-852 | 02-02-84 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1096 | 1130 |
| 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) | 1.1 GPM | 9.1 GPM | 1.9 GPM | 3 GPM | .37 GPM | .63 GPM |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-0 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | C |
| 10 | pH (Standard Units) | 7.84 | 7.97 | 7.59 | 8.26 | 6.77 | 7.87 |
| 11 | Total Acidity (mg/l CaCO3) | 6.20 | 1.80 | 4.60 | 1.20 | 64.00 | 5.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 116.00 | 108.20 | 97.20 | 312.80 | 201.80 | 176.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 837 | 341 | 278 | 1042 | 1592 | 453 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.51 | 0.02 | 0.08 | <0.02 | 0.95 | <0.02 |
| 16 | Total Sulfates (mg/l) | 297.0 | 43.00 | 29.00 | 220.0 | 692.0 | 38.0 |
| 17 | Total Iron (mg/l) | 0.17 | 0.19 | 0.54 | <0.04 | 0.59 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 2 | <2 | 53 | 4 | 42 | 6 |
| 19 | Total Hardness (mg/l as CaCO3) | 388.00 | 148.00 | 124.00 | 470.00 | 860.00 | 208.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-0 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-0 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-9 | CMS-10 | CMS-12 | CMW-2 | CMDS-1 | CMD-1 |
| 2 | Identification Number | 02-02-857 | 02-02-842 | 02-02-849 | 02-02-831 | 02-02-836 | 02-02-828 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 1130 | 1132 | 1080 | 1190 | 1080 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | -- | 21' | -- | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 16.5' | -- | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | 1.9 GPM | 3.9 GPM | 1.8 GPM | --- | 6 GPM | 74 CFS |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | C | B | C | B | --- |
| 10 | pH (Standard Units) | 7.31 | 7.71 | 8.18 | 8.93 | 7.72 | 8.13 |
| 11 | Total Acidity (mg/l CaCO3) | 18.60 | 2.60 | 3.20 | 0.00 | 7.80 | 2.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 101.00 | 71.00 | 147.60 | 277.80 | 219.00 | 116.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 895 | 207 | 485 | 715 | 507 | 421 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | <0.02 | <0.02 | 0.04 | <0.02 | <0.02 | 0.02 |
| 16 | Total Sulfates (mg/l) | 350.0 | 21.00 | 82.00 | 25.0 | 24.0 | 55.0 |
| 17 | Total Iron (mg/l) | 0.06 | 0.05 | 1.20 | 1.43 | <0.04 | 0.06 |
| 18 | Total Suspended Solids (mg/l) | <2 | 5 | 34 | 4 | <2 | <2 |
| 19 | Total Hardness (mg/l as CaCO3) | 428.00 | 84.00 | 220.00 | <10.00 | 240.00 | 172.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMD-2 | CMD-2A | CMD-4 | CMD-5 | CMD-6 | CMD-7 |
| 2 | Identification Number | 02-02-856 | 02-02-832 | 02-02-834 | 02-02-839 | 02-02-829 | 02-02-854 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 930 | 930 | 985 | 935 | 938 | 938 |
| 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) | 8.3 CFS | 1.44 CFS | .12 CFS | .09 CFS | .05 CFS | .02 CFS |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | --- | --- | --- | --- | --- | --- |
| 10 | pH (Standard Units) | 8.48 | 8.13 | 8.30 | 8.35 | 8.10 | 8.40 |
| | Total Acidity (mg/l CaCO3) | 0.00 | 3.00 | 0.00 | 0.00 | 4.60 | 0.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 78.00 | 93.00 | 128.60 | 163.60 | 102.00 | 187.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 307 | 291 | 398 | 539 | 959 | 814 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.04 | 0.07 | 0.02 | <0.02 | 0.32 | 0.03 |
| 16 | Total Sulfates (mg/l) | 47.0 | 35.00 | 55.00 | 99.0 | 332.0 | 205.0 |
| 17 | Total Iron (mg/l) | 0.18 | 0.21 | 0.21 | <0.04 | 0.33 | 0.13 |
| 18 | Total Suspended Solids (mg/l) | 3 | 2 | <2 | <2 | <2 | 2 |
| 19 | Total Hardness (mg/l as CaCO3) | 120.00 | 120.00 | 176.00 | 224.00 | 360.00 | 300.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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NOTE: For each sample provide data for either item 13 or 14.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMU-1 | CMU-2 | CMU-2A | CMU-5 | CMU-6 | CMD-6A |
| 2 | Identification Number | 02-02-827 | 02-02-835 | 02-02-830 | 02-02-840 | 02-02-850 | 02-02-851 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 930 | 930 | 985 | 935 | 938 | 938 |
| 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) | 73 CFS | 1.25 CFS | 6.47 CFS | .006 CFS | .006 CFS | .0002 CFS |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | --- | --- | --- | --- | --- | --- |
| 10 | pH (Standard Units) | 8.17 | 8.08 | 8.06 | 7.80 | 8.25 | 7.73 |
| | Total Acidity (mg/l CaCO3) | 2.00 | 1.80 | 3.20 | 2.00 | 0.80 | 2.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | 117.40 | 85.80 | 66.60 | 87.40 | 115.00 | 70.20 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 417 | 279 | 239 | 237 | 321 | 224 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.02 | <0.02 | 0.02 | <0.02 | <0.02 | <0.02 |
| 16 | Total Sulfates (mg/l) | 56.0 | 33.00 | 26.00 | 22.0 | 31.0 | 28.00 |
| 17 | Total Iron (mg/l) | 0.06 | 0.06 | 0.09 | 0.05 | 0.15 | 0.17 |
| 18 | Total Suspended Solids (mg/l) | <2 | <2 | 2 | <2 | <2 | 2 |
| 19 | Total Hardness (mg/l as CaCO3) | 172.00 | 116.00 | 96.00 | 96.00 | 144.00 | 92.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMU-6B | CMU-6C | CMU-7 | | | |
| 2 | Identification Number | 02-02-843 | 02-02-844 | 02-02-853 | | | |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | | | |
| 4 | Surface Elevation for Sampling Station (msl) | 1140 | 1120 | 1098 | | | |
| 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) | .006 CFS | .007 CFS | .01 CFS | | | |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | | | |
| 9 | Aquifer/Zone Identification For Well/Spring | --- | --- | --- | | | |
| 10 | pH (Standard Units) | 7.86 | 7.54 | 7.62 | | | |
| 11 | Total Acidity (mg/l CaCO3) | 4.20 | 3.00 | 9.20 | | | |
| 12 | Total Alkalinity (mg/l CaCO3) | 94.20 | 70.60 | 173.60 | | | |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 257 | 215 | 824 | | | |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | | | |
| 15 | Total Manganese (mg/l) | <0.02 | <0.02 | 0.44 | | | |
| 16 | Total Sulfates (mg/l) | 23.0 | 24.00 | 218.0 | | | |
| 17 | Total Iron (mg/l) | <0.04 | 0.04 | 0.16 | | | |
| 18 | Total Suspended Solids (mg/l) | <2 | <2 | <2 | | | |
| 19 | Total Hardness (mg/l as CaCO3) | 112.00 | 92.00 | 324.00 | | | |
| 20 | Nitrates | --- | --- | --- | | | |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | | | |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | | | |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14D**
**(SURFACE WATER BODIES/PUBLIC WATER SUPPLIES)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Surface Water/ Public Supply Identification # | Type of Surface Water/Public Supply | Name of Owner of Surface Water/ Public Supply | Known Uses of Surface Water/ Public Supply |
|---|---|---|---|
| CMU-1 TO CMD-1 CAPTINA CREEK | PERENNIAL STREAM | SEE MAP | NONE |
| CMU-2A TO CMD-2 PINEY CREEK | PERENNIAL STREAM | SEE MAP | NONE |
| CMU-2 TO CMD2A LONG RUN | PERENNIAL STREAM | SEE MAP | NONE |
| CMS-3 TO CMD-4 | INTERMITTENT STREAM | SEE MAP | NONE |
| CMU-5 TO CMD-5 UNNAMED STREAM "S" | INTERMITTENT STREAM | SEE MAP | NONE |
| CMU-6, STREAM "D" | INTERMITTENT STRM | SEE MAP | NONE |
| CMU-6A, STREAM "C" | INTERMITTENT STRM. | SEE MAP | NONE |
| CMU-6B, STREAM "M" | INTERMITTENT STRM | SEE MAP | NONE |
| CMU-6C, STREAM "B" | INTERMITTENT STRM | SEE MAP | NONE |
| CMS-8, STREAM "Q" | INTERMITTENT STRM | SEE MAP | NONE |
| CMS-9, STREAM "N" | INTERMITTENT STRM | SEE MAP | NONE |
| CMS-10 TO CMD-6 STR. "L", & STR. "A" | INTERMITTENT STREAM | SEE MAP | NONE |
| CMU-7 TO CMD-7 | INTERMITTENT STREAM | SEE MAP | NONE |
| CMWI-1 | IMPOUNDMENT | SEE MAP | NONE |
| UNNAMED STREAM "Y" | INTERMITTENT STRM | SEE MAP | NONE |
| CMS-4 STREAM | EPHEMERAL | SEE MAP | NONE |
| 1ST UNNAMMED TRIB TO STREAM. "S" | EPHEMERAL | SEE MAP | NONE |

ADDENDUM TO PART 2, ATTACHMENTS 14A, 14C, AND 14D
**AMERICAN ENERGY CORPORATION**

| SAMPLE SITE | STATE PLANE COORDINATES Y | X |
|---|---|---|
| CMS-1 | 639,673 | 2,412,018 |
| CMS-2 | 695,211 | 2,411,424 |
| CMS-3 | 695,689 | 2,411,189 |
| CMS-4 | 694,623 | 2,413,299 |
| CMS-5 | 694,630 | 2,413,543 |
| CMS-6 | 696,760 | 2,414,890 |
| CMS-7 | 695,772 | 2,413,694 |
| CMS-8 | 696,047 | 2,412,901 |
| CMS-9 | 695,641 | 2,412,485 |
| CMS-10 | 695,975 | 2,412,245 |
| CMS-11 | 696,536 | 2,410,921 |
| CMS-12 | 697,089 | 2,411,578 |
| CMS-13 | 697,541 | 2,414,334 |
| CMDS-1 | 694,984 | 2,411,941 |
| CMW-2 | 696,132 | 2,410,878 |
| CMD-1 | 698,122 | 2,414,571 |
| CMD-2 | 695,578 | 2,415,600 |
| CMD-2A | 693,133 | 2,413,806 |
| CMD-4 | 694,004 | 2,411,597 |
| CMD-5 | 693,882 | 2,414,253 |
| CMD-6 | 694,927 | 2,414,928 |
| CMD-7 | 695,606 | 2,415,315 |
| CMU-1 | 697,669 | 2,411,114 |
| CMU-2 | 693,612 | 2,411,555 |
| CMU-2A | 693,342 | 2,413,875 |
| CMU-5 | 694,662 | 2,412,807 |
| CMU-6 | 696,934 | 2,413,478 |

ADDENDUM TO PART 2, ATTACHMENTS 14A, 14C, AND 14D
**AMERICAN ENERGY CORPORATION**

| | STATE PLANE | COORDINATES |
|---|---|---|
| **SAMPLE SITE** | **Y** | **X** |
| CMU-6A | 696,992 | 2,413,152 |
| CMU-6B | 696,194 | 2,412,576 |
| CMU-6C | 696,273 | 2,412,331 |
| CMU-7 | 696,876 | 2,414,501 |
| CMWI-1 | 696,018 | 2,411,180 |

NOTES: X - Y coordinates for CMWI-1 was determined using a point near the center of the impoundment as shown by the sample designation (triangle in a circle) on the permit application map.

X-Y coordinates for all monitoring wells are listed in the Hydrogeologic Investigation Report, Appendix 1, Table 1.

D. (3) Based on the data listed on Attachment 14A, and other information submitted with this application, identify the seasonal variations in water quality and quantity for the streams identified in Part 2, D(2).

**SEE ATTACHMENT 14A**

E. HYDROLOGIC DETERMINATION-**Permit, Shadow Area, and Adjacent Area**

Based on the information submitted in response to items B, C, and D in this part of the permit application, submit an addendum describing the probable hydrologic consequences of this proposed underground mining operation on the hydrologic regime of the proposed permit area, shadow area, and adjacent area. The description shall include findings on each of the following items:

(1) The consequences of the proposed operation on the contents of total suspended and dissolved solids, total iron, total manganese, acidity, and pH.

(2) Whether adverse impacts may occur to the hydrologic balance;

(3) The impact the proposed operation will have on:

(a) sediment yield from the disturbed area,

(b) flooding and stream flow alteration or diminution,

(c) ground water and surface water availability.

**SEE HYDROGEOLOGIC INVESTIGATION REPORT, SECTION 5.3, POND ANALYSIS SUMITTED WITH APPROVED ARP R-0425-5, ORIGINAL PERMIT D-0425, AND ADDENDUM TO THIS ITEM.**

F. ALTERNATIVE WATER SUPPLY INFORMATION-**Permit, Shadow Area and Adjacent Area**

(1) Based on the response in Part 2, item E, submit an addendum identifying the extent to which the proposed coal mining activities may proximately result in contamination, diminution, or interruption of an underground or surface source of water within the proposed permit area, shadow area, and adjacent area that is used for domestic, agricultural, industrial, or other legitimate use.

**SEE ADDENDUM TO PART 2, F(1&2) IN APPROVED ARP R-0425-5**

(2) If contamination, diminution, or interruption may result, submit an addendum identifying the alternative sources of water supply that could be developed to replace the existing sources including information on water availability and suitability of alternative sources for existing pre-mining uses and postmining land uses.

**SEE ADDENDUM TO PART 2, F(1&2) IN APPROVED ARP R-0425-5**

ADDENDUM TO PART 2, PAGE 18, ITEM E.
AMERICAN ENERGY CORPORATION

The probable hydrologic consequences of constructing an additional refuse disposal area on top of an existing reclaimed refuse disposal area should be negligible. Please note that the existing refuse disposal area has been reclaimed and vegetated for some time. Surface water sample analyses conducted for Permit D-1159 and A.R.P. R-1159-4, which include three separate sites, D-8, D-8A, and D-10, are included in this application to illustrate the absence of hydrologic impacts due to the existing refuse disposal area. A location map has been included to show the sample sites in relation to the existing disposal area. According to these analyses, surface water has not been affected by previous refuse disposal at this site. Monitoring well sample analyses are included in the "First Annual Report Groundwater Statistical Evaluation" submitted in May, 2002. No additional information, other than what has been addressed in the Hydrogeological Investigation, can be assessed from this report. The above referenced report is the basis for background data on groundwater at this site

Spring CMS-7 discharges intermittently from the existing refuse disposal area. Any flow originating from the existing refuse disposal area will be collected and handled by the leachate collection system. All water from the leachate collection system will flow to Pond 012 where it can be treated, if necessary, before it is released to the stream system. No water discharge from within the existing or proposed refuse disposal areas will be commingled with the flow in the ground water collection system.

The probable hydrologic consequences of not extending the additional refuse disposal area completely over the existing refuse will be negligible. The existing refuse disposal area is reclaimed and revegetated. Infiltration of water into and out of the existing refuse disposal area will not be affected by the proposed refuse disposal area covering the site due to the proposed leachate collection system. This refuse disposal operation should have no impact on the hydrologic balance.

The proposed refuse disposal area should have no impact on the abandoned gas well. According to Division of Oil and Gas records, this well was dry, and plugged when abandoned. No excavation will take place near the well. No evidence of the well can be found in the field.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

**ADDENDUM TO PART 2, PAGE 18, ITEM E. AMERICAN ENERGY CORP.**

APPLICANT BENNOC, INC. (D-1159-1)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | D-2 | D-3 | D-6 | D-8 | D-9 | D-30 |
| 2 | Identification Number | 279406 | 279407 | 279426 | 279427 | 279428 | 279430 |
| 3 | High (H)/Low (L) Designation (if applicable) | SUPPLE MENTAL | SUPPLE MENTAL | SUPPLE MENTAL | SUPPLE MENTAL | SUPPLE MENTAL | H |
| 4 | Surface Elevation for Sampling Station (msl) | 960 | 935 | 940 | 940 | 940 | 920 |
| 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) | 1.08 CFS | 35 CFS | 0.2 CFS | 1.19 CFS | 5 GPM | 27 GPM |
| 8 | Date Above Measurements Made | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 7.87 | 7.65 | 7.56 | 7.54 | 7.33 | 7.74 |
| | Total Acidity (mg/l CaCO3) | 8.00 | 8.00 | 12.00 | 6.00 | 12.00 | 8.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 70.00 | 60.00 | 232.00 | 70.00 | 122.00 | 114.00 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 255.00 | 179.00 | 433.00 | 503.00 | 423.00 | 308.00 |
| 14 | Total Dissolved Solids (mg/l) | -- | -- | -- | -- | -- | -- |
| 15 | Total Manganese (mg/l) | 0.023 | 0.017 | <0.008 | 0.295 | <0.008 | <0.008 |
| 16 | Total Sulfates (mg/l) | 44.45 | 37.87 | 98.78 | 171.23 | 100.43 | 62.56 |
| 17 | Total Iron (mg/l) | 2.12 | 1.33 | 0.099 | 0.148 | 0.221 | 0.287 |
| 18 | Total Suspended Solids (mg/l) | 47.00 | 30.00 | 10.00 | 7.00 | 21.00 | 43.00 |
| 19 | Total Hardness (mg/l as CaCO3) | 85.83 | 70.20 | 253.21 | 229.99 | 173.64 | 149.52 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 |
| 22 | Date Last Precipitation Event Occurred | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 |

Laboratory Name Ream & Haager Laboratories, Inc.
Address 1226 Kaderly Street NW City New Philadelphia
State Ohio Zip 44663

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.

9/88

**ADDENUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.**

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. (ALLISON)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | Identification No. of sampling Station from Hydrology Map | D-3 | D-4 | D-5 | D-6 | D-7 | D-8 |
| 2. | Lab Identification Number 94- | 03-464 | 03-463 | 03-466 | 03-467 | 03-468 | 03-469 |
| 3. | High (H) / Low (L) Designation (if applicable) | H | H | H | H | H | H |
| 4. | Surface Elevation for Sampling Station (msl) | 935 | 940 | 940 | 940 | 938 | 940 |
| 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) | 12.3 CFS | .13 CFS | .12 CFS | .26 CFS | .26 CFS | 1.08 CFS |
| 8. | Date Above Measurements Made | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 |
| 9. | Aquifer/Zone Identification for Well/Spring | -- | -- | -- | -- | -- | -- |
| 10. | pH (Standard Units) | 7.90 | 7.88 | 7.92 | 8.16 | 8.09 | 8.04 |
| 11. | Total Acidity (mg/1 CaCO3) | 8.40 | 7.80 | 9.20 | 4.40 | 3.60 | 4.60 |
| 12. | Total Alkalinity (mg/1 CaCO3) | 97.60 | 86.60 | 119.60 | 198.20 | 172.00 | 124.20 |
| 13. | Specific Conductivity (umho/cm at 25.) | 200 | 170 | 290 | 392 | 519 | 700 |
| 14. | Total Dissolved Solids (mg/1) | -- | -- | -- | -- | -- | -- |
| 15. | Total Manganese (mg/1) | 0.04 | < 0.02 | < 0.02 | < 0.02 | 0.10 | 0.36 |
| 16. | Total Sulfates (mg/1) | 30.0 | 34.0 | 34.0 | 78.0 | 103.0 | 270.0 |
| 17. | Total Iron (mg/1) | 0.18 | 0.21 | 0.12 | 0.13 | 0.21 | 0.83 |
| 18. | Total Suspended Solids (mg/1) | 6.0 | 4.0 | 2.0 | 5.0 | 3.0 | 9.0 |
| 19. | Total Hardness (mg/1 as CaCO3) | 124.0 | 124.0 | 120.0 | 168.0 | 249.0 | 259.0 |
| 20. | Date Sampled for Analysis | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 |
| 21. | Date Last Precipitation Event | 3-7-94 | 3-7-94 | 3-7-94 | 3-7-94 | 3-7-94 | 3-7-94 |

Laboratory Name Industrial Lab Analysis, Inc.
Address 2240 Williamsburg Drive City Glen Dale
State West Virginia Zip 26083

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 item 14.

9/88

**ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.**

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. (ALLISON)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | Identification No. of sampling Station from Hydrology Map | D-3 | D-4 | D-5 | D-6 | D-7 | D-8 |
| 2. | Lab Identification Number 93- | 12-1117 | 12-1118 | 12-1119 | 12-1120 | 12-1121 | 12-1122 |
| 3. | High (H) / Low (L) Designation (if applicable) | L | L | L | L | L | L |
| 4. | Surface Elevation for Sampling Station (msl) | 935 | 940 | 940 | 940 | 938 | 940 |
| 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) | 3.4 CFS | .05 CFS | .03 CFS | .1 CFS | .07 CFS | .25 CFS |
| 8. | Date Above Measurements Made | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 |
| 9. | Aquifer/Zone Identification for Well/Spring | -- | -- | -- | -- | -- | -- |
| 10. | pH (Standard Units) | 7.93 | 7.82 | 7.83 | 7.97 | 7.98 | 7.50 |
| 11. | Total Acidity (mg/1 $CaCO_3$) | 6.60 | 8.00 | 7.60 | 6.40 | 6.60 | 14.00 |
| 12. | Total Alkalinity (mg/1 $CaCO_3$) | 113.60 | 83.00 | 134.80 | 199.60 | 190.00 | 171.00 |
| 13. | Specific Conductivity (umho/cm at 25.) | 273 | 222 | 333 | 589 | 621 | 963 |
| 14. | Total Dissolved Solids (mg/1) | -- | -- | -- | -- | -- | -- |
| 15. | Total Manganese (mg/1) | 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 0.73 |
| 16. | Total Sulfates (mg/1) | 33.0 | 39.0 | 47.0 | 120.0 | 104.0 | 404.0 |
| 17. | Total Iron (mg/1) | 0.05 | < 0.04 | < 0.04 | 0.04 | 0.07 | 0.73 |
| 18. | Total Suspended Solids (mg/1) | 4.0 | 7.0 | 6.0 | 3.0 | 2.0 | 5.0 |
| 19. | Total Hardness (mg/1 as $CaCO_3$) | 143.0 | 121.0 | 173.0 | 256.0 | 301.0 | 462.0 |
| 20. | Date Sampled for Analysis | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 |
| 21. | Date Last Precipitation Event | 12-25-93 | 12-25-93 | 12-25-93 | 12-25-93 | 12-29-93 | 12-29-93 |

Laboratory Name Industrial Lab Analysis, Inc.
Address 2240 Williamsburg Drive City Glen Dale
State West Virginia Zip 26083

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 item 14.

ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

Quarterly Monitoring Report Sheet
(Submit in Quadruplicate)

Permitee: American Energy Corp. Permit Number: D-1159

_____1st Qtr. ___X___ 2nd Qtr. _____ 3rd Qtr. _____ 4th Qtr.

_____ Pre-Mining, ___X___ Mining, _____, Post mining (X appropriate blank for mine status)

| Monitoring Site Id No. (e.g. S-1 , W-3 ) | S-23 | D-10 | D-8A | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X2,411,937 Y 696,728 | X2,417,484 Y 696,454 | X 2,413,624 Y 695,395 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 1125 | 898 | 1080 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality , Quantity , or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Water Surface (Feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 53' | 21' |
| Stream or spring Discharge (CFS or GPM) | 6.4 gpm | 1.7 cfs | 0.1 cfs | -- | -- |
| Date Measured | 05-16-02 | 05-16-02 | 05-16-02 | 05-16-02 | 05-16-02 |
| pH Standard Units | 7.61 | 7.49 | 7.90 | 7.41 | 7.62 |
| Total Acidity mg/l as CaCO3 | 1.60 | 3.80 | 2.80 | 7.20 | 4.80 |
| Total Alkalinity mg/l as CaCO3 | 27.20 | 60.00 | 71.40 | 275.20 | 232.00 |
| Total Iron mg/l | 0.28 | 0.30 | 1.42 | <0.04 | 0.05 |
| Total Manganese mg/l | 0.03 | <0.02 | 0.44 | <0.02 | 0.02 |
| Total Suspended Solids mg/l | 3.0 | 8.0 | 6.0 | <2.0 | <2.0 |
| Total Hardness mg/l | 56.0 | 72.0 | 220.0 | 390.0 | 300.0 |
| Total Sulfate mg/l | 24.0 | 19.0 | 111.0 | 73.0 | 70.0 |
| Specific Conductance @25 "C umho/cm | 131 | 170 | 552 | 852 | 7.03 |

Permitee's Signature: Date: June 25, 2002

Laboratory Name: Industrial Lab Analysis

Analyst's Signature: [illegible] Date: 6-5-02

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee AMERICAN ENERGY CORPORATION Permit Number Allison D-1159

X 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | ★ D - 10 | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696.454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 52' | 20.1' |
| Stream or Spring Discharge (cfs or gpm) | 4.9 cfs | 2 cfs | 3 cfs | -- | -- |
| Date Measured | 2/15/02 | 2/15/02 | 2/15/02 | 2/15/02 | 2/15/02 |
| pH (Standard Units) | 7.62 | 7.53 | 7.49 | 7.37 | 7.59 |
| Total Acidity (mg/l CaCo3) | 4.00 | 2.00 | 2.00 | 8.00 | 6.00 |
| Total Alkalinity (mg/l CaCo3) | 84.00 | 84.00 | 70.00 | 280.00 | 240.00 |
| Total Iron (mg/l) | 0.057 | 0.054 | 0.051 | 0.031 | 0.035 |
| Total Manganese (mg/l) | < 0.01 | 0.014 | < 0.01 | < 0.01 | < 0.01 |
| Total Suspended Solids (mg/l) | < 1.0 | < 1.0 | < 1.0 | 9 | < 1.0 |
| Total Hardness (mg/l CaCo3) | 119.33 | 107.65 | 85.20 | 188.30 | 206.44 |
| Total Sulfates (mg/l) | 46.09 | 128.41 | 101.25 | 186.04 | 112.77 |
| Specific Conductance (at 25° C in µmhos/cm) | 303.00 | 267.00 | 230.00 | 1,010.00 | 709.00 |

| | |
|---|---|
| Permittee's Signature | Date March 22, 2002 |

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date February 27, 2002 |

*Ream & Haager Lab. #'s 322286 thru 322290*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., X 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D - 10 ★ | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 56' | 25' |
| Stream or Spring Discharge (cfs or gpm) | 1.85 cfs | 0.22 cfs | 0.8 cfs | -- | -- |
| Date Measured | 11/15/01 | 11/15/01 | 11/15/01 | 11/15/01 | 11/15/01 |
| pH (Standard Units) | 7.16 | 7.26 | 7.02 | 6.98 | 7.31 |
| Total Acidity (mg/l CaCo3) | 6.00 | 6.00 | 4.00 | 14.00 | 12.00 |
| Total Alkalinity (mg/l CaCo3) | 126.00 | 120.00 | 106.00 | 294.00 | 262.00 |
| Total Iron (mg/l) | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Total Manganese (mg/l) | < 0.01 | < 0.01 | 0.036 | < 0.01 | 0.013 |
| Total Suspended Solids (mg/l) | 14 | 6 | < 1.0 | 8 | 4 |
| Total Hardness (mg/l CaCo3) | 276.15 | 273.52 | 212.67 | 161.59 | 280.27 |
| Total Sulfates (mg/l) | 79.02 | 34.57 | 14.81 | 115.24 | 58.44 |
| Specific Conductance (at 25° C in µmhos/cm) | 547.00 | 434.00 | 537.00 | 3,190.00 | 2,830.00 |

| Permittee's Signature | Date December 4, 2001 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. |
|---|---|
| Analyst's Signature | Date November 26, 2001 |

*Ream & Haager Lab. #'s 317699 thru 317703*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., ____ 2nd Qtr., X 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D - 10 ★ | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 55.8' | 23.4' |
| Stream or Spring Discharge (cfs or gpm) | 19 cfs | 0.3 cfs | 17.5 cfs | -- | -- |
| Date Measured | 8/30/01 | 8/30/01 | 8/30/01 | 8/30/01 | 8/30/01 |
| pH (Standard Units) | 7.79 | 7.58 | 7.63 | 7.45 | 7.52 |
| Total Acidity (mg/l CaCo3) | 4.00 | 8.00 | 4.00 | 14.00 | 12.00 |
| Total Alkalinity (mg/l CaCo3) | 102.00 | 120.00 | 80.00 | 304.00 | 230.00 |
| Total Iron (mg/l) | 0.173 | 0.130 | 0.075 | 0.055 | 0.065 |
| Total Manganese (mg/l) | 0.011 | 0.279 | 0.012 | < 0.01 | 0.014 |
| Total Suspended Solids (mg/l) | 1 | 1 | < 1.0 | < 1.0 | 1 |
| Total Hardness (mg/l CaCo3) | 154.42 | 174.87 | 110.54 | 241.64 | 161.59 |
| Total Sulfates (mg/l) | 23.04 | 37.04 | 41.16 | 102.90 | 54.33 |
| Specific Conductance (at 25° C in µmhos/cm) | 357.00 | 356.00 | 265.00 | 1,050.00 | 864.00 |

| | |
|---|---|
| Permittee's Signature | Date September 18, 2001 |

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date September 12, 2001 |

*Ream & Haager Lab. #'s 313686 thru 313690*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., X 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D - 10 ☆ | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 | X 2,411,287 | X 2,413,435 | X 2,416,692 | X 2,416,577 |
| | Y 696.454 | Y 693,468 | Y 691,110 | Y 694,256 | Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 55.7' | 16' |
| Stream or Spring Discharge (cfs or gpm) | 33 cfs | 20.3 cfs | 31.6 cfs | -- | -- |
| Date Measured | 5/22/01 | 5/22/01 | 5/22/01 | 5/22/01 | 5/22/01 |
| pH (Standard Units) | 7.98 | 7.78 | 7.73 | 7.36 | 7.60 |
| Total Acidity (mg/l CaCo3) | 14.00 | 10.00 | 14.00 | 40.00 | 28.00 |
| Total Alkalinity (mg/l CaCo3) | 120.00 | 80.00 | 100.00 | 394.00 | 264.00 |
| Total Iron (mg/l) | 0.048 | 0.268 | 0.923 | 0.152 | < 0.03 |
| Total Manganese (mg/l) | < 0.01 | < 0.01 | 0.011 | < 0.01 | < 0.01 |
| Total Suspended Solids (mg/l) | 65 | 145 | 33 | 9 | 4 |
| Total Hardness (mg/l CaCo3) | 724.04 | 183.25 | 120.54 | 122.42 | 299.48 |
| Total Sulfates (mg/l) | 148.17 | 97.13 | 46.09 | 93.84 | 121.83 |
| Specific Conductance (at 25° C in µmhos/cm) | 342.00 | 199.00 | 231.00 | 1,050.00 | 730.00 |

| Permittee's Signature | Date June 29, 2001 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | Joseph W. Smith | Date June 7, 2001 |

*Ream & Haager Lab. #'s 309109 thru 309113*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159

X 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | U-10 | W-2 | U-3 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,413,435 Y 691,110 | X 2,416,692 Y 694,256 | X 2,411,287 Y 693,468 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 942 | 1235 | 960 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | 103' | -- | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | 54.4' | -- | 22' |
| Stream or Spring Discharge (cfs or gpm) | 43.2 cfs | 34.3 cfs | -- | 9.24 cfs | -- |
| Date Measured | 2/1/01 | 2/1/01 | 2/1/01 | 2/1/01 | 2/1/01 |
| pH (Standard Units) | 7.04 | 7.15 | 7.32 | 7.96 | 7.17 |
| Total Acidity (mg/l CaCo3) | 6.00 | 8.00 | 28.00 | 8.00 | 32.00 |
| Total Alkalinity (mg/l CaCo3) | 54.00 | 38.00 | 256.00 | 52.00 | 226.00 |
| Total Iron (mg/l) | 0.339 | 0.179 | < 0.03 | 0.191 | < 0.03 |
| Total Manganese (mg/l) | 0.067 | < 0.01 | < 0.01 | < 0.1 | < 0.01 |
| Total Suspended Solids (mg/l) | 14 | 3 | < 1.0 | < 1.0 | < 1.0 |
| Total Hardness (mg/l CaCo3) | 106.62 | 65.73 | 209.99 | 77.42 | 172.93 |
| Total Sulfates (mg/l) | 39.51 | 23.04 | 80.67 | 39.51 | 99.87 |
| Specific Conductance (at 25°C in µmhos/cm) | 255.00 | 181.00 | 900.00 | 200.00 | 1,080.00 |

| | |
|---|---|
| Permittee's Signature | Date April 10, 2001 |

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date February 13, 2001 |

*Ream & Haager Lab. #'s 303491 thru 303495*
*Hamilton & Associates*



AEC 11333

04/94

# ADDENDUM, TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159 (Allison)

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., X 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | W-2 | W-3 | W-7 | U-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X2,417,484 Y 696,454 | X2,416,692 Y 594,256 | X2,416,577 Y 692,370 | X2,417,692 Y 697,385 | X2,411,287 Y 693,468 |
| Surface Elevation of Monitoring Site | 898 | 1235 | 1260 | 1062 | 960 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | 103' | 115' | UNKNOWN | -- |
| Static Water Level of Well Below Land Surface (feet) | -- | 59.2' | 26.8' | 64.3' | -- |
| Stream or Spring Discharge (cfs or gpm) | 6 cfs | -- | -- | -- | 2 cfs |
| Date Measured | 11/10/00 | 11/10/00 | 11/10/00 | 11/10/00 | 11/10/00 |
| pH (Standard Units) | 6.87 | 7.44 | 7.51 | 8.17 | 7.75 |
| Total Acidity (mg/l CaCo3) | 8.00 | 30.00 | 24.00 | 12.00 | 12.00 |
| Total Alkalinity (mg/l CaCo3) | 142.00 | 346.00 | 296.00 | 430.00 | 146.00 |
| Total Iron (mg/l) | 0.119 | < 0.05 | 0.080 | < 0.05 | 0.077 |
| Total Manganese (mg/l) | < 0.008 | < 0.008 | 0.011 | < 0.008 | 0.010 |
| Total Suspended Solids (mg/l) | 2 | 1 | < 1.0 | < 1.0 | < 1.0 |
| Total Hardness (mg/l CaCo3) | 170.07 | 522.46 | 454.64 | 70.32 | 161.94 |
| Total Sulfates (mg/l) | 47.74 | 82.32 | 74.08 | 153.93 | 54.33 |
| Specific Conductance (at 25° C in µmhos/cm) | 423.00 | 1,240.00 | 1,080.00 | 1,010.00 | 378.00 |

| Permittee's Signature | Date |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | | Date November 24, 2000 |

*Ream & Haager Lab. #'s 300555 thru 300559*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison - D-1159

____ 1st Qtr., ____ 2nd Qtr., X 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | U-10 | U-3 | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 | X 2,413,435 | X 2,411,287 | X 2,416,692 | X 2,416,577 |
| | Y 696,454 | Y 691,110 | Y 693,468 | Y 594,256 | Y 692,370 |
| Surface Elevation of Monitoring Site | 898 | 942 | 960 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | Access Denied | Inaccess-ible |
| Stream or Spring Discharge (cfs or gpm) | 1.44 cfs | 0.45 cfs | 0,08 cfs | -- | -- |
| Date Measured | 8/14/00 | 8/14/00 | 8/14/00 | 8/14/00 | 8/14/00 |
| pH (Standard Units) | 8.14 | 7.94 | 7.85 | 7.42 | 7.80 |
| Total Acidity (mg/l CaCo3) | 4.00 | 18.00 | 4.00 | 6.00 | 4.00 |
| Total Alkalinity (mg/l CaCo3) | 130.00 | 104.00 | 130.00 | 270.00 | 224.00 |
| Total Iron (mg/l) | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Total Manganese (mg/l) | < 0.008 | < 0.008 | <0.008 | <0.008 | < 0.008 |
| Total Suspended Solids (mg/l) | 1.0 | 1.0 | 5.0 | 1.0 | 1.0 |
| Total Hardness (mg/l CaCo3) | 209.06 | 130.27 | 154.09 | 536.43 | 368.16 |
| Total Sulfates (mg/l) | 446.17 | 35.40 | 172.05 | 244.49 | 211.56 |
| Specific Conductance (at 25° C in µmhos/cm) | 470.00 | 297.00 | 362.00 | 1,360.00 | 1,040.00 |

| Permittee's Signature | Date |
|---|---|

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date August 30, 2000 |

*Ream & Haager Lab. #'s 296788 thru 296792*
*Hamilton & Associates*
*1 of 2*

AEC 11335

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., X 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 | U-3 | U-10 | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X2,417,484 Y 696,454 | X2,411,287 Y 693,468 | X2,413,435 Y 691,110 | X2,416,692 Y 594,256 | X2,416,577 Y 692,370 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | Access Denied | Inaccessible |
| Stream or Spring Discharge (cfs or gpm) | 4.8 cfs | 0.78 cfs | 0.9 cfs | -- | -- |
| Date Measured | 5/15/00 | 5/15/00 | 5/15/00 | 5/15/00 | 5/15/00 |
| pH (Standard Units) | 8.42 | 8.25 | 8.21 | 8.16 | 8.31 |
| Total Acidity (mg/l CaCo3) | 14.00 | 22.00 | 18.00 | 42.00 | 34.00 |
| Total Alkalinity (mg/l CaCo3) | 108.00 | 110.00 | 92.00 | 294.00 | 242.00 |
| Total Iron (mg/l) | 0.157 | <0.05 | <0.05 | <0.05 | <0.05 |
| Total Manganese (mg/l) | <0.008 | <0.008 | 0.009 | <0.008 | <0.008 |
| Total Suspended Solids (mg/l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Total Hardness (mg/l CaCo3) | 188.19 | 163.05 | 134.06 | 226.25 | 332.52 |
| Total Sulfates (mg/l) | 90.55 | 116.07 | 80.67 | 125.60 | 141.59 |
| Specific Conductance (at 25° C in µmhos/cm) | 396.00 | 333.00 | 287.00 | 1,090.00 | 987.00 |

| Permittee's Signature | Date |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | | Date May 23, 2000 |

*Ream & Haager Lab. #'s 293271 thru 293275*
*Hamilton & Assoc.*
*Page 1 of 2*

AEC 11336

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159

X 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | W-2 | W-7 | U-3 | U-10 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X2,417,484 Y 696,454 | X2,416,692 Y 694,256 | X2,417,692 Y 697,385 | X2,411,287 Y 693,468 | X2,413,435 Y 691,110 |
| Surface Elevation of Monitoring Site | 898 | 1235 | 1062 | 960 | 942 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | 103' | Unknown | -- | -- |
| Static Water Level of Well Below Land Surface (feet) | -- | Access Denied | 53.3' | -- | -- |
| Stream or Spring Discharge (cfs or gpm) | 8.4 cfs | -- | -- | 2.4 cfs | 6.1 cfs |
| Date Measured | 2/9/00 | 2/9/00 | 2/9/00 | 2/9/00 | 2/9/00 |
| pH (Standard Units) | 7.66 | 7.26 | 7.96 | 7.51 | 7.57 |
| Total Acidity (mg/l CaCo3) | 10.00 | 52.00 | 36.00 | 20.00 | 14.00 |
| Total Alkalinity (mg/l CaCo3) | 94.00 | 274.00 | 254.00 | 92.00 | 84.00 |
| Total Iron (mg/l) | 0.085 | <0.05 | <0.05 | <0.05 | <0.05 |
| Total Manganese (mg/l) | 0.076 | <0.008 | <0.008 | <0.008 | <0.008 |
| Total Suspended Solids (mg/l) | 2.00 | 1.00 | 3.00 | 1.00 | 1.00 |
| Total Hardness (mg/l CaCo3) | 179.16 | 254.25 | 166.98 | 141.72 | 114.46 |
| Total Sulfates (mg/l) | 98.78 | 118.54 | 142.41 | 79.85 | 65.03 |
| Specific Conductance (at 25° C in µmhos/cm) | 301.00 | 1,029.00 | 638.00 | 273.00 | 218.00 |

Resident @ W-3 not home, Could not collect sample

| Permittee's Signature | Date February 25, 2000 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. |
|---|---|
| Analyst's Signature | Date February 18, 2000 |

*Ream & Haager Lab. #'s 289846 thru 289850*
*Hamilton & Assoc.*
*Page 1 of 1*

AEC 11337

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

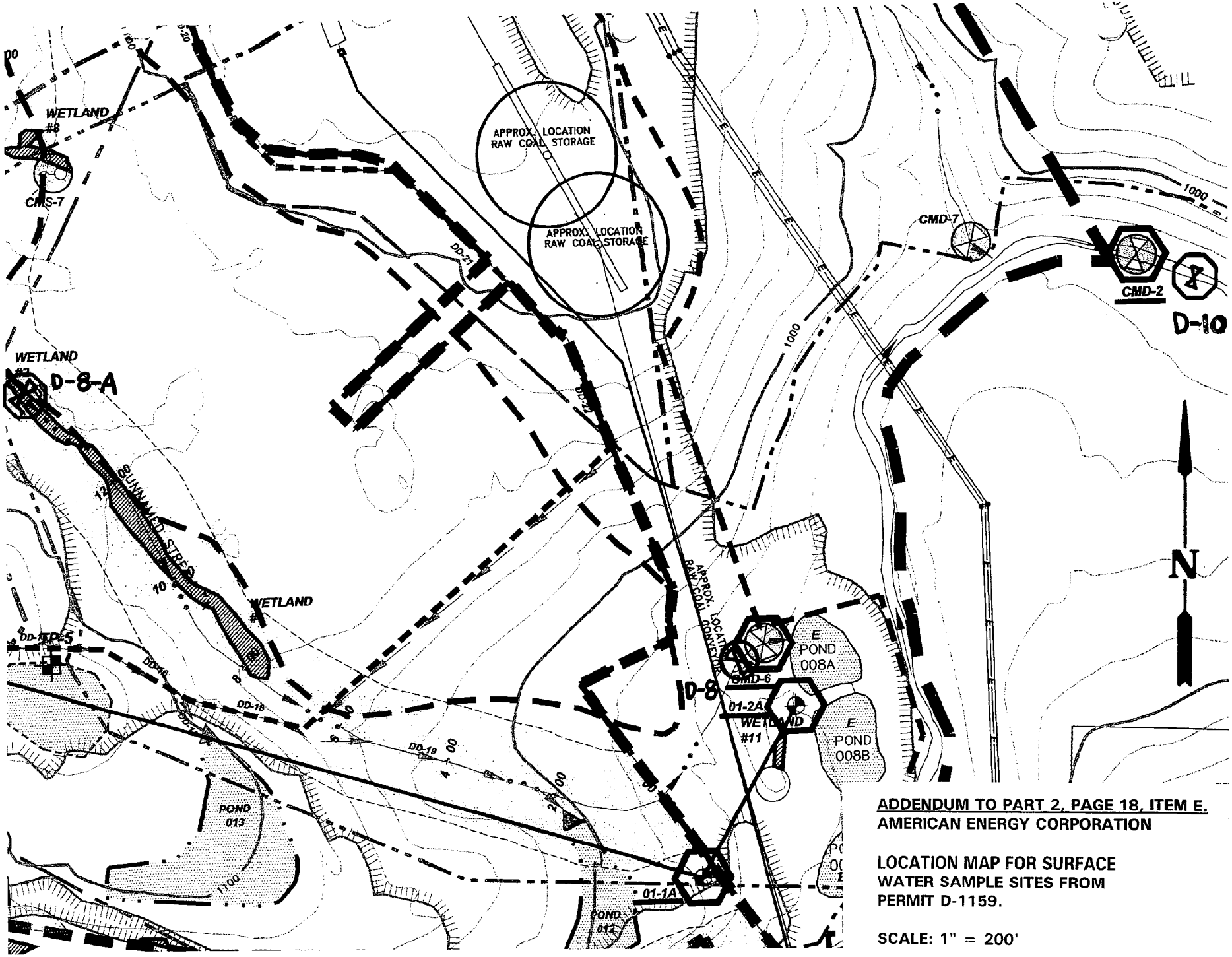
____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | U-3 | U-10 | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 594,256 | X 2,416,577 Y 692,370 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | Access Denied | Access Denied |
| Stream or Spring Discharge (cfs or gpm) | 2.6 cfs | 1.9 cfs | 0.54 cfs | -- | -- |
| Date Measured | 12/7/99 | 12/7/99 | 12/7/99 | 12/7/99 | 12/7/99 |
| pH (Standard Units) | 7.75 | 7.49 | 7.46 | 7.44 | 7.59 |
| Total Acidity (mg/l CaCo3) | 12.00 | 8.00 | 10.00 | 28.00 | 28.00 |
| Total Alkalinity (mg/l CaCo3) | 98.00 | 102.00 | 76.00 | 278.00 | 192.00 |
| Total Iron (mg/l) | 0.119 | <0.05 | 0.053 | <0.05 | <0.05 |
| Total Manganese (mg/l) | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 |
| Total Suspended Solids (mg/l) | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 |
| Total Hardness (mg/l CaCo3) | 186.69 | 155.02 | 121.52 | 526.19 | 434.69 |
| Total Sulfates (mg/l) | 78.20 | 74.08 | 46.92 | 147.35 | 91.38 |
| Specific Conductance (at 25° C in µmhos/cm) | 323.00 | 273.00 | 259.00 | 967.00 | 846.00 |

| Permittee's Signature | Date January 4, 2000 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. |
|---|---|
| Analyst's Signature | Date December 21, 1999 |

*Ream & Haager Lab. #'s 287902 thru 287906*
*Hamilton & Assoc.*
*Page 1 of 2*




**ADDENDUM TO PART 2, PAGE 18, ITEM E.**
**AMERICAN ENERGY CORPORATION**

**LOCATION MAP FOR SURFACE WATER SAMPLE SITES FROM PERMIT D-1159.**

**SCALE: 1" = 200'**

AEC 11339

G. LAND USE INFORMATION-**Permit Area**

(1) Describe the uses of the land within the proposed permit area existing at the time of the filing of this permit application and provide a map which delineates the area of each land use.

THE PROPOSED PERMIT AREA IS COMPOSED OF 72% UNDEVELOPED LAND AND 28% **PASTURELAND**. SEE ADDENDUM TO PART 2, PAGE 19, ITEM G(1), PRE-MINING LAND USE MAP.

(2) Was the land use described in item G(1) above changed within five years before the anticipated date of beginning this proposed mining operation? _____ Yes, __X__ No. If "yes," submit and addendum describing the historic use of the land.

(3) Analyze the capability of the land within the proposed permit area before any mining to support a variety of uses, giving consideration to soil and foundation characteristics, topography, vegetative cover, and hydrology of the proposed permit area.

AFTER GIVING CONSIDERATION TO SOIL AND FOUNDATION CHARACTERISTICS, TOPOGRAPHY, VEGETATIVE COVER AND HYDROLOGY OF THE PROPOSED PERMIT AREA, THE LAND COULD SUPPORT USES SUCH AS UNDEVELOPED, RECRRATIONAL, PASTURELAND AND WILDLIFE HABITAT. EXAMPLES ARE PASTURELAND USED FOR LIVESTOCK GRAZING AND WILDLIFE HABITAT DUE TO THE VEGETATIVE COVER.

(4) Analyze the productivity of the land within the proposed permit area before any mining to include average yields obtained under high level of management.

SEE ADDENDUM TO PART 2, PAGE 19, ITEM G(4)

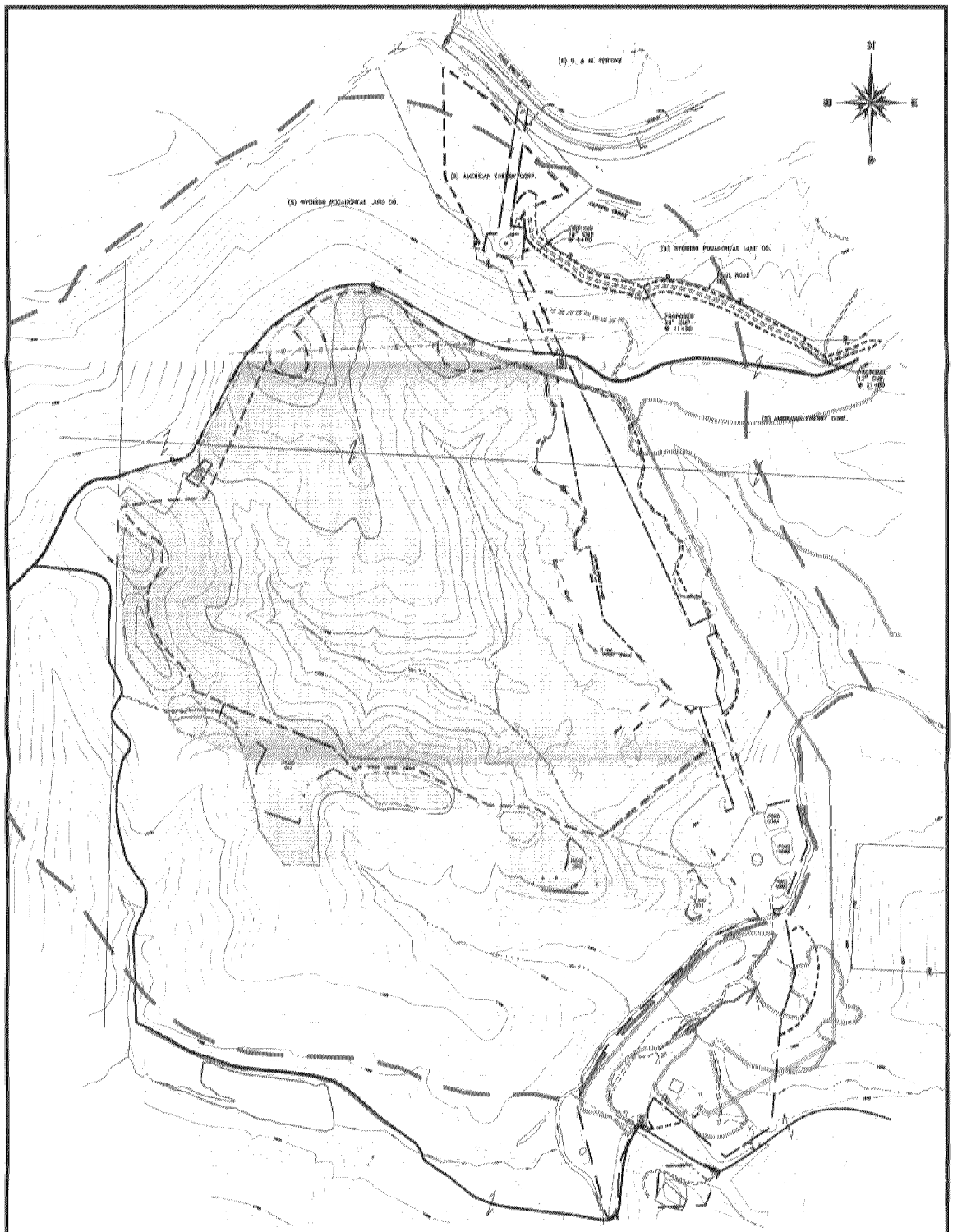
(5) Is any land within the proposed permit area classified as prime farmland? __X__ Yes, _____ No.

(6) Submit an addendum describing the use of the land within the permit area, including the creation of permanent water impoundments, that is proposed to be made of the land following reclamation, including information regarding the utility and capacity of the reclaimed land to support a variety of alternative uses.

SEE ADDENDA TO PART 2, PAGE 19, ITEM G(6)

(7) Are there existing land use classifications under local law of the proposed permit area? _____ Yes, __X__ No. If "yes," describe the land use classification and submit as an addendum to the permit application, the comments of the governmental agency which would have to initiate, implement, approve or authorize the proposed use of the land following reclamation. If "no," describe the sources of information on which the determination was made.

FRED BENNETT, BELMONT COUNTY ENGINEER




DENOTES PROPOSED PERMIT LIMITS

DENOTES PASTURELAND

DENOTES UNDEVELOPED LAND

NOTE: THE PREMINING LAND USE WILL REMAIN ON ALL AREAS WHERE THE SURFACE IS NOT DISTURBED.

| | |
|---|---|
| ADDENDUM TO PART 2, PAGE 19, ITEM G(1) | |
| AMERICAN ENERGY CORPORATION | |
| PRE-MINING LAND USE MAP | |
| SECTIONS: 3 & 4 | |
| TOWNSHIP: 5 RANGE: 5 | |
| TOWNSHIP: WAYNE | |
| COUNTY: BELMONT | CONTOUR INTERVAL: 20' |
| SCALE: 1" = 500' | COMM. #01008 PRE-MINING.DWG |
| DATE PREPARED: NOVEMBER 5, 2001 | |
| JACK A. HAMILTON & ASSOCIATES, INC. PLUSHING, OHIO DRAWN BY: SSU | DATE REVISED: 8-29-02 DATE REVISED: |

AEC 11341

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

| Soil name and map symbol | Corn | Winter wheat | Oats | Grass-legume hay | Alfalfa hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Ton | Ton | AUM* |
| AeC---------- Allegheny Variant | 105 | 40 | 65 | 3.5 | --- | 5.5 |
| As---------- Ashton | 125 | 50 | 70 | 4.5 | 5.0 | 7.0 |
| BaB, BaD, BaF---------- Barkcamp | --- | --- | --- | --- | --- | --- |
| BcB---------- Barkcamp | --- | --- | --- | --- | --- | 3.0 |
| BcD---------- Barkcamp | --- | --- | --- | --- | --- | 2.0 |
| BeB---------- Bethesda | --- | 20 | 40 | 2.0 | --- | 3.3 |
| BeD---------- Bethesda | --- | 15 | 35 | 1.5 | --- | 3.0 |
| BhB, BhD---------- Bethesda | --- | --- | --- | --- | --- | 2.0 |
| BhE, BhF---------- Bethesda | --- | --- | --- | --- | --- | --- |
| BsC---------- Brookside | 100 | 40 | 60 | 4.5 | --- | 7.0 |
| BsD---------- Brookside | 90 | 35 | 55 | 4.0 | --- | 7.0 |
| BsE---------- Brookside | --- | --- | --- | --- | --- | --- |
| BuB---------- Brookside-Urban land | --- | --- | --- | --- | --- | --- |
| BuD---------- Brookside-Urban land | --- | --- | --- | --- | --- | --- |
| Cg---------- Chagrin | 125 | 45 | 65 | 4.5 | 5.0 | 7.0 |
| ChB---------- Chili | 85 | 34 | 70 | 4.2 | --- | 6.6 |
| CmB---------- Chili-Urban land | --- | --- | --- | --- | --- | --- |
| CuB---------- Culleoka | 100 | 32 | 65 | 4.0 | --- | 6.0 |
| CuC---------- Culleoka | 90 | 28 | 60 | 3.5 | --- | 5.5 |
| DkB---------- Dekalb | 80 | 30 | 55 | 3.5 | --- | 5.5 |
| DkC---------- Dekalb | 70 | 25 | 50 | 3.3 | --- | 5.0 |
| DkD---------- Dekalb | 70 | 25 | 50 | 3.0 | --- | 4.5 |

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Corn | Winter wheat | Oats | Grass-legume hay | Alfalfa hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Ton | Ton | AUM* |
| DkE---------- Dekalb | --- | --- | --- | --- | --- | 4.0 |
| DmF---------- Dekalb | --- | --- | --- | --- | --- | --- |
| Dp, Ds. Dumps | | | | | | |
| DuB---------- Duncannon-Urban land | --- | --- | --- | --- | --- | --- |
| EbB---------- Elba | 100 | 45 | 60 | 4.5 | 4.7 | 7.0 |
| EbC---------- Elba | 95 | 40 | 55 | 4.0 | 4.5 | 6.0 |
| EbD---------- Elba | 85 | 35 | 50 | 3.8 | 4.2 | 5.8 |
| EbE---------- Elba | --- | --- | --- | --- | --- | 4.0 |
| ElB---------- Elkinsville | 120 | 48 | 70 | 4.0 | 4.5 | 6.0 |
| ElC---------- Elkinsville | 110 | 44 | 65 | 3.6 | 4.3 | 5.8 |
| ElD---------- Elkinsville | 90 | 36 | 60 | 3.0 | 4.0 | 4.5 |
| FbB, FbD---------- Fairpoint | --- | --- | --- | --- | --- | 3.0 |
| FcB---------- Fairpoint | --- | 25 | 45 | 2.5 | --- | 4.0 |
| FcD---------- Fairpoint | --- | 20 | 40 | 2.0 | --- | 3.0 |
| FtA---------- Fitchville | 110 | 38 | 60 | 4.3 | --- | 6.5 |
| He---------- Hartshorn | 100 | 40 | 60 | 4.0 | --- | 6.0 |
| LeB---------- Lowell | 110 | 40 | 65 | 4.0 | 5.0 | 6.0 |
| LeC---------- Lowell | 100 | 35 | 60 | 3.7 | 4.8 | 5.8 |
| LeD---------- Lowell | 90 | 30 | 55 | 3.5 | 4.5 | 5.5 |
| LeE---------- Lowell | --- | --- | --- | --- | --- | 4.0 |
| LeF---------- Lowell | --- | --- | --- | --- | --- | --- |
| LoB---------- Lowell-Westmoreland | 110 | 38 | 70 | 3.8 | 4.8 | 5.8 |
| LoC---------- Lowell-Westmoreland | 100 | 35 | 63 | 3.4 | 4.4 | 5.5 |
| LoD---------- Lowell-Westmoreland | 90 | 30 | 58 | 3.3 | 4.3 | 5.0 |

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Corn | Winter wheat | Oats | Grass-legume hay | Alfalfa hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Ton | Ton | AUM* |
| LoE---------- Lowell-Westmoreland | --- | --- | --- | --- | --- | 4.0 |
| LoF, LpF---------- Lowell-Westmoreland | --- | --- | --- | --- | --- | --- |
| MnB---------- Morristown | --- | 30 | 50 | 3.0 | --- | 4.5 |
| MnD---------- Morristown | --- | 25 | 45 | 2.5 | --- | 4.0 |
| MnE---------- Morristown | --- | --- | --- | --- | --- | 2.0 |
| MoB, MoD---------- Morristown | --- | --- | --- | --- | --- | 3.0 |
| MoE, MoF---------- Morristown | --- | --- | --- | --- | --- | --- |
| Ne---------- Newark | 100 | --- | --- | 4.5 | --- | 7.0 |
| Nm---------- Newark | --- | --- | --- | --- | --- | --- |
| Nn---------- Newark Variant | 90 | --- | --- | 4.0 | --- | 6.0 |
| No---------- Nolin Variant | 135 | 45 | 65 | 4.5 | 4.5 | 7.0 |
| Nu---------- Nolin Variant-Urban land | --- | --- | --- | --- | --- | --- |
| OtB---------- Otwell | 105 | 47 | 65 | 3.6 | --- | 5.8 |
| OtC---------- Otwell | 75 | 38 | 60 | 3.2 | --- | 5.0 |
| RcC---------- Richland | 120 | 40 | 70 | 3.5 | --- | 5.8 |
| RcD---------- Richland | 110 | 35 | 60 | 3.0 | --- | 4.5 |
| RcE---------- Richland | --- | --- | --- | --- | --- | 4.0 |
| RhB---------- Richland | 125 | 45 | 75 | 4.0 | --- | 6.0 |
| Uc---------- Udorthents-Pits | --- | --- | --- | --- | --- | --- |
| Ud---------- Udorthents-Urban land | --- | --- | --- | --- | --- | --- |
| WhB---------- Wellston | 105 | 40 | 70 | 4.0 | 4.5 | 6.0 |
| WhC---------- Wellston | 100 | 35 | 65 | 4.0 | 4.5 | 6.0 |
| WkB---------- Westmore | 110 | 40 | 70 | 4.5 | 5.0 | 7.0 |

See footnote at end of table.

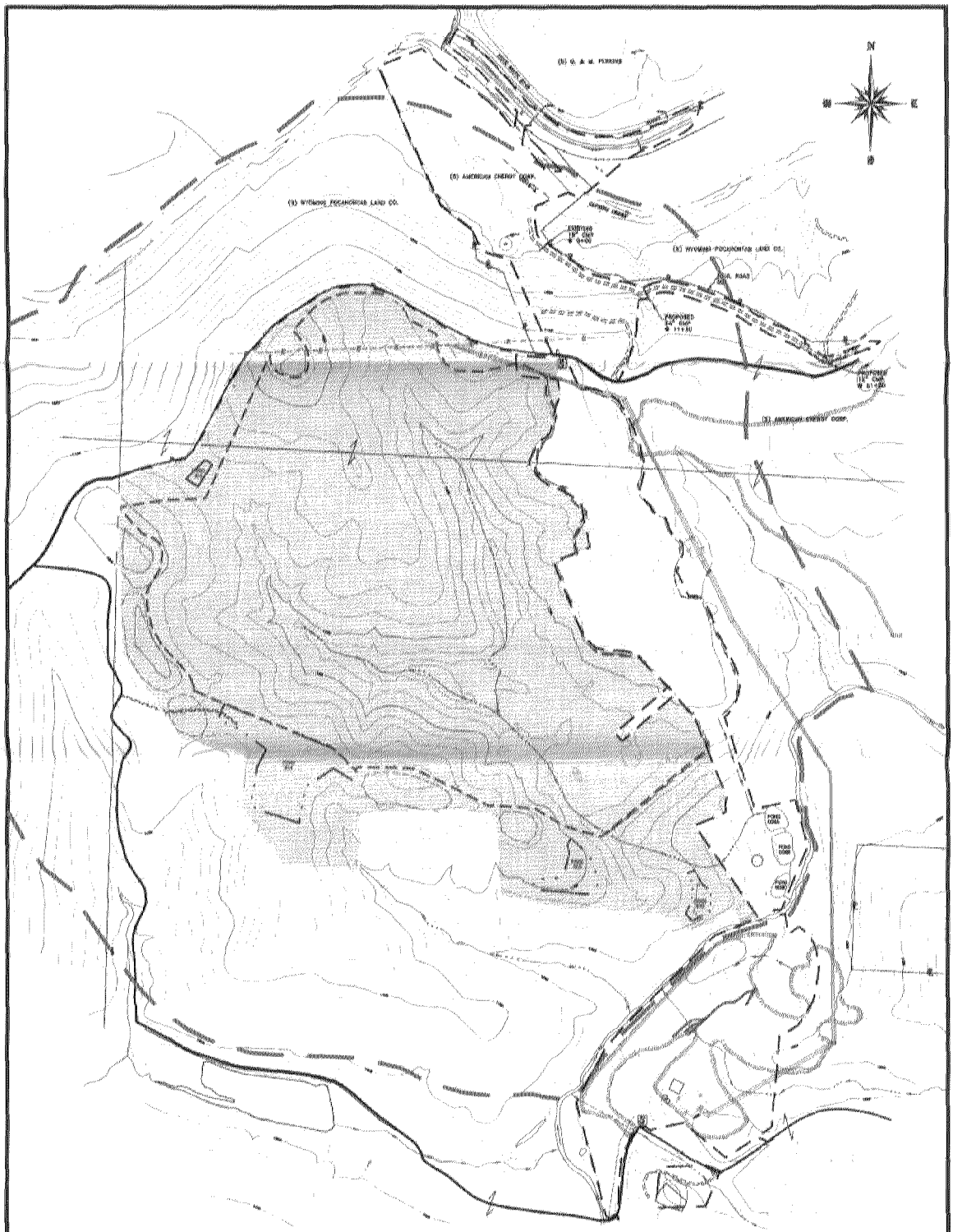
TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

| Soil name and map symbol | Corn | Winter wheat | Oats | Grass-legume hay | Alfalfa hay | Pasture |
|---|---|---|---|---|---|---|
| | Bu | Bu | Bu | Ton | Ton | AUM* |
| WkC---------- Westmore | 105 | 35 | 70 | 4.3 | 5.8 | 6.6 |
| WkD---------- Westmore | 100 | 32 | 65 | 4.0 | 4.5 | 6.0 |
| WmB---------- Westmoreland | 110 | 35 | 70 | 3.5 | 4.5 | 5.8 |
| WmC---------- Westmoreland | 100 | 35 | 65 | 3.0 | 4.0 | 4.5 |
| WmD---------- Westmoreland | 70 | 30 | 60 | 3.0 | 4.0 | 4.5 |
| WmE---------- Westmoreland | --- | --- | --- | --- | --- | 4.0 |
| WmF---------- Westmoreland | --- | --- | --- | --- | --- | --- |
| WoC---------- Westmoreland-Upshur | 96 | 30 | 65 | 3.0 | 4.0 | 4.5 |
| WoD---------- Westmoreland-Upshur | 85 | 30 | 60 | 2.8 | 3.5 | 4.2 |
| [illegible]---------- [illegible]nesville | 95 | 35 | 60 | 3.5 | --- | 5.8 |
| ZnC---------- Zanesville | 85 | 35 | 55 | 3.5 | --- | 5.8 |

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Addendum to Part 2, Page 19, Item G (6)
American Energy Corporation

The use of the land following reclamation will be pastureland. See Addendum to Part 2, Page 19, Item G(6), Post-Mining Land Use Map. The post-mining land use for this area will be aesthetically appropriate and corresponds with adjacent land uses. Grasses and legumes will be used as a cover crop. Following reclamation, the capability and productivity of the land will be greater than that at the present time. The reclaimed land could sustain other agricultural or recreational uses.




DENOTES PROPOSED PERMIT LIMITS

DENOTES PASTURELAND

NOTE: THE PREMINING LAND USE WILL REMAIN ON ALL AREAS WHERE THE SURFACE IS NOT DISTURBED.

| | |
|---|---|
| ADDENDUM TO PART 2, PAGE 19, ITEM G(6) | |
| AMERICAN ENERGY CORPORATION | |
| POST-MINING LAND USE MAP | |
| SECTIONS 3 & 4 | |
| TOWNSHIP: 5 RANGE: 5 | |
| TOWNSHIP: WAYNE | |
| COUNTY : BELMONT | CONTOUR INTERVAL: 20' |
| SCALE: 1" = 500' | COMM. #01009 POST-MINING.DWG |
| DATE PREPARED: NOVEMBER 5, 2001 | |
| JACK A. HAMILTON & ASSOCIATES, INC. FLUSHING, OHIO DRAWN BY: BBU | DATE REVISED: 8-28-02 DATE REVISED: |

G. (8) Submit as an addendum a copy of the comments from the legal or equitable owner of record of the surface of the proposed permit area concerning the proposed land use.

SEE ADDENDUM TO PART 2, PAGE 20, ITEM G(8), LAND OWNER COMMENTS

(9) Describe the consideration which has been given to making all of the proposed coal mining activities consistent with surface owner plans and applicable state and local land use plans and programs.

NO STATE OR LOCAL LAND USE PLANS EXIST FOR THIS AREA. ALL OF THE PROPOSED COAL MINING ACTIVITIES EXPLAINED IN THIS APPLICATION ARE CONSISTENT WITH THE SURFACE OWNERS PLANS.

(10) Describe how the proposed land use is to be achieved and the necessary support activities that may be needed to achieve the proposed land use.

THE PROPOSED LAND USE WILL BE ACHIEVED BY FOLLOWING THE PROPOSED RECLAMATION PLAN DESCRIBED IN PART 3 OF THIS APPLICATION.

(11) Is the postmining land use to be different from the premining land use? __X__ Yes, _____ No. If "yes," submit as an addendum to the permit application, the plans and findings required by paragraph (D) of rule 1501:13-9-17 of the Administrative Code.

SEE ADDENDA TO PART 2, PAGE 20, ITEM G(11)

(12) Has the proposed permit area been previously mined? __X__ Yes, _____ No. If "yes," provide the following information, if available.

(a) Type of mining method UNDERGROUND
(b) Coal seam mined #8
(c) Non coal mineral mined N/A
(d) Extent of mining (acres) 34.8
(e) Approximate dates 1978
(f) Land use preceding mining N/A

(a) Type of mining method SURFACE FACILITY FOR UNDERGROUND MINE
(b) Coal seam mined N/A
(c) Non coal mineral mined N/A
(d) Extent of mining (acres) 39.3
(e) Approximate dates 1984
(f) Land use preceding mining UNDEVELOPED

H. PRIME FARMLAND INVESTIGATION-**Permit Area**

(1) Does the proposed permit area include any land that is prime farmland, taking into consideration the negative determinations listed in paragraph (L)(2) of rule 1501:13-4-13 of the Administrative Code?
_____ Yes, __X__ No.

(2) If the response to item H.(1) is "yes," submit Attachment 15.

(3) If the response to item H.(1) is "no," submit Attachment 16.

**Addendum to Part 2, Page 20, Item G(8), American Energy Corporation**

**TO:** American Energy Corporation

**FROM:** American Energy Corporation

**Location of Proposed Permit Area**:

| | |
|---|---|
| County/Twp. Belmont / Wayne | Lot/Section 3 & 4 |

The proposed postmining land use (s) for your property is/are checked below:

| | | | |
|---|---|---|---|
| X | Cropland | | Residential Land Use |
| X | Pasture Land | | Forest |
| | Grazing Land | | Undeveloped Land Use |
| | Industrial Land Use | | Fish & Wildlife |
| | Commercial Land Use | | Recreation land Use |
| | Developed Water Resources | | |

Pursuant to Ohio Department of Natural Resources, Division of Mines and Reclamation, Ohio Coal Mining and Reclamation Rule 1501:13-4-05(G)(2) of the Ohio Administrative Code, surface owner comments concerning the proposed postmining land use(s) for the proposed permit area are required. Please check the appropriate box below.

| | |
|---|---|
| X | I concur with the proposed postmining land uses identified by the mine operator. |
| | I DO NOT concur with the proposed postmining land uses. |

COMMENTS:

SIGNATURE OF SURFACE OWNER — DATE 11-30-01

SIGNATURE OF SURFACE OWNER — DATE

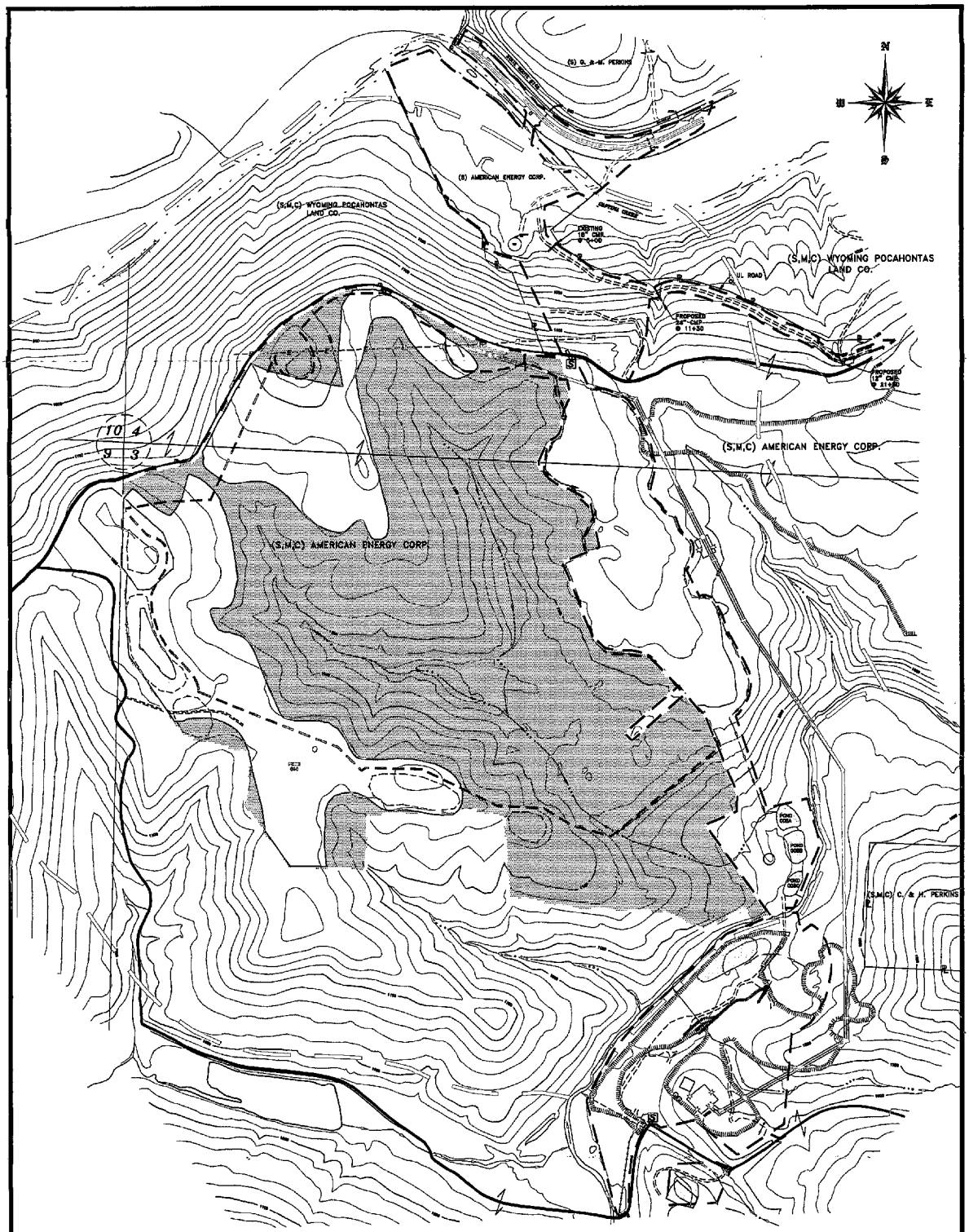
Please check each (if any) of the following listed wildlife enhancements that you would be interested in having on your property. **PLEASE NOTE:** Checking a box does not require the operator to provide any or all of selected enhancements. This form is a tool to help landowners better understand options that may be available through the coal company.

| | | | |
|---|---|---|---|
| | Tree/Shrub Planting | | Small Depressions |
| | Ponds/Wetlands | | Perching/Nesting Structures |
| | Brushpiles | | Other: |
| | Rockpiles | | Other: |

**WAIVER STATEMENT (Optional for Surface Owner):** I, the above named surface owner, waive my right to comment on any revision to the permit application during the application review process that results in a change in the postmining land use(s) from those shown above. (NOTE: I DO NOT WAIVE MY RIGHT TO COMMENT ON ANY PROPOSED POSTMINING LAND USE CHANGE AFTER PERMIT ISSUANCE.)

SIGNATURE OF SURFACE OWNER — DATE 11-30-01

SIGNATURE OF SURFACE OWNER — DATE




DENOTES PROPOSED PERMIT LIMITS

DENOTES AREA WHERE LAND USE CHANGE IS BEING REQUESTED FROM UNDEVELOPED TO PASTURELAND

NOTE: THE PREMINING LAND USE WILL REMAIN ON ALL AREAS WHERE THE SURFACE IS NOT DISTURBED.

| | |
|---|---|
| **ADDENDUM TO PART 2, PAGE 20, ITEM G(11)** | |
| **AMERICAN ENERGY CORPORATION** | |
| **LAND USE CHANGE MAP** | |
| SECTIONS 3 & 4 | |
| TOWNSHIP: 6 RANGE: 5 | |
| TOWNSHIP: WAYNE | |
| COUNTY : BELMONT | CONTOUR INTERVAL: 20' |
| SCALE: 1" = 500' | COMM. #01008 LANDUSECHNGE.DWG |
| DATE PREPARED: NOVEMBER 6, 2001 | |
| JACK A. HAMILTON & ASSOCIATES, INC. FLUSHING, OHIO DRAWN BY: SSU | DATE REVISED: 7-10-02 DATE REVISED: 8-13-02 DATE REVISED: 8-29-02 |

ADDENDUM TO PART 2, PAGE 20, ITEM G(11)
AMERICAN ENERGY CORPORATION

NOTIFICATION OF LAND USE CHANGE

TO: U.S. Fish and Wildlife
Division of Ecological Services
6950-H Americana Parkway
Reynoldsburg, Ohio 43068

Division of Wildlife
Building C-4
Fountain Square
Columbus, Ohio 43224

Note: This form is to be completed only if a land use change is to occur.

1. Is a copy of the coal mine permit application currently on file with the Division of Reclamation? X Yes, _____ No.

2. Coal mine permit application no. D-0425-2

3. Application to revise permit no. N/A

4. Other: permit no. N/A address the status of this permit:

5. Applicant AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD

City BEALLSVILLE State OHIO Zip 43716

6. Application Location

County BELMONT Township WAYNE

Section 3 & 4 Lot _____ Acres 154.4

Township 6 Range 5 Quadrangle HUNTER

7. Pre-mining Land Use

UNDEVELOPED

8. Post-mining Land Use

PASTURELAND

9. Revegetation Plan (SPECIES AND AMOUNTS)

8 LBS/AC. ORCHARD GRASS 10 LBS/AC. RED CLOVER

7 LBS/AC. ALFALFA 10 LBS/AC. TIMOTHY

10. Stream Variance Request X Yes, _____ No. If yes, enclose

A) Copy of Stream Variance Request
B) Percentage of tree cover within 100' buffer zone

Enclose a location map and a copy of the quadrangle map with the mine site highlighted in yellow.

ADDENDUM TO PART 2, PAGE 20, ITEM G(11)
AMERICAN ENERGY CORPORATION

PRE-MINING LAND USE: UNDEVELOPED

POST MINING LAND USE: PASTURELAND

RULE 1501:13-9-17(D)(1-6)

1. THIS PROPOSED LAND USE IS COMPATIBLE WITH THE ADJACENT LAND USES WHICH PRIMARILY CONSIST OF PASTURELAND AND UNDEVELOPED LAND. THERE ARE NO EXISTING LOCAL, STATE OR FEDERAL LAND USE POLICIES OR PLANS FOR THE AREA. A NOTIFICATION OF THE LAND USE CHANGE HAS BEEN MAILED TO U.S. FISH & WILDLIFE AND TO THE DIVISION OF WILDLIFE. NO ZONING OR OTHER CHANGES WILL BE REQUIRED FOR THIS LAND USE CHANGE.

2. BASED ON SOIL TYPES IN THE AREA, THE PLAN IS FEASIBLE. FOR A SCHEDULE SHOWING HOW THE PROPOSED USE WILL BE DEVELOPED AND ACHIEVED WITHIN A REASONABLE TIME SEE PLANTING SCHEDULE IN PART 3 OF THIS PERMIT APPLICATION.

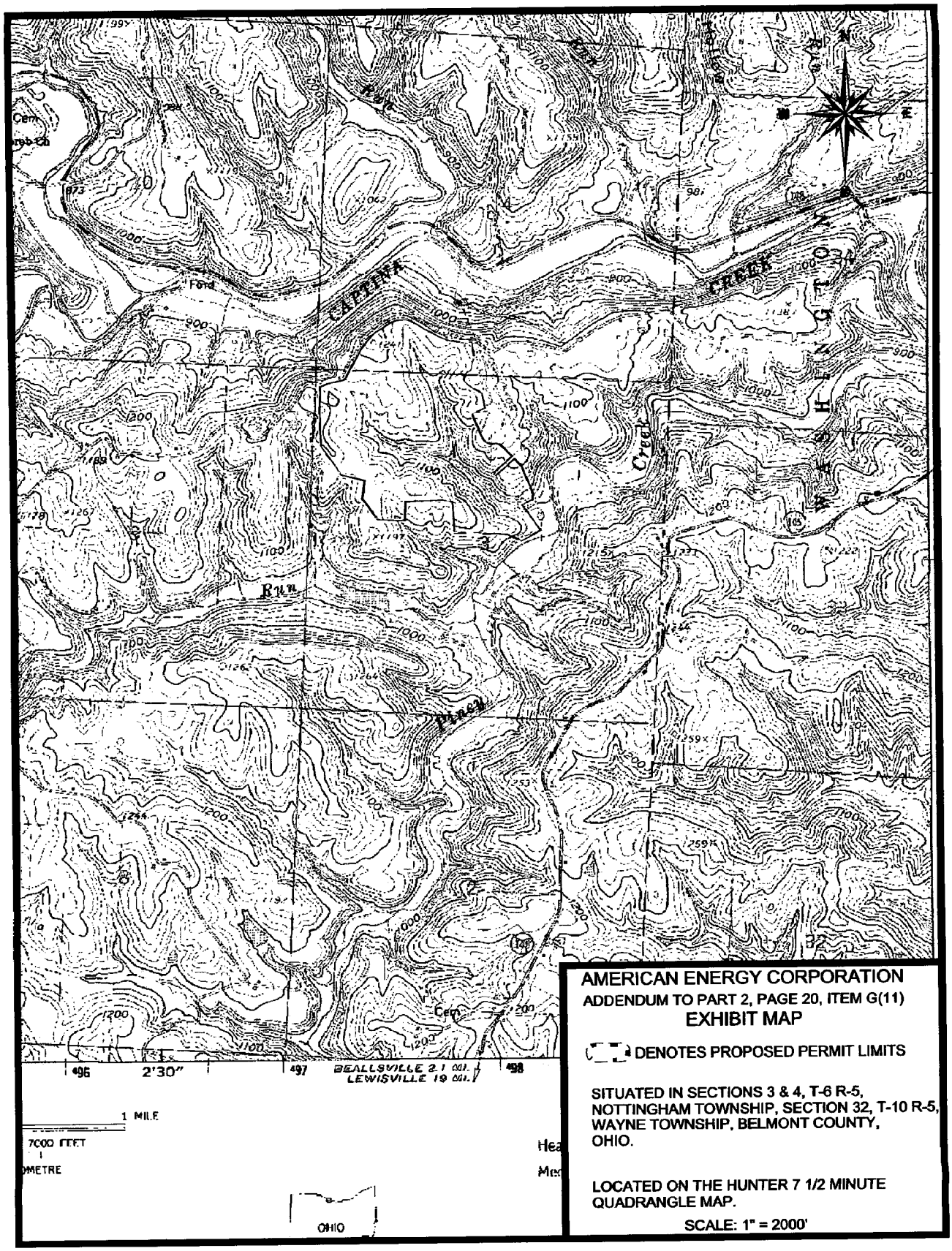
3. THERE ARE NO PUBLIC FACILITIES REQUIRED FOR THIS PROPOSED LAND USE.

4. THIS PROPOSED LAND USE WILL NEITHER PRESENT ACTUAL OR PROBABLE HAZARD TO PUBLIC HEALTH OR SAFETY, NOR WILL IT POSE ANY ACTUAL OR PROBABLE THREAT OF WATER FLOW DIMINUTION OR POLLUTION.

5. THIS PROPOSED LAND USE WILL NOT CHANGE THE RECLAMATION SCHEDULE FOR THIS PERMIT APPLICATION.

6. THIS PROPOSED LAND USE SHOULD NOT HAVE ANY ADVERSE EFFECTS ON FISH AND WILDLIFE. AN OPPORTUNITY TO COMMENT HAS BEEN PROVIDED TO THE APPROPRIATE STATE AND FEDERAL FISH AND WILDLIFE MANAGEMENT AGENCIES. THE NOTIFICATION OF LAND USE CHANGE WAS MAILED TO THE U.S. FISH AND WILDLIFE AND THE DIVISION OF WILDLIFE.

NOTE: THE PRE-MINING LAND USE WILL REMAIN ON ALL AREAS IN WHICH THE SURFACE HAS NOT BEEN DISTURBED.




**AMERICAN ENERGY CORPORATION**

**ADDENDUM TO PART 2, PAGE 20, ITEM G(11)**

**EXHIBIT MAP**

DENOTES PROPOSED PERMIT LIMITS

SITUATED IN SECTIONS 3 & 4, T-6 R-5, NOTTINGHAM TOWNSHIP, SECTION 32, T-10 R-5, WAYNE TOWNSHIP, BELMONT COUNTY, OHIO.

LOCATED ON THE HUNTER 7 1/2 MINUTE QUADRANGLE MAP.

SCALE: 1" = 2000'

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 16**
**(NEGATIVE DETERMINATION OF PRIME FARMLAND)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the applicant is demonstrating that the permit area or a portion of the permit area is not prime farmland. Check ( ) the appropriate item numbers and attach the documents used to make the demonstration.

**SEE VALID EXISTING RIGHTS STATEMENT DESCRIBED BELOW**

_____ 1. Lands within the proposed permit area have not been historically used for cropland.

_____ 2. The slope of the land within the proposed area is greater than eight percent.

_____ 3. On the basis of a second order soil survey meeting the standards of the National Cooperative Soil Survey, there are no soil map units within the proposed permit area that have been designated prime farmland by the U.S. Soil Conservation Service.

_____ 4. On the basis of a first order soil survey commissioned by the applicant and meeting the standard of the National Cooperative Soil Survey, there were found to be no prime farmland map units as designated by the S.C.S. within the proposed permit area (See Attachment 15, item 2 for 1st order survey criteria).

**Attached form OH-CPA-65 completed by James Forshey, District conservationist for Belmont County Natural Resources Conservation Service has found this area to contain a prime farmland soil unit. As previously stated in the approved 12 Ac. IBR for D-0425, American energy Corporation claims valid existing rights based on deeds executed in 1966 and 1967, which include mining and surface rights. Therefore, American Energy Corporation, under Section 1501:13-4-12 (F)(1) of the Ohio Revised Code, is exempt from the Prime Farmland regulation. See approved 12 Acre IBR for deed and mining rights for parcels No 70 (2-5-44), No. 27 5th tract (2-13-41), No. 27 1st & 2nd tracts (2-13-63 & 2-13-64).**

U.S. Department of Agriculture
Natural Resources Conservation Service

OH-CPA-65
Rev. 9/94

NOV 28 2001

**Certification of Prime/Nonprime Farmland**

Name of Mine Operator American Energy Corporation

Location of Permit Application Area Sections 3, 4, + 9, T-6, R-5 Wayne Twp.

Size of Permit Area (Acres) 160 ac

**Check Appropriate Block:**

1. ☐ I have determined that this permit application DOES NOT contain prime farmland in accordance with the edition of the current county Prime Farmland Map Unit List found in the county Field Office Technical Guide.

2. ☒ I have found that this permit application CONTAINS prime farmland in accordance with the edition of the Prime Farmland Map Units for Ohio and/or the current county Prime Farmland Map Unit List, whichever is more current.

A soil map has been attached and prime units are as follows:

| Soil Map Symbol | Map Unit Name |
|---|---|
| WhB | Wellston silt loam 3 to 8% slopes |
| WkB | Westmore silt loam 3 to 8% slopes |
| WmB | Westmoreland silt loam 3 to 8% slopes |
| | |

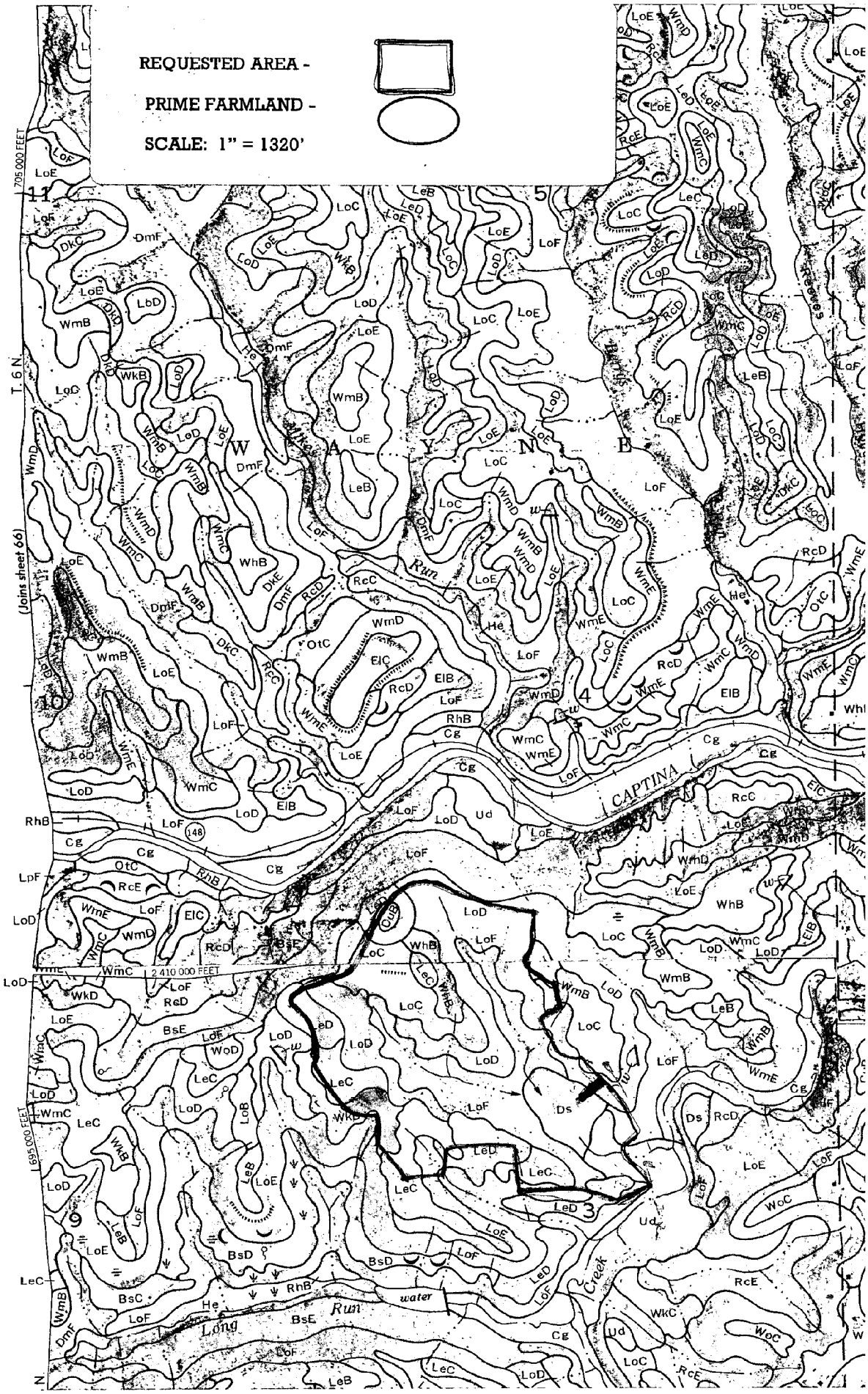
Signature James W. Forshey 11/8/01

**Jim Forshey, Natural Resources Conservation Service**
1119 East Main St., Barnesville, OH 43713, (614) 425-1100

AEC 11355

BELMONT COUNTY, OHIO NO. 67

This map compiled on 1973 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.




Service and cooperating agencies.
tioned.

AEC 11356

## PRIME FARMLAND DESCRIPTION
(Original undisturbed soil profile)

WhB -- Wellston silt loam, 3 to 8 percent slopes.

This soil has a brown friable silt loam surface layer (A Horizon) about 7 inches thick. The subsoil (B Horizon) is about 40 inches thick. The upper 20 inches is brown, friable silt loam. The lower 20 inches is yellowish brown and strong brown firm loam. Weathered siltstone bedrock is about 59 inches.

Hay Yield 4.3 T/Ac

## PRIME FARMLAND DESCRIPTION
(Original undisturbed soil profile)

WkB -- Westmore silt loam, 3 to 8 percent slopes.

This soil has brown, friable silt loam surface layer (A Horizon) about 8 inches thick. The subsoil (B Horizon) is about 33 inches thick. The upper 17 inches is yellowish brown, friable silt loam and silty clay loam. The lower 16 inches is olive brown, mottled, firm clay. Weathered shale bedrock is at about 50 inches.

Hay Yield 4.9 T/Ac

## PRIME FARMLAND DESCRIPTION
(Original undisturbed soil profile)

WmB-- Westmoreland silt loam, 3 to 8 percent slopes.

This soil has a brown, friable silt loam surface layer (A Horizon) about 8 inches thick. The subsoil (B Horizon) is about 27 inches thick. The upper 20 inches is brown and dark yellowish brown, friable silt loam and firm clay loam. The lower 7 inches is yellowish brown, firm channery clay loam.

Hay Yield 4.2 T/Ac

PART 3 RECLAMATION AND OPERATIONS PLANS

A. GENERAL REQUIREMENTS-**Permit Area** (Item A. (1) and A. (2)-**Permit and Underground Workings)**

(1) Submit an addendum describing the type and method of coal mining procedures for this application. Explain how these procedures will maximize the use and conservation of the coal resources.

**THE PROPOSED ADJACENT AREA WILL BE UTILIZED FOR COAL REFUSE DISPOSAL. SINCE THE MAJORITY OF THE COAL MUST BE CLEANED PRIOR TO BURNING BY AN ELECTRIC POWER PLANT FACILITY, THIS PROCEDURE WILL MAXIMIZE THE USE OF COAL RESOURCES BY PROVIDING DISPOSAL AREA FOR REFUSE FROM THE PREPARATION PLANT. THIS OPERATION DOES NOT APPLY TO CONSERVATION OF THE COAL RESOURCES. ALSO, SEE ADDENDUM TO PART 3, PAGE 21, ITEM A(1).**

**N/A**(2) Indicate the anticipated annual and total production of coal from this proposed operation.

Annual _____ Total _____

**N/A**(3) Will this operation be combined with surface coal mining activities to the extent that contemporaneous reclamation of areas disturbed by surface mining will be delayed or such that the underground workings will be within 500 feet of the surface mining activities? _____ Yes, _____ No. If "yes," submit Attachment 30.

**N/A**(4) Are experimental mining practices to be employed in the proposed mining operations? _____ Yes, _____ No. If "yes," submit as an addendum to the permit application, the description, maps, and plans required by paragraph (B) of rule 1501:13-4-12 of the Administrative Code.

**N/A**(5) Are mountaintop removal mining practices to be employed in the proposed mining operations? _____ Yes, _____ No. If "yes," submit as an addendum to the permit application the information required by paragraph (C) of rule 1501:13-4-12 of the Administrative Code.

**N/A**(6) Are the natural pre-mining slopes within the permit area in excess of twenty (20) degrees? _____ Yes, _____ No. If "yes," submit an addendum demonstrating compliance with the steep slope mining provisions of paragraph (D) of rule 1501:13-4-12 and 1501:13-13-05 of the Administrative Code.

**N/A**(7) Is augering proposed within the permit area? _____ Yes, _____ No. If "yes," submit Attachment 18.

**N/A**(8) Are variances from approximate original contour to be employed for the proposed underground mining surface operations? _____ Yes, _____ No. If "yes," submit an addendum to the permit application demonstrating compliance with paragraph (E) and/or (K) of rule 1501:13-4-12 of the Administrative Code.

ADDENDUM TO PART 3, PAGE 21, ITEM A(1)
AMERICAN ENERGY CORPORATION

Project development is as follows:

1. Prior to construction, a sedimentation pond will be constructed downstream of all proposed earthmoving activities. Erosion and sediment will be controlled by placement of haybales or silt fence as appropriate to earthmoving tasks. Diversion ditches will be constructed to direct surface water from the construction area. Fresh water will be diverted away from the site. Ditches within the disturbed area will be directed to sediment ponds. Diversion channels will be seeded or lined with durable riprap as shown in attached plans.

2. The proposed fill site will be cleared and grubbed after the erosion and sedimentation controls have been installed. Vegetation will be chipped or burned. Hardwood trees greater than 14 inches in diameter will be salvaged. An OEPA permit to burn will be obtained by the contractor prior to any burning.

3. Topsoil will be removed from the project area and stockpiled as shown on the Application map. Other soils in the project area, unsuitable for the refuse fill foundation will be removed and either stockpiled or used to construct berms.

4. Groundwater collection drains will be installed in the valley bottom and to point seeps. Details are shown on drawing 11 of attached plans.

5. The projected fill area will be lined with three feet of recompacted clay. Specifications are contained in Appendix IV of the Engineering Report. Installation details are shown on drawing 12 of the attached plans.

6. A leachate collection system will be constructed on the clay liner. Details are shown on drawing 12 of attached plans. All leachate will be directed to Pond 016 for phase 1 development, and later for phase 2 leachate will be directed to Pond 015 and Pond 016. For the remaining phases, Ponds 012, 013 and 014 will be constructed and Pond 016 will be eliminated.

7. Coarse coal refuse will be placed on the clay lined surface. Refuse will be placed in horizontal lifts, two feet thick maximum. Each lift will be compacted by a padfoot compactor, sheepsfoot, or from controlling site traffic, loaded rock trucks (Cat 777's payload 85 tons).

8. The site will be capped upon reaching final fill elevations. Details are shown on drawing 12 of attached plans. Reclamation plans are contained in Section 8 of the Engineering Report.

A. **N/A** (9) Will access to the underground workings be gained through a drift entry? ____ Yes, _____ No. If "yes," provide as an addendum sufficient information to determine the location of the entry relative to the highest elevation of the coal reserve. Is the drift entry located so as to eliminate the potential for a gravity discharge? _____ Yes, _____ No. If "no," the applicant must demonstrate that the coal seam is not acid or iron producing. Provide an analysis of the strata immediately above and below the coal, and the coal seam itself, sufficient to demonstrate that the water quality from the entry will meet effluent limitations without treatment.

**N/A** (10) For entries to underground workings other than drift entries, provide as an addendum sufficient information to determine the location of the entry relative to the coal reserve. Are the entries located so as to eliminate the potential for a gravity discharge? _____ Yes, _____ No. If "no," provide the following demonstration:

(a) the gravity discharge will meet effluent limitations without treatment, or

(b) the water will be treated to meet effluent limitations and provisions will be made for consistent maintenance of the treatment facility throughout the anticipated period of gravity discharge.

**N/A** (11) Will the permanent entry seals be designed to withstand the maximum anticipated hydraulic head when the operations are abandoned? _____ Yes, _____ No. If "yes," submit the appropriate information demonstrating that this will be accomplished. If "no," provide a typical plan for the seals to be used to close the mine entries pursuant to applicable state and federal regulations.

(12) Submit an addendum describing the construction, modification, maintenance, and removal (unless to be retained for postmining land use), including the proposed engineering techniques and major equipment to be used, of the following facilities:

(a) dams, embankments, and other impoundments. Do any of the plans for water, sediment, or slurry impoundments meet the requirements of 30 CFR 77.216? _____ Yes, __X__ No. If "Yes," submit as an addendum a plan that addresses each of the requirements in 30 CFR 77.216-2.

(b) overburden and topsoil handling and storage areas and structures.

**SEE ADDENDUM TO PART 3, PAGE 22, ITEM A(12)(a)**

**ALSO SEE ATTACHMENT 28 FOR HANDLING OF MATERIALS TO BE USED FOR THE LINER AND FINAL COVER**

ADDENDUM TO PART 3, PAGE 22, ITEM A(12)(a)

AMERICAN ENERGY CORPORATION

(a) The sediment ponds will be constructed in accordance with the Attachment 20's contained in this permit application using current and prudent engineering practices and shall be certified as such. If the need for field adjustments should arise during construction an "as built" Attachment 20 will be submitted with the certification. Foundation areas will be cleared of all vegetative and organic materials. A core trench will be installed to ensure stability of the embankment. Immediately after construction has been completed the embankment will be seeded and mulched. The sediment ponds will be inspected at least quarterly and maintenance provided when needed. The sediment ponds will be cleaned out when sediment accumulation reaches 60% of design capacity. The sediment ponds will be removed at the appropriate times after revegetation of the affected area. The pond areas will be reclaimed in accordance with procedures outlined in the Addendum to Part 3, Page 24, Item D.

A. (12) (c) coal removal, handling, storage, cleaning, and transportation areas and structures; including, but not limited to, preparation plants, beltlines, tipples, rail sidings, and primary roads. For roads, conveyors and rail systems, submit an addendum describing the information required pursuant to paragraph (L) of rule 1501:13-4-14 and 1501:13-10-01 of the Administrative Code.

(d) spoil removal, handling, storage, transportation, and disposal areas and structures, including underground development waste or excess spoil disposal sites. If underground development waste or excess spoil is to be generated, submit an addendum describing the information required by paragraphs (O) and (P) of rule 1501:13-4-14 and 1501:13-9-07 of the Administrative Code.

(e) mine facilities such as portal/shaft development, boreholes, de-gas holes, vents, office or shop buildings and maintenance facilities.

(f) water and air pollution control facilities.

(13) Provide an estimate of the cost per acre to reclaim the permit area. ___$2500____

(14) Will the proposed operation include any of the following:

(a) disposal of coal mine waste from a wash plant, tipple or other source? __X__ Yes, _____ No. If "yes," submit Attachment 28 and, if applicable, the information required by paragraph (H) of rule 1501:13-4-14 of the Administrative Code.
**SEE ATTACHMENT 28 IN ENGINEERS REPORT**

(b) disposal of fly ash or other noncoal wastes? _____ Yes, __X__ No. If "yes," submit an addendum which addresses the disposal material and a detailed disposal plan, pursuant to paragraph (E) of rule 1501:13-9-09 of the Administrative Code.

(c) return of slurry or other mine waste or material into the abandoned underground workings? _____ Yes, __X__ 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. EXISTING STRUCTURES-**Permit Area**

(1) Are any existing structures proposed to be used in connection with or to facilitate the coal mining and reclamation operation? _____ Yes, __X__ No. If "yes," submit as an addendum to the permit application a description of each structure. The description shall include the information required by paragraph (B)(1) of rule 1501:13-4-14 of the Administrative Code.

B. (2) Are any existing structures proposed to be modified or reconstructed for use in connection with or to facilitate the coal mining and reclamation operation? _____ Yes, _____ No. If "yes," submit as an addendum to the permit application, a compliance plan for each structure. The plan shall include the information required by paragraph (B) (2) of rule 1501:13-4-14 of the Administrative Code.

C. BLASTING-**Permit Area**

Will blasting occur within 25 feet of the surface during shaft and portal development or other on-site development? _____ Yes, _____ No. If "yes," submit Attachment 29.

D. RECLAMATION PLAN - GENERAL REQUIREMENTS-**Permit Area** (Item D.12)-**Permit, Shadow, and Adjacent Area)**

(1) Provide a detailed timetable for the completion of backfilling and grading for each mining year.

**SEE ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a)**

(2) Provide a detailed timetable for the completion of resoiling for each mining year.

**SEE ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a)**

(3) Provide a detailed timetable for the completion of planting for each mining year.

**SEE ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a)**

(4) Describe the plan for backfilling, compacting and grading of the disturbed permit area, including the disposal of all mine generated debris.

**SEE ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a) AND DRAWING 6**

(5) Submit an addendum describing the plan for the removal, storage, redistribution and stabilization of topsoil, subsoil, or approved alternative resoiling material to meet the requirements of rule 1501:13-9-03 of the Administrative Code. If an alternative resoiling material is to be used, submit Attachment 19.

**SEE ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a)**

(6) Provide the following information for the revegetation plan:

(a) Schedule for revegetation to include planting of temporary vegetation.

**SEE ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a)**

ADDENDUM TO PART 3, PAGE 24, ITEM D(1 - 6a)
AMERICAN ENERGY CORPORATION

**D(1)** This is a proposed coal refuse disposal site. Grading will be done contemporaneously with raising the fill structure. This facility is designed to accommodate coarse coal refuse through the year 2016, possibly longer. Coarse coal refuse will be placed in horizontal lifts, two feet thick maximum. Each lift will be compacted. The site will be constructed in stages to elevations and grades shown in the Engineering Report, Section 7. Each stage takes an average of two years to complete. The site design capacity is 15 million cubic yards. Site life is 10 to 15 years depending on actual material density.

**D(2)** Resoiling will begin as soon as possible, or within 60 days, for areas filled to final design elevations. The resoiling operation, in ascending order over the refuse surface, consists of two feet of re-compacted clay, eighteen inches in inert earthen fill, and six inches of soil suitable for supporting vegetative growth. These operations are consistent with good agricultural practice for soil handling and favorable planting conditions. Resoiling will be completed prior to the next appropriate planting season, or within 180 days, for areas filled to final design elevation. Also see Engineers Report, Section 7.

**D(3)** Planting will be completed on each area filled to final design capacity, following resoiling, during the first appropriate period for favorable planting conditions after final preparation. Planting on each area will be done in a timely manner after resoiling is completed, considering weather conditions. See Engineers Report, Section 7.

NOTE: An exact timetable for a project of this type is extremely hard to detail, and therefore, not actually appropriate.

**D(4)** Coarse coal refuse will be placed in horizontal lifts, two feet thick maximum. Each lift will be compacted using a padfoot or sheepsfoot compactor, or from controlling traffic of on-site loaded trucks and other equipment. The site will be constructed to elevations and grades as shown on the attached engineering plan. The maximum grade of side slopes will be 33% (3H:1V). The top or plateau section will be crowned with a 2% slope to promote surface drainage. See Drawing 5.

Soil stabilization will be accomplished through grade control, proper drainage and prompt revegetation.

The site will be used only for the disposal of coarse coal refuse. This includes earthen materials or waste rock from mining operations such as claystone, shale, sandstone, limestone, and carbonaceous strata. Materials subject to decay or rust such as organics and metals shall not be placed in the fill.

**D(5)** Topsoil and subsoil in the proposed fill site will be removed, stockpiled, seeded and mulched. Stockpile areas will be located within the permit area. These areas will not be affected by excessive water, wind erosion, unnecessary compaction, or contamination. Wind and water erosion will be mitigated by use of a quick growing annual or perennial vegetation. Seeding will be done in a timely manner when weather conditions are favorable.

All topsoil will be redistributed. This will be achieved by hauling or pushing it from the storage areas. A uniform thickness of six inches will be distributed. Excessive compaction will be prevented by not redistributing excessively wet soils, and limiting equipment tracking.

**D(6)a)** Temporary vegetation will be planted immediately after resoiling and permanent vegetation will be planted no later than the next appropriate planting season following resoiling.

D. (6) (b) List the species and amounts per acre of seeds and seedlings to be used.

(c) Describe the methods to be used in planting and seeding.

(d) Describe the mulching techniques.

**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(6b - 7)**

(7) Describe the soil testing plan for evaluation of the results of topsoil handling and reclamation procedures related to revegetation.

**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(6b - 7)**

(8) Submit an addendum describing the measures to be employed to handle and place acid or toxic-forming materials in accordance with paragraph (J) of rule 1501:13-9-04, and paragraph(J) of rule 1501:13-9-14 of the Administrative Code.

**HANDLING AND PLACEMENT OF ACID OR TOXIC FORMING MATERIALS WILL TAKE PLACE WITHIN THE PROPOSED REFUSE DISPOSAL SITE.**

(9) Describe the measures, including appropriate cross-sections and maps, to be used to plug, case or manage mine openings or bore holes other than those entries utilized to gain access to the underground workings, pursuant to rule 1501:13-9-02 of the Administrative Code. **SEE HYDROGEOLOGIC INVESTIGATION, PAGE 19, ITEM 6.1.1.4 FOR CLOSURE OF MONITORING WELLS. ANY EXPLORATION HOLES, BORE HOLES, AND OTHER OPENINGS ENCOUNTERED WILL BE SEALED WITH IMPERIOUS MATERIAL.**

(10) Is the reclamation plan consistent with local physical, environmental, and climatological conditions?
__X__ Yes, _____ No.

(11) Identify any other applicable air and water quality laws and regulations and health and safety standards and describe the steps to be taken to comply with each.

**APPROPRIATE STEPS HAVE BEEN TAKEN TO COMPLY WITH MSHA, CHAPTER 1521 O.R.C., AND STATE AND FEDERAL EPA REGULATIONS. ISSUANCE OF THE MODIFICATION OF THE N.P.D.E.S. PERMIT IS EMINENT. THE 401 CERTIFICATION WAS ISSUED SEPTEMBER 13, 2002.**

(12) Submit an addendum describing 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 and achieving enhancement of such resources where practical for the permit, shadow, and adjacent areas.
**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(12)**

ADDENDUM TO PART 3, PAGE 25, ITEM D(6b-7)
AMERICAN ENERGY CORPORATION

**D(6)b)** Temporary cover will consists of a combination mixture of rye/oats and/or wheat at an application rate of two bushels per acre.

Permanent Vegetation will consists of the following:

8 pounds/acre Orchard Grass
7 pounds/acre Birdsfoot Trefoil
4 pounds/acre Timothy
10 pounds/acre Red Clover

**D(6)c)** Upon resoiling, the area will be disced, swept, rocks removed, redisced and grain drilled.

**D(6)d)** Areas will be mulched with hay or straw at the rate of 2 tons per acre with a mulching machine or manually.

**D(7)** The soil testing plan consists of collecting representative samples by probing the resoiled area to achieve composite samples and thickness. Soil samples will be tested by an approved lab to determine lime and fertilizer recommendations for grass-legume establishment.

ADDENDUM TO PART 3, PAGE 25,
ITEM D(11), AMERICAN ENERGY CORP.

**OhioEPA**
State of Ohio Environmental Protection Agency

STREET ADDRESS:
Lazarus Government Center
122 S. Front Street
Columbus, OH 43215-1099

TELE: (614) 644-3020 FAX: (614) 644-2329

MAILING ADDRESS:
P.O. Box 1049
Columbus, OH 43216-1049

OHIO E.P.A.
SEP 13 2002
ENTERED DIRECTOR'S JOURNAL

**Certified Mail**

September 13, 2002

American Energy Corporation
Attn: Robert D. Moore, President
43521 Mayhugh Hill Road
Township Highway 88
Beallsville, Ohio 43716

I certify this to be a true and accurate copy of the official document as filed in the records of the Ohio Environmental Protection Agency
By: Zona L Clements Date 9/13/02

Re: Belmont County / Wayne Township
Grant of Section 401 Water Quality Certification (Preferred Design Alternative)
Project to expand an existing valley fill coarse coal refuse disposal facility
Ohio EPA ID No.020724

Ladies and Gentlemen:

The Director of Ohio Environmental Protection Agency hereby authorizes the above referenced project under one or both of the following authorities.

Section 401 Water Quality Certification
Pursuant to Section 401 of the Federal Water Pollution Control Act, Public Law 95-217, the Director of Ohio Environmental Protection Agency hereby certifies that the above-referenced project will comply with the applicable provisions of Sections 301, 302, 303, 306, and 307 of the Federal Water Pollution Control Act.

Ohio Isolated Wetland Permit
Pursuant to Ohio Revised Code Chapter 6111 and Ohio Administrative Code Chapter 3745-1, and other applicable provisions of state law, the Director of Ohio Environmental Protection Agency hereby concludes that the above-referenced project will comply with the applicable provisions of Sections 6111.03 and 6111.04 of the Ohio Revised Code.

This authorization is specifically limited to a Section 401 Water Quality Certification and/or Ohio Isolated Wetlands permit with respect to water pollution and does not relieve the applicant of further certifications or Permits as may be necessary under the law. I have determined that a lowering of water quality in the Piney Creek watershed (05030106) as authorized by this certification/Ohio Isolated Wetlands Permit is necessary. I have made this determination based upon the consideration of all public comments, and including the technical, social, and economic considerations concerning this application and its impact on waters of the state.

I. **Conditions**

This Section 401 Water Quality Certification pertains to the Preferred Alternative, and is issued subject to the following modifications and/or conditions:

A. The work shall take place during low flow conditions in order to minimize adverse impacts to water quality away from the project site.

B. Fill used in this project shall consist of suitable material free from toxic contaminants in other than trace quantities.

C. Steps shall be taken during construction to minimize bank erosion.

D. Steps shall be taken upon completion of this project, to ensure bank stability. This may include but is not limited to, the placement of riprap or bank seeding.

E. Equipment shall be installed at the facility to eliminate the possibility of spills and control dust that may enter the waterway by runoff or point discharge.

F. Any damages to the immediate environment of the project by equipment needed for construction or hauling will be repaired immediately.

G. Within 60 days of the issuance date of this certification/permit, American Energy Corporation's submittal of an acceptable, notarized, recorded, and filed conservation easement with an acceptable 501(c)(3) organization. One 30-day extension will be allowed, if requested in writing prior to the deadline. The conservation easement shall protect, in perpetuity,

Piney Creek South - 1970 feet,
Piney Creek North - 2513 feet,
Unnamed Stream C- 1690 feet,
Unnamed Stream D- 1710 feet,
Unnamed Stream E- 610 feet,
Long Run - 2678 feet,
Wetland A- 2.66 acres

No fill may be placed in the streams or wetlands until the terms of this condition are met.

## II. Impacts

A. Streams- 7,161 linear feet of intermittent stream and 2,002 linear feet of ephemeral stream

B. Wetlands- 1.8 acres

## III. Mitigation

A. Streams-

1. Preservation of 6,688 ft, comprised of 2,678 feet of Long Run (Exceptional Warmwater Habitat), 1,710 feet of unnamed Stream D, 1,690 feet of unnamed Stream C, and 610 feet of Stream E, via conservation easement.

2. Enhancement to 4,483 feet of Piney Creek, comprised of 1,970 ft south of site and 2,513 feet north of site, via planting of trees and shrubs in the riparian zone, per page M2 of the applicants mitigation plan and drawing 20.

B. Wetlands- Creation and preservation via conservation easement of 2.66 acres of wetland. The wetland shall be created from the existing abandoned freshwater pond, by the lowering of the dam and planting of wetland vegetation.

C. Buffers - The site will be graded to provide more gentle slopes to reduce the amount of siltation reaching the wetland. The 50 ft wide perimeter buffer will be planted with hardwoods, conifers and grasses, according to the Wetland Construction Drawing #20.

## IV. Monitoring

A. Streams - QHEI's should be performed annually on each of the 6 reaches under conservation easement, with the goal of improving the existing QHEI of each reach, at the end of 5 years.

B. Wetlands- Per the applicant's monitoring plan (pages M8, M10)

C. Reporting Requirements- Annual water quality, hydrology, soils, and vegetation surveys shall be conducted. A report containing these data shall be submitted to Ohio EPA for each of five consecutive years following completion of wetland and stream mitigation construction. The first annual report is due to Ohio EPA by December 31 of the full year following completion of mitigation construction. All subsequent reports shall be submitted by December 31st of each of the five monitoring years.

V. **Mitigation Performance Criteria**

A. Streams- Piney Creek South - QHEI > 59
Piney Creek North - QHEI > 59
Unnamed Stream C- QHEI > 45
Unnamed Stream D- QHEI > 66.5
Unnamed Stream E- QHEI > 54.5
Long Run - QHEI > 78

B. Wetlands- 2.66 acres of category 2 or 3 non-forested wetland.

VI. **Timing of Mitigation** - No fill may be placed in the streams or wetlands until the terms of condition I.G. are met.

VII. **Notifications to Ohio EPA** - The applicant shall inform Ohio EPA by letter providing the date of completion of the wetland and stream mitigation. The shall reference the following information: American Energy Corp
Century Mine Project
Ohio EPA ID# 020724

VIII. **Third-Year Site Review** - The applicant shall arrange an on-site mitigation meeting with Ohio EPA during the growing season after the third year report has been submitted. The purpose of this inspection is to determine if the mitigation project has been constructed in accordance with the agreement between the applicant and Ohio EPA.

IX. **Contingency Plans** - If the wetland mitigation site is not performing as proposed by the end of the fifth year of post construction monitoring, the monitoring period may be extended and or the applicant may be required to revise the existing mitigation site or seek out new or additional wetland mitigation areas. The contingency plan supplied by the applicant is approved, except for the proposed use of riprap to stabilize bank erosion.

If necessary, Ohio EPA may make recommendations to improve the wetland. The applicant is responsible for undertaking any reasonable modifications identified by Ohio EPA.

Within five (5) years after completion of construction of the mitigation wetlands dedicated for the Century Mine project, the applicant shall have developed a minimum of 2.66 acres of jurisdictional Category 2 and/or 3 non forested wetlands.

**Monitoring Criteria:**

The reports shall contain, at a minimum, the following information:

**As-built Drawings:** An 8.5 by 11 inch as-built drawing of the mitigation wetland (first year only).

**Water Chemistry Monitoring:** A grab sample shall be collected in May of each monitoring year in each wetland mitigation area. The samples shall be analyzed for ammonia, nitrates, nitrite, carbon, total sulfates, total iron, total manganese, specific conductivity, pH, turbidity, total suspended solids, heavy metals and biochemical oxygen demand.

**Hydrology Monitoring:** Water level data shall be collected in May and late August of each monitoring year. Ground water levels shall be measured in the absence of inundated conditions.

**Soils Monitoring:** A minimum of one soil probe or test pit per acre of mitigated wetland shall be collected. Describe the soil profile and hydric soil indicators. Indicate the soil map unit name (soil series and phase) and the taxonomic subgroup.

**Vegetation Monitoring:** The location and name of each plant community type within the mitigation area and buffer area shall be marked on a scaled drawing or scaled aerial photograph (base map) and named.

A representative observation point shall be selected in each plant community type in each distinct wetland mitigation area. This shall be a point which best represents the characteristics of the entire plant community. The observation points shall be marked on the base map.

The dominant plant species shall be visually determined in each vegetation layer of each community type, and the scientific names of these species shall be included in the report. Dominant species are those species which have the greatest relative basal area (woody overstory), greatest height (woody overstory), greatest percentage of aerial coverage (herbaceous understory), and/or greatest number of stems (woody vines).

The applicant shall conduct delineation of the restored mitigation wetland during the growing season of the fifth year after completion of construction of the mitigation wetlands using the United States Army Corps of Engineers 1987 Wetland Delineation Manual (or successor document).

**Miscellaneous**
The applicant is responsible for ensuring that the wetland is not filled, drained, or otherwise converted to upland. If the property is sold, the deed shall ensure that the wetland will not be filled, drained, or otherwise converted to upland.

You are hereby notified that this action of the Director is final and may be appealed to the Environmental Review Appeals Commission pursuant to Section 3745.04 of the Ohio Revised Code by any person who was a party to this proceeding. The appeal must be in writing and set forth the action complained of and the grounds upon which the appeal is based. It must be filed with the Environmental Review Appeals Commission within thirty (30) days after the notice of the Director's action. A copy of the appeal must be served on the Director of the Ohio Environmental Protection Agency and the Environmental Enforcement Section of the Office of the Attorney General within three (3) days of the filing with the Commission. An appeal may be filed with the Environmental Review Appeals Commission, 236 East Town Street, Room 300, Columbus, Ohio 43266-0557.

Sincerely,

Christopher Jones
Director

cc: Scott Hans, U.S. Army Corps of Engineers, Pittsburgh District
Mary Knapp, U.S. Fish & Wildlife Service
Scott Stiteler, ODNR
Kevin Pierard, U.S. EPA, Region 5
L. Fay, OEPA, DSW
M. Kuklis, OEPA, SEDO
401 file

ADDENDUM TO PART 2, PAGE 25, ITEM D(12)
AMERICAN ENERGY CORPORATION

D(12) The adverse impacts from the proposed refuse operation on wildlife and related environmental values should be minimized by disturbing the smallest area practical in advance of fill placement, and by minimizing the time between removal of vegetative cover and replanting of the reclaimed area. Fish do not exist within the proposed fill area because of intermittent flows.

The construction of sediment ponds and the creation of temporary brush piles throughout the refuse fill process will provide temporary habitat for wildlife and aquatic life. The portion of Piney Creek downstream of the project will continue to provide a natural habitat for wildlife while the fill site is operational. Tree lines along the undisturbed sections of the permit area will provide travel lanes and cover for wildlife. Upon final reclamation, the seeded areas will provide a suitable mixture of open areas for food and the natural woods and brushlands for cover to promote the successful return of wildlife to the area. A wetland delineation was performed by Enviro Science, Inc. during June 2001. See attached delineation report.

WILLIAM J. SIPLIVY, P.E., INC.
Geotechnical Engineer

RECEIVED
DEC 1 3 2001
DIVISION OF MINERAL
RESOURCES MANAGEMENT

RECEIVED
OCT 3 2001

22 September 2001

Ms. Amy Holtshouse
Ohio Environmental Protection Agency
Division of Surface Water, 401 Wetlands Section
122 South Front Street
Columbus, Ohio 43216-1049

**Re: Preliminary Considerations for Century Mine Wetlands Mitigation Plan**

Dear Ms. Holtshouse:

Thank you for taking the time last Tuesday to review mitigation requirements associated with the proposed Century mine coarse coal refuse disposal facility, located in Sections 3 and 4, Wayne Township, Belmont County, Ohio.

Attached please find a copy of the Wetlands Verification Report issued by Mr. Scott Hans of the U. S. Army Corps of Engineers, Pittsburgh District. This Report verifies the two target areas in our Wetlands Delineation Investigation contain 1.837 acres of wetlands, in eleven separate areas, and 11,678 lineal feet of intermittent streams and 2,176 lineal feet of ephemeral streams.

Since this initial investigation, area 2, the western-most ravine, is no longer being considered. The following are therefore removed from the project: wetland areas 9, 10 and 11; and stream segments S, T, V, W, X, Y, Z and 1,154 lineal feet (down-gradient section) of stream segment A.

The current project area will affect wetland areas 1 through 8, containing a combined 1.774 acres; and stream segments A through R, containing 7,161 lineal feet of intermittent streams, and 2,002 lineal feet of ephemeral streams. These are summarized on attached Table 1. The Mitigation Plan for an OEPA Section 401 Certification will be based on this acreage and stream length.

Please feel free to call if there any questions.

Sincerely,

William J. Siplivy, P.E., Inc.

William J. Siplivy

William J. Siplivy, P.E., C.P.G.
President

cc: R. Desko

50 Munroe Falls Avenue • Munroe Falls, Ohio 44262 • 330-686-8911 • wjsiplivy@aol.com

D0425-2

**TABLE 1**
**AFFECTED WETLANDS & STREAMS**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**21 SEPTEMBER 2001**

**WETLANDS**

| Area | Category | Acres |
|---|---|---|
| 1 | Modified 2 | 0.353 |
| 2 | Modified 2 | 0.539 |
| 3 | Modified 2 | 0.502 |
| 4 | 2 | 0.043 |
| 5 | 2 | 0.014 |
| 6 | Modified 2 | 0.046 |
| 7 | Modified 2 | 0.206 |
| 8 | 1 | 0.071 |
| **Total** | | **1.774** |

**STREAMS**

| Segment | OHWM Width (ft.) | Type | Length (ft.) | Acres |
|---|---|---|---|---|
| A | 6 | Intermittent | 980 | 0.135 |
| B | 4 | Intermittent | 1,972 | 0.181 |
| C | 4 | Intermittent | 2,350 | 0.216 |
| D | 3 | Intermittent | 488 | 0.034 |
| L | 3 | Intermittent | 295 | 0.020 |
| M | 3 | Intermittent | 475 | 0.033 |
| N | 3 | Intermittent | 246 | 0.017 |
| Q | 3 | Intermittent | 355 | 0.024 |
| **Total** | | | **7,161** | **0.660** |
| E | 2 | Ephemeral | 128 | 0.006 |
| F | 3 | Ephemeral | 413 | 0.028 |
| G | 3 | Ephemeral | 136 | 0.006 |
| H | 3 | Ephemeral | 287 | 0.020 |
| I | 2 | Ephemeral | 178 | 0.008 |
| J | 2 | Ephemeral | 180 | 0.008 |
| K | 2 | Ephemeral | 365 | 0.017 |
| P | 3 | Ephemeral | 194 | 0.013 |
| R | 2 | Ephemeral | 121 | 0.006 |
| **Total** | | | **2,002** | **0.112** |

**SUMMARY**

| | Acres | Stream Length (ft.) |
|---|---|---|
| 1. Wetlands | 1.774 | |
| 2. Streams | | |
| A. Intermittent | | 7,161 |
| B. Ephemeral | | 2,002 |
| **Total** | **1.774** | **9,163** |

D0425-2

AEC 11375

Date: 9-7-01

# Regulatory Report Form

**U.S. Army Corps of Engineers, Pittsburgh District**
**1000 Liberty Avenue**
**Pittsburgh, PA 15222**

**Project Name:** Century Mine Valley Fill RAMS ID# 200101542

Applicant: Century Mine Organization: _____
Address: c/o William J. Sipolivy P.E.
50 Munroe Falls Ave. Munroe, OH 44262
Agent: (wetland) EnviroScience, Inc.

**Site Info:** Township: Warne County: Belmont State: OH
Property Size: 180 Acre
Property Location: South of S.R. 148 + Captina Creek
Waterway: Unnamed Tribs To Piney Creek Mile: _____ Bank: _____

**Authority:**

☐ Section 10 of the Rivers and Harbors Act of 1899 regulates structures and/or work affecting Navigable Waters.

☒ Section 404 of the Clean Water Act regulates the discharge of dredge and/or fill material into all waters of the United States, including wetlands.

**Corps Action:**

☐ **Jurisdictional Determination.** Wetlands and/or other waters are present on the described property. It is recommended that these areas be accurately delineated and compared to development plans prior to any earth disturbances.

☐ **No Jurisdictional Wetlands** or other waters are present on the described property.

☒ **Final Jurisdictional Determination.** The wetland delineation prepared by EnviroScience, dated 21 June 2001, with drawings ~~dated~~ Attached, is acceptable and accurately depicts existing conditions on the property. (Optional, This report indicates 11 wetland areas Totalling 1.837 Acres, Ephemeral Channel - 2,176 ft. Intermittent Channel - 11,678 ft. Stream Acreage 1.295 Acres

☐ **Unauthorized fills** exist on this property. This office should be contacted immediately to resolve this matter.

**Project Description:** Propose site preparation fills for construction of a coal refuse disposal area.

00425-2

AEC 11376

**Basis For Jurisdictional Determination:**

☐ Portions of the project area are located below the ordinary high water mark of waters currently defined as navigable waters of the United States.

☑ The property contains open water areas such as stream channels, man made conveyances, lakes, ponds, rivers etc., defined by ordinary high water marks, and with a connection to navigable or interstate waters.

☑ Wetland conditions were determined by the presence of hydrophytic vegetation, hydric soils, and wetland hydrology, as per methods outlined in the Corps of Engineers wetland delineation manual. Such areas are adjacent to or have a connection to navigable or interstate waters.

☐ Wetlands or other waters have been identified which do not have a direct connection to navigable or interstate waters, however these areas could affect interstate or foreign commerce, through recreational use, industrial usage, migratory birds, and natural resources.

**Projected Permit Requirements based on preliminary proposal:**

☐ The project will likely require an individual Department of the Army Permit. Application required to the Corps.

☐ No permit is required based on drawings dated_____.

☑ The project may qualify for Federal authorization under a Nationwide or Regional General Permit. An Application should be submitted to the Corps for the proposed activity.

☐ The project may qualify for Federal authorization under the PA State Programmatic General Permit. Appropriate application should be made to the County Conservation District or Regional office of Department of Environmental Protection.

Date of Site Visit: 8-17-01 Inspector: Scott Hans

Signature: Scott A. Hans Date: 9-7-01

This determination will remain valid for five years from this date unless new information warrants a revised determination.

Contact Phone No. 412-395-7154

## NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

| Applicant: Century Mine | File Number: 2001015224 | Date: 1-7-01 |
|---|---|---|
| Attached is: | | See Section below |
| | INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission) | A |
| | PROFFERED PERMIT (Standard Permit or Letter of permission) | B |
| | PERMIT DENIAL | C |
| ✓ | APPROVED JURISDICTIONAL DETERMINATION | D |
| | PRELIMINARY JURISDICTIONAL DETERMINATION | E |

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

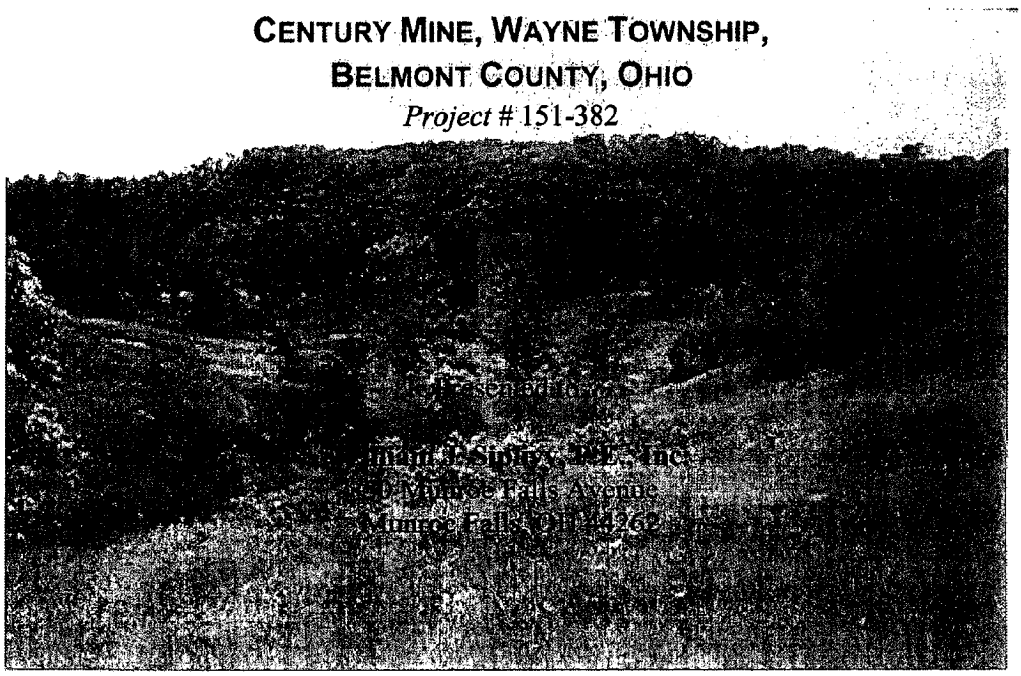
E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

D0425-2

# WETLANDS AND OTHER WATERS DELINEATION REPORT

## CENTURY MINE, WAYNE TOWNSHIP, BELMONT COUNTY, OHIO

*Project* # 151-382



Prepared by:

**EnviroScience, Inc.**, 3781 Darrow Road, Stow, Ohio 44224-4035
(800) 940-4025 • www.enviroscienceinc.com

21 June 2001

## STATEMENT OF CERTIFICATION

*The analyses, opinions and conclusions in this report are based entirely on EnviroScience's unbiased, professional judgment. EnviroScience's compensation is not in any way contingent on any action or event resulting from this study. Neither EnviroScience nor any EnviroScience employee has any vested interest in the property examined in this study.*

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## EXECUTIVE SUMMARY

EnviroScience, Inc. performed a delineation of wetlands and other waters on 30 and 31 May 2001 for William J. Siplivy, P.E., Inc. at an approximately 180-acre site in Belmont County, Ohio. The study area is located in Wayne Township, just south of State Route 148 and Captina Creek, and just north of Piney Creek. The study area is presently bordered to the east by mining development, and to the north, south and west by agricultural and undeveloped land.

The study area is comprised of the drainage areas of two intermittent tributaries of Piney Creek, with a majority of the area composed of the northernmost stream basin. Consisting of two smaller tributary hollows which merge into one valley, the central portion of this basin was used as a coal mine several decades ago as evidenced by soil excavation and erosion, early successional growth, and an abandoned coal silo to the southeast. Timber has also been harvested from much of the hardwood forest in the northern and western portions of this drainage basin. The southern drainage basin, considerably smaller, is relatively undisturbed and generally exists as mature forest. Open fields, used as agricultural land for hay cultivation, are located along the northern ridge tops throughout both of the drainage areas. The natural vegetational communities on the property consist of several successional stages from open field in disturbed and agricultural areas to undisturbed mature forest in the southwestern stream valley.

Eleven wetlands accounting for 1.837 acres were delineated. Twenty-one ephemeral and intermittent headwater streams having ordinary high water mark (OHWM) widths of 2-6 ft account for an additional 1.295 acres and 11,618 l.f. of waterway. These wetlands and streams may be under state or federal jurisdiction. No filling or disturbance may occur in areas without obtaining a permit. Please contact the Ohio EPA Division of Surface Water at 614-644-2001 or the USACE Pittsburgh District Office at 412-395-7154 before working in these areas.

## 1.0 INTRODUCTION AND SITE DESCRIPTION

EnviroScience, Inc. performed a delineation of wetlands and other waters on 30 and 31 May 2001 for William J. Siplivy, P.E., Inc. at an approximately 180-acre site in Belmont County, Ohio (Map 1; Appendix A). The study area is located in Wayne Township, just south of State Route 148 and Captina Creek, and just north of Piney Creek (Map 2; Appendix A). The study area is presently bordered to the east by mining development (Photo 1, Appendix B), and to the north, south and west by agricultural and undeveloped land.

The study area is comprised of the drainage areas of two intermittent tributaries of Piney Creek, with a majority of the area composed of the northernmost stream basin. Consisting of two smaller tributary hollows which merge into one valley, the central portion of this basin was used as a coal mine several decades ago as evidenced by soil excavation and erosion (Photo 2, Appendix B), early successional growth (Photo 3, Appendix B), and an abandoned coal silo to the southeast (Photo 4, Appendix B). Timber has also been harvested from much of the hardwood forest in the northern and western portions of this drainage basin (Photos 5 and 6, Appendix B). The southern drainage basin, considerably smaller, is relatively undisturbed and generally exists as mature forest. Open fields, used as agricultural land for hay cultivation, are located along the northern ridge tops throughout both of the drainage areas. The natural vegetational communities on the property consist of several successional stages from open field in disturbed and agricultural areas to undisturbed mature forest in the southwestern stream valley.

The site is located in the Captina Creek drainage basin (hydrologic # 05030106) which drains approximately 180 sq mi of southeastern Ohio. The surveyed area is within the Unglaciated Allegheny Plateau phytogeographic region (Schaffner 1932) and Western Allegheny Plateau Level III and Permian Hills Level IV Ecoregions (Woods et al. 1998) of Ohio. Original vegetation was most likely removed at the time of European settlement for agricultural purposes.

## 2.0 METHODOLOGY

Government agencies regulate coastal and inland waters for commerce, flood control and water quality. These water bodies provide numerous functions and values necessary to protect and sustain our quality of life. Wetlands comprise a significant portion of regulated waters. The U.S. Army Corps of Engineers (USACE) and Environmental Protection Agency (EPA) jointly define wetlands as:

> "Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The remaining deepwater aquatic habitats (open waters) are defined by the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987) as:

> ". . . areas that are permanently inundated at mean annual water depths >6.6 ft or permanently inundated areas ≤6.6 ft in depth that do not support rooted emergent or woody plant species."

The methods used for determining and delineating wetlands and open waters strictly adhere to those found in the *Corps of Engineers Wetlands Delineation Manual* (Environmental Laboratory 1987). Wetland and open water boundaries were determined by the disappearance of one or more of their diagnostic characteristics. Ordinary high water marks (OHWM) define the outermost regulatory boundaries of ephemeral and open waters.

Each sample plot, and the perimeter of each wetland and other water was surveyed and marked in the field with pink and orange flags, respectively. A global positioning system (GPS), accurate to within one meter, was used, in conjunction with aerial photography and topographical maps, for the survey. Computer Aided Design (CAD) software allowed wetlands dimensions to be determined and the site map to be produced.

## 2.1 WETLANDS

### 2.1.1 Determination

Initially, a review of agency resources was performed to give insight as to where potential wetlands and other significant ecological resources may exist. Resources used include some or all of the following:

1. U.S. Geological Survey (USGS) topographical maps;
2. National Wetlands Inventory (NWI) maps;
3. Soil Survey of Belmont County, Ohio (Rubel et al. 1981);
4. Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM);
5. Ohio Department of Natural Resources (ODNR) Natural Heritage data; and
6. Aerial Photographs.

A field inspection of the site was then completed to identify major plant communities and to visually locate potential wetlands. The routine, onsite (Level 2) wetland determination was used to perform the delineation. Wetland communities were classified according to structural categorization given by Cowardin et al. (1979). Mature nonwetland communities, having reached a stable equilibrium were classified according to Anderson (1982) and Gordon (1966, 1969). Disturbed and successional nonwetland communities were classified as one of the categories described in Table 1.

**Table 1. Nonwetland Communities.**

| | Community | Description |
|---|---|---|
| Disturbed | Urban | regularly maintained land; residential; industrial |
| | Agricultural | land used for producing crops or raising livestock; cropland; pastureland |
| | Cleared | disturbed areas devoid of most vegetation from recent clearing, grading or filling |
| Successional | Open Field | herbaceous community without woody vegetation |
| | Old Field | herbaceous community having woody vegetation coverage of <50% |
| | Scrub Thicket | community dominated by woody vegetation <6 m (20 ft) tall |
| | Forest | community dominated by woody vegetation >6 m (20 ft) tall |

Sample plots were established within each natural community and potential wetland. Complete data for each sample plot was collected and recorded on USACE Routine Wetland Determination Data Forms. Vegetation, hydrology and soils were evaluated at each sample plot.

#### 2.1.1.1 Vegetation

To detect the presence or absence of hydrophytic vegetation, four plant strata were evaluated within specific radii of the plot center. Each stratum was ranked by aerial cover in descending order of abundance. Table 1 provides information on each.

**Table 2. Vegetative Strata.**

| Stratum | Definition | Survey Area |
|---|---|---|
| Herbs | herbaceous macrophytes | 3-m (10-ft) radius |
| Shrubs | woody non-climbing plants <6 m (20 ft) tall | 10-m (33-ft) radius |
| Vines | woody climbing plants | 10-m (33-ft) radius |
| Trees | woody non-climbing plants >6 m (20 ft) tall | 10-m (33-ft) radius |

Dominant species were chosen as those which cumulatively totaled in order of abundance, immediately exceed 50% and additionally include any individual species with an abundance of 20% or more. Dominant taxa were identified using recognized local guides: nomenclature follows the *National List of Scientific Plant Names* (1982). All dominant species within each stratum were then assigned an indicator according to Reed (1988) and Tiner et al. (1995). Table 2 summarizes the indicators.

**Table 3. Plant Indicators.**

| Indicator | Category | Definition |
|---|---|---|
| OBL | Obligate Wetland | almost exclusively found in wetlands |
| FACW | Facultative Wetland | most likely found in wetlands |
| FAC | Facultative | equally likely found in wetlands or nonwetlands |
| FACU | Facultative Upland | most likely found in nonwetlands |
| UPL | Obligate Upland | almost exclusively found in nonwetlands |

Additionally, positive (+) and negative (-) symbols used with these indicators signify a higher or lower frequency of occurring in wetlands, respectively. An 'NI' (no indicator) designation represents species where not enough information is available to assign an indicator; an 'NL' (no listing) designation is given to species whose identification was not determined sufficiently enough to assign an indicator.

#### 2.1.1.2 Hydrology

To detect presence or absence of wetland hydrology, surface and subsurface hydrologic indicators were evaluated at the sample plot and throughout the adjacent community. Sources of wetland hydrology include direct precipitation, headwater flooding, backwater flooding, ground water or any combination of these.

#### 2.1.1.3 Soils

The upper horizons of the soil at each sample plot were examined to detect the presence or absence of hydric soils indicators. Soil matrix color and mottle characteristics for each horizon were determined by comparing a moist sample with *EarthColors, Soil Color Book* (Color Communications, Inc. 1997).

### 2.1.2 Categorization

Each wetland system was categorized in accordance with version 5.0 of the Ohio EPA's Ohio Rapid Assessment Method for Wetlands (ORAM) (Mack 2001). Each form consists of a narrative rating and a quantitative rating. The narrative rating requires ODNR Natural Heritage data, and serves to alert the rater of certain qualities that may have an obvious affect on the wetland category. The quantitative rating is based on wetland characteristics such as size, buffers, hydrology, disturbance and habitat. Scores from the quantitative rating produced a wetland category of 1-3, based on Mack (2000).

Category 1 wetlands are considered very low quality and are generally considered not restorable. They represent small emergent wetlands, which often have a predominance of invasive/exotic species. Modified Category 2 wetlands are degraded systems that have potential to be restored, while straight Category 2 are medium quality systems which represent the majority of Ohio's wetlands. Category 3, considered the highest quality, symbolize large, undisturbed, forested wetlands and regionally significant systems.

## 2.2 OTHER WATERS

Other waters includes ephemeral and open waters. These waters are broken down into two morphological divisions: 1) ponds and lakes; and 2) streams and rivers.

### 2.2.1 Ponds and Lakes

Palustrine systems other than wetlands, and lacustrine waters are addressed as ponds and lakes. These non-linear open waters may harbor important aquatic communities such as vegetated shallows (aquatic bed) and mud flats. They are classified according to Cowardin et al. (1979).

### 2.2.2 Streams and Rivers

Riverine systems are linear flowing waters bounded by a channel. Cowardin et al. (1979) divides these system into four groupings, however, for the purpose of this report streams will be placed into three regulatory types, listed below.

| | |
|---|---|
| Ephemeral: | An ephemeral stream only conveys runoff precipitation and meltwater; it is permanently located above the water table and is most often dry. |
| Intermittent: | An intermittent stream is located below the water table for parts of the year, yet it does have dry periods. |
| Perennial: | A perennial stream typically has flowing water throughout the entire year. |

For regulatory purposes it is also important to delineate headwater streams from those below headwater. Generally speaking, this point occurs near the point between intermittent and perennial streams.

## 3.0 AGENCY RESOURCES

### 3.1 USGS TOPOGRAPHICAL MAP

The study area is located on the Hunter quadrangle of the USGS 7.5-minute series, topographical map (Map 3; Appendix A). The landscape generally slopes to the southeast and consists of steep hills and valleys. In the north, the map depicts two branching valleys shown in association with intermittent streams flowing south and east, respectively. These streams converge and flow southeast near the center of the study area creating a larger valley. The southern stream basin, also a deep valley, is depicted flowing southeast into Piney Creek, a perennial stream just south of the study area. Elevations range from 1,220 ft atop the highest knoll in the north to 970 ft in the southeast along Piney Creek.

### 3.2 NWI MAP

The Hunter quadrangle NWI map is shown on Map 4 of Appendix A. The map depicts one pond within the study area. Located in the southeastern portion of the site, it is depicted as a palustrine, open water, intermittently exposed/permanent, excavated (POWZx) system. Three similar ponds are also shown just to the east of the study area. In addition, Piney Creek, which flows northeast along the southern study limits is shown as a riverine, upper perennial, open water, intermittently exposed/permanent (R3OWZ) system. No other wetlands or streams are shown within the study area.

### 3.3 COUNTY SOIL SURVEY

The site is found on Sheets 67 and 75 of the Soil Survey of Belmont County, Ohio (Rubel et al. 1981). See Map 5 in Appendix A. The map depicts two branching intermittent draingeways in

the north; one flows, south and the other east. These streams, each fed by smaller drainageways, converge at a mine dump near the center of the study area, exit the dump to the south and flow east to Piney Creek. In addition, a third intermittent drainageway is depicted to the southwest flowing southeast into Piney Creek. This stream is also fed by a smaller drainageway. Descriptions for all soil types located on the site is in Appendix C.

### 3.4 FIRM

The FIRM of Belmont County, Ohio depicts almost the entire study as area determined to be outside the 500 yr. floodplain. However, a narrow area in the southeast along Piney Creek is, depicted as area which becomes inundated by 100 yr. flood events.

### 3.5 NATURAL HERITAGE DATABASE

The ODNR has no records of rare, endangered, or protected species within the project area (Appendix D). There is record, however, of one *Juglans cinerea* (butternut), a state potentially threatened tree species located just southeast of the study area. In addition, the search also identified Ravens Rock, a privately owned and protected natural area, as being located several hundred feet to the south of the site. No other unique ecological areas, geologic features, breeding or non-breeding animal concentrations, champion trees, forests, or wildlife areas were noted.

## 4.0 RESULTS

Eighteen sample plots were established within seven natural communities. Two of these communities are considered wetlands. Table 4 summarizes the sample plot data.

**Table 4. Sample Plot Results.**

| Sample Plot | Photo(s)* | Community | Hydrophytic Vegetation | Wetlands Hydrology | Hydric Soil | Status |
|---|---|---|---|---|---|---|
| 1 | 7 | open field | | | | nonwetland |
| 2 | 8 | forest | | | | nonwetland |
| 3 | 9 | forest | | | | nonwetland |
| 4 | 10 | palustrine forest (PFO) | ✔ | ✔ | ✔ | wetland |
| 5 | 11 | forest | | | | nonwetland |
| 6 | 12 | shrub thicket | ✔ | | | nonwetland |
| 7 | 13 | palustrine scrub shrub (PSS) | ✔ | ✔ | ✔ | wetland |
| 8 | 14 | old field | | | | nonwetland |
| 9 | - | PFO | ✔ | ✔ | ✔ | wetland |
| 10 | 15 | mixed mesophytic forest | | | | nonwetland |
| 11 | 16 | PFO | ✔ | ✔ | ✔ | wetland |
| 12 | 17 | mixed mesophytic forest | | | | nonwetland |
| 13 | 18 | old field | | | | nonwetland |
| 14 | 19 | shrub thicket | | | | nonwetland |
| 15 | 20 | mixed floodplain forest | | ✔ | ✔ | nonwetland |
| 16 | 21 | mixed floodplain forest | ✔ | | ✔ | nonwetland |
| 17 | 22 | old field | | | | nonwetland |
| 18 | 23 | mixed mesophytic forest | | | | nonwetland |

* photos are located in Appendix B

Each sample plot and the delineated wetlands and other waters are illustrated on Map 6 (Appendix A). The following section describes general conditions found within each wetland community and summarizes relevant information from the data forms, located in Appendix E.

### 4.1 NONWETLANDS

Although selective timbering is evident throughout the study area, much of the central and western portions of the land exist as mature forest with a dense successional understory. The southeastern stream basin, however, does not appear to have been timbered recently, as

evidenced by comparative thinner undergrowth. Common plants seen throughout these forests include *Acer saccharum* (sugar maple, FACU-), *Quercus rubra* (red oak, FACU-), *Prunus serotina* (black cherry, FACU), *Carya cordiformis* (bitternut hickory, FACU+), *Aesculus glabra* (Ohio buckeye, FACU+), *Lindera benzoin* (spicebush, FACW-), *Rosa multiflora* (multiflora rose, FACU), *Parthenocissus quinquefolia* (Virginia creeper, FACU), and *Polystichum acrostichoides* (Christmas fern, FACU-).

Small portions of successional growth also occur in areas previously used for agricultural purposes. Existing as old field and shrub thickets, these areas are dominated by *Crataegus* sp. (hawthorn, NL), *Rhus typhina* (staghorn sumac, UPL), *Rosa multiflora* (multiflora rose, FACU), *Rubus allegheniensis* (Allegheny blackberry, FACU-), *Solidago* sp. (goldenrod, NL), and various grasses.

Lastly, vast areas of open field, located in hayfields and previously mined areas, exist throughout the property. Common plants observed in these areas include *Melilotus officinalis* (yellow sweetclover, FACU-), *Daucus carota* (wild carrot, UPL), *Achillea millefolium* (common yarrow, FACU), and *Poa* sp. (bluegrass, NL).

## 4.2 WETLANDS

Eleven wetlands were identified and delineated within the study area. These were composed of PSS and PFO communities. Each wetland system has been categorized using ORAM v. 5.0; scoring forms are included in Appendix F. Wetland results are given in Table 5 and each community is briefly described in the following sections.

**Table 5. Wetland Results.**

| Wetland | Photo(s)* | Community | Category | Acreage |
|---|---|---|---|---|
| 1 | 24 | PSS | Modified 2 | 0.353 |
| 2 | 13, 25 | PSS | Modified 2 | 0.539 |
| 3 | - | PFO & PSS | Modified 2 | 0.502 |
| 4 | 10 | PFO | 2 | 0.043 |
| 5 | 16 | PFO | 2 | 0.014 |
| 6 | - | PFO | Modified 2 | 0.046 |
| 7 | - | PSS | Modified 2 | 0.206 |
| 8 | - | PSS | 1 | 0.071 |
| 9 | 26 | PFO | 2 | 0.026 |
| 10 | 27 | PSS | 1 | 0.010 |
| 11 | - | PSS | 1 | 0.027 |
| **TOTAL** | | | | **1.837** |

* photos are located in Appendix B

### 4.2.1 Palustrine Scrub Shrub

Sample Plot 7 represents dense shrub communities found along intermittent streams. Appearing somewhat disturbed, these areas were most likely once cleared when the coal mine was in operation. Including Wetlands 1, 2, 7, 8, 11 and portions of Wetland 3, these communities generally consist of *Salix interior* (sandbar willow, OBL), *Carex squarrosa* (squarrose sedge, FACW), and *Carex granularis* (meadow sedge, FACW+). *Typha angustifolia* (narrow-leaved cattail, OBL) and *Cornus amomum* (silky dogwood, FACW) are also common. Wetland 10, although a similar community, is fed by a hillside seep. The soils consist of a low chroma color, and a sulfidic odor was observed. Soils within the community are inundated and/or saturated within the upper 12 in.

### 4.2.2 Palustrine Forested

Sample Plot 9 represents a forested wetland community existing the intermittent streams. Existing under a more well defined canopy, the community includes Wetland 6 and a majority of Wetland 3. Dominant plants within the community include *Salix nigra* (black willow, FACW+), *Platanus*

*occidentalis* (sycamore, FACW-), *Onoclea sensibilis* (sensitive fern, FACW), *Equisetum arvense* (field horsetail, FAC), and *Solidago gigantea* (giant goldenrod, FACW). Dominant hydrophytic plant species comprise 86 % of total dominant plant species. The primary wetland hydrology indicator is saturation within the upper 12 in. of the soil, and low chroma soil colors were observed.

Sample Plots 4 and 11 represent groundwater seep wetlands which include Wetlands 4-5 and 9-10. Existing along the hillsides, these wetlands are relatively small in area. Domininant plants found within the community include *Ulmus americana* (American elm, FACW-), *Fraxinus pennsylvanica* (green ash, FACW), *Lindera benzoin* (spicebush, FACW-), *Acer rubrum* (red maple, FAC), and *Circaea alpina* (small Enchanter's nightshade, FACW). Soils were saturated within the upper 12 in., and low chroma colors were observed.

### 4.3 STREAMS AND RIVERS

Twenty-four ephemeral and intermittent streams were identified and delineated within the study area. The results are depicted in Table 6.

**Table 6. Stream and River Results.**

| Stream | Photo(s)* | OHWM Width | Type | Length (l.f.) | Acreage |
|---|---|---|---|---|---|
| A | 4, 24 | 6 | intermittent | 2,134 | 0.294 |
| B | 6 | 4 | intermittent | 1,972 | 0.181 |
| C | 28 | 4 | intermittent | 2,350 | 0.216 |
| D | 29 | 3 | intermittent | 488 | 0.034 |
| E | - | 2 | ephemeral | 128 | 0.006 |
| F | - | 3 | ephemeral | 413 | 0.028 |
| G | 30 | 3 | ephemeral | 136 | 0.006 |
| H | - | 3 | ephemeral | 287 | 0.020 |
| I | - | 2 | ephemeral | 178 | 0.008 |
| J | - | 2 | ephemeral | 180 | 0.008 |
| K | 31 | 2 | ephemeral | 365 | 0.017 |
| L | 5 | 3 | intermittent | 295 | 0.020 |

| Stream | Photo(s)* | OHWM Width | Type | Length (l.f.) | Acreage |
|---|---|---|---|---|---|
| M | 32 | 3 | intermittent | 475 | 0.033 |
| N | - | 3 | intermittent | 246 | 0.017 |
| P | - | 3 | ephemeral | 194 | 0.013 |
| Q | - | 3 | intermittent | 355 | 0.024 |
| R | - | 2 | ephemeral | 121 | 0.006 |
| S | 33 | 6 | intermittent | 1,646 | 0.227 |
| ✓ T ✓ | - | 4 ephem | intermittent | 296 | 0.027 |
| V | - | 3 | intermittent | 161 | 0.011 |
| ✓ W ✓ | 34 | 3 ephem | intermittent | 491 | 0.034 |
| X | - | 3 | ephemeral | 174 | 0.012 |
| ✓ Y ✓ | 35 | 3 ephem | intermittent | 453 | 0.031 |
| ✓ Z ✓ | - | 3 ephem | ~~intermittent~~ | 316 | 0.022 |
| TOTALS | | | Ephemeral | ~~2,176~~ 2494 | 1.295 |
| | | | Intermittent | ~~11,678~~ 11,362 | |

* photos are located in Appendix B

Streams C-D, L-N, Q, S-T, and V-Z are all fed by hillside seeps, merging to form the larger remaining systems. These systems drain water from the site into Piney Creek (Photo 36, Appendix B), part of the Captina Creek drainage area.

## 5.0 REGULATORY JURISDICTION

These wetlands, deepwater aquatic habitats and other waters may be under the jurisdiction of the Ohio EPA or USACE. No filling or disturbance should occur within these areas without their written permission. Please contact the Ohio EPA Division of Surface Water at 614-644-2001 or the USACE Pittsburgh District Office at 412-395-7154 before working in these areas.

## 6.0 ASSUMPTIONS AND DISCLAIMERS

The constant influence of man on the study area can result in a rapid change of ecological boundaries. Over time, natural succession and changes in hydrology can also affect their

boundaries. Precision of GPS collected data is subject to variation caused by canopy cover, atmospheric interference and satellite configuration. Because slight inaccuracies are possible, all acreages and derived boundaries presented in this report are approximate.

The results and conclusions contained in this report apply to the year and date in which the data were collected. This report is not considered officially valid until it is approved by the USACE. The report is then valid for a period of five years from the date of issue. Refer to USACE Regulatory Guidance Letter # 94-1 (23 May 1994).

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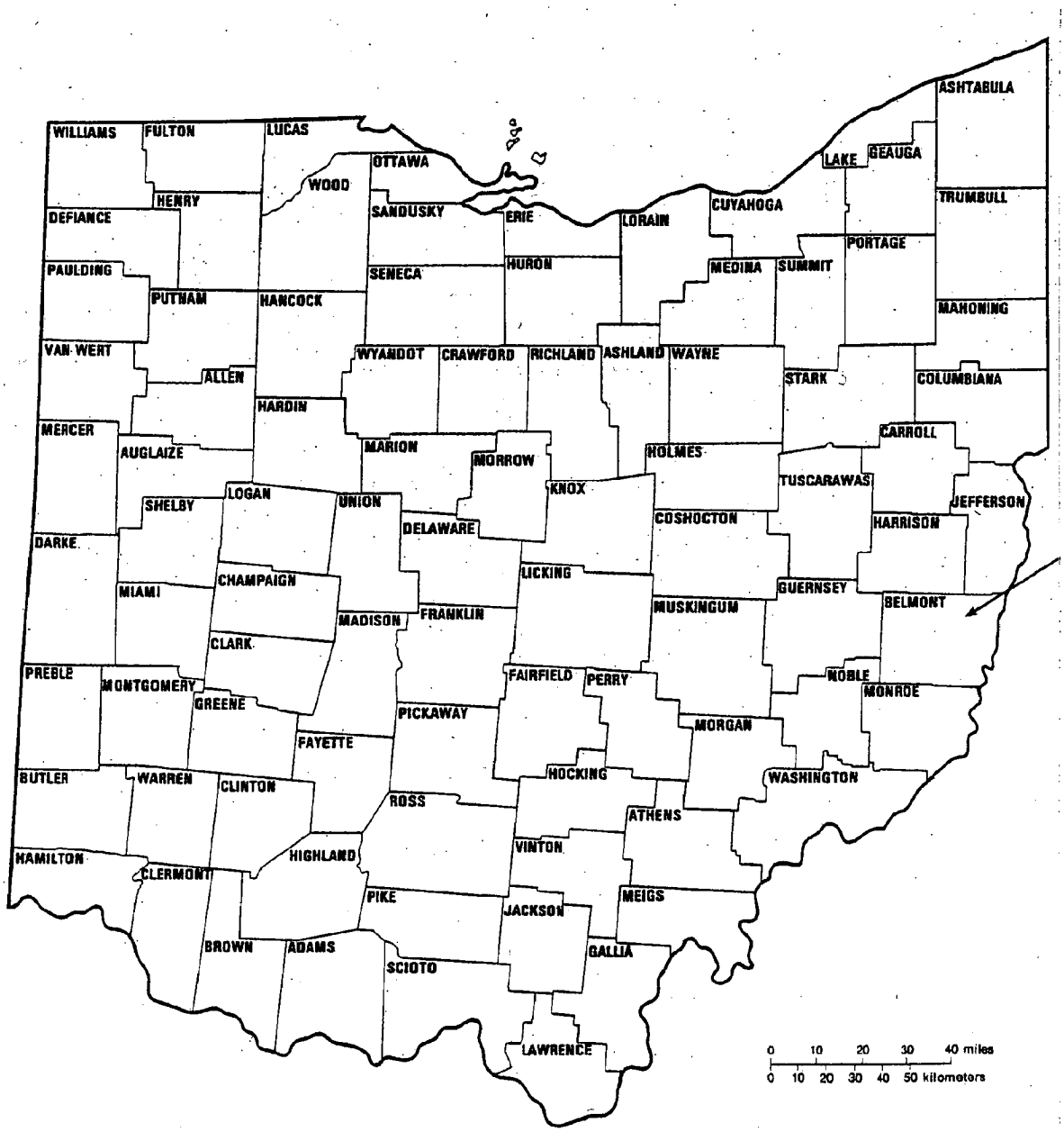
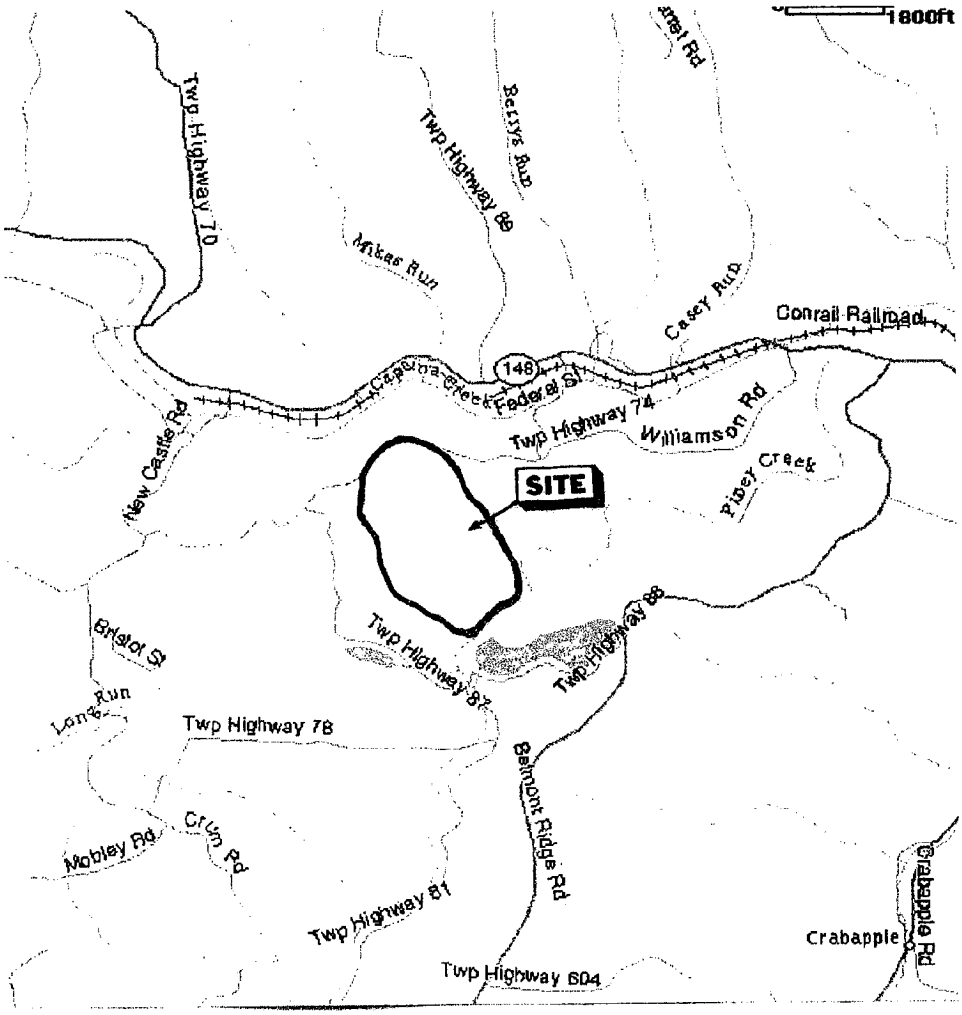
# Appendix A:

# Maps

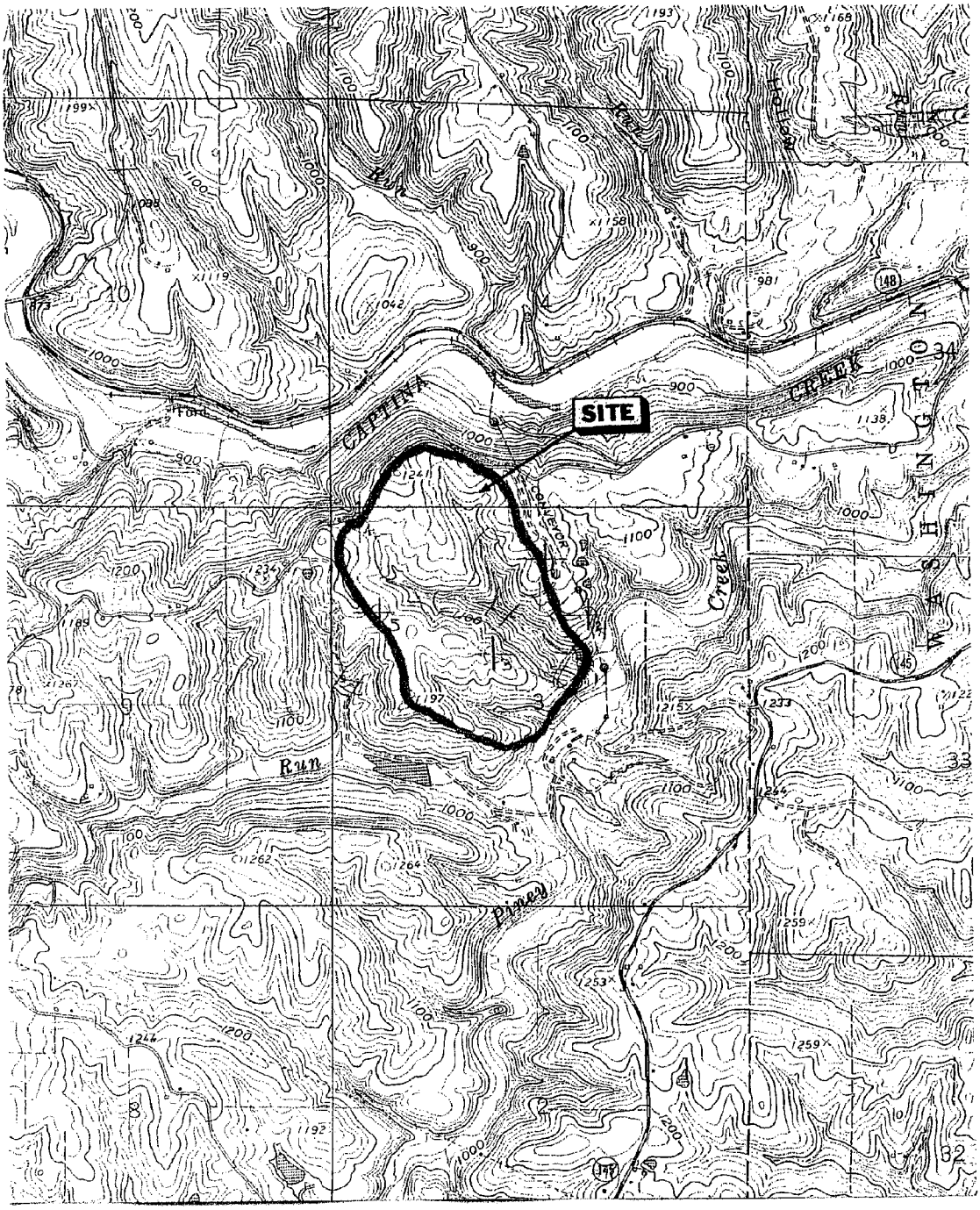
**Map 1. Location of Belmont County, Ohio.**



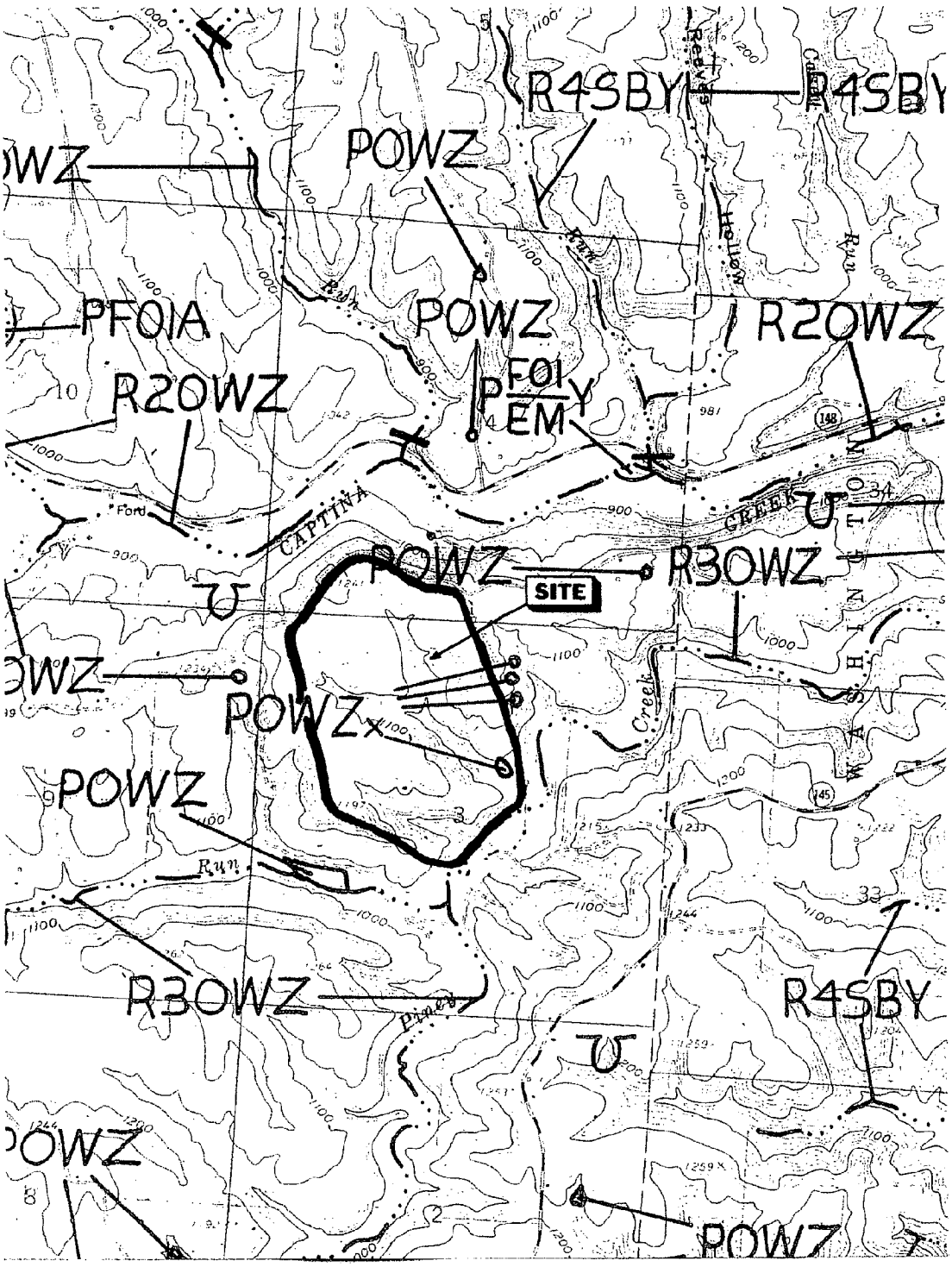
**Map 2. Location of Site on Highway Map of Belmont County, Ohio.**



**Map 3. USGS 7.5-minute Topographical Map of Site (Hunter Quadrangle).**
**(Scale: 1 inch = 2000 feet)**



**Map 4. NWI Map of Site (Hunter Quadrangle).**
**(Scale: 1 inch = 2000 feet)**



**Map 5. From Sheets 67 and 75 of the *Soil Survey of Belmont County, Ohio.***
**(Scale: 1 inch = 1667 feet)**

**Photo 1. Looking southeast at mining activity from Photo Location 1.**

**Photo 2. Looking northeast at soil erosion from PhotoLocation 2 .**

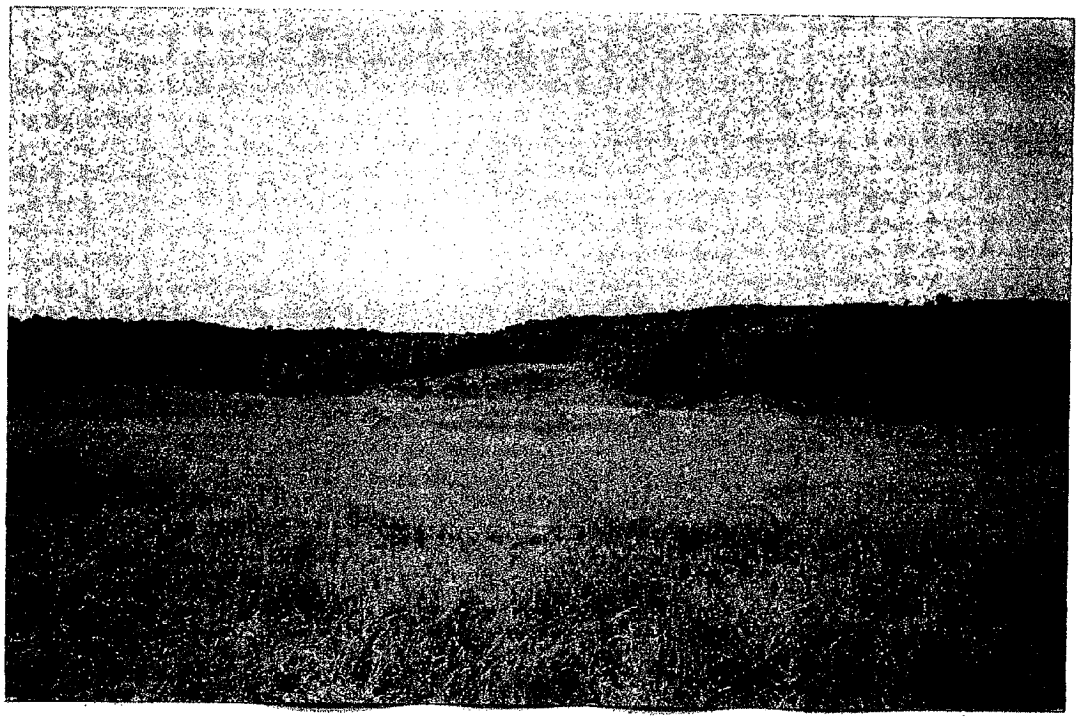


**Photo 3. Looking southwest at vast open field from Photo Location 3.**

**Photo 4. Looking southeast at the abandoned coal silo from Photo Location 4.**

**Photo 5. Looking west at timber debris along Stream L from Photo Location 5.**

**Photo 6. Looking north at timber debris along Stream B from Photo Location 6.**

**Photo 7. Looking southwest at Sample Plot 1.**

**Photo 8. Looking north at Sample Plot 2.**

**Photo 9. Looking southeast at Sample Plot 3.**

**Photo 10. Looking north at Sample Plot 4, Wetland 4.**

**Photo 11. Looking northwest at Sample Plot 5.**

**Photo 12. Looking northwest at Sample Plot 6.**

**Photo 13. Looking northwest at Sample Plot 7, Wetland 2.**

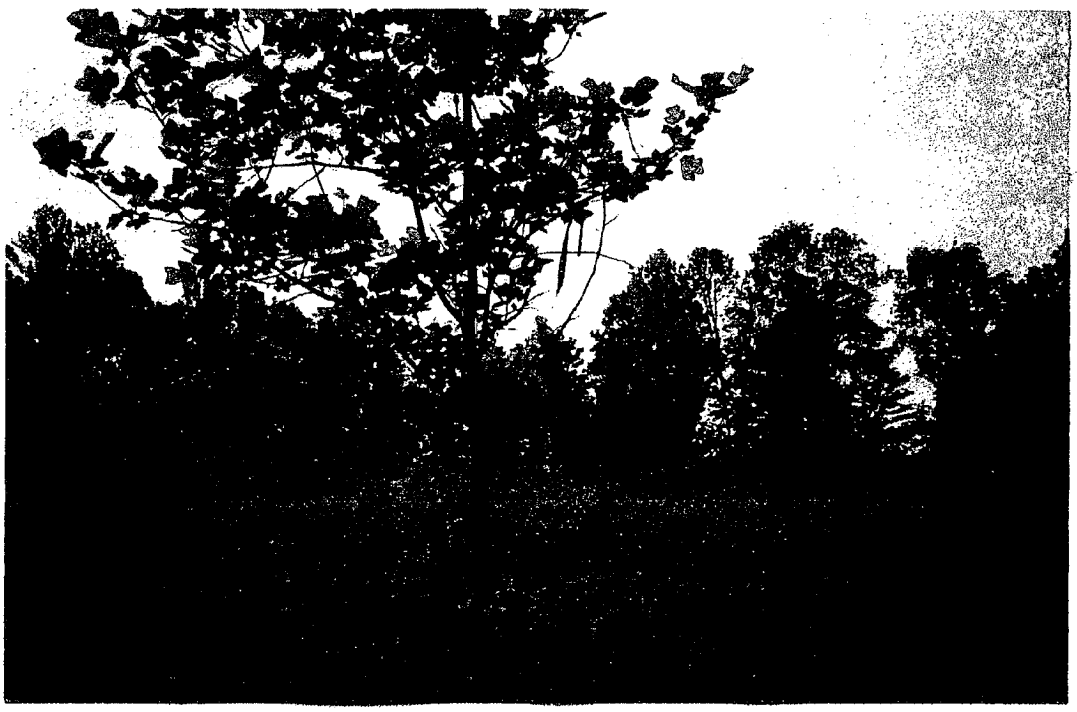


**Photo 14. Looking northeast at Sample Plot 8.**

**Photo 15. Looking north at Sample Location 10.**

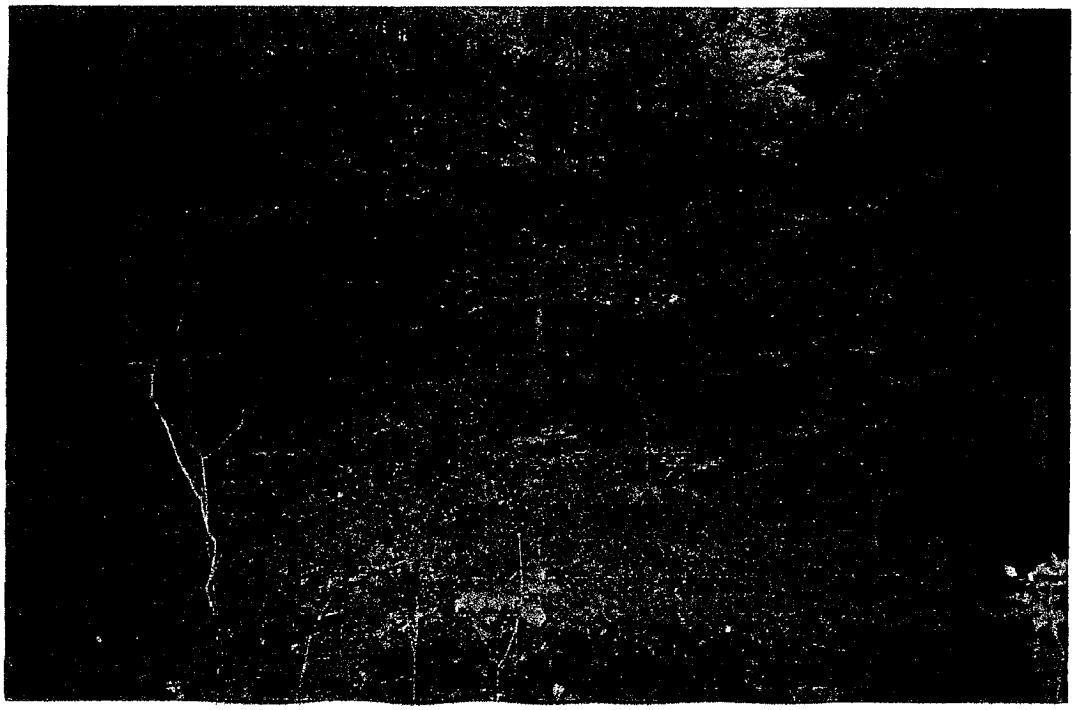


**Photo 16. Looking southeast at Sample Plot 11, Wetland 5.**

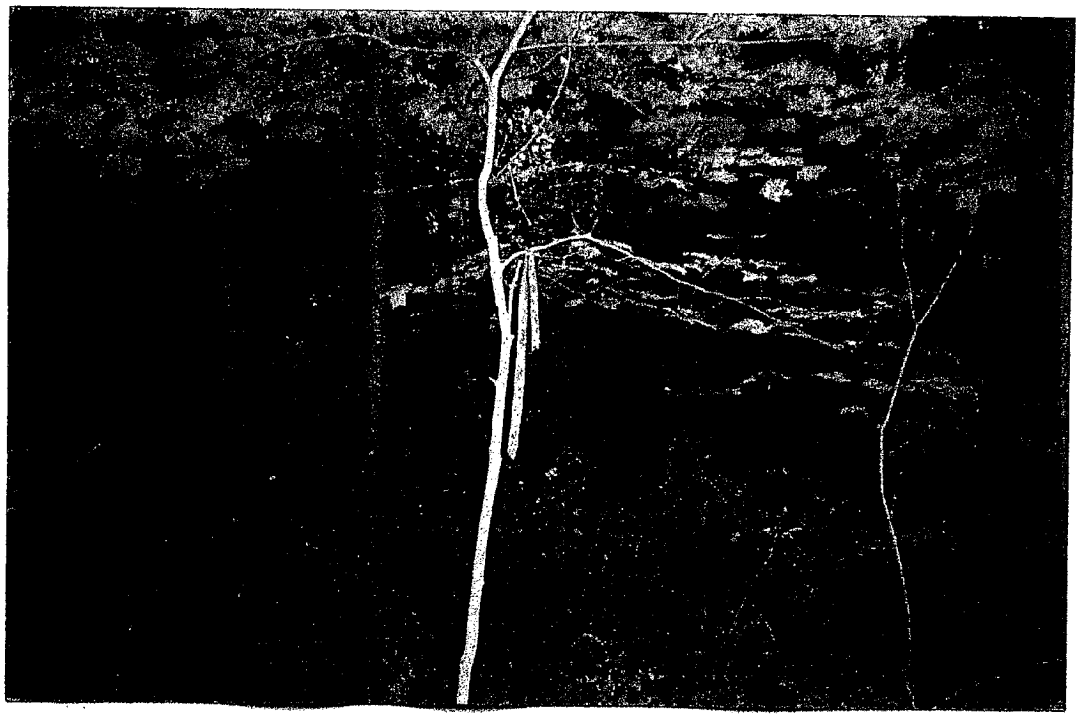


**Photo 17. Looking southeast at Sample Plot 12.**

**Photo 18. Looking south at Sample Plot 13.**

**Photo 19. Looking northeast at Sapmle Plot 14.**

**Photo 20. Looking east at Sample Plot 15.**

**Photo 21. Looking northwest at Sample Plot 16.**

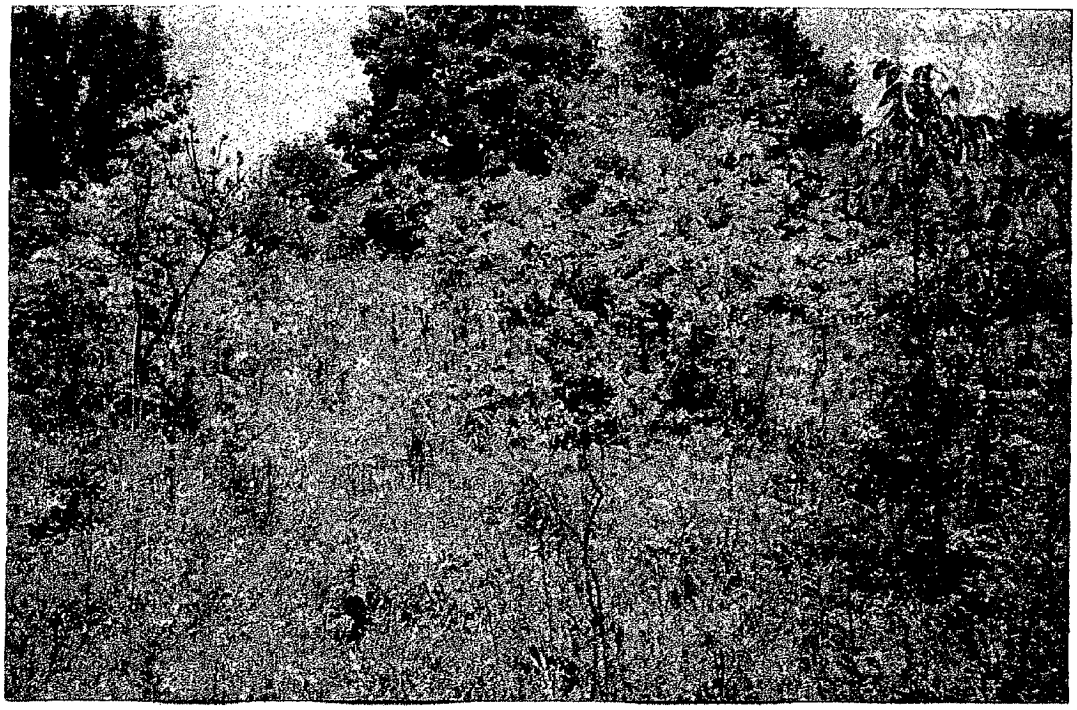


**Photo 22. Looking north at Sample Plot 17 .**

**Photo 23. Looking east at Sample Plot 18.**

**Photo 24. Looking southeast at Wetland 1, Stream A from Photo Location 7.**

**Photo 25. Looking northwest at Wetland 2 from Photo Location 7.**

**Photo 26. Looking northwest at seep in Wetland 9 from Photo Location 8.**

**Photo 27. Looking south at Wetland 10 from Photo Location 9.**

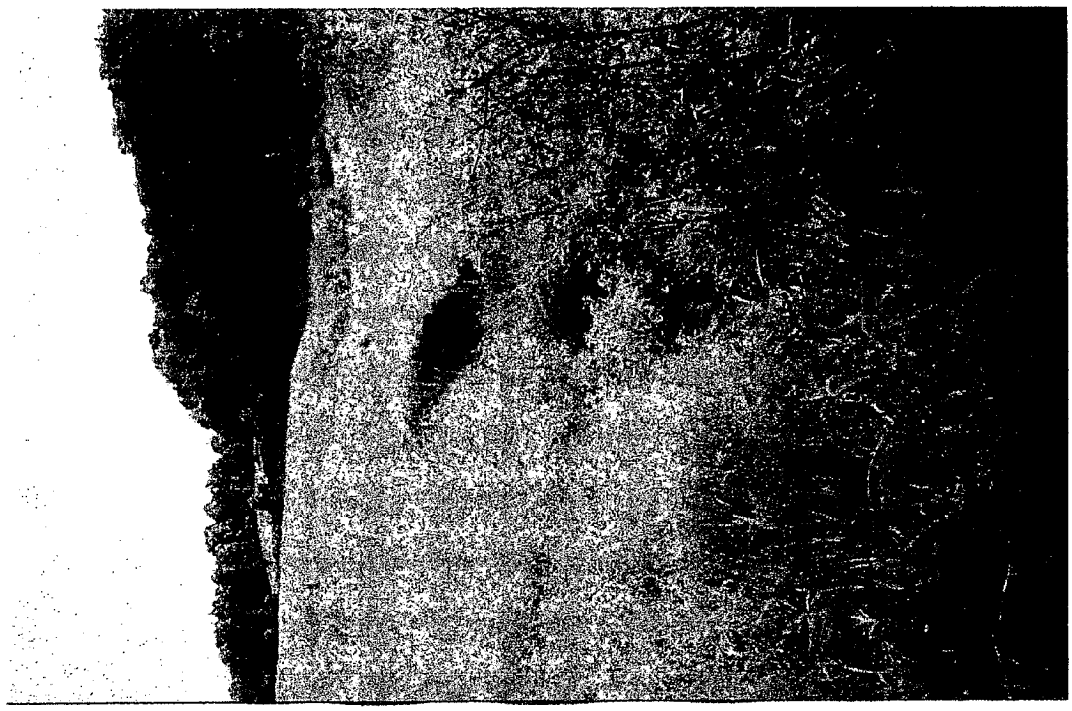


**Photo 28. Looking south at Stream C from Photo Location 10.**

**Photo 29. Looking southwest at Stream D from Photo Location 11.**

**Photo 30. Looking southeast at Stream G from Photo Location 12.**

**Photo 31. Looking southwest at Stream K from Photo Location 13.**

**Photo 32. Looking southwest at Stream M from Photo Location 14.**

**Photo 33. Looking southeast at Stream S from Photo Location 15.**

**Photo 34. Looking north at Stream W from Photo Location 16.**

**Photo 35. Looking north at Stream Y from Photo Location 17.**

**Photo 36. Looking southwest at Piney Creek from Photo Location 18.**

# Appendix C:

# Soil Survey Information

## Description of Soil Types Found on Site (Rubel et al. 1981).

**CuB—Culleoka silt loam, 3 to 8 percent slopes.** This moderately deep, gently sloping, well drained soil is mainly on ridgetops. A few areas are on the crests of knolls. Most areas are smooth and slightly convex and range from 3 to 60 acres.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The brown, friable subsoil is about 17 inches thick. It is silt loam in the upper part and channery loam in the lower part. The substratum is yellowish brown, friable very channery loam. Fine grained sandstone bedrock is at about 33 inches.

Included with this soil in mapping are small areas of the deep Wellston and Westmoreland soils near the center of the wider ridgetops. Severely eroded soils that are shallow over bedrock are included near slope breaks and narrow ridge crests. Those soils have a channery silt loam surface layer. Also included are areas underlain by hard bedrock. Included soils make up about 20 percent of most areas.

Permeability is moderate or moderately rapid in this Culleoka soil, and the available water capacity is low. Runoff is medium in cultivated areas. A few hard siltstone and sandstone fragments are in the surface ayer, and the content of fragments increases with ı asing depth in the subsoil. The shrink-swell potential . Potential frost action is moderate. The root zone s moderately deep over sandstone bedrock. In unlimed areas, reaction in the root zone is medium acid or strongly acid in the topsoil and subsoil and strongly acid o slightly acid in the substratum.

Most of the acreage is farmed. A small acreage is vooded. The potential is medium for cultivated crops, ıay, pasture, and building site development, low to nedium for sanitary facilities, and high for trees.

This soil is suited to corn and small grain and to ırasses and legumes for hay, but it is droughty. In ultivated areas, the hazard of erosion is moderate. Deep-rooted legumes are difficult to maintain in many ıreas. Controlling erosion, maintaining tilth and organic natter content and conserving moisture are concerns of nanagement. Conservation tillage, which leaves crop esidue on the surface; grasses and legumes; ıcorporating crop residue into the plow layer; and cover rops, contour tillage, and stripcropping reduce the azard of erosion. Tilling within the optimum range of ıoisture content helps to prevent soil compaction.

This soil is suited to pasture. Reseeding with cover rops or companion crops or by trash mulch or no-till eeding reduces the hazard of erosion. Proper stocking, asture rotation, mowing to control weeds, and timely pplication of lime and fertilizer are needed to maintain a ood stand of key forage plants. Limiting grazing in inter and other wet periods helps to prevent soil ction.

s soil is suited to trees. Mechanical planting and ıowing to reduce plant competition are possible. pecies selected for planting should be somewhat lerant of droughtiness.

This soil is suitable as a site for buildings without basements. Depth to bedrock is a limitation for houses with basements. Depth to bedrock and the possible contamination of ground water are severe limitations for sanitary facilities. Local roads can be improved by using a suitable base material.

The capability subclass is IIe. The woodland suitability subclass is 2o.

**Ds—Dumps, mine.** This unit consists mostly of steep and very steep ridges or cone-shaped piles of waste material from deep coal mining. The material is quite variable but is mostly soft, impure coal and black, carbonaceous (roof) shale that originally contained a relatively high content of sulfur compounds. The material is locally referred to as mine gob, gob, or gob piles. Some areas have burned or have oxidized with time and consist of hard, red to gray, shaly or gravelly material referred to locally as "red dog." Slopes are mostly steep or very steep but in a few areas have graded tops that are nearly level to strongly sloping.

This material was acid when mined. Oxidized material, or red dog, is medium acid to neutral. Both burned and unburned material has poor physical properties for plant growth, and most areas are barren. A few of the larger areas have been covered with soil material and support plants. Mine gob has a high content of organic carbon but is very low in the type of organic matter characteristic of natural soils. Oxidized material is very low in organic carbon and does not have organic matter. Both materials have a low or very low available water capacity. Water percolating through the extremely acid material is a source of local stream pollution in many areas.

Abandoned areas should be reclaimed to prevent erosion, sedimentation, and acid drainage. Soil material used to cover these areas should be seeded with grasses or planted with trees that tolerate a fairly low available water capacity and acid conditions.

Some areas could be developed as openland habitat. Red dog is a source of surface material for many township roads and private driveways.

No capability subclass or woodland suitability subclass is assigned.

**LeC—Lowell silt loam, 8 to 15 percent slopes.** This deep, strongly sloping, moderately well drained soil is on side slopes and hillside benches. Some areas are on rounded ridgetops, low knolls on hilltops, and along small upland drainageways near divides. Slopes are typically smooth and are even to slightly convex. Individual areas range from 3 to 100 acres.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable silty clay loam, and the middle and lower parts are yellowish

brown and strong brown, firm silty clay mottled with grayish brown below 25 inches. The substratum is light olive brown, firm gravelly silty clay loam. Hard limestone bedrock is at about 50 inches.

About 10 to 30 percent of most areas is included small areas of Elba, Upshur, and Westmore soils. Elba soils have a higher lime content than does this Lowell soil and are on the crest of ridges and on slope breaks. Upshur soils have a redder subsoil than Lowell soil and are in thin bands around low knolls on hilltops. Westmore soils have less clay in the upper part of the the subsoil than Lowell soils have and are mostly in saddles and near the center of ridgetops. Also included are small areas of somewhat poorly drained soils in seep spots.

Permeability is moderately slow in this Lowell soil, and runoff from cultivated areas is rapid. A perched seasonal high water table is at a depth of 30 to 60 inches. The available water capacity is moderate. The shrink-swell potential and potential frost action are moderate. Unless the soil has been limed, reaction is medium acid to very strongly acid in the upper part of the root zone and neutral to strongly acid in the lower part.

This soil is used mainly for cultivated crops, hay, and pasture. A few small areas are wooded. The potential is high for cultivated crops, hay, pasture, and openland and woodland wildlife habitat. It is medium for trees and for building site development and low to medium for sanitary facilities.

This soil is suited to cultivated crops and small grain and to grasses and legumes for hay and pasture. Deep-rooted legumes, such as alfalfa, are difficult to maintain in some areas. If the soil is cultivated or the plant cover removed for other purposes, the erosion hazard is severe. If conservation measures are used, a common rotation includes a cultivated crop or small grain about half the time of the rotation. Seeding with a companion crop or cover crop reduces the erosion hazard. The soil is well suited to no-till management and contour stripcropping. Grassed waterways are commonly used where water concentrates in natural channels.

This soil is well suited to pasture. Reseeding with cover crops or companion crops or by trash mulch or no-till seeding reduces erosion. The soil compacts easily if it is grazed during wet periods.

This soil is suited to trees and openland and woodland wildlife habitat. Locating skid trails and logging roads on the contour reduces erosion. Mechanical planting and mowing to reduce plant competition are possible.

This soil is moderately well suited as a site for buildings without basements if special design and installation procedures are used. The slope, hard bedrock at a depth of 40 to 72 inches, seasonal wetness, moderate shrink-swell potential, and moderately slow permeability are limitations. Driveways and local roads and streets should be located across the slope to reduce erosion and the angle of incline. They can be improved by using a suitable base material. Leach lines in septic tank absorption fields should be constructed across the slope to reduce seepage of the effluent to the surface. Maintaining cover on the site as much as possible during construction reduces erosion.

The capability subclass is IIIe. The woodland suitability subclass is 3c.

**LeD—Lowell silt loam, 15 to 25 percent slopes.** This deep, moderately steep, moderately well drained soil is on hillsides, on knolls on ridgetops, and on bench-like bands around hillsides, bounded above and below by steeper soils. Areas on hillsides are mainly long and narrow, and those on knolls on ridgetops are rounded. Slopes are dominantly smooth. Most areas range from 10 to 100 acres.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable silty clay loam, and the middle and lower parts are strong brown and yellowish brown, firm silty clay with mottles below about 25 inches. The substratum is light olive brown, firm gravelly silty clay loam. Hard limestone bedrock is at about 50 inches.

Included with this soil in mapping are areas of Culleoka, Upshur, and Brookside soils. The moderately deep Culleoka soils are commonly near slope breaks. The Upshur soils, which have redder subsoil than this Lowell soil, are in bands around knolls on hilltops. The deeper Brookside soils formed in colluvium in concave areas and near the lowest part of hillsides. They are subject to hillside slippage. Included soils make up 15 to 30 percent of most areas.

Permeability is moderately slow. A perched seasonal high water table is at a depth of 30 to 60 inches. Runoff from cultivated areas is very rapid. The available water capacity, shrink-swell potential, and potential frost action are moderate. In unlimed areas, reaction is medium acid to very strongly acid in the upper part of the root zone and neutral to strongly acid in the lower part.

Most areas are used for crops and pasture. Other areas are wooded. The potential is medium for cultivated crops, small grain, and trees and is high for pasture and hay. It is low for sanitary facilities and building site development.

This soil is suited to small grain and to grasses and legumes for hay. It is suited to cultivated crops in the cropping system if the hazard of erosion is controlled and careful management is used. A commonly used rotation includes cultivated crops one-fourth the time. Deep-rooted legumes are difficult to maintain in many areas. The erosion hazard is very severe in cultivated areas. Controlling erosion and maintaining tilth and organic matter content are concerns of management. No-till management, conservation tillage, which leaves crop residues on the surface, incorporating crop residue into the plow layer, contour stripcropping grasses and legumes in the cropping system, cover crops, and

grassed waterways reduce the hazard of erosion and help maintain tilth and organic matter content. Tilling within the proper moisture range helps to prevent soil compaction.

This soil is suited to pasture but poorly suited to winter grazing. If the soil is overgrazed or plowed to prepare seedbeds the hazard of erosion is very severe. Reseeding by the trash mulch or no-till seeding or with cover crops or companion crops reduces the hazard of erosion. Proper stocking, pasture rotation, mowing for weed control, and timely application of lime and fertilizer are needed to maintain a good stand of key forage plants. Limiting grazing during wet periods helps to prevent soil compaction.

Even though the high clay content in the subsoil limits growth, this soil is suited to trees and woodland wildlife habitat. Locating logging roads and skid trails on the contour reduces erosion. Coves and north- and east-facing slopes are the best woodland sites. These sites have more water available for growth and have cooler temperatures because they have less exposure to the prevailing winds and the sun. Use of equipment is moderately limited because of the steep slopes, but mechanical planting and mowing to reduce plant competition are possible.

The moderately steep slopes, moderately slow permeability, some seasonal wetness, and bedrock at a depth of 40 to 72 inches severely limit the use of this soil as a site for buildings and sanitary facilities. Trails in recreation areas should be protected against erosion and should be laid out on the contour if possible.

The capability subclass is IVe. The woodland suitability subclass is 3c.

**LoC—Lowell-Westmoreland silt loams, 8 to 15 percent slopes.** This map unit consists of moderately well drained Lowell soil and well drained Westmoreland soil on rounded ridgetops, knolls, and to a lesser extent, on side slopes. These deep, strongly sloping soils are mainly on smooth, even or slightly convex slopes. Areas on ridgetops and side slopes are dominantly long and narrow; those on knolls are rounded. Most areas range from 5 to 100 acres.

Most areas are about 45 percent Lowell silt loam and 35 percent Westmoreland silt loam; the Westmoreland soil, however, is dominant in some areas. Areas of the two soils are so intricately mixed or are so small that mapping them separately is not practical.

Typically, the surface layer of the Lowell soil is brown, friable silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable silty clay loam, and the middle and lower parts are strong brown and yellowish brown, firm silty clay with depths below about 25 inches. The substratum is light olive brown, firm gravelly silty clay loam. Hard limestone bedrock is at about 50 inches.

Typically, the surface layer of the Westmoreland soil is brown, friable silt loam about 8 inches thick. The subsoil is about 27 inches thick. The upper and middle parts are brown and dark yellowish brown, friable silt loam and firm clay loam, and the lower part is yellowish brown, firm channery clay loam. The substratum is yellowish brown, firm channery clay loam. Hard sandstone bedrock is at about 50 inches.

Included with these soils in mapping are areas of Culleoka soils and Westmore soils. The moderately deep Culleoka soils are mainly on slope breaks and near ridge crests. Westmore soils are more silty in the upper part than Lowell and Westmoreland soils and are typically on less sloping areas near the center of ridgetops and saddles. Included soils make up about 20 percent of most areas.

Permeability is moderately slow in the Lowell soil and moderate in the Westmoreland soil. Depth to the seasonal high water table is 30 to 60 inches in the Lowell soil and 36 to 72 inches in the Westmoreland soil. Runoff from cultivated areas is rapid. The available water capacity is moderate in both soils. The shrink-swell potential is moderate in the Lowell soil and low in the Westmoreland soil. Potential frost action is moderate in both soils. In unlimed areas, reaction is very strongly acid to medium acid in the root zone of the Westmoreland soil. Reaction in the Lowell soil is very strongly acid to medium acid in the upper part of the root zone and strongly acid to neutral in the lower part.

Most areas are farmed. The potential is high for cultivated crops, small grain, hay, pasture, and openland and woodland wildlife habitat. It is medium for building site development and medium to low for sanitary facilities. It is medium for trees in the Lowell soil and high in the Westmoreland soil.

These soils are suited to cultivated crops and small grain and to grasses and legumes for hay (fig.7). If conservation measures are used, a common rotation includes a cultivated crop or small grain about half the time of the rotation. Deep-rooted legumes may be difficult to maintain. The erosion hazard is severe in cultivated areas. Controlling erosion and maintaining tilth and the organic matter content are concerns of management. Conservation tillage, which leaves crop residue on the surface, grasses and legumes in the cropping system, returning crop residue, contour stripcropping, cover crops, and grassed waterways reduce the hazard of erosion and help to maintain tilth and organic matter content. Tilling within the optimum range of moisture content helps to prevent soil compaction.

These soils are suited to pasture. If they are overgrazed or plowed for seedbed preparation, the hazard of erosion is severe. Reseeding by the trash mulch or no-till methods or with cover crops or companion crops reduces the hazard of erosion. Proper stocking, pasture rotation, mowing to control weeds, and timely application of lime and fertilizer are needed to maintain a good stand of key forage plants. Controlling grazing in winter and other wet periods helps to prevent soil compaction.

These soils are suited to trees and woodland wildlife abitat. Locating logging roads and skid trails on the ontour, if practical, reduces erosion. Mechanical lanting and mowing to reduce plant competition are ossible on these soils.

Even though the slope of the Westmoreland soil is a nitation, the Westmoreland soil is better suited as a site r buildings and sanitary facilities than the Lowell soil. imitations in the Lowell soil are moderately slow ermeability, slope, seasonal wetness, and the moderate hrink-swell potential of the clayey subsoil. Foundations the Lowell soil should be designed to prevent tructural damage caused by shrinking and swelling of e soil. Foundation drains and exterior wall coatings elp to prevent wet basements in homes constructed on e Lowell soil. Local roads on both soils can be nproved by providing a suitable base material. Both oils are suited to such recreation uses as picnic areas nd paths and trails.

The capability subclass is IIIe. The woodland suitability ubclass is 3c for the Lowell soil and 2o for the Vestmoreland soil.

**LoD—Lowell-Westmoreland silt loams, 15 to 25 ent slopes.** This map unit consists of moderately drained Lowell soil and well drained Westmoreland soil on hillsides. These deep, moderately steep soils are mainly on the upper third of hillsides. A few areas are on narrow ridgetops, knolls on rounded ridgetops, and hillside benches. Slopes are mainly even. Irregularities occur along a few small drainageways. Small sandstone fragments are at the surface of the Westmoreland soil. Most areas are 10 to 100 acres.

Most areas are about 45 percent Lowell silt loam and 35 percent Westmoreland silt loam; the Westmoreland soil, however, is dominant in some areas. The two soils are commonly in alternating strips across the hillside. Steeper areas are dominantly Westmoreland soil. The two soils are in strips so narrow or so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Lowell soil is brown, friable silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable silty clay loam, and the middle and lower parts are strong brown and yellowish brown, firm silty clay with mottles below about 25 inches. The substratum is light olive brown, firm gravelly silty clay loam. Hard limestone bedrock is at about 50 inches.

Typically, the surface layer of the Westmoreland soil is brown, friable silt loam about 8 inches thick. The subsoil is about 27 inches thick. The upper and middle parts are brown and dark yellowish brown, friable silt loam and firm clay loam, and the lower part is yellowish brown, hannery clay loam. The substratum is yellowish wn, firm channery clay loam. Hard sandstone bedrock is at about 50 inches.

Included with these soils in mapping are small areas of somewhat poorly drained soils on concave slopes and some seasonal wetness in the Lowell soil are severe limitations for buildings and sanitary facilities. Maintaining as much cover as possible on the site during construction reduces erosion. Trails in recreation areas should be protected against erosion and should be laid out on the contour if possible.

The capability subclass is IVe. The woodland suitability subclass is 3c for the Lowell soil and 2r for the Westmoreland soil.

**LoE—Lowell-Westmoreland silt loams, 25 to 40 percent slopes.** This map unit consists of steep, well drained, deep soils on hillsides. Slopes are generally smooth. In some areas, irregularities are along drainageways. Seep spots are common in areas of the Lowell soil. Most areas of this map unit are 10 to 50 acres.

Most areas are about 45 percent Lowell silt loam and 35 percent Westmoreland silt loam. The two soils are in alternating strips across the hillside or in areas so small that mapping them separately is not practical.

Typically, the surface layer of the Lowell soil is brown, friable silt loam about 6 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown, friable silty clay loam, and the middle and lower parts are strong brown and yellowish brown, firm silty clay. The substratum is light olive brown, firm gravelly silty clay loam. Hard limestone bedrock is at about 46 inches.

Typically, the surface layer of the Westmoreland soil is brown, friable silt loam about 6 inches thick. The subsoil is about 24 inches thick. The upper and middle parts are brown and dark yellowish brown, friable silt loam and firm clay loam, and the lower part is yellowish brown, firm channery clay loam. The substratum is yellowish brown, firm channery clay loam. Hard sandstone bedrock is at about 46 inches.

Included with these soils in mapping are small areas of somewhat poorly drained soils around seep spots. Also included are the deeper Brookside soils in concave areas or narrow bands on the lower part of some slopes. They are subject to hillside slippage. Included soils make up about 20 percent of most areas.

Permeability is moderately slow in the Lowell soil and moderate in the Westmoreland soil. The available water capacity and potential frost action are moderate in both soils. Runoff is very rapid if the plant cover is removed. The shrink-swell potential is moderate for the Lowell soil and low for the Westmoreland soil. Unless limed, the root zone of the Lowell soil is very strongly acid to medium acid in the upper part and strongly acid to neutral in the lower part. The root zone of the Westmoreland soil is very strongly acid to medium acid.

These soils are used mainly for pasture, trees, and woodland wildlife habitat. The potential is medium for hay and pasture and low for cultivated crops, small grain, sanitary facilities, and building site development. The potential for woodland wildlife habitat is high in both soils.

## Description of Soil Types Found on Site (continued).

Even though the steep slope limits the use of some equipment, these soils are suited to pasture. Smooth slopes are suited to hay. If the soils are overgrazed or cultivated for seedbed preparation, the hazard of erosion is very severe. Reseeding by the trash mulch or no-till methods or with a companion crop reduces the hazard of erosion. Proper stocking, pasture rotation, mowing for weed control, and timely application of lime and fertilizer are needed to maintain a good stand of key forage plants. Controlling grazing in winter and other wet periods helps to prevent soil compaction. Deep-rooted legumes are difficult to maintain in many areas.

These soils are suited to trees. Locating logging roads and skid trails on the contour reduces erosion. The steep slopes limit the use of planting and mowing equipment. Coves and north- and east-facing slopes are the best woodland sites. These sites have more water available for growth and have cooler temperatures because they have less exposure to the prevailing winds and the sun.

The steep slope is a severe limitation for buildings, sanitary facilities, and most recreation uses. Hillside slippage is also a hazard on the Lowell soil and on the included Brookside soils. Trails in recreation areas should be protected against erosion and should be laid out on the contour if possible.

The capability subclass is VIe. The woodland suitability subclass is 3c for the Lowell soil and 2r for the Westmoreland soil.

**LoF—Lowell-Westmoreland silt loams, 40 to 70 percent slopes.** This map unit consists of deep, very steep, well drained soils on hillsides and along deeply entrenched drainageways. Slopes are generally smooth. In some areas, however, slopes have benches and sharp breaks at sandstone bedrock escarpments and irregularities at hillside slips. Most areas are 50 to 200 acres.

Most areas are about 45 percent Lowell silt loam and 35 percent Westmoreland silt loam. The two soils commonly occur in such narrow bands across the hillsides or in areas that are so intricately mixed that mapping them separately is not practical.

Typically, the surface layer of the Lowell soil is brown, friable silt loam about 6 inches thick. The subsoil is about 30 inches thick. The upper part is yellowish brown, friable silty clay loam, and the middle and lower parts are strong brown and yellowish brown, firm silty clay. The substratum is light olive brown, firm gravelly silty clay loam. Hard limestone bedrock is at about 45 inches.

Typically, the surface layer of the Westmoreland soil is brown, friable silt loam about 5 inches thick. The subsoil is about 24 inches thick. The upper and middle parts are brown and dark yellowish brown, friable silt loam and firm clay loam, and the lower part is yellowish brown, firm channery clay loam. The substratum is yellowish brown, firm channery clay loam. Hard sandstone bedrock is at about 42 inches.

Included with these soils in mapping are small areas of Dekalb and Brookside soils. The moderately deep Dekalb soils are on the uppermost part of hillsides, near slope breaks, and above outcrops of sandstone bedrock. The moderately well drained Brookside soils are in coves and on lower hillside positions. They are subject to hillside slippage. Included soils make up about 20 percent of most areas.

Permeability is moderate in the Westmoreland soil and moderately slow in the Lowell soil. Runoff is very rapid. The available water capacity is moderate in both soils. The shrink-swell potential is moderate in the Lowell soil and low in the Westmoreland soil. Potential frost action is moderate in both soils. Unless it has been limed, the Westmoreland soil is medium acid to very strongly acid in the root zone and the Lowell soil is medium acid to very strongly acid in the upper part of the root zone and strongly acid to neutral in the lower part.

About two-thirds of the acreage is woodland and one-third unimproved pasture. The potential for trees is medium in the Lowell soil and high in the Westmoreland soil. In both soils the potential is low for crops, pasture, sanitary facilities, and building site development and good for woodland wildlife habitat.

These soils are poorly suited to pasture. The slopes are too steep for commonly used equipment. Some areas used for pasture are reverting to brush because they are difficult to manage.

These soils are suited to trees. On very steep slopes, however the use of logging equipment is severely limited and mechanical planting is not possible. Plant competition can be reduced by girdling. Locating skid trails and logging roads on the contour makes logging easier and reduces erosion. Coves and north- and east-facing slopes are the best woodland sites. These sites have more water available for growth and have cooler temperatures because they have less exposure to the prevailing winds and the sun.

The very steep slopes of both soils and the hazard of hillside slippage of the Lowell soil and the included Brookside soils severely limit the use of these soils as sites for buildings, sanitary facilities, and most recreation uses. Trails in recreation areas should be protected against erosion and should be laid out on the contour if possible.

The capability subclass is VIIe. The woodland suitability is 3c for the Lowell soils and 2r for the Westmoreland soils.

**WhB—Wellston silt loam, 3 to 8 percent slopes.** This deep, gently sloping, well drained soil is on broad ridgetops and benches. Slopes are dominantly smooth and even to convex. Areas are 3 to 50 acres.

Typically, the surface layer is yellowish brown, friable silt loam about 8 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown and brown, friable silt loam and silty clay loam, and the lower

part is olive brown, friable gravelly silt loam. The substratum is light olive brown, friable very gravelly silt loam. Partly weathered siltstone bedrock is at about 59 inches.

Included with this soil in mapping are small areas of the more loamy Westmoreland soils and the moderately deep Dekalb soils near slope breaks. The moderately well drained Zanesville soils are at the center of the broader ridgetops. Included soils make up about 15 percent of most areas.

Permeability is moderate in this Wellston soil, and the available water capacity is high. Runoff is medium from cultivated areas. The shrink-swell potential is low. Potential frost action is high. In unlimed areas, the upper part of the root zone is medium acid to extremely acid and the lower part is medium acid to very strongly acid.

Most of the acreage is in crops and pasture. A small acreage is wooded. The potential is high for cultivated crops, hay, pasture, and trees, high or medium for most sanitary facilities, and high for building site development.

This soil is suited to corn and small grain and to grasses and legumes for hay. Cultivated crops can be grown year after year if the hazard of erosion is controlled. Deep-rooted legumes are difficult to maintain in many areas. The hazard of erosion is moderate in cultivated areas. Controlling erosion and maintaining tilth and organic matter content are concerns of management. Conservation tillage, which leaves crop residue on the surface, incorporating crop residue into the plow layer, grasses and legumes in the cropping system, contour tillage, stripcropping, and cover crops help to control the erosion hazard and maintain tilth and organic matter content. Tilling within the optimum range of moisture content helps to prevent soil compaction.

This soil is suited to pasture. If it is overgrazed or plowed for seedbed preparation, the hazard of erosion is moderate. Reseeding with cover crops or companion crops or by trash mulch or no-till seeding reduces the hazard of erosion. Proper stocking, pasture rotation, mowing for weed control, and timely application of lime and fertilizer are needed to maintain a good stand of key forage plants. Controlling grazing in winter and other wet periods helps to prevent soil compaction.

This soil is suited to trees. Mechanical planting and mowing to reduce plant competition are possible.

This soil provides some of the best sites in the uplands for buildings. It is also suited to sanitary facilities, such as septic tank absorption fields, if good design and installation procedures are used. Local roads can be improved by providing a suitable base material to reduce damage from frost action.

The capability subclass is IIe. The woodland suitability subclass is 2o.

**Ud—Udorthents-Urban land complex.** This map unit consists mostly of areas that have been cut and filled during the construction of highways. These areas are about 60 percent Udorthents and about 35 percent Urban land. The areas of Udorthents and Urban land are so small or so long and narrow that mapping them separately is not practical. Urban land is the paved part of areas. Udorthents are mainly in the cut and fill part of areas.

Typically, the upper 60 inches of Udorthents is a mixture of rock fragments and silty clay loam, silt loam, loam, channery loam, and shaly silty clay loam from natural soils.

Typically, Urban land consists of concrete or asphalt over subgrade material.

Included in mapping are bedrock escarpments along highways and a few borrow pits where the soils were removed to reclaim surface-mined land.

Permeability in the Udorthents is highly variable, ranging from very slow to rapid. The available water capacity is low or very low. The organic matter content is very low.

The surface of Udorthents seals after hard rains and cracks during drying because of shrinkage. On some nearly level areas, uneven settling has occurred. Steep and very steep areas are subject to hillside slippage. Plant cover should be maintained to reduce runoff and erosion. Most areas support grasses and shrubs.

No capability subclass or woodland suitability subclass is assigned.

# Appendix D:

# Natural Heritage Database Information

RECEIVED JUN 07 2001

# Ohio Department of Natural Resources

BOB TAFT, GOVERNOR

SAMUEL W. SPECK, DIRECTOR

**Division of Natural Areas and Preserves**
*Stuart Lewis, Chief*
1889 Fountain Square, Bldg. F-1
Columbus, OH 43224-1388
*Phone: (614) 265-6453; Fax: (614) 267-3096*

June 4, 2001

Luke Rychlik
EnviroScience, Inc.
3781 Darrow Road
Stow, OH 44224-4035

Dear Mr. Rychlik:

I have reviewed our Natural Heritage maps and files for the 180 acre Ohio Valley Coal project area, including a half mile radius, in Sections 3 and 4 of Wayne Township, Belmont County, Hunter Quad. The numbers and letters on the list below correspond to the areas marked in red on the accompanying map. A circle represents an exact location. Exactness is determined by the accuracy and detail of information provided by the surveyor. Common name, scientific name and status are given for each species.

**HUNTER QUAD**
A. Raven Rocks (privately owned and protected natural area)
1. *Juglans cinerea* - Butternut, potentially threatened

There are no existing or proposed state nature preserves or scenic rivers at the project site. We are also unaware of any geologic features, breeding or non-breeding animal concentrations, champion trees, or state parks, forests or wildlife areas in the project vicinity.

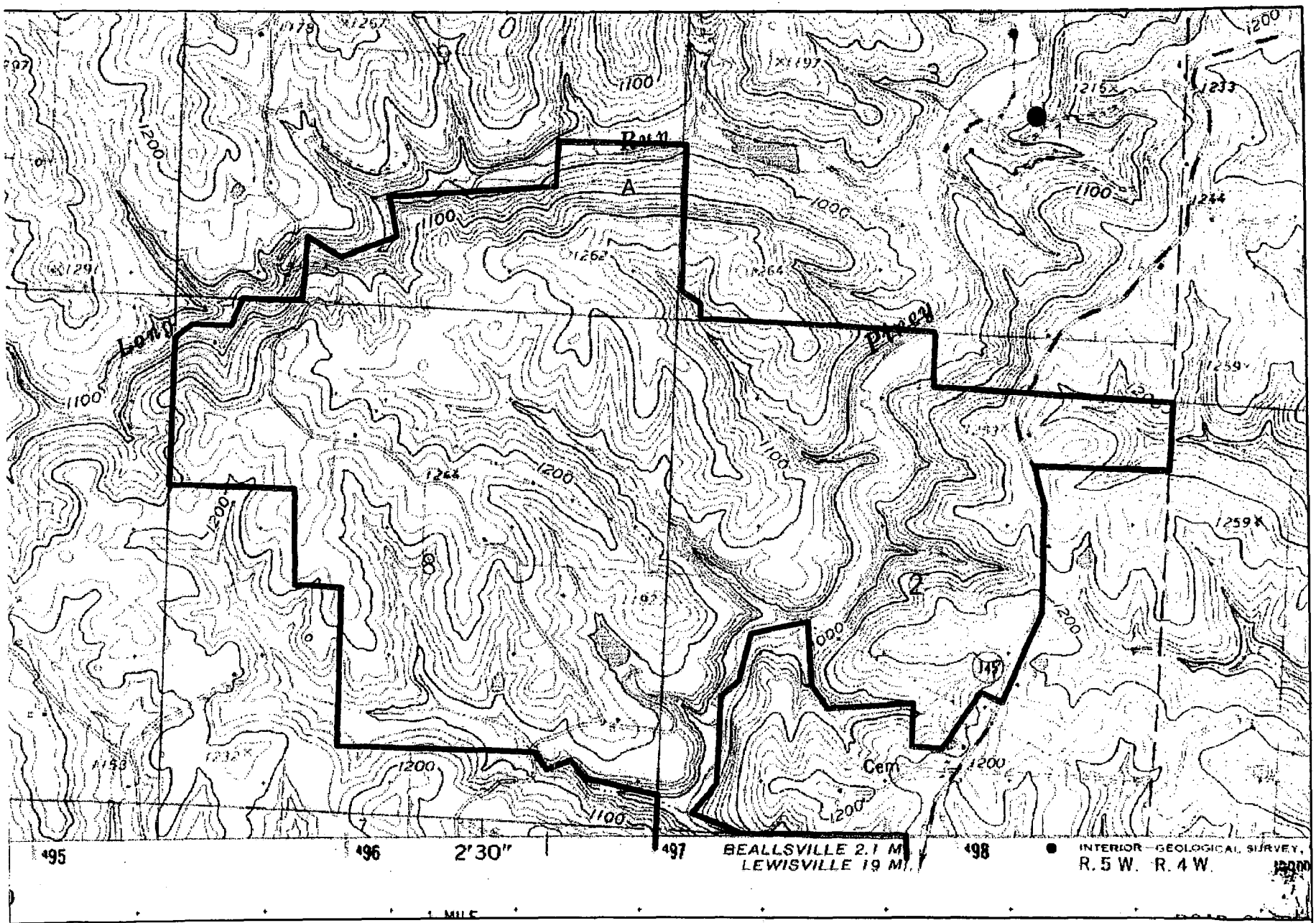
Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Please note that although we inventory all types of plant communities, we only maintain records on the highest quality areas. Also, we do not have data for all Ohio wetlands. For additional information on wetlands and National Wetlands Inventory maps, please contact Jim Given in the Division of Real Estate and Land Management at 614-265-6770.

Please contact me at 614-265-6818 if I can be of further assistance.

Sincerely,

Debbie Woischke

Debbie Woischke, Ecological Analyst
Support Services Group




Name: HUNTER
Date: 6/4/101
Scale: 1 inch equals 1333 feet

Location: 039° 53' 08.3" N 081° 02' 04.6" W
Caption: EnviroScience, Inc.;
Ohio Valley Coal project

AHC 1144344

# Appendix E:

# Routine Wetland Determination Data Forms

AEC 11436

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Open field<br>Transect ID: ____<br>Plot ID: Sample Location 1 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Melilotus officinalis* | herb | FACU- | 1 | | |
| 2 *Trifolium pratense* | herb | FACU- | 2 | | |
| 3 *Daucus carota* | herb | UPL | 3 | | |
| 4 *Poa sp.* | herb | NL | 4 | | |
| 5 *Achillea millefolium* | herb | FACU | 5 | | |
| 6 | | | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 0% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |

Remarks:

No hydrology.

## SOILS

| Map Unit Name (Series and Phase): | Lowell silt loam, 8-15 percent slopes (LeC) | Dr[redacted] Field Observations Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 5/2 | | | |
| 1-16 | | 10YR 4/6 | 10YR 5/8 | F/F/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

## WETLAND DETERMINATION

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century mine<br>Applicant/Owner: American Energy Corp<br>Investigator: L. Rychlik, M. Bradac WDS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Forest<br>Transect ID: ____<br>Plot ID: Sample Location 2 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Tilia americana* | tree | FACU | 1 | | |
| 2 *Acer saccharum* | tree | FACU- | 2 | | |
| 3 *Acer saccharum* | shrub | FACU- | 3 | | |
| 4 *Rosa multiflora* | shrub | FACU | 4 | | |
| 5 *Prunus serotina* | shrub | FACU | 5 | | |
| 6 *Podophyllum peltatum* | herb | FACU | 6 | | |
| 7 *Polystichum acrostichoides* | herb | FACU- | 7 | | |
| 8 *Viola sp.* | herb | NL | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 0%

Remarks:

Selective timbering several years prior creates very thick understory.

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | |

Remarks:

No hydrology.

**SOILS**

| Map Unit Name (Series and Phase): | Wellston silt loam, 3 to 8 percent slopes (WhB) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Ultic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-2 | | 10YR 3/2 | | | |
| 2-10 | | 10YR 5/6 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJB | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Forest<br>Transect ID: ____<br>Plot ID: Sample Location 3 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Acer saccharum* | tree | FACU | 1 | | |
| 2 *Quercus rubra* | tree | FACU- | 2 | | |
| 3 *Acer saccharum* | shrub | FACU | 3 | | |
| 4 *Aesculus glabra* | shrub | FACU+ | 4 | | |
| 5 *Parthenocissus quinquefolia* | herb | FACU | 5 | | |
| 6 *Toxicodendron radicans* | herb | FAC | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 16%

Remarks:

Selective timbering several years prior creates very thick understory.

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | |

Remarks:

No hydrology.

## SOILS

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 8 to 15 percent slopes (LoC) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 4/2 | | | |
| 1-6 | | 10YR 5/3 | | | |
| 6-16 | | 10YR 5/6 | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance:** Few=F; Common=C; Many=M. **Size:** Fine=F; Medium=M; Coarse=C. **Contrast:** Faint=F; Distinct=D; Prominent=P.

## WETLAND DETERMINATION

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJB | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: PFO<br>Transect ID: ____<br>Plot ID: Sample Location 4 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Acer rubrum* | tree | FAC | 1 *Solidago sp.* | herb | NL |
| 2 *Ulmus americana* | tree | FACW- | 2 | | |
| 3 *Ulmus americana* | shrub | FACW- | 3 | | |
| 4 *Fraxinus pennsylvanica* | shrub | FACW | 4 | | |
| 5 *Juncus effusus* | herb | FACW+ | 5 | | |
| 6 *Impatiens sp.* | herb | FACW | 6 | | |
| 7 *Parthenocissus quinquefolia* | herb | FACU | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 85%

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>X Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>X FAC-Neutral Test (5 : 1)<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: ____(in.)<br>Depth to Free Water in Pit: ____(in.)<br>Depth to Saturated Soil: 0 (in.) | |

Remarks:

**SOILS**

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 15 to 25 percent slopes (LoD) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 3/2 | | | |
| 1-16 | | 10YR 5/1 | 7.5 YR 4/6 | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X_Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Forest<br>Transect ID: ____<br>Plot ID: Sample Location 5 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Acer rubrum* | tree | FAC | 1 | | |
| 2 *Sassafras albidum* | shrub | FACU- | 2 | | |
| 3 *Lindera benzoin* | shrub | FACW | 3 | | |
| 4 *Carya cordiformis* | shrub | FACU+ | 4 | | |
| 5 *Rubus allegheniensis* | shrub | FACU | 5 | | |
| 6 *Toxicodendron radicans* | herb | FAC | 6 | | |
| 7 *Potentilla canadensis* | herb | UPL | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 42%

Remarks:

Selective timbering several years prior creates very thick understory.

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | |

Remarks:

No hydrology.

**SOILS**

| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 8 to 15 percent slopes (LoC) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 3/2 | | | |
| 1-10 | | 10YR 4/3 | | | |
| 10-16 | | 10YR 5/6 | 7.5YR 5/8 | F/M/P | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. Size: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | No | Is the Sampling Point Within a Wetland? Yes No |
| Wetland Hydrology Present? | Yes | No | |
| Hydric Soils Present? | Yes | No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp<br>Investigator: L. Rychuk, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Old field<br>Transect ID: ____<br>Plot ID: Sample Location 6 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Populus deltoides* | tree | FAC | 1 *Solidago sp.* | herb | NL |
| 2 *Salix sp.* | shrub | NL | 2 | | |
| 3 *Rhus typhina* | shrub | UPL | 3 | | |
| 4 *Achillea millefolium* | herb | FACU | 4 | | |
| 5 *Equisetum arvense* | herb | FAC | 5 | | |
| 6 *Apocynum sibiricum* | herb | FAC | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 60%

Remarks:

**HYDROLOGY**

___Recorded Data (Describe in Remarks):
___Stream, Lake, or Tide Gauge
___Aerial Photographs
___Other
_X_No Recorded Data Available

Field Observations:
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators:
Primary Indicators:
___Inundated
___Saturated Upper 12 Inches
___Water Marks
___Drift Lines
___Sediment Deposits
___Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___Oxidized Root channels in Upper 12 Inches
___Water Stained Leaves
___Local Soil Survey Data
___FAC-Neutral Test ( : )
___Other (Explain in Remarks)

Remarks:

No hydrology.

**SOILS**

| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 15 to 25 percent slopes (LoD) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 4/2 | | | |
| 1-4 | | 10YR 5/3 | 7.5YR 5/6 | C/M/P | |
| 4-10 | | 10YR 6/1 | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X_Gleyed or Low-Chroma Colors*
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

*Soils do not seem to be typical, as the community is located on a slope.

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | No | Is the Sampling Point Within a Wetland? Yes No |
| Wetland Hydrology Present? | Yes | No | |
| Hydric Soils Present? | Yes | No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WBS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: PSS<br>Transect ID: ____<br>Plot ID: Sample Location 7 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Salix interior* | shrub | OBL | 1 *Typha angustifolia* | herb | OBL |
| 2 *Carex squarrosa* | herb | FACW | 2 | | |
| 3 *Carex granularis* | herb | FACW+ | 3 | | |
| 4 | | | 4 | | |
| 5 | | | 5 | | |
| 6 | | | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 100% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>X Inundated<br>X Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>X FAC-Neutral Test (3 : 0)<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: 0-2 (in.)<br>Depth to Free Water in Pit: ____ (in.)<br>Depth to Saturated Soil: 0 (in.) | |

Remarks:

**SOILS**

| Map Unit Name (Series and Phase): | Dumps, mine (Ds) | Drainage Class: N/A<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | N/A | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-10 | | 10YR 5/1 | N2.5 | C/M/P | |
| | | | 2.5YR 3/6 | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
_X Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Old field<br>Transect ID: ____<br>Plot ID: Sample Location 8 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Vitis sp.* | vine | NL | 1 | | |
| 2 *Liriodendron tulipifera* | shrub | FACU | 2 | | |
| 3 *Rosa multiflora* | shrub | FACU | 3 | | |
| 4 *Solidago altissima* | herb | FACU- | 4 | | |
| 5 *Trifolium pratense* | herb | FACU- | 5 | | |
| 6 *Achillea millefolium* | herb | FACU | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 0% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | |

Remarks:

No hydrology.

AEC 11452

**SOILS**

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40-70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-3 | | 10YR 3/2 | | | |
| 3-16 | | 10YR 4/2 | 7.5 YR 5/8 | F/M/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

- ___Histosol
- ___Histic Epipedon
- ___Sulfidic Odor
- ___Aquic Moisture Regime
- ___Reducing Conditions
- X Gleyed or Low-Chroma Colors
- X Concretions
- ___High Organic Content in Surface Layer in Sandy Soils
- ___Organic Streaking in Sandy Soils
- ___Listed on Local Hydric Soils List
- ___Listed on National Hydric Soils List
- ___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: PFO<br>Transect ID: ____<br>Plot ID: Sample Location 9 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Salix nigra* | tree | FACW | 1 | | |
| 2 *Platanus occidentalis* | tree | FACW- | 2 | | |
| 3 *Rubus allegheniensis* | shrub | FACU | 3 | | |
| 4 *Onoclea sensibilis* | herb | FACW | 4 | | |
| 5 *Equisetum arvense* | herb | FAC | 5 | | |
| 6 *Solidago gigantea* | herb | FACW | 6 | | |
| 7 *Valerianella radiata* | herb | FAC | 7 | | |
| 8 | | | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 86% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>X Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: 0 (in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>X FAC-Neutral Test (4 : 1)<br>___Other (Explain in Remarks) |

Remarks:

## SOILS

| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40 to 70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-6 | | 10YR 3/2 | | | |
| 6-16 | | 10YR 4/2 | 10YR 5/6 | C/M/P | |
| | | | N 2.5 | C/M/P | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X_Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | No | Is the Sampling Point Within a Wetland? Yes No |
| Wetland Hydrology Present? | Yes | No | |
| Hydric Soils Present? | Yes | No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: CENTURY MINE<br>Applicant/Owner: AMERICAN ENERGY CORP.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Comm. ID: Mixed Mesophytic Forest<br>Transect ID: _____<br>Plot ID: Sample Location 10 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Liriodendron tulipfera* | tree | FACU | 1 | | |
| 2 *Acer rubrum* | tree | FAC | 2 | | |
| 3 *Prunus serotina* | tree | FACU | 3 | | |
| 4 *Aesculus glabra* | tree | FACU+ | 4 | | |
| 5 *Lindera benzoin* | shrub | FACW | 5 | | |
| 6 *Rosa multiflora* | shrub | FACU | 6 | | |
| 7 *Parthenocissus quinquefolia* | herb | FACU | 7 | | |
| 8 *Polystichum acrostichoides* | herb | FACU- | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 25% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |

Remarks:

No hydrology.

**SOILS**

| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40 to 70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-3 | | 10YR 2/2 | | | |
| 3-16 | | 10YR 4/4 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: PFO<br>Transect ID: ____<br>Plot ID: Sample Location 11 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Platanus occidentalis* | tree | FACW- | 1 | | |
| 2 *Ulmus americana* | tree | FACW- | 2 | | |
| 3 *Fraxinus pennsylvanica* | tree | FACW | 3 | | |
| 4 *Rosa multiflora* | shrub | FACU | 4 | | |
| 5 *Lindera benzoin* | shrub | FACW | 5 | | |
| 6 *Aesculus glabra* | shrub | FACU+ | 6 | | |
| 7 *Circaea alpina* | herb | FACW | 7 | | |
| 8 *Geum sp.* | herb | NL | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 71% | | |

Remarks:

**HYDROLOGY**

____Recorded Data (Describe in Remarks):
____Stream, Lake, or Tide Gauge
____Aerial Photographs
____Other
X No Recorded Data Available

Field Observations:
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: 2 (in.)
Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:
Primary Indicators:
____Inundated
X Saturated Upper 12 Inches
____Water Marks
____Drift Lines
____Sediment Deposits
____Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
____Oxidized Root channels in Upper 12 Inches
____Water Stained Leaves
____Local Soil Survey Data
X FAC-Neutral Test (5 : 2)
____Other (Explain in Remarks)

Remarks:

Seep

**SOILS**

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 15-25 percent slopes (LoD) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-3 | | 10YR 3/2 | | | |
| 3-16 | | 10YR 5/2 | 10YR 6/6 | F/F/P | very wet |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X_Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: CENTURY MINE<br>Applicant/Owner: AMERICAN ENERGY CORP.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Comm. ID: Mixed Mesophytic Forest<br>Transect ID: ____<br>Plot ID: Sample Location 12 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Quercus rubra* | tree | FACU- | 1 *Prunus serotina* | tree | FACU |
| 2 *Carya cordiformis* | tree | FACU+ | 2 *Platanus occidentalis* | tree | FACW- |
| 3 *Acer saccharum* | tree | FACU | 3 | | |
| 4 *Vitis sp.* | vine | NL | 4 | | |
| 5 *Acer saccharum* | shrub | FACU | 5 | | |
| 6 *Rosa multiflora* | shrub | FACU | 6 | | |
| 7 *Aesculus glabra* | shrub | FACU+ | 7 | | |
| 8 *Rosa multiflora* | herb | FACU | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 0% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |

Remarks:

No hydrology.

**SOILS**

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40 to 70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-2 | | 10YR 4/2 | | | |
| 2-16 | | 10YR 5/4 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: CENTURY MINE<br>Applicant/Owner: AMERICAN ENERGY CORP.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/31/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Old field<br>Transect ID: ____<br>Plot ID: Sample Location 13 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Crataegus sp.* | shrub | NL | 1 | | |
| 2 *Rhus typhina* | shrub | UPL | 2 | | |
| 3 *Rosa multiflora* | shrub | FACU | 3 | | |
| 4 *Solidago graminifolia* | herb | FAC | 4 | | |
| 5 *Solidago altissima* | herb | FACU- | 5 | | |
| 6 *Grass sp.* | herb | NL | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 25%

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available. | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |

Remarks:

No hydrology.

**SOILS**

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell silt loam, 15 to 25 percent slopes (LeD) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-3 | | 10YR 4/2 | | | |
| 3-16 | | 10YR 6/4 | 7.5YR 5/8 | F/F/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: CENTURY MINE<br>Applicant/Owner: AMERICAN ENERGY CORP.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/30/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Shrub thicket<br>Transect ID: ____<br>Plot ID: Sample Location 14 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Rubus allegheniensis* | shrub | FACU | 1 | | |
| 2 *Rumex obtusifolius* | herb | FACU- | 2 | | |
| 3 *Impatiens sp.* | herb | FACW | 3 | | |
| 4 *Rubus allegheniensis* | herb | FACU | 4 | | |
| 5 | | | 5 | | |
| 6 | | | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 25% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands<br>Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | |

Remarks:

No hydrology.

## SOILS

| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40-70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 3/2 | | | |
| 1-6 | | 10YR 4/6 | 10YR 7/1 | C/C/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

Only the upper 6 " of soil could be sampled due to rocky texture.

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

## WETLAND DETERMINATION

| | | |
|---|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/31/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Comm. ID: Mixed Floodplain Forest<br>Transect ID: ____<br>Plot ID: Sample Location 15 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Ulmus americana* | tree | FACW- | 1 | | |
| 2 *Acer saccharum* | tree | FACU | 2 | | |
| 3 *Vitis aestivalis* | vine | FACU | 3 | | |
| 4 *Acer saccharum* | shrub | FACU | 4 | | |
| 5 *Rosa multiflora* | shrub | FACU | 5 | | |
| 6 *Verbesina alternifolia* | herb | FAC | 6 | | |
| 7 *Laportea canadensis* | herb | FAC | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 42%

Remarks:

**HYDROLOGY**

___Recorded Data (Describe in Remarks):
___Stream, Lake, or Tide Gauge
___Aerial Photographs
___Other
X No Recorded Data Available

Field Observations:
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: 0 (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___Inundated
X Saturated Upper 12 Inches
___Water Marks
___Drift Lines
___Sediment Deposits
___Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___Oxidized Root channels in Upper 12 Inches
___Water Stained Leaves
___Local Soil Survey Data
___FAC-Neutral Test ( : )
___Other (Explain in Remarks)

Remarks:

**SOILS**

| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40-70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-4 | | 10YR 3/2 | 7.5YR 5/8 | C/F/P | |
| 4-8 | | 10YR 4/2 | 7.5YR 5/8 | C/F/P | |
| | | | 10YR 6/2 | F/M/D | |
| 8-16 | | 10YR 5/1 | 7.5YR 5/8 | C/M/P | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X_Gleyed or Low-Chroma Colors
_X_Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | No | Is the Sampling Point Within a Wetland? Yes No |
| Wetland Hydrology Present? | Yes | No | |
| Hydric Soils Present? | Yes | No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: CENTURY MINE<br>Applicant/Owner: AMERICAN ENERGY CORP<br>Investigator: L. Rychlik, M. Bradac WJB | Date: 5/31/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Comm. ID: Mixed Floodplain Forest<br>Transect ID: ____<br>Plot ID: Sample Location 16 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Ulmus americana* | tree | FACW- | 1 | | |
| 2 *Fraxinus pennsylvanica* | shrub | FACW | 2 | | |
| 3 *Lindera benzoin* | shrub | FACW | 3 | | |
| 4 *Verbesina alternifolia* | herb | FAC | 4 | | |
| 5 *Galium aparine* | herb | FACU | 5 | | |
| 6 *Caulophyllum thalictroides* | herb | UPL | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 67% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>X FAC-Neutral Test (3 : 2)<br>___Other (Explain in Remarks) |

Remarks:

No hydrology. The area appears to seldomly become saturated during rare flood events.

## SOILS

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40-70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-3 | | 10YR 3/2 | | | |
| 3-16 | | 10YR 4/2 | 7.5 YR 5/8 | F/M/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
_X_Gleyed or Low-Chroma Colors
_X_Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | No | Is the Sampling Point Within a Wetland? Yes No |
| Wetland Hydrology Present? | Yes | No | |
| Hydric Soils Present? | Yes | No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: CENTURY MINE<br>Applicant/Owner: AMERICAN ENERGY CORP.<br>Investigator: L. Rychlik, M. Bradac WJS | Date: 5/31/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Community ID: Old field<br>Transect ID: ____<br>Plot ID: Sample Location 17 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Carya cordiformis* | tree | FACU+ | 1 | | |
| 2 *Parthenocissus quinquefolia* | vine | FACU | 2 | | |
| 3 *Carya cordiformis* | shrub | FACU+ | 3 | | |
| 4 *Rosa multiflora* | shrub | FACU | 4 | | |
| 5 *Sassafras albidum* | shrub | FACU- | 5 | | |
| 6 *Chrysanthemum leucanthemu* | herb | UPL | 6 | | |
| 7 *Achillea millefolium* | herb | FACU | 7 | | |
| 8 *Solidago rugosa* | herb | FAC | 8 | | |
| Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) | | | 13% | | |

Remarks:

**HYDROLOGY**

| | |
|---|---|
| ___Recorded Data (Describe in Remarks):<br>___Stream, Lake, or Tide Gauge<br>___Aerial Photographs<br>___Other<br>X No Recorded Data Available | Wetland Hydrology Indicators:<br>Primary Indicators:<br>___Inundated<br>___Saturated Upper 12 Inches<br>___Water Marks<br>___Drift Lines<br>___Sediment Deposits<br>___Drainage Patterns in Wetlands |
| Field Observations:<br>Depth of Surface Water: _____(in.)<br>Depth to Free Water in Pit: _____(in.)<br>Depth to Saturated Soil: _____(in.) | Secondary Indicators (2 or more required):<br>___Oxidized Root channels in Upper 12 Inches<br>___Water Stained Leaves<br>___Local Soil Survey Data<br>___FAC-Neutral Test ( : )<br>___Other (Explain in Remarks) |

Remarks:

No hydrology.

## SOILS

| Map Unit Name (Series and Phase): | Lowell silt loam, 15 to 25 percent slopes (LeD) | Drainage Class: MWD<br>Field Observations<br>Confirm Map Type? Yes No |
|---|---|---|
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-1 | | 10YR 4/2 | | | |
| 1-12 | | 10YR 5/4 | 7.5YR 4/6 | F/F/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

## WETLAND DETERMINATION

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes | No | Is the Sampling Point Within a Wetland? Yes No |
| Wetland Hydrology Present? | Yes | No | |
| Hydric Soils Present? | Yes | No | |

Remarks:

Approved by HQUSACE 3/92

**DATA FORM 1**
**ROUTINE WETLAND DETERMINATION**
(1987 COE Wetlands Delineation Manual)

| | |
|---|---|
| Project/Site: Century Mine<br>Applicant/Owner: American Energy Corp<br>Investigator: L. Rychlik, M. Bradac WBS | Date: 5/31/01<br>County: Belmont<br>State: Ohio |
| Do Normal Circumstances exist on the site? Yes No<br>Is the site significantly disturbed (Atypical Situation)? Yes No<br>Is the area a potential Problem Area? Yes No<br>(If needed, explain on reverse.) | Comm. ID: Mixed Mesophytic Forest<br>Transect ID: ____<br>Plot ID: Sample Location 18 |

**VEGETATION**

| Dominant Plant Species | Stratum | Indicator | Other Noted Plant Species | Stratum | Indicator |
|---|---|---|---|---|---|
| 1 *Acer saccharum* | tree | FACU | 1 *Trillium sp.* | herb | NL |
| 2 *Aesculus glabra* | tree | FACU+ | 2 *Caulophyllum thalictroides* | herb | UPL |
| 3 *Aesculus glabra* | shrub | FACU+ | 3 | | |
| 4 *Ulmus americana* | shrub | FACW | 4 | | |
| 5 *Laportea canadensis* | herb | FAC | 5 | | |
| 6 *Polystichum acrostichoides* | herb | FACU- | 6 | | |
| 7 | | | 7 | | |
| 8 | | | 8 | | |

Percent of Dominant Plant Species that are OBL, FACW, or FAC (excluding FAC-) 33%

Remarks:

**HYDROLOGY**

___Recorded Data (Describe in Remarks):
___Stream, Lake, or Tide Gauge
___Aerial Photographs
___Other
X No Recorded Data Available

Field Observations:
Depth of Surface Water: _____(in.)
Depth to Free Water in Pit: _____(in.)
Depth to Saturated Soil: _____(in.)

Wetland Hydrology Indicators:
Primary Indicators:
___Inundated
___Saturated Upper 12 Inches
___Water Marks
___Drift Lines
___Sediment Deposits
___Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___Oxidized Root channels in Upper 12 Inches
___Water Stained Leaves
___Local Soil Survey Data
___FAC-Neutral Test ( : )
___Other (Explain in Remarks)

Remarks:

No hydrology.

**SOILS**

| | | |
|---|---|---|
| Map Unit Name (Series and Phase): | Lowell-Westmoreland silt loams, 40-70 percent slopes (LoF) | Drainage Class: WD<br>Field Observations<br>Confirm Map Type? Yes No |
| Taxonomy (Subgr): | Typic Hapludalfs | |

Profile Description:

| Depth (inches) | Horizon | Matrix Color (Munsell Moist) | Mottle Colors (Munsell Moist) | Mottle Abundance/ Size/Contrast* | Texture, Concretions, Structure, etc. |
|---|---|---|---|---|---|
| 0-2 | | 10YR 4/2 | | | |
| 2-16 | | 10YR 4/6 | 10YR 5/3 | F/C/P | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Hydric Soil Indicators:

___Histosol
___Histic Epipedon
___Sulfidic Odor
___Aquic Moisture Regime
___Reducing Conditions
___Gleyed or Low-Chroma Colors
___Concretions
___High Organic Content in Surface Layer in Sandy Soils
___Organic Streaking in Sandy Soils
___Listed on Local Hydric Soils List
___Listed on National Hydric Soils List
___Other (Explain in Remarks)

Remarks:

* **Abundance**: Few=F; Common=C; Many=M. **Size**: Fine=F; Medium=M; Coarse=C. **Contrast**: Faint=F; Distinct=D; Prominent=P.

**WETLAND DETERMINATION**

| | |
|---|---|
| Hydrophytic Vegetation Present? Yes No<br>Wetland Hydrology Present? Yes No<br>Hydric Soils Present? Yes No | Is the Sampling Point Within a Wetland? Yes No |

Remarks:

Approved by HQUSACE 3/92

# Appendix F:

# Ohio Rapid Assessment Method for Wetlands Rating Forms

# Background Information

| | |
|---|---|
| Name: | L. Rychlik |
| Date: | 6-18-01 |
| Affiliation: | EnviroScience, Inc. |
| Address: | 3781 Darrow Rd. Stow, OH 44224 |
| Phone Number: | 330-688-0111 |
| e-mail address: | lrychlik@enviroscienceinc.com |
| **Name of Wetland:** | Wetlands 1-11 |
| Vegetation Communit(ies): | PFO, PSS |
| HGM Class(es): | Isolated Depressional & Riparian Depressional |

Location of Wetland include map, address, north arrow, landmarks, distances, roads, etc.

See EnviroScience's Wetlands AND OTHER WATERS Delineation Report (19 June 2001)

Map 6: Site Map of Wetlands and Other Waters in Appendix A

| | |
|---|---|
| Lat/Long or UTM Coordinate | — |
| USGS Quad Name | HUNTER |
| County | BELMONT |
| Township | WAYNE |
| Section and Subsection | — |
| Hydrologic Unit Code | 05030106 |
| Site Visit | ✓ |
| National Wetland Inventory Map | ✓ |
| Ohio Wetland Inventory Map | |
| Soil Survey | ✓ |
| Delineation report/map | ✓ |
| Wetland Size (acres/~~hectares~~) | 0.010 - 0.539 |

Name: L. Rychlik

sketch (include north arrow, relationship with other surface waters, vegetation zones, etc.)

See Map 6: Site Map of Wetlands and Other Waters

in Appendix A

of EnviroScience's Wetlands and other Waters Delineation Report (19 June 2001

Comments, Narrative Discussion, Justification of Category Changes

The central portion of the study area was once used for mining purposes several decades ago. Significant alterations to the natural community and structure are apparent here.

Final score: 20-51 Category 1-2

# Narrative Rating

INSTRUCTIONS. Answer each of the following questions. Questions 1, 2, 3 and 4 should be answered based on information obtained from the site visit or the literature *and* by submitting a Data Services Request to the Ohio Department of Natural Resources, Division of Natural Areas and Preserves, Natural Heritage Data Services, 1889 Fountain Square Court, Building F-1, Columbus, Ohio 43224, 614-265-6453 (phone), 614-265-3096 (fax), http://www.dnr.state.oh.us/odnr/dnap/. The remaining questions are designed to be answered primarily by the results of the site visit. Refer to the User's Manual for descriptions of these wetland types. Note: "Critical habitat" is a legally defined in the Endangered Species Act and is the geographic area containing physical or biological features essential to the conservation of a listed species or as an area that may require special management considerations or protection. The Rater should contact the Region 3 Headquarters or the Reynoldsburg Ecological Services Office for updates as to whether critical habitat has been designated for other federally listed threatened or endangered species. "Documented" means the wetland is listed in the appropriate State of Ohio database.

| # | Question | Circle one | |
|---|---|---|---|
| 1 | **Critical Habitat.** Is the wetland in a township, section, or subsection of a United States Geological Survey 7.5 minute Quadrangle that has been designated by the U.S. Fish and Wildlife Service as "critical habitat" for any threatened or endangered plant or animal species? Note: as of January 1, 2001, of the federally listed endangered or threatened species which can be found in Ohio, the Indiana Bat has had critical habitat designated (50 CFR 17.95(a)) and the piping plover has had critical habitat proposed (65 FR 41812 July 6, 2000). | YES<br>Wetland should be evaluated for possible Category 3 status<br>Go to Question 2 | NO<br>Go to Question 2 |
| 2 | **Threatened or Endangered Species.** Is the wetland known to contain an individual of, or documented occurrences of federal or state-listed threatened or endangered plant or animal species? | YES<br>Wetland is a Category 3 wetland.<br>Go to Question 3 | NO<br>Go to Question 3 |
| 3 | **Documented High Quality Wetland.** Is the wetland on record in Natural Heritage Database as a high quality wetland? | YES<br>Wetland is a Category 3 wetland<br>Go to Question 4 | NO<br>Go to Question 4 |
| 4 | **Significant Breeding or Concentration Area.** Does the wetland contain documented regionally significant breeding or nonbreeding waterfowl, neotropical songbird, or shorebird concentration areas? | YES<br>Wetland is a Category 3 wetland<br>Go to Question 5 | NO<br>Go to Question 5 |
| 5 | **Category 1 Wetlands.** Is the wetland less than 0.5 hectares (1 acre) in size and **hydrologically isolated** and either 1) comprised of vegetation that is dominated (greater than eighty per cent areal cover) by *Phalaris arundinacea, Lythrum salicaria,* or *Phragmites australis,* or 2) an acidic pond created or excavated on mined lands that has little or no vegetation? | YES<br>Wetland is a Category 1 wetland<br>Go to Question 6 | NO<br>Go to Question 6 |
| 6 | **Bogs.** Is the wetland a peat-accumulating wetland that 1) has no significant inflows or outflows, 2) supports acidophilic mosses, particularly *Sphagnum* spp., 3) the acidophilic mosses have >30% cover, 4) at least one species from Table 1 is present, and 5) the cover of invasive species (see Table 1) is <25%? | YES<br>Wetland is a Category 3 wetland<br>Go to Question 7 | NO<br>Go to Question 7 |
| 7 | **Fens.** Is the wetland a carbon accumulating (peat, muck) wetland that is the saturated during most of the year, primarily by a discharge of free flowing, mineral rich, ground water with a circumneutral ph (5.5-9.0) and with one or more plant species listed in Table 1 and the cover of invasive species listed in Table 1 is <25%? | YES<br>Wetland is a Category 3 wetland<br>Go to Question 8a | NO<br>Go to Question 8a |

| # | Question | Circle one | |
|---|---|---|---|
| 8a | **"Old Growth Forest."** Is the wetland a forested wetland and is the forest characterized by, but not limited to, the following characteristics: overstory canopy trees of great age (exceeding at least 50% of a projected maximum attainable age for a species); little or no evidence of human-caused understory disturbance during the past 80 to 100 years; an all-aged structure and multilayered canopies; aggregations of canopy trees interspersed with canopy gaps; and significant numbers of standing dead snags and downed logs? | YES<br><br>Wetland is a Category 3 wetland.<br><br>Go to Question 8b | (NO)<br><br>Go to Question 8b |
| 8b | **Mature forested wetlands.** Is the wetland a forested wetland with 50% or more of the cover of upper forest canopy consisting of deciduous trees with large diameters at breast height (dbh), generally diameters greater than 45cm (17.7in) dbh? | YES<br><br>Wetland should be evaluated for possible Category 3 status.<br><br>Go to Question 9a | (NO)<br><br>Go to Question 9a |
| 9a | **Lake Erie coastal and tributary wetlands.** Is the wetland located at an elevation less than 575 feet on the USGS map, adjacent to this elevation, or along a tributary to Lake Erie that is accessible to fish? | YES<br><br>Go to Question 9b | (NO)<br><br>Go to Question 10 |
| 9b | Does the wetland's hydrology result from measures designed to prevent erosion and the loss of aquatic plants, i.e. the wetland is partially hydrologically restricted from Lake Erie due to lakeward or landward dikes or other hydrological controls? | YES<br><br>Wetland should be evaluated for possible Category 3 status<br><br>Go to Question 9d | NO<br><br>Go to Question 9c |
| 9c | Are Lake Erie water levels the wetland's primary hydrological influence, i.e. the wetland is hydrologically unrestricted (no lakeward or upland border alterations), or the wetland can be characterized as an "estuarine" wetland with lake and river influenced hydrology. These include sandbar deposition wetlands, estuarine wetlands, river mouth wetlands, or those dominated by submersed aquatic vegetation. | YES<br><br>Go to Question 9d | NO<br><br>Go to Question 9d |
| 9d | Does the wetland have a predominance of native species within its vegetation communities, although non-native or disturbance tolerant native species can also be present? | YES<br><br>Wetland is a Category 3 wetland<br><br>Go to Question 10 | NO<br><br>Go to Question 9e |
| 9e | Does the wetland have a predominance of non-native or disturbance tolerant native plant species within its vegetation communities? | YES<br><br>Wetland should be evaluated for possible Category 3 status<br><br>Go to Question 10 | NO<br><br>Go to Question 10 |
| 10 | **Lake Plain Sand Prairies (Oak Openings)** Is the wetland located in Lucas, Fulton, Henry, or Wood Counties and can the wetland be characterized by the following description: the wetland has a sandy substrate with interspersed organic matter, a water table often within several inches of the surface, and often with a dominance of the gramineous vegetation listed in Table 1 (woody species may also be present). The Ohio Department of Natural Resources Division of Natural Areas and Preserves can provide assistance in confirming this type of wetland and its quality. | YES<br><br>Wetland is a Category 3 wetland.<br><br>Go to Question 11 | (NO)<br><br>Go to Question 11 |
| 11 | **Relict Wet Prairies.** Is the wetland a relict wet prairie community dominated by some or all of the species in Table 1. Extensive prairies were formerly located in the Darby Plains (Madison and Union Counties), Sandusky Plains (Wyandot, Crawford, and Marion Counties), northwest Ohio, Erie County, and portions of western Ohio Counties (e.g. Darke, Mercer, Miami, Montgomery, etc.). | YES<br><br>Wetland should be evaluated for possible Category 3 status<br><br>Complete Quantitative Rating | (NO)<br><br>Complete Quantitative Rating |

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 1, 2, 7 | Rater(s): L. Rychlik | Date: 6-18-07 |
|---|---|---|

## Metric 1. Wetland Area (size).

max 6 pts. | subtotal: 2 | 2

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [x] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

max 14 pts. | subtotal: 10 | 12

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [x] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

max 30 pts. | subtotal: 11 | 23

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3)
- [x] Precipitation (1)
- [x] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [x] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [ ] Recovered (7)
- [x] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [ ] road bed/RR track
- [x] dredging
- [x] other mining activity

## Metric 4. Habitat Alteration and Development.

max 20 pts. | subtotal: 8 | 31

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [x] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [x] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [x] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [x] mowing
- [ ] grazing
- [x] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [x] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [x] dredging
- [ ] farming
- [ ] nutrient enrichment

subtotal this page: 31

last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 1, 2, 7 | Rater(s): L. Rychlik | Date: 6-18-01 |
|---|---|---|

31
subtotal first page

## 0 (max 10 pts.) 31 (subtotal) Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## 2 (max 20 pts.) 33 (subtotal) Metric 6. Plant communities, interspersion, microtopography.

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [0] Emergent
- [2] Shrub
- [0] Forest
- [0] Mudflats
- [0] Open water
- [0] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [✓] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [✓] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [0] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [0] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

## 33 GRAND TOTAL (max 100 pts)

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html
last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 3, 6 | Rater(s): L. Rychlik | Date: 6-18-01 |
|---|---|---|

## Metric 1. Wetland Area (size).

| max 8 pts. | subtotal |
|---|---|
| 2 | 2 |

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [x] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [ ] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

| max 14 pts. | subtotal |
|---|---|
| 10 | 12 |

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [x] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

| max 30 pts. | subtotal |
|---|---|
| 15.5 | 17.5 |

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3)
- [x] Precipitation (1)
- [x] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [x] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [x] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

## Metric 4. Habitat Alteration and Development.

| max 20 pts. | subtotal |
|---|---|
| 11 | 28.5 |

4a. Substrate disturbance. Score one or double check and average.

- [x] None or none apparent (4)
- [ ] Recovered (3)
- [x] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [x] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [x] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

28.5

subtotal this page

last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 3, 6 | Rater(s): Rychlik | Date: 6-18-01 |
|---|---|---|

28.5
subtotal first page

## 0 (max 10 pts.) 28.5 (subtotal) Metric 5. Special Wetlands.

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## 4 (max 20 pts.) 32.5 (subtotal) Metric 6. Plant communities, interspersion, microtopography.

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [0] Emergent
- [1] Shrub
- [2] Forest
- [0] Mudflats
- [0] Open water
- [0] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [✓] Low (1)
- [ ] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [✓] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [0] Vegetated hummucks/tussucks
- [1] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [0] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

## 32.5 GRAND TOTAL (max 100 pts)

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 4 & 5 | Rater(s): L. Rychlik | Date: 6-18-01 |
|---|---|---|

## Metric 1. Wetland Area (size).

max 6 pts. | subtotal: 0 | 0

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [x] <0.1 acres (0.04ha) (0 pts)

## Metric 2. Upland buffers and surrounding land use.

max 14 pts. | subtotal: 7 | 7

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [x] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest; prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [x] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

## Metric 3. Hydrology.

max 30 pts. | subtotal: 22 | 29

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [x] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [x] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

## Metric 4. Habitat Alteration and Development.

max 20 pts. | subtotal: 12 | 41

4a. Substrate disturbance. Score one or double check and average.

- [x] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [x] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [x] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [x] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

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ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 4 & 5 | Rater(s): L. Rychlik | Date: 6-18-01 |
|---|---|---|

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## 0 | 41 Metric 5. Special Wetlands.

max 10 pts. subtotal

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## 4 | 45 Metric 6. Plant communities, interspersion, microtopography.

max 20 pts. subtotal

6a. Wetland Vegetation Communities. Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [0] Emergent
- [0] Shrub
- [2] Forest
- [0] Mudflats
- [0] Open water
- [0] Other _____

6b. horizontal (plan view) Interspersion. Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [✓] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [✓] Absent (1)

6d. Microtopography. Score all present using 0 to 3 scale.

- [0] Vegetated hummucks/tussucks
- [1] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [0] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

## 45 GRAND TOTAL (max 100 pts)

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 8, 10, 11 | Rater(s): L. Rychlik | Date: 6-19-01 |
|---|---|---|

| 0 | 0 |
|---|---|
| max 6 pts. | subtotal |

## Metric 1. Wetland Area (size).

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [x] <0.1 acres (0.04ha) (0 pts)

| 7 | 7 |
|---|---|
| max 14 pts. | subtotal |

## Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [ ] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [x] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [x] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

| 10 | 17 |
|---|---|
| max 30 pts. | subtotal |

## Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [ ] Other groundwater (3)
- [x] Precipitation (1)
- [x] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [ ] Semi- to permanently inundated/saturated (4)
- [x] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [ ] None or none apparent (12)
- [ ] Recovered (7)
- [x] Recovering (3)
- [x] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [x] filling/grading
- [ ] road bed/RR track
- [x] dredging
- [x] other mining activity

| 5 | 22 |
|---|---|
| max 20 pts. | subtotal |

## Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- [ ] None or none apparent (4)
- [ ] Recovered (3)
- [x] Recovering (2)
- [x] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [ ] Moderately good (4)
- [ ] Fair (3)
- [x] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [ ] None or none apparent (9)
- [ ] Recovered (6)
- [x] Recovering (3)
- [x] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [x] clearcutting
- [ ] selective cutting
- [x] woody debris removal
- [ ] toxic pollutants
- [x] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [x] dredging
- [ ] farming
- [ ] nutrient enrichment

| 22 |
|---|
| subtotal this page |

last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetlands 8, 11 | Rater(s): L. Rychlik | Date: 6-18-07 |
|---|---|---|

22
subtotal first page

## 0 | 22 Metric 5. Special Wetlands.

max 10 pts. subtotal

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## -2 | 20 Metric 6. Plant communities, interspersion, microtopography.

max 20 pts. subtotal

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [0] Emergent
- [1] Shrub
- [0] Forest
- [0] Mudflats
- [0] Open water
- [0] Other_____

6b. horizontal (plan view) Interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [✓] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [✓] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [ ] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [0] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [0] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

## 20 GRAND TOTAL (max 100 pts)

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

last revised 1 February 2001 jjm

ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetland 9 | Rater(s): L. Rychlik | Date: 6-18-01 |
|---|---|---|

| 0 | 0 |
|---|---|
| max 6 pts. | subtotal |

## Metric 1. Wetland Area (size).

Select one size class and assign score.

- [ ] >50 acres (>20.2ha) (6 pts)
- [ ] 25 to <50 acres (10.1 to <20.2ha) (5 pts)
- [ ] 10 to <25 acres (4 to <10.1ha) (4 pts)
- [ ] 3 to <10 acres (1.2 to <4ha) (3 pts)
- [ ] 0.3 to <3 acres (0.12 to <1.2ha) (2pts)
- [ ] 0.1 to <0.3 acres (0.04 to <0.12ha) (1 pt)
- [x] <0.1 acres (0.04ha) (0 pts)

| 10 | 10 |
|---|---|
| max 14 pts. | subtotal |

## Metric 2. Upland buffers and surrounding land use.

2a. Calculate average buffer width. Select only one and assign score. Do not double check.

- [x] WIDE. Buffers average 50m (164ft) or more around wetland perimeter (7)
- [ ] MEDIUM. Buffers average 25m to <50m (82 to <164ft) around wetland perimeter (4)
- [ ] NARROW. Buffers average 10m to <25m (32ft to <82ft) around wetland perimeter (1)
- [ ] VERY NARROW. Buffers average <10m (<32ft) around wetland perimeter (0)

2b. Intensity of surrounding land use. Select one or double check and average.

- [ ] VERY LOW. 2nd growth or older forest, prairie, savannah, wildlife area, etc. (7)
- [x] LOW. Old field (>10 years), shrubland, young second growth forest. (5)
- [ ] MODERATELY HIGH. Residential, fenced pasture, park, conservation tillage, new fallow field. (3)
- [x] HIGH. Urban, industrial, open pasture, row cropping, mining, construction. (1)

| 21 | 31 |
|---|---|
| max 30 pts. | subtotal |

## Metric 3. Hydrology.

3a. Sources of Water. Score all that apply.

- [ ] High pH groundwater (5)
- [x] Other groundwater (3)
- [x] Precipitation (1)
- [ ] Seasonal/Intermittent surface water (3)
- [ ] Perennial surface water (lake or stream) (5)

3b. Connectivity. Score all that apply.

- [ ] 100 year floodplain (1)
- [ ] Between stream/lake and other human use (1)
- [ ] Part of wetland/upland (e.g. forest), complex (1)
- [ ] Part of riparian or upland corridor (1)

3c. Maximum water depth. Select only one and assign score.

- [ ] >0.7 (27.6in) (3)
- [ ] 0.4 to 0.7m (15.7 to 27.6in) (2)
- [x] <0.4m (<15.7in) (1)

3d. Duration inundation/saturation. Score one or dbl check.

- [x] Semi- to permanently inundated/saturated (4)
- [ ] Regularly inundated/saturated (3)
- [ ] Seasonally inundated (2)
- [ ] Seasonally saturated in upper 30cm (12in) (1)

3e. Modifications to natural hydrologic regime. Score one or double check and average.

- [x] None or none apparent (12)
- [ ] Recovered (7)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] ditch
- [ ] tile
- [ ] dike
- [ ] weir
- [ ] stormwater input
- [ ] point source (nonstormwater)
- [ ] filling/grading
- [ ] road bed/RR track
- [ ] dredging
- [ ] other_____

| 17 | 48 |
|---|---|
| max 20 pts. | subtotal |

## Metric 4. Habitat Alteration and Development.

4a. Substrate disturbance. Score one or double check and average.

- [x] None or none apparent (4)
- [ ] Recovered (3)
- [ ] Recovering (2)
- [ ] Recent or no recovery (1)

4b. Habitat development. Select only one and assign score.

- [ ] Excellent (7)
- [ ] Very good (6)
- [ ] Good (5)
- [x] Moderately good (4)
- [ ] Fair (3)
- [ ] Poor to fair (2)
- [ ] Poor (1)

4c. Habitat alteration. Score one or double check and average.

- [x] None or none apparent (9)
- [ ] Recovered (6)
- [ ] Recovering (3)
- [ ] Recent or no recovery (1)

Check all disturbances observed

- [ ] mowing
- [ ] grazing
- [ ] clearcutting
- [ ] selective cutting
- [ ] woody debris removal
- [ ] toxic pollutants
- [ ] shrub/sapling removal
- [ ] herbaceous/aquatic bed removal
- [ ] sedimentation
- [ ] dredging
- [ ] farming
- [ ] nutrient enrichment

| 48 |
|---|
| subtotal this page |

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ORAM v. 5.0 Field Form Quantitative Rating

| Site: Wetland 9 | Rater(s): L. Rychlik | Date: 6-18-01 |
|---|---|---|

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subtotal first page

## Metric 5. Special Wetlands.

0 (max 10 pts.) | 0 (subtotal)

Check all that apply and score as indicated.

- [ ] Bog (10)
- [ ] Fen (10)
- [ ] Old growth forest (10)
- [ ] Mature forested wetland (5)
- [ ] Lake Erie coastal/tributary wetland-unrestricted hydrology (10)
- [ ] Lake Erie coastal/tributary wetland-restricted hydrology (5)
- [ ] Lake Plain Sand Prairies (Oak Openings) (10)
- [ ] Relict Wet Prairies (10)
- [ ] Known occurrence state/federal threatened or endangered species (10)
- [ ] Significant migratory songbird/water fowl habitat or usage (10)
- [ ] Category 1 Wetland. See Question 1 Qualitative Rating (-10)

## Metric 6. Plant communities, interspersion, microtopography.

3 (max 20 pts.) | 51 (subtotal)

6a. Wetland Vegetation Communities.
Score all present using 0 to 3 scale.

- [0] Aquatic bed
- [0] Emergent
- [0] Shrub
- [2] Forest
- [0] Mudflats
- [0] Open water
- [0] Other _____

6b. horizontal (plan view) Interspersion.
Select only one.

- [ ] High (5)
- [ ] Moderately high(4)
- [ ] Moderate (3)
- [ ] Moderately low (2)
- [ ] Low (1)
- [✓] None (0)

6c. Coverage of invasive plants. Refer to Table 1 ORAM long form for list. Add or deduct points for coverage

- [ ] Extensive >75% cover (-5)
- [ ] Moderate 25-75% cover (-3)
- [ ] Sparse 5-25% cover (-1)
- [ ] Nearly absent <5% cover (0)
- [✓] Absent (1)

6d. Microtopography.
Score all present using 0 to 3 scale.

- [0] Vegetated hummucks/tussucks
- [0] Coarse woody debris >15cm (6in)
- [0] Standing dead >25cm (10in) dbh
- [0] Amphibian breeding pools

**Vegetation Community Cover Scale**

| | |
|---|---|
| 0 | Absent or comprises <0.1ha (0.2471 acres) contiguous area |
| 1 | Present and either comprises small part of wetland's vegetation and is of moderate quality, or comprises a significant part but is of low quality |
| 2 | Present and either comprises significant part of wetland's vegetation and is of moderate quality or comprises a small part and is of high quality |
| 3 | Present and comprises significant part, or more, of wetland's vegetation and is of high quality |

**Narrative Description of Vegetation Quality**

| | |
|---|---|
| low | Low spp diversity and/or predominance of nonnative or disturbance tolerant native species |
| mod | Native spp are dominant component of the vegetation, although nonnative and/or disturbance tolerant native spp can also be present, and species diversity moderate to moderately high, but generally w/o presence of rare threatened or endangered spp |
| high | A predominance of native species, with nonnative spp and/or disturbance tolerant native spp absent or virtually absent, and high spp diversity and often, but not always, the presence of rare, threatened, or endangered spp |

**Mudflat and Open Water Class Quality**

| | |
|---|---|
| 0 | Absent <0.1ha (0.247 acres) |
| 1 | Low 0.1 to <1ha (0.247 to 2.47 acres) |
| 2 | Moderate 1 to <4ha (2.47 to 9.88 acres) |
| 3 | High 4ha (9.88 acres) or more |

**Microtopography Cover Scale**

| | |
|---|---|
| 0 | Absent |
| 1 | Present very small amounts or if more common of marginal quality |
| 2 | Present in moderate amounts, but not of highest quality or in small amounts of highest quality |
| 3 | Present in moderate or greater amounts and of highest quality |

**51 GRAND TOTAL (max 100 pts)**

Refer to the most recent ORAM Score Calibration Report for the scoring breakpoints between wetland categories at the following address: http://www.epa.state.oh.us/dsw/401/401.html

last revised 1 February 2001 jjm

18 July 2001

Ms. Amy Holtshouse
Ohio Environmental Protection Agency
Division of Surface Water, 401 Wetlands Section
122 South Front Street
Columbus, Ohio 43216-1049

Re: CENTURY MINE WETLANDS INVESTIGATION

Dear Ms. Holtshouse:

As requested, attached please find QHEI scores for the streams identified in our wetlands delineation report for the Century mine, located in Wayne Township, Belmont County, Ohio. The QHEI's were determined from field observations made on July 13, by Robert Curtis and Mark Bradac, of EnviroScience, Inc., Stow, Ohio.

Please feel free to call if there any questions.

Thank you very much.

Sincerely,

William J. Siplivy, P.E., Inc.

William J. Siplivy, P.E., C.P.G.
President

17 July 2001

Mr. William J. Siplivy
56854 Pleasant Ridge Road
Alledonia, Ohio 43902

Re: Project # 151-382 - Stream Evaluations

Bill:

Mr. Mark Bradac and I revisited the 180-acre site in Belmont County to conduct Qualitative Habitat Evaluation Indeces (QHEI), as requested by Amy Holtshouse of the Ohio EPA. The results are indicated in the following table:

| Stream | QHEI Score | Aquatic Life Use designation |
|---|---|---|
| A | 40.50 | Modified Warmwater Habitat (MWH) |
| B | 53.50 | * |
| C(north) | 48.50 | * |
| C(south) | 20.50 | Limited Resource Water (LRW) |
| D | 49.50 | * |
| E | 38.00 | MWH |
| F | 27.50 | LRW |
| G | 22.50 | LRW |
| H | 27.50 | LRW |
| I | 31.00 | MWH |
| J | 43.00 | MWH |
| K | 42.50 | MWH |
| L | 28.50 | LRW |
| M | 47.50 | * |
| N | 32.00 | MWH |
| P | 32.00 | MWH |
| Q | 34.50 | MWH |
| R | 30.00 | MWH |
| S | 59.75 | * |
| T | 43.50 | MWH |
| V | 33.00 | MWH |
| W | 29.50 | LRW |
| X | 34.00 | MWH |
| Y | 35.00 | MWH |
| Z | 42.50 | MWH |

* between MWH and Warmwater Habitat (WWH)

ES ENVIRO SCIENCE INCORPORATED
3781 DARROW ROAD, STOW, OHIO 44224
330-688-0111 / TOLL FREE: 800-940-4025 / FAX: 330-688-3858

Nearly all of the streams were dry and no fish were observed except within Piney Creek. The scores reflect this by all being low. Please call me with any questions or changes.

Respectfully,

Robert L. Curtis
Wetland Scientist/Project Manager

enc: QHEI Field Sheets (2 copies)

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 40.5

River Code: NA RM: NA Stream Century Mine, Stream A
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments Ent [illegible] 19

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE |
|---|---|---|
| ☐☐-BLDR/SLBS[10] | | |
| ☐☑-BOULDER [9] | 40 | |
| ☐☐-COBBLE [8] | 10 | |
| ☐☐-HARDPAN [4] | | |
| ☐☐-MUCK [2] | | |
| ☐☐-SILT [2] | 40 | 30 |
| ☐☐-GRAVEL [7] | 10 | |
| ☐☐-SAND [6] | 10 | |
| ☑☐-BEDROCK[5] | 40 | 20 |
| ☐☐-DETRITUS[3] | | |
| ☐☐-ARTIFICIAL[0] | | |

NOTE: (Ignore sludge originating from point-sources; score on natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]

SUBSTRATE ORIGIN — Check ONE (OR 2 & AVERAGE): ☐-LIMESTONE [1] ☐-TILLS [1] ☐-WETLANDS[0] ☐-HARDPAN [0] ☐-SANDSTONE [0] ☐-RIP./RAP [0] ☐-LACUSTRINE [0] ☑-SHALE [-1] ☑-COAL FINES [-2]

SUBSTRATE QUALITY — Check ONE (OR 2 & AVERAGE):
SILT: ☑-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]
EMBEDDEDNESS: ☑-EXTENSIVE [-2] ☐-MODERATE [-1] ☐-NORMAL [0] ☐-NONE [1]

Substrate: 8.5 Max 20

COMMENTS

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

TYPE: (Check *All* That Apply): ☐-UNDERCUT BANKS [1] ☐-OVERHANGING VEGETATION [1] ☑-SHALLOWS (IN SLOW WATER) [1] ☐-ROOTMATS [1] ☐-POOLS>70 cm [2] ☐-ROOTWADS [1] ☐-BOULDERS [1] ☐-OXBOWS, BACKWATERS [1] ☐-AQUATIC MACROPHYTES [1] ☐-LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*): ☐-EXTENSIVE > 75% [11] ☐-MODERATE 25-75% [7] ☑-SPARSE 5-25% [3] ☐-NEARLY ABSENT < 5% [1]

COMMENTS:

Cover: 7 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

SINUOSITY: ☐-HIGH [4] ☑-MODERATE [3] ☑-LOW [2] ☐-NONE [1]
DEVELOPMENT: ☐-EXCELLENT [7] ☑-GOOD [5] ☑-FAIR [3] ☐-POOR [1]
CHANNELIZATION: ☑-NONE [6] ☐-RECOVERED [4] ☐-RECOVERING [3] ☐-RECENT OR NO RECOVERY [1]
STABILITY: ☑-HIGH [3] ☐-MODERATE [2] ☐-LOW [1]
MODIFICATIONS/OTHER: ☐-SNAGGING ☑-RELOCATION ☐-CANOPY REMOVAL ☐-DREDGING ☐-ONE SIDE CHANNEL MODIFICATIONS ☐-IMPOUND. ☐-ISLANDS ☐-LEVEED ☑-BANK SHAPING

Channel: 15.5 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

RIPARIAN WIDTH — L R (Per Bank): ☐☐-WIDE >50m [4] ☐☐-MODERATE 10-50m [3] ☐☐-NARROW 5-10 m [2] ☐☐-VERY NARROW <5 m[1] ☐☐-NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank): ☑☐-FOREST, SWAMP [3] ☐☐-SHRUB OR OLD FIELD [2] ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] ☐☐-FENCED PASTURE [1] ☐☐-CONSERVATION TILLAGE [1] ☐☐-URBAN OR INDUSTRIAL [0] ☐☐-OPEN PASTURE, ROWCROP [0] ☑☑-MINING/CONSTRUCTION [0]

BANK EROSION — L R (Per Bank): ☐☐-NONE/LITTLE [3] ☑☑-MODERATE [2] ☐☐-HEAVY/SEVERE[1]

Riparian: 3.5 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!): ☐-> 1m [6] ☐-0.7-1m [4] ☐-0.4-0.7m [2] ☐-0.2-0.4m [1] ☑-< 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE): ☐-POOL WIDTH > RIFFLE WIDTH [2] ☐-POOL WIDTH = RIFFLE WIDTH [1] ☐-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES] (Check *All* That Apply): ☐-EDDIES[1] ☐-FAST[1] ☐-MODERATE[1] ☑-SLOW[1] ☑-TORRENTIAL[-1] ☑-INTERSTITIAL[-1] ☑-INTERMITTENT[-2]

COMMENTS:

Pool/Current: 0 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH: ☐-Best Areas >10 cm [2] ☐-Best Areas 5-10 cm[1] ☑-Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH: ☐-MAX > 50 [2] ☑-MAX < 50[1]

RIFFLE/RUN SUBSTRATE: ☑-STABLE (e.g. Cobble, Boulder) [2] ☐-MOD. STABLE (e.g. Large Gravel) [1] ☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS: ☐-NONE [2] ☐-LOW [1] ☐-MODERATE [0] ☑-EXTENSIVE [-1]

COMMENTS: ☐-NO RIFFLE [Metric=0]

Riffle/Run: 2 Max 8

Gradient: 4 Max 10

**6] GRADIENT (ft/mi):** 3.83 **DRAINAGE AREA (sq.mi.):** <1 %POOL: ☐ %GLIDE: ☐ %RIFFLE: ☐ %RUN: ☐

*Best areas must be large enough to support a population of riffle-dwelling fish species.

EPA 4520 7/16/98

AEC 11491

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 6 | | | | | | | | |

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 53.5

River Code: NA RM: NA Stream Century Mine, Stream B
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments photo 12

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐ BLDR/SLBS [10] | | 50 | ☐ ☐ GRAVEL [7] | 50 | 10 |
| ☐ ☐ BOULDER [9] | | | ☐ ☐ SAND [6] | 20 | 10 |
| ☐ ☐ COBBLE [8] | 20 | 20 | ☐ ☐ BEDROCK [5] | | |
| ☐ ☐ HARDPAN [4] | | | ☐ ☐ DETRITUS [3] | | |
| ☐ ☐ MUCK [2] | | | ☐ ☐ ARTIFICIAL [0] | | |
| ☐ ☐ SILT [2] | 10 | 10 | | | |

NOTE (Ignores bedrock and artificial substrates; scores natural substrates)
☐ 5 or More [2]
☐ 4 or Less [0]
NUMBER OF SUBSTRATE TYPES:

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ - LIMESTONE [1]
☐ - TILLS [1]
☐ - WETLANDS [0]
☐ - HARDPAN [0]
☐ - SANDSTONE [0]
☐ - RIP/RAP [0]
☐ - LACUSTRINE [0]
☐ - SHALE [-1]
☐ - COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐ - SILT HEAVY [-2]
☐ - SILT MODERATE [-1]
☐ - SILT NORMAL [0]
☐ - SILT FREE [1]

EMBEDDEDNESS:
☐ - EXTENSIVE [-3]
☐ - MODERATE [-1]
☐ - NORMAL [0]
☐ - NONE [1]

COMMENTS

Substrate: 17.5 Max 20

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]
COMMENTS: [illegible]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 4 Max 20

<5 = M
A = 0

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☐ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☐ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☐ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 16 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☐ ☐ - WIDE > 50m [4] | ☐ ☐ - FOREST, SWAMP [3] | ☐ ☐ - CONSERVATION TILLAGE [1] | ☐ ☐ - NONE/LITTLE [3] |
| ☐ ☐ - MODERATE 10-50m [3] | ☐ ☐ - SHRUB OR OLD FIELD [2] | ☐ ☐ - URBAN OR INDUSTRIAL [0] | ☐ ☐ - MODERATE [2] |
| ☐ ☐ - NARROW 5-10m [2] | ☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1] | ☐ ☐ - OPEN PASTURE, ROW CROP [0] | ☐ ☐ - HEAVY/SEVERE [1] |
| ☐ ☐ - VERY NARROW < 5 m [1] | ☐ ☐ - FENCED PASTURE [1] | ☐ ☐ - MINING/CONSTRUCTION [0] | |
| ☐ ☐ - NONE [0] | | | |

Riparian: 4 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES] (Check *All* That Apply)
☐ - EDDIES [1]
☐ - FAST [1]
☐ - MODERATE [1]
☐ - SLOW [1]
☐ - TORRENTIAL [-1]
☐ - INTERSTITIAL [-1]
☐ - INTERMITTENT [-2]

COMMENTS:

Pool/Current: 1 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☐ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐ - STABLE (e.g., Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g., Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2]
☐ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 8 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): > 40 DRAINAGE AREA (sq.mi.): < 1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Percent underlain by or supporting riffle-dwelling species.

EPA 4520 7/16/98

AEC 11493

Is Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain:

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| y | | | | | | | | |

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

AEC 11494

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 48.5

River Code: NA RM: NA Stream Century Mine, Stream C - North
Date 7/13/01 Location North of Riley Creek just east of confluence w/ Long Run
Scorers Initials: R.C, MB Comments natural - intermittent

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS[10] | | | ☐☐-GRAVEL [7] | 10 | 10 |
| ☐☐-BOULDER [9] | | | ☑☐-SAND [6] | 60 | 20 |
| ☐☑-COBBLE [8] | 20 | 50 | ☐☐-BEDROCK[5] | | |
| ☐☐-HARDPAN [4] | 10 | 20 | ☐☐-DETRITUS[3] | | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL[0] | | |
| ☐☐-SILT [2] | | | | | |

NOTE (Ignores sludge originating from point-sources; score natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS[0]
☑-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☑-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☑-NORMAL [0]
☐-NONE [1]

Substrate: 14 Max 20

COMMENTS

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: not functional

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☑ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☑ - NONE [6] | ☑ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☑ - MODERATE [3] | ☑ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☐ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☐ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☐ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 17 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION**-(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | FLOOD PLAIN QUALITY L R | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑☑-WIDE > 50m [4] | ☑☑-FOREST, SWAMP [3] | ☐☐-CONSERVATION, TILLAGE [1] | ☑☑-NONE/LITTLE [3] |
| ☐☐-MODERATE 10-50m [3] | ☐☐-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] | ☐☐-MODERATE [2] |
| ☐☐-NARROW 5-10 m [2] | ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROW CROP [0] | ☐☐-HEAVY/SEVERE [1] |
| ☐☐-VERY NARROW <5 m [1] | ☑☑-FENCED PASTURE [1] | ☐☐-MINING/CONSTRUCTION [0] | |
| ☐☐-NONE [0] | | | |

Riparian: 9 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☑ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☐ -POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐ -EDDIES[1] ☐ -TORRENTIAL[-1]
☐ -FAST[1] ☑ -INTERSTITIAL[-1]
☐ -MODERATE [1] ☑ -INTERMITTENT[-2]
☑ -SLOW [1]

COMMENTS:

Pool/Current: 0 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☐ - Best Areas >10 cm [2]
☐ - Best Areas 5-10 cm [1]
☑ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☑ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☑ STABLE (e.g. Cobble, Boulder) [2]
☑ MOD. STABLE (e.g. Large Gravel) [1]
☐ UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2]
☑ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 3.5 Max 8

Gradient: 4 Max 10

**6] GRADIENT (ft/mi):** >40 **DRAINAGE AREA (sq.mi.):** <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support a population of riffle-obligate fish species.

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Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain: _____

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 20.5

River Code: NA RM: NA Stream Century Mine - Stream C - South
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RCC MB Comments disturbed - intermittent

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS[10] | | | ☐☑-GRAVEL [7] | | 40 |
| ☐☐-BOULDER [9] | | | ☐☐-SAND [6] | | 20 |
| ☐☐-COBBLE [8] | 10 | | ☐☐-BEDROCK[5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS[3] | | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL[0] | | |
| ☑☐-SILT [2] | 90 | 40 | | | |

NOTE (Ignore sludge originating from point-sources; score natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS[0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☑-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☑-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☑-EXTENSIVE [-2]
☐-MODERATE [-1]
☐-NORMAL [0]
☐-NONE [1]

Substrate: 4 (Max 20)

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐___ UNDERCUT BANKS [1]
☐___ OVERHANGING VEGETATION [1]
☐___ SHALLOWS (IN SLOW WATER) [1]
☐___ ROOTMATS [1]
☐___ POOLS > 70 cm [2]
☐___ ROOTWADS [1]
☐___ BOULDERS [1]
☐___ OXBOWS, BACKWATERS [1]
☐___ AQUATIC MACROPHYTES [1]
☐___ LOGS OR WOODY DEBRIS [1]

COMMENTS: not fine/rare

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐- EXTENSIVE > 75% [11]
☐- MODERATE 25-75% [7]
☐- SPARSE 5-25% [3]
☑- NEARLY ABSENT < 5% [1]

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐- HIGH [4] | ☐- EXCELLENT [7] | ☑- NONE [6] | ☐- HIGH [3] | ☐- SNAGGING ☐- IMPOUND. |
| ☐- MODERATE [3] | ☐- GOOD [5] | ☐- RECOVERED [4] | ☐- MODERATE [2] | ☑- RELOCATION ☐- ISLANDS |
| ☑- LOW [2] | ☐- FAIR [3] | ☐- RECOVERING [3] | ☑- LOW [1] | ☑- CANOPY REMOVAL ☐- LEVEED |
| ☐- NONE [1] | ☑- POOR [1] | ☐- RECENT OR NO RECOVERY [1] | | ☐- DREDGING ☑- BANK SHAPING |
| | | | | ☐- ONE SIDE CHANNEL MODIFICATIONS |

Channel: 10 (Max 20)

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

**RIPARIAN WIDTH** L R (Per Bank)
☐☐-WIDE > 50m [4]
☐☐- MODERATE 10-50m [3]
☐☐-NARROW 5-10 m [2]
☐☐- VERY NARROW < 5 m [1]
☑☑- NONE [0]

**FLOOD PLAIN QUALITY** (*PAST 100 Meter RIPARIAN*)

| L R (Most Predominant Per Bank) | L R |
|---|---|
| ☑☑-FOREST, SWAMP [3] | ☐☐-CONSERVATION TILLAGE [1] |
| ☐☐-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] |
| ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROWCROP [0] |
| ☐☐-FENCED PASTURE [1] | ☑☐-MINING/CONSTRUCTION [0] |

**BANK EROSION** L R (Per Bank)
☐☐-NONE/LITTLE [3]
☐☐-MODERATE [2]
☑☑-HEAVY/SEVERE [1]

Riparian: 2.5 (Max 10)

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐- >1m [6]
☐- 0.7-1m [4]
☐- 0.4-0.7m [2]
☐- 0.2-0.4m [1]
☑- < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐-POOL WIDTH > RIFFLE WIDTH [2]
☐-POOL WIDTH = RIFFLE WIDTH [1]
☑-POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES!]** (Check *All* That Apply)
☐-EDDIES [1]
☐-FAST [1]
☑-MODERATE [1]
☑-SLOW [1]
☐-TORRENTIAL [-1]
☑-INTERSTITIAL [-1]
☑-INTERMITTENT [-2]

COMMENTS:

Pool/Current: -1 (Max 12)

**CHECK ONE OR CHECK 2 AND AVERAGE**

**RIFFLE DEPTH**
☐- Best Areas > 10 cm [2]
☐- Best Areas 5-10 cm [1]
☑- Best Areas < 5 cm [RIFFLE=0]

**RUN DEPTH**
☐- MAX > 50 [2]
☑- MAX < 50 [1]

**RIFFLE/RUN SUBSTRATE**
☐-STABLE (e.g. Cobble, Boulder) [2]
☐-MOD. STABLE (e.g. Large Gravel) [1]
☑-UNSTABLE (Fine Gravel, Sand) [0]

**RIFFLE/RUN EMBEDDEDNESS**
☐- NONE [2]
☐- LOW [1]
☐- MODERATE [0]
☑- EXTENSIVE [-1]

COMMENTS: ☐- NO RIFFLE [Metric=0]

Riffle/Run: 0 (Max 8)

Gradient: 4 (Max 10)

**6] GRADIENT (ft/mi):** 240 **DRAINAGE AREA (sq.mi.):** <1

%POOL: ___ %GLIDE: ___
%RIFFLE: ___ %RUN: ___

*Best areas must be large enough to support a population of riffle-dwelling species.

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AEC 11497

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

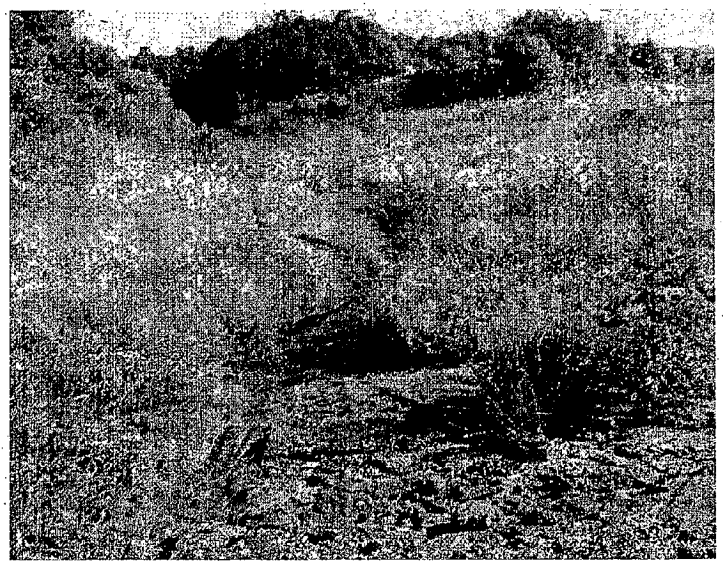
Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 4 | | | | | | | | |

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐

Other: _____

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far: _____ |
| ☐ ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 49.5

River Code: NA RM: NA Stream Century Mine, Stream D
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments Mt Emmitsburg photo 6

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | | | ☐ ☐-GRAVEL [7] | 20 | 30 |
| ☐ ☐-BOULDER [9] | 10 | 30 | ☐ ☐-SAND [6] | 10 | 10 |
| ☐ ☐-COBBLE [8] | 10 | 30 | ☐ ☐-BEDROCK [5] | | |
| ☐ ☐-HARDPAN [4] | | | ☐ ☐-DETRITUS [3] | | |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☐ ☐-SILT [2] | 50 | | | | |

NOTE (Ignore sludge originating from point sources; score natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ - LIMESTONE [1]
☐ - TILLS [1]
☐ - WETLANDS [0]
☐ - HARDPAN [0]
☐ - SANDSTONE [0]
☐ - RIP/RAP [0]
☐ - LACUSTRINE [0]
☐ - SHALE [-1]
☐ - COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐ - SILT HEAVY [-2]
☐ - SILT MODERATE [-1]
☐ - SILT NORMAL [0]
☐ - SILT FREE [1]

EMBEDDEDNESS:
☐ - EXTENSIVE [-2]
☐ - MODERATE [-1]
☐ - NORMAL [0]
☐ - NONE [1]

COMMENTS

Substrate: 11 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ - UNDERCUT BANKS [1]
☐ - OVERHANGING VEGETATION [1]
☐ - SHALLOWS (IN SLOW WATER) [1]
☐ - ROOTMATS [1]
☐ - POOLS > 70 cm [2]
☐ - ROOTWADS [1]
☐ - BOULDERS [1]
☐ - OXBOWS, BACKWATERS [1]
☐ - AQUATIC MACROPHYTES [1]
☐ - LOGS OR WOODY DEBRIS [1]

COMMENTS: Fish cover

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 5 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

SINUOSITY
☐ - HIGH [4]
☐ - MODERATE [3]
☐ - LOW [2]
☐ - NONE [1]

DEVELOPMENT
☐ - EXCELLENT [7]
☐ - GOOD [5]
☐ - FAIR [3]
☐ - POOR [1]

CHANNELIZATION
☐ - NONE [6]
☐ - RECOVERED [4]
☐ - RECOVERING [3]
☐ - RECENT OR NO RECOVERY [1]

STABILITY
☐ - HIGH [3]
☐ - MODERATE [2]
☐ - LOW [1]

MODIFICATIONS/OTHER
☐ - SNAGGING
☐ - RELOCATION
☐ - CANOPY REMOVAL
☐ - DREDGING
☐ - IMPOUND.
☐ - ISLANDS
☐ - LEVEED
☐ - BANK SHAPING
☐ - ONE SIDE CHANNEL MODIFICATIONS

COMMENTS:

Channel: 18 Max 20

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)
☐ ☐ - WIDE > 50m [4]
☐ ☐ - MODERATE 10-50m [3]
☐ ☐ - NARROW 5-10 m [2]
☐ ☐ - VERY NARROW < 5 m [1]
☐ ☐ - NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank)
☐ - FOREST, SWAMP [3]
☐ ☐ - SHRUB OR OLD FIELD [2]
☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ - FENCED PASTURE [1]
☐ ☐ - CONSERVATION TILLAGE [1]
☐ ☐ - URBAN OR INDUSTRIAL [0]
☐ ☐ - OPEN PASTURE, ROW CROP [0]
☐ ☐ - MINING/CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐ ☐ - NONE/LITTLE [3]
☐ ☐ - MODERATE [2]
☐ ☐ - HEAVY/SEVERE [1]

COMMENTS:

Riparian: 6.5 Max 10

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐ - EDDIES [1]
☐ - FAST [1]
☐ - MODERATE [1]
☐ - SLOW [1]
☐ - TORRENTIAL [-1]
☐ - INTERSTITIAL [-1]
☐ - INTERMITTENT [-2]

COMMENTS:

Pool/Current: -1 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐ - Best Areas >10 cm [2]
☐ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☐ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐ - STABLE (e.g. Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2]
☐ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 4 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): 240 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support populations of riffle-dwelling species.

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AEC 11499

Is Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | _____ | _____ | _____ | _____ | _____ |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

| Average Width | Aver De | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|
| 5 | | | | |

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far: _____ |
| ☐ ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 38

River Code: NA RM: NA Stream Century Mine, Stream 5
Date 7/13/01 Location Northeast Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments natural - ephemeral
photo 6

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ BLDR/SLBS [10] | | | ☐ GRAVEL [7] | 35 | 5 |
| ☐ BOULDER [9] | | | ☐ SAND [6] | 50 | 30 |
| ☐ COBBLE [8] | | | ☐ BEDROCK [5] | | |
| ☐ HARDPAN [4] | 10 | 5 | ☐ DETRITUS [3] | | |
| ☐ MUCK [2] | | | ☐ ARTIFICIAL [0] | | |
| ☐ SILT [2] | 5 | 5 | | | |

NOTE (Ignores bridge originating from point sources; scour or natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐ 5 or More [2] ☐ 4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** (Check ONE (OR 2 & AVERAGE)): ☐ LIMESTONE [1] ☐ TILES [1] ☐ WETLANDS [0] ☐ HARDPAN [0] ☐ SANDSTONE [0] ☐ RIP/RAP [0] ☐ LACUSTRINE [0] ☐ SHALE [-1] ☐ COAL FINES [-2]

**SUBSTRATE QUALITY** (Check ONE (OR 2 & AVERAGE)):
SILT: ☐ SILT HEAVY [-2] ☐ SILT MODERATE [-1] ☐ SILT NORMAL [0] ☐ SILT FREE [1]
EMBEDDEDNESS: ☐ EXTENSIVE [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☐ NONE [1]

Substrate: 10 (Max 20)

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply): ☐ UNDERCUT BANKS [1] ☐ OVERHANGING VEGETATION [1] ☐ SHALLOWS (IN SLOW WATER) [1] ☐ ROOTMATS [1] ☐ POOLS > 70 cm [2] ☐ ROOTWADS [1] ☐ BOULDERS [1] ☐ OXBOWS, BACKWATERS [1] ☐ AQUATIC MACROPHYTES [1] ☐ LOGS OR WOODY DEBRIS [1]
COMMENTS: flow function

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*): ☐ EXTENSIVE > 75% [11] ☐ MODERATE 25-75% [7] ☐ SPARSE 5-25% [3] ☐ NEARLY ABSENT < 5% [1]

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

SINUOSITY: ☐ HIGH [4] ☐ MODERATE [3] ☐ LOW [2] ☐ NONE [1]
DEVELOPMENT: ☐ EXCELLENT [7] ☐ GOOD [5] ☐ FAIR [3] ☐ POOR [1]
CHANNELIZATION: ☐ NONE [6] ☐ RECOVERED [4] ☐ RECOVERING [3] ☐ RECENT OR NO RECOVERY [1]
STABILITY: ☐ HIGH [3] ☐ MODERATE [2] ☐ LOW [1]
MODIFICATIONS/OTHER: ☐ SNAGGING ☐ RELOCATION ☐ CANOPY REMOVAL ☐ DREDGING ☐ ONE SIDE CHANNEL MODIFICATIONS ☐ IMPOUND. ☐ ISLANDS ☐ LEVEED ☐ BANK SHAPING

Channel: 11 (Max 20)

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH (L R (Per Bank)): ☐ WIDE > 50m [4] ☐ MODERATE 10-50m [3] ☐ NARROW 5-10m [2] ☐ VERY NARROW < 5m [1] ☐ NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) (L R (Most Predominant Per Bank)): ☐ FOREST, SWAMP [3] ☐ SHRUB OR OLD FIELD [2] ☐ RESIDENTIAL, PARK, NEW FIELD [1] ☐ FENCED PASTURE [1] ☐ CONSERVATION TILLAGE [1] ☐ URBAN OR INDUSTRIAL [0] ☐ OPEN PASTURE, ROW CROP [0] ☐ MINING/CONSTRUCTION [0]

BANK EROSION (L R (Per Bank)): ☐ NONE/LITTLE [3] ☐ MODERATE [2] ☐ HEAVY/SEVERE [1]

Riparian: 10 (Max 10)

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!): ☐ > 1m [6] ☐ 0.7-1m [4] ☐ 0.4-0.7m [2] ☐ 0.2-0.4m [1] ☐ < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE): ☐ POOL WIDTH > RIFFLE WIDTH [2] ☐ POOL WIDTH = RIFFLE WIDTH [1] ☐ POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply): ☐ EDDIES [1] ☐ FAST [1] ☐ MODERATE [1] ☐ SLOW [1] ☐ TORRENTIAL [-1] ☐ INTERSTITIAL [-1] ☐ INTERMITTENT [-2]

COMMENTS:

Pool/Current: 2 (Max 12)

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH: ☐ Best Areas > 10 cm [2] ☐ Best Areas 5-10 cm [1] ☐ Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH: ☐ MAX > 50 [2] ☐ MAX < 50 [1]

RIFFLE/RUN SUBSTRATE: ☐ STABLE (e.g. Cobble, Boulder) [2] ☐ MOD. STABLE (e.g. Large Gravel) [1] ☐ UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS: ☐ NONE [2] ☐ LOW [1] ☐ MODERATE [0] ☐ EXTENSIVE [-1]

COMMENTS: run functional ☐ NO RIFFLE [Metric=0]

Riffle/Run: 4 (Max 8)

GRADIENT (ft/mi): > 40 DRAINAGE AREA (sq.mi.): < 1

%POOL: %GLIDE: %RIFFLE: %RUN:

Gradient: 4 (Max 10)

*Best areas must be large enough to support a population of riffle-obligate species.

EPA 4520 7/16/98

AEC 11501

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11502

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 27.5

River Code: NA RM: NA Stream Century Mine, Stream F
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments not natural - ecoregion change
Photo 1

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐ BLDR/SLBS [10] | | | ☐ ☐ GRAVEL [7] | | 20 |
| ☐ ☐ BOULDER [9] | | | ☐ ☐ SAND [6] | 80 | 20 |
| ☒ ☐ COBBLE [8] | 50 | | ☐ ☐ BEDROCK [5] | | |
| ☐ ☐ HARDPAN [4] | | | ☐ ☐ DETRITUS [3] | | |
| ☐ ☐ MUCK [2] | | | ☐ ☐ ARTIFICIAL [0] | | |
| ☐ ☐ SILT [2] | 20 | 10 | | | |

NOTE: (Ignore sludge originating from point-sources; score natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐ 5 or More [2] ☒ 4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ - LIMESTONE [1]
☐ - TILLS [1]
☐ - WETLANDS [0]
☐ - HARDPAN [0]
☐ - SANDSTONE [0]
☐ - RIP/RAP [0]
☐ - LACUSTRINE [0]
☐ - SHALE [-1]
☒ - COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT:
☐ - SILT HEAVY [-2]
☒ - SILT MODERATE [-1]
☐ - SILT NORMAL [0]
☐ - SILT FREE [1]
EMBEDDEDNESS:
☐ - EXTENSIVE [-2]
☒ - MODERATE [-1]
☒ - NORMAL [0]
☐ - NONE [1]

Substrate: 10.5 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☒ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1] ☐ EXTENSIVE > 75% [11]
☒ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1] ☐ MODERATE 25-75% [7]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1] ☐ SPARSE 5-25% [3]
☐ ROOTMATS [1] COMMENTS: non natural ☒ NEARLY ABSENT < 5% [1]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☒ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☒ - RELOCATION ☐ - ISLANDS |
| ☒ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☒ - LOW [1] | ☐ - CANOPY REMOVAL ☐ - INFEED |
| ☐ - NONE [1] | ☒ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

poor natural

Channel: 10 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★ River Right Looking Downstream ★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☐ ☐ - WIDE > 50m [4] | ☐ ☐ - FOREST, SWAMP [3] | ☐ ☐ - CONSERVATION TILLAGE [1] | ☐ ☐ - NONE/LITTLE [3] |
| ☐ ☐ - MODERATE 10-50m [3] | ☒ ☒ - SHRUB OR GRD FIELD [2] | ☐ ☐ - URBAN OR INDUSTRIAL [0] | ☐ ☐ - MODERATE [2] |
| ☐ ☐ - NARROW 5-10m [2] | ☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1] | ☐ ☐ - OPEN PASTURE, ROWCROP [0] | ☒ ☒ - HEAVY/SEVERE [1] |
| ☐ ☐ - VERY NARROW < 5m [1] | ☐ ☐ - FENCED PASTURE [1] | ☒ ☒ - MINING/CONSTRUCTION [0] | |
| ☐ ☐ - NONE [0] | | | |

Riparian: 2 Max 10

COMMENTS:

**5.] POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☒ - < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☒ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES]** (Check *All* That Apply)
☐ - EDDIES [1] ☐ - TORRENTIAL [-1]
☐ - FAST [1] ☐ - INTERSTITIAL [1]
☐ - MODERATE [1] ☒ - INTERMITTENT [-2]
☐ - SLOW [1]

COMMENTS:

Pool/Current: -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

| RIFFLE DEPTH | RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS |
|---|---|---|---|
| ☐ - Best Areas > 10 cm [2] | ☐ - MAX > 50 [2] | ☐ - STABLE (e.g. Cobble, Boulder) [2] | ☐ - NONE [2] |
| ☐ - Best Areas 5-10 cm [1] | ☐ - MAX < 50 [1] | ☒ - MOD. STABLE (e.g. Large Gravel) [1] | ☐ - LOW [1] |
| ☒ - Best Areas < 5 cm (RIFFLE=0) | | ☐ - UNSTABLE (Fine Gravel, Sand) [0] | ☒ - MODERATE [0] |
| | | | ☐ - EXTENSIVE [-1] |

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 2 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): 240 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support a population of riffle-obligate species.

EPA 4520 7/16/98

AEC 11503

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | |

Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:

dry

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far:_____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 12 5

River Code: NA RM: NA Stream Century Mine, Stream 6
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments May be natural

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);** PHAO 3

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ BEDROCK/SLABS [10] | | | ☐ GRAVEL [7] | | |
| ☐ BOULDER [9] | | | ☐ SAND [6] | | 60 |
| ☐ COBBLE [8] | 10 | 30 | ☐ BEDROCK [5] | | |
| ☐ HARDPAN [4] | | | ☐ DETRITUS [3] | | |
| ☐ MUCK [2] | | | ☐ ARTIFICIAL [0] | | |
| ☐ SILT [2] | 90 | | | | |

NOTE: (Ignores bedrock originating from point-sources; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐ 5 or More [2] ☐ 4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ - LIMESTONE [1]
☐ - TILLS [1]
☐ - WETLANDS [0]
☐ - HARDPAN [0]
☐ - SANDSTONE [0]
☐ - RIP/RAP [0]
☐ - LACUSTRINE [0]
☐ - SHALE [-1]
☐ - COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐ - SILT HEAVY [-2]
☐ - SILT MODERATE [-1]
☐ - SILT NORMAL [0]
☐ - SILT FREE [1]

EMBEDDEDNESS:
☐ - EXTENSIVE [-2]
☐ - MODERATE [-1]
☐ - NORMAL [0]
☐ - NONE [1]

Substrate: 2 (Max 20)

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

**TYPE: (Check *All* That Apply)**
☐ - UNDERCUT BANKS [1]
☐ - OVERHANGING VEGETATION [1]
☐ - SHALLOWS (IN SLOW WATER) [1]
☐ - ROOTMATS [1]
☐ - POOLS > 70 cm [2]
☐ - ROOTWADS [1]
☐ - BOULDERS [1]
☐ - OXBOWS, BACKWATERS [1]
☐ - AQUATIC MACROPHYTES [1]
☐ - LOGS OR WOODY DEBRIS [1]
COMMENTS: [illegible]

**AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)**
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION |
| ☐ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☐ - CANOPY REMOVAL |
| ☐ - NONE [1] | ☐ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING |
| | | | | ☐ - IMPOUND. |
| | | | | ☐ - ISLANDS |
| | | | | ☐ - LEVEED |
| | | | | ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 10 (Max 20)

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

**RIPARIAN WIDTH** L R (Per Bank)
☐ ☐ - WIDE > 50m [4]
☐ ☐ - MODERATE 10-50m [3]
☐ ☐ - NARROW 5-10m [2]
☐ ☐ - VERY NARROW < 5 m [1]
☐ ☐ - NONE [0]

**FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)** L R (Most Predominant Per Bank)
☐ ☐ - FOREST, SWAMP [3]
☐ ☐ - SHRUB OR OLD FIELD [2]
☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ - FENCED PASTURE [1]
☐ ☐ - CONSERVATION TILLAGE [1]
☐ ☐ - URBAN OR INDUSTRIAL [0]
☐ ☐ - OPEN PASTURE, ROWCROP [0]
☐ ☐ - MINING/CONSTRUCTION [0]

**BANK EROSION** L R (Per Bank)
☐ ☐ - NONE/LITTLE [3]
☐ ☐ - MODERATE [2]
☐ ☐ - HEAVY/SEVERE [1]

Riparian: 6.5 (Max 10)

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH (Check 1 ONLY!)**
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOLS=0]

**MORPHOLOGY (Check 1 or 2 & AVERAGE)**
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)**
☐ - EDDIES [1]
☐ - FAST [1]
☐ - MODERATE [1]
☐ - SLOW [1]
☐ - TORRENTIAL [-1]
☐ - INTERSTITIAL [1]
☐ - INTERMITTENT [-2]

COMMENTS:

Pool/Current: -1 (Max 12)

**CHECK ONE OR CHECK 2 AND AVERAGE**

**RIFFLE DEPTH**
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

**RUN DEPTH**
☐ - MAX > 50 [2]
☐ - MAX < 50 [1]

**RIFFLE/RUN SUBSTRATE**
☐ - STABLE (e.g. Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

**RIFFLE/RUN EMBEDDEDNESS**
☐ - NONE [2]
☐ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 6 (Max 8)

Gradient: 4 (Max 10)

GRADIENT (ft/mi): > 40 DRAINAGE AREA (sq.mi.): < 1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best measure but also consider other cover types and complexity of riffle-dwelling species.

EPA 4520 7/16/98

AEC 11505

Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | _____ | _____ | _____ | _____ | _____ |

Subjective Rating (1-10) ☐

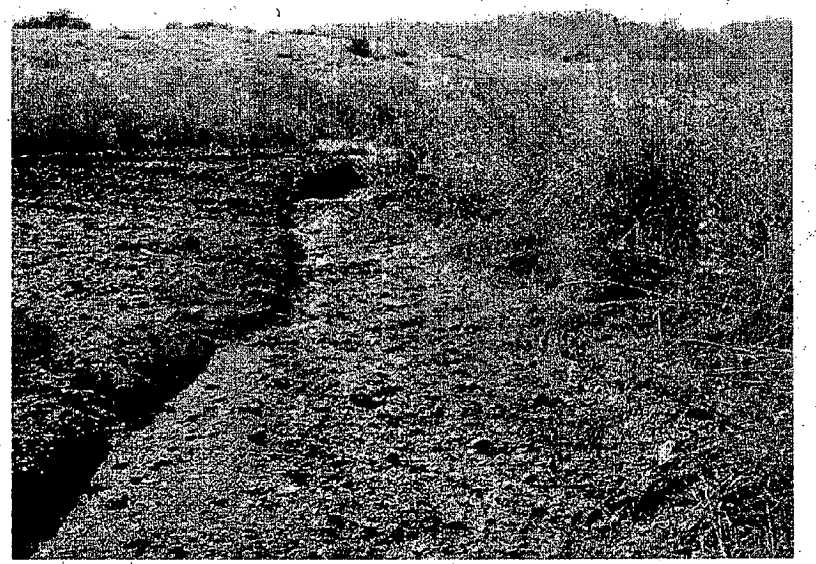
Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ - High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 6 | | | | | | | | |

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11506

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 27.5

River Code: NA RM: NA Stream Century Mine, Stream H
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments not natural!

Photo 2 Ditto F

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBST [10] | | | ☐☐-GRAVEL [7] | | 20 |
| ☐☐-BOULDER [9] | | | ☑☐-SAND [6] | 80 | 20 |
| ☐☑-COBBLE [8] | | 50 | ☐☐-BEDROCK [5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS [3] | | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☐☐-SILT [2] | | 20 10 | | | |

NOTE (Ignores hydrogeologic origin of substrate; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILES [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☑-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☑-SILT NORMAL [0]
☐-SILT FREE [1]
EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☑-MODERATE [-1]
☑-NORMAL [0]
☐-NONE [1]

Substrate 10 5 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: not long channel

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☑ - NEARLY ABSENT < 5% [1]

Cover 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY |
|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☑ - NONE [6] | ☐ - HIGH [3] |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] |
| ☑ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☑ - LOW [1] |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | |

MODIFICATIONS/OTHER
☐ - SNAGGING ☐ - IMPOUND.
☑ - RELOCATION ☐ - ISLANDS
☑ - CANOPY REMOVAL ☐ - LEVEED
☐ - DREDGING ☐ - BANK SHAPING
☐ - ONE SIDE CHANNEL MODIFICATIONS

Channel 10 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | FLOOD PLAIN QUALITY L R | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☐☐-WIDE > 50m [4] | ☐☐-FOREST, SWAMP [3] | ☐☐-CONSERVATION TILLAGE [1] | ☐☐-NONE/LITTLE [3] |
| ☑☐-MODERATE 10-50m [3] | ☑☑-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] | ☐☐-MODERATE [2] |
| ☐☐-NARROW 5-10m [2] | ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROWCROP [0] | ☑☑-HEAVY/SEVERE [1] |
| ☐☐-VERY NARROW <5 m [1] | ☐☐-FENCED PASTURE [1] | ☑☑-MINING/CONSTRUCTION [0] | |
| ☑☑-NONE [0] | | | |

Riparian 2 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☑ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES]** (Check *All* That Apply)
☐ - EDDIES [1] ☐ - TORRENTIAL [-1]
☐ - FAST [1] ☐ - INTERSTITIAL [-1]
☐ - MODERATE [1] ☑ - INTERMITTENT [-2]
☐ - SLOW [1]

COMMENTS:

Pool/Current -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

| RIFFLE DEPTH | RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS |
|---|---|---|---|
| ☐ - Best Areas > 10 cm [2] | ☐ - MAX > 50 [2] | ☐ - STABLE (e.g. Cobble, Boulder) [2] | ☐ - NONE [2] |
| ☐ - Best Areas 5-10 cm [1] | ☑ - MAX < 50 [1] | ☑ - MOD. STABLE (e.g. Large Gravel) [1] | ☐ - LOW [1] |
| ☑ - Best Areas < 5 cm [RIFFLE=0] | | ☐ - UNSTABLE (Fine Gravel, Sand) [0] | ☑ - MODERATE [0] |
| | | | ☐ - EXTENSIVE [-1] |

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run 2 Max 8

Gradient 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

Best areas must be large enough to support a population of riffle-dwelling species.

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AEC 11507

Is Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain:

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | |

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far:_____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11508

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 34

River Code: NA RM: NA Stream Century Mine, Stream I
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments ephemeral
Photo 11

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | | | ☐ ☐-GRAVEL [7] | 10 | 25 |
| ☐ ☐-BOULDER [9] | | | ☐ ☐-SAND [6] | 10 | 25 |
| ☐ ☐-COBBLE [8] | | | ☐ ☐-BEDROCK [5] | | |
| ☑ ☐-HARDPAN [4] | 30 | | ☐ ☐-DETRITUS [3] | | |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☐ ☑-SILT [2] | 50 | | | | |

NOTE: (Ignores sludge originating from point-sources; scores natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILES [1]
☐ -WETLANDS [0]
☑ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP/RAP [0]
☐ -LACUSTRINE [0]
☐ -SHALE [-1]
☐ -COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐ -SILT HEAVY [-2]
☐ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☑ -SILT FREE [1]

EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☑ -NORMAL [0]
☐ -NONE [1]

Substrate: 6 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☑ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☑ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: not functional

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☑ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY |
|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☑ - NONE [6] | ☐ - HIGH [3] |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☑ - MODERATE [2] |
| ☑ - LOW [2] | AVR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | |

MODIFICATIONS/OTHER
☐ - SNAGGING ☐ - IMPOUND.
☐ - RELOCATION ☐ - ISLANDS
☑ - CANOPY REMOVAL ☐ - LEVEED
☐ - DREDGING ☐ - BANK SHAPING
☐ - ONE SIDE CHANNEL MODIFICATIONS

Channel: 10.5 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | L R | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑ ☐ - WIDE > 50m [4] | ☑ - FOREST, SWAMP [3] | ☐ ☐ - CONSERVATION TILLAGE [1] | ☑ ☑ - NONE/LITTLE [3] |
| ☐ ☐ - MODERATE 10-50m [3] | ☐ ☐ - SHRUB OR OLD FIELD [2] | ☐ ☐ - URBAN OR INDUSTRIAL [0] | ☐ ☐ - MODERATE [2] |
| ☑ ☑ - NARROW 5-10 m [2] | ☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1] | ☐ ☐ - OPEN PASTURE, ROW CROP [0] | ☐ ☐ - HEAVY/SEVERE [1] |
| ☐ ☐ - VERY NARROW < 5 m [1] | ☑ - FENCED PASTURE [1] | ☐ ☐ - MINING/CONSTRUCTION [0] | |
| ☐ ☐ - NONE [0] | | | |

Riparian: 8 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☑ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES]** (Check *All* That Apply)
☐ - EDDIES [1] ☐ - TORRENTIAL [-1]
☐ - FAST [1] ☐ - INTERSTITIAL [-1]
☑ - MODERATE [1] ☑ - INTERMITTENT [-2]
☐ - SLOW [1]

COMMENTS:

Pool/Current: 0.5 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

| RIFFLE DEPTH | RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS |
|---|---|---|---|
| ☐ - Best Areas > 10 cm [2] | ☐ - MAX > 50 [2] | ☐ - STABLE (e.g. Cobble, Boulder) [2] | ☐ - NONE [2] |
| ☐ - Best Areas 5-10 cm [1] | ☑ - MAX < 50 [1] | ☑ - MOD. STABLE (e.g. Large Gravel) [1] | ☐ - LOW [1] |
| ☑ - Best Areas < 5 cm [RIFFLE=0] | | ☐ - UNSTABLE (Fine Gravel, Sand) [0] | ☑ - MODERATE [0] |
| | | | ☐ - EXTENSIVE [-1] |

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 2 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Instream habitat and macroinvertebrate population or riffle-obligate species.

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Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ - High

| First Sampling Pass | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| | | | | | |

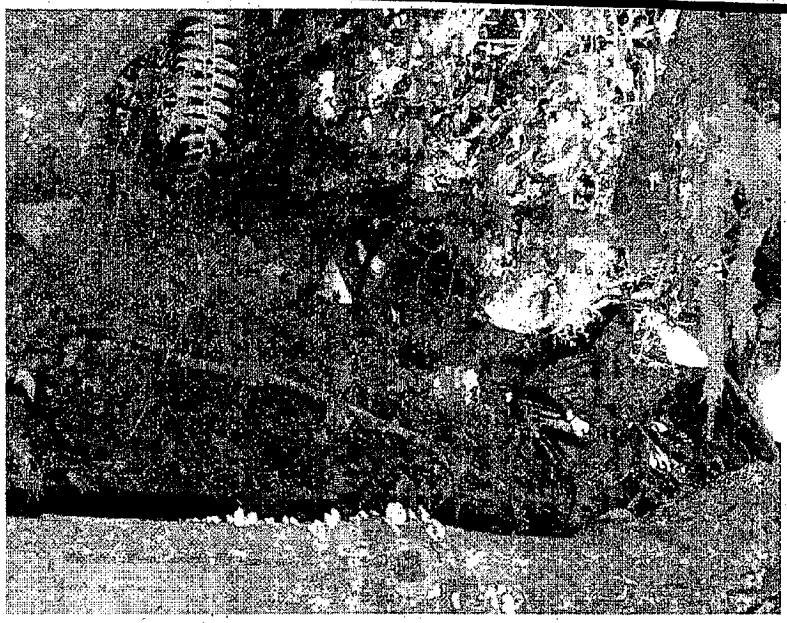
Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 43

River Code: NA RM: NA Stream Century Mine, Stream J
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments natural photo 10

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | 60 | | ☐ ☐-GRAVEL [7] | 10 | 10 |
| ☐ ☐-BOULDER [9] | | | ☐ ☐-SAND [6] | 30 | 20 |
| ☑ ☐-COBBLE [8] | 50 | | ☐ ☐-BEDROCK [5] | | |
| ☐ ☐-HARDPAN [4] | | | ☐ ☐-DETRITUS [3] | | |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☐ ☐-SILT [2] | 10 | 10 | | | |

NOTE (Ignores sludge originating from point sources; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☑ 5 or More [2] ☐ 4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ -LIMESTONE [1]
☐ -TILLS [1]
☐ -WETLANDS [0]
☐ -HARDPAN [0]
☐ -SANDSTONE [0]
☐ -RIP/RAP [0]
☐ -LACUSTRINE [0]
☑ -SHALE [-1]
☐ -COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐ -SILT HEAVY [-2]
☑ -SILT MODERATE [-1]
☐ -SILT NORMAL [0]
☐ -SILT FREE [1]

EMBEDDEDNESS:
☐ -EXTENSIVE [-2]
☐ -MODERATE [-1]
☑ -NORMAL [0]
☐ -NONE [1]

Substrate: 18 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]
COMMENTS: (not measured)

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ EXTENSIVE > 75% [11]
☐ MODERATE 25-75% [7]
☐ SPARSE 5-25% [3]
☑ NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ -HIGH [4] | ☐ -EXCELLENT [7] | ☐ -NONE [6] | ☑ -HIGH [3] | ☐ -SNAGGING ☐ -IMPOUND. |
| ☐ -MODERATE [3] | GOOD [5] | ☑ -RECOVERED [4] | ☐ -MODERATE [2] | ☐ -RELOCATION ☐ -ISLANDS |
| ☑ -LOW [2] | ☐ -FAIR [3] | ☐ -RECOVERING [3] | ☐ -LOW [1] | ☑ -CANOPY REMOVAL ☐ -LEVEED |
| ☐ -NONE [1] | ☑ -POOR [1] | ☐ -RECENT OR NO RECOVERY [1] | | ☐ -DREDGING ☐ -BANK SHAPING |
| | | | | ☐ -ONE SIDE CHANNEL MODIFICATIONS |

Channel: 12 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

**RIPARIAN WIDTH** L R (Per Bank)
☑ ☑ -WIDE > 50m [4]
☐ ☐ -MODERATE 10-50m [3]
☐ ☐ -NARROW 5-10m [2]
☐ ☐ -VERY NARROW < 5 m [1]
☐ ☐ -NONE [0]

**FLOOD PLAIN QUALITY** (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank)
☐ FOREST, SWAMP [3]
☐ ☐ -SHRUB OR OLD FIELD [2]
☐ ☐ -RESIDENTIAL, PARK, NEW FIELD [1]
☑ ☑ -FENCED PASTURE [1]
☐ ☐ -CONSERVATION TILLAGE [1]
☐ ☐ -URBAN OR INDUSTRIAL [0]
☐ ☐ -OPEN PASTURE, ROWCROP [0]
☐ ☐ -MINING/CONSTRUCTION [0]

**BANK EROSION** L R (Per Bank)
☑ ☑ -NONE/LITTLE [3]
☐ ☐ -MODERATE [2]
☐ ☐ -HEAVY/SEVERE [1]

Riparian: 8 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐ -POOL WIDTH > RIFFLE WIDTH [2]
☐ -POOL WIDTH = RIFFLE WIDTH [1]
☑ -POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES!]** (Check *All* That Apply)
☐ -EDDIES [1]
☐ -FAST [1]
☐ -MODERATE [1]
☐ -SLOW [1]
☐ -TORRENTIAL [-1]
☑ -INTERSTITIAL [-1]
☑ -INTERMITTENT [-2]

COMMENTS:

Pool/Current: 3 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

**RIFFLE DEPTH**
☐ -Best Areas > 10 cm [2]
☐ -Best Areas 5-10 cm [1]
☑ -Best Areas < 5 cm [RIFFLE=0]

**RUN DEPTH**
☐ -MAX > 50 [2]
☑ -MAX < 50 [1]

**RIFFLE/RUN SUBSTRATE**
☑ -STABLE (e.g. Cobble, Boulder) [2]
☐ -MOD. STABLE (e.g. Large Gravel) [1]
☐ -UNSTABLE (Fine Gravel, Sand) [0]

**RIFFLE/RUN EMBEDDEDNESS**
☐ -NONE [2]
☐ -LOW [1]
☑ -MODERATE [0]
☐ -EXTENSIVE [-1]

COMMENTS: ☐ -NO RIFFLE [Metric=0]

Riffle/Run: 3 Max 8
Gradient: 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best measure when large enough population of riffle-dwelling species.

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Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | _____ | _____ | _____ | _____ | _____ |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11512

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 42.5

River Code: NA RM: NA Stream Century Mine, Stream 1C
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments natural - ephemeral
potential 9

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS [10] | | | ☐☐-GRAVEL [7] | 10 | 40 |
| ☑☐-BOULDER | | 10 | ☐☐-SAND [6] | 20 | 40 |
| ☐☐-COBBLE [8] | 10 | | ☐☐-BEDROCK [5] | | |
| ☐☐-HARDPAN [4] | | 10 | ☐☐-DETRITUS [3] | | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☐☐-SILT [2] | 20 | | | | |

NOTE: (Ignores sludge originating from point-sources; scores only natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☑-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☑-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☑-MODERATE [-1]
☐-NORMAL [0]
☐-NONE [1]

Substrate: 17 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]

COMMENTS: not Piney Fork

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☑ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | GOOD [5] | ☑ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☑ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☑ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 12 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-**(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | L R | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑☑-WIDE > 50m [4] | ☐☐-FOREST, SWAMP [3] | ☐☐-CONSERVATION TILLAGE [1] | ☑☑-NONE/LITTLE [3] |
| ☐☐-MODERATE 10-50m [3] | ☐☐-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] | ☐☐-MODERATE [2] |
| ☐☐-NARROW 5-10 m [2] | ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROWCROP [0] | ☐☐-HEAVY/SEVERE [1] |
| ☐☐-VERY NARROW < 5 m [1] | ☑☑-FENCED PASTURE [1] | ☐☐-MINING/CONSTRUCTION [0] | |
| ☐☐-NONE [0] | | | |

Riparian: 6 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☑ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐ - EDDIES [1]
☐ - FAST [1]
☐ - MODERATE [1]
☐ - SLOW [1]
☐ - TORRENTIAL [-1]
☑ - INTERSTITIAL [1]
☑ - INTERMITTENT [-2]

COMMENTS:

Pool/Current: -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☑ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☑ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☑ - STABLE (e.g. Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☑ - NONE [2]
☐ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 4 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Test areas must be large enough to support a population of riffle-dwelling species.

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Is Sampling Reach Representative of the Stream (Y/N)___ If Not, Explain:

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

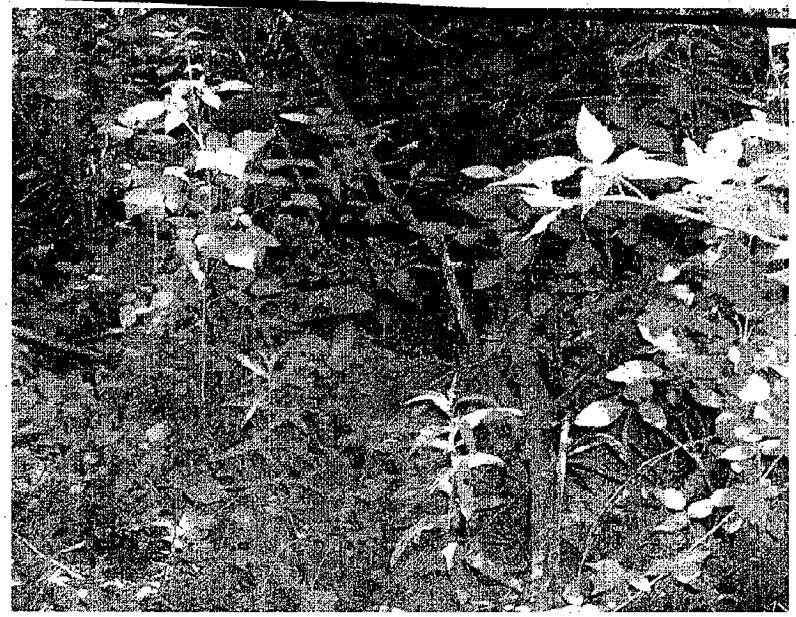
Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

Major Suspected Sources of Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far:_____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11514

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 28.5

River Code: NA RM: NA Stream Century Mine, Stream L
Date 7/13/01 Location North of Piney Creek ~~just east of~~ confluence with Long Run
Scorers Initials: RC, MB Comments Ephemeral Photo 13 & 14

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | | | ☐ ☐-GRAVEL [7] | 20 | 30 |
| ☐ ☐-BOULDER [9] | | | ☐ ☐-SAND [6] | 20 | 20 |
| ☐ ☐-COBBLE [8] | | | ☐ ☐-BEDROCK [5] | | |
| ☐ ☐-HARDPAN [4] | 50 | | ☐ ☐-DETRITUS [3] | | |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☑ ☐-SILT [2] | 60 | | | | |

NOTE: (Ignore sludge original; ing from point sources; score only natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐ 5 or More [2] ☑ 4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ - LIMESTONE [1]
☐ - TILLS [1]
☐ - WETLANDS [0]
☑ - HARDPAN [0]
☐ - SANDSTONE [0]
☐ - RIP/RAP [0]
☐ - LACUSTRINE [0]
☐ - SHALE [-1]
☐ - COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐ - SILT HEAVY [-2]
☐ - SILT MODERATE [-1]
☑ - SILT NORMAL [0]
☐ - SILT FREE [1]

EMBEDDEDNESS:
☐ - EXTENSIVE [-2]
☐ - MODERATE [-1]
☑ - NORMAL [0]
☐ - NONE [1]

Substrate: 6 (Max 20)

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: Fish [illegible]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☑ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☑ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☑ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☑ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☑ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 11.5 (Max 20)

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑ ☐ - WIDE > 50m [4] | ☐ ☐ - FOREST, SWAMP [3] | ☐ ☐ - CONSERVATION TILLAGE [1] | ☐ ☐ - NONE/LITTLE [3] |
| ☐ - MODERATE 10-50m [3] | ☐ ☐ - SHRUB OR OLD FIELD [2] | ☐ ☐ - URBAN OR INDUSTRIAL [0] | ☐ ☐ - MODERATE [2] |
| ☑ ☐ - NARROW 5-10m [2] | ☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1] | ☐ ☐ - OPEN PASTURE, ROWCROP [0] | ☐ ☐ - HEAVY/SEVERE [1] |
| ☐ ☐ - VERY NARROW < 5m [1] | ☑ ☑ - FENCED PASTURE [1] | ☐ ☐ - MINING/CONSTRUCTION [0] | |
| ☐ ☐ - NONE [0] | | | |

Riparian: 6 (Max 10)

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☑ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES!]** (Check *All* That Apply)
☐ - EDDIES [1] ☐ - TORRENTIAL [-1]
☐ - FAST [1] ☐ - INTERSTITIAL [-1]
☐ - MODERATE [1] ☑ - INTERMITTENT [-2]
☐ - SLOW [1]

COMMENTS:

Pool/Current: -2 (Max 12)

**CHECK ONE OR CHECK 2 AND AVERAGE**

**RIFFLE DEPTH**
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☑ - Best Areas < 5 cm [RIFFLE=0]

**RUN DEPTH**
☐ - MAX > 50 [2]
☑ - MAX < 50 [1]

**RIFFLE/RUN SUBSTRATE**
☐ - STABLE (e.g. Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g. Large Gravel) [1]
☑ - UNSTABLE (Fine Gravel, Sand) [0]

**RIFFLE/RUN EMBEDDEDNESS**
☐ - NONE [2]
☑ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 2 (Max 8)

Gradient: 4 (Max 10)

GRADIENT (ft/mi): 240 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Represents substrate and/or support for population of riffle-obligate fish species.

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Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

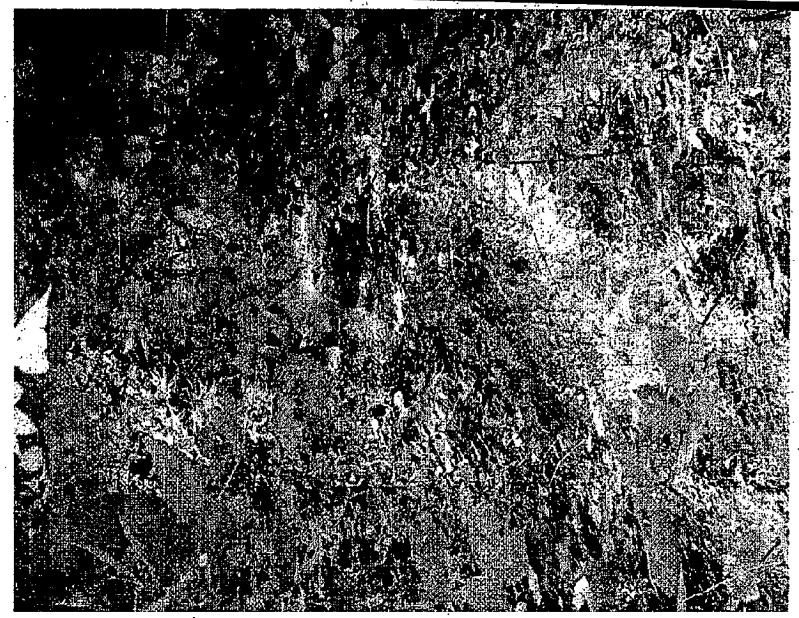
Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | |

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11516

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 42.5

River Code: NA RM: NA Stream Century Mine, Stream M
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments Natural, no photo 8

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE |
|---|---|---|
| ☐ BLDR/SLBS [10] | | |
| ☐ BOULDER [9] | 5 | |
| ☑ COBBLE [8] | 30 | 10 |
| ☑ HARDPAN [4] | 25 | 80 |
| ☐ MUCK [2] | | |
| ☐ SILT [2] | | |
| ☐ GRAVEL [7] | 30 | 10 |
| ☐ SAND [6] | 10 | |
| ☐ BEDROCK [5] | | |
| ☐ DETRITUS [3] | | |
| ☐ ARTIFICIAL [0] | | |

NOTE (Ignores sludge originating from point-sources; scores natural substrates)

NUMBER OF SUBSTRATE TYPES: ☑ 5 or More [2] ☐ 4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ LIMESTONE [1]
☐ TILLS [1]
☐ WETLANDS [0]
☑ HARDPAN [0]
☐ SANDSTONE [0]
☐ RIP/RAP [0]
☐ LACUSTRINE [0]
☐ SHALE [-1]
☐ COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT: ☐ SILT HEAVY [-2] ☐ SILT MODERATE [-1] ☑ SILT NORMAL [0] ☐ SILT FREE [1]
EMBEDDEDNESS: ☐ EXTENSIVE [-2] ☐ MODERATE [-1] ☐ NORMAL [0] ☑ NONE [1]

Substrate: 15 Max 20

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: not functional

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ EXTENSIVE > 75% [11]
☐ MODERATE 25-75% [7]
☐ SPARSE 5-25% [3]
☑ NEARLY ABSENT < 5% [1]

Cover: 2 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ HIGH [4] | ☐ EXCELLENT [7] | ☑ NONE [6] | ☐ HIGH [3] | ☐ SNAGGING ☐ IMPOUND. |
| ☐ MODERATE [3] | ☐ GOOD [5] | ☐ RECOVERED [4] | ☑ MODERATE [2] | ☐ RELOCATION ☐ ISLANDS |
| ☑ LOW [2] | ☑ FAIR [3] | ☐ RECOVERING [3] | ☐ LOW [1] | ☑ CANOPY REMOVAL ☐ LEVEED |
| ☐ NONE [1] | ☐ POOR [1] | ☐ RECENT OR NO RECOVERY [1] | | ☐ DREDGING ☐ BANK SHAPING |
| | | | | ☐ ONE SIDE CHANNEL MODIFICATIONS |

Channel: 13 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank) | BANK EROSION L R (Per Bank) |
|---|---|---|
| ☑ ☑ WIDE > 50m [4] | ☐ ☑ FOREST, SWAMP [3] | ☑ ☑ NONE/LITTLE [3] |
| ☐ ☐ MODERATE 10-50m [3] | ☑ ☑ SHRUB OR OLD FIELD [2] | ☐ ☐ MODERATE [2] |
| ☐ ☐ NARROW 5-10 m [2] | ☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1] | ☐ ☐ HEAVY/SEVERE [1] |
| ☐ ☐ VERY NARROW < 5 m [1] | ☐ ☐ FENCED PASTURE [1] | |
| ☐ ☐ NONE [0] | ☐ ☐ CONSERVATION TILLAGE [1] | |
| | ☐ ☐ URBAN OR INDUSTRIAL [0] | |
| | ☐ ☐ OPEN PASTURE, ROWCROP [0] | |
| | ☐ ☐ MINING/CONSTRUCTION [0] | |

Riparian: 9.5 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH (Check 1 ONLY!)**
☐ > 1m [6]
☐ 0.7-1m [4]
☐ 0.4-0.7m [2]
☐ 0.2-0.4m [1]
☑ < 0.2m [POOLS=0]

**MORPHOLOGY (Check 1 or 2 & AVERAGE)**
☐ POOL WIDTH > RIFFLE WIDTH [2]
☑ POOL WIDTH = RIFFLE WIDTH [1]
☐ POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)**
☐ EDDIES [1] ☐ TORRENTIAL [-1]
☐ FAST [1] ☐ INTERSTITIAL [1]
☑ MODERATE [1] ☑ INTERMITTENT [-2]
☐ SLOW [1]

COMMENTS:

Pool/Current: 0 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

| RIFFLE DEPTH | RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS |
|---|---|---|---|
| ☐ Best Areas > 10 cm [2] | ☐ MAX > 50 [2] | ☐ STABLE (e.g. Cobble, Boulder) [2] | ☑ NONE [2] |
| ☐ Best Areas 5-10 cm [1] | ☑ MAX < 50 [1] | ☑ MOD. STABLE (e.g. Large Gravel) [1] | ☐ LOW [1] |
| ☑ Best Areas < 5 cm [RIFFLE=0] | | ☐ UNSTABLE (Fine Gravel, Sand) [0] | ☐ MODERATE [0] |
| | | | ☐ EXTENSIVE [-1] |

COMMENTS: ☐ NO RIFFLE [Metric=0]

Riffle/Run: 7 Max 8

GRADIENT (ft/mi): 240 DRAINAGE AREA (sq.mi.): 21

%POOL: %GLIDE:
%RIFFLE: %RUN:

Gradient: 4 Max 10

*Occurrence of the lampsilis ovata group or presence of riffle-obligate species.

EPA 4520 7/16/98

AEC 11517

Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far: _____ |
| ☐ ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 37

River Code: NA RM: NA Stream Century Mine, Stream N
Date 7/13/01 Location North of Piney Creek, just east of confluence with Long Run
Scorers Initials: RC, MB Comments (Phenna) photo 6.7

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES*; *Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS[10] | | | ☐☐-GRAVEL [7] | 5 | |
| ☐☐-BOULDER [9] | | | ☐☐-SAND [6] | 5 | |
| ☐☐-COBBLE [8] | | | ☐☐-BEDROCK[5] | | |
| ☑☐-HARDPAN [4] | 70 | | ☐☐-DETRITUS[3] | 10 | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL[0] | | |
| ☐☐-SILT [2] | | | | | |

NOTE: (Ignores sludge originating from point sources; score natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS[0]
☑-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☑-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☑-NORMAL [0]
☐-NONE [1]

Substrate: 8 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ POOLS >70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: (poll functions)

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☑ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY |
|---|---|---|---|
| ☐-HIGH [4] | ☐-EXCELLENT [7] | ☐-NONE [6] | ☐-HIGH [3] |
| ☐-MODERATE [3] | ☐-GOOD [5] | ☑-RECOVERED [4] | ☐-MODERATE [2] |
| ☑-LOW [2] | FAIR [3] | ☐-RECOVERING [3] | ☐-LOW [1] |
| ☐-NONE [1] | ☑-POOR [1] | ☐-RECENT, OR NO RECOVERY [1] | |

MODIFICATIONS/OTHER
☐ - SNAGGING ☐ - IMPOUND.
☐ - RELOCATION ☐ - ISLANDS
☑ - CANOPY REMOVAL ☐ - LEVEED
☐ - DREDGING ☐ - BANK SHAPING
☐ - ONE SIDE CHANNEL MODIFICATIONS

Channel: 11 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)
☐☐-WIDE > 50m [4]
☑☑-MODERATE 10-50m [3]
☐☐-NARROW 5-10m [2]
☐☐-VERY NARROW < 5 m[1]
☐☐-NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank)
☐☐-FOREST, SWAMP [3]
☐☐-SHRUB OR OLD FIELD [2]
☐☐-RESIDENTIAL, PARK, NEW FIELD [1]
☑☑-FENCED PASTURE [1]
L R
☐☐-CONSERVATION TILLAGE [1]
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-OPEN PASTURE, ROWCROP [0]
☐☐-MINING/CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☑☑-NONE/LITTLE [3]
☐☐-MODERATE [2]
☐☐-HEAVY/SEVERE [1]

Riparian: 8 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐-> 1m [6]
☐-0.7-1m [4]
☐-0.4-0.7m [2]
☐-0.2-0.4m [1]
☑-< 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐-POOL WIDTH > RIFFLE WIDTH [2]
☐-POOL WIDTH = RIFFLE WIDTH [1]
☑-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐-EDDIES[1] ☐-TORRENTIAL[-1]
☐-FAST[1] ☐-INTERSTITIAL[-1]
☐-MODERATE [1] ☑-INTERMITTENT[-2]
☐-SLOW [1]

COMMENTS:

Pool/Current: -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐-Best Areas > 10 cm [2]
☐-Best Areas 5-10 cm [1]
☑-Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐-MAX > 50 [2]
☑-MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐-STABLE (e.g.; Cobble; Boulder) [2]
☑-MOD. STABLE (e.g.; Large Gravel) [1]
☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐-NONE [2]
☑-LOW [1]
☐-MODERATE [0]
☐-EXTENSIVE [-1]

COMMENTS: ☐-NO RIFFLE [Metric=0]

Riffle/Run: 2 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1 %POOL: %GLIDE: %RIFFLE: %RUN:

*Backwater, the largest, or the supporting population of riffle-obligate fish species.

EPA 4520 7/16/98

AEC 11519

Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☒ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far: _____ |
| ☐ ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 32

River Code: NA RM: NA Stream Century Mine, Stream P
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments ephemeral
Photo 16

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS [10] | | | ☐☐-GRAVEL [7] | | 20 |
| ☐☐-BOULDER [9] | | | ☐☐-SAND [6] | | 20 |
| ☐☐-COBBLE [8] | | 10 | ☐☐-BEDROCK [5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS [3] | | 50 |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☐☐-SILT [2] | | | | | |

no pool

NOTE: (Ignores sludge originating from point sources; score natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT: ☐-SILT HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]
EMBEDDEDNESS: ☐-EXTENSIVE [-2] ☐-MODERATE [-1] ☐-NORMAL [0] ☐-NONE [1]

COMMENTS

Substrate: 5 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ BOLDERS >70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: poor for trout

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☐ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☐ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☐ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 11 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)
☐☐-WIDE > 50m [4]
☐☐-MODERATE 10-50m [3]
☐☐-NARROW 5-10 m [2]
☐☐-VERY NARROW <5 m [1]
☐☐-NONE [0]

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)* L R (Most Predominant Per Bank)
☐☐-FOREST, SWAMP [3]
☐☐-SHRUB OR OLD FIELD [2]
☐☐-RESIDENTIAL, PARK, NEW FIELD [1]
☐☐-FENCED PASTURE [1]
☐☐-CONSERVATION TILLAGE [1]
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-OPEN PASTURE, ROWCROP [0]
☐☐-MINING/CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐☐-NONE/LITTLE [3]
☐☐-MODERATE [2]
☐☐-HEAVY/SEVERE [1]

Riparian: 10 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES] (Check *All* That Apply)
☐ - EDDIES [1] ☐ - TORRENTIAL [-1]
☐ - FAST [1] ☐ - INTERSTITIAL [-1]
☐ - MODERATE [1] ☐ - INTERMITTENT [-2]
☐ - SLOW [1]

COMMENTS:

Pool/Current: -2 Max 12

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☐ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐ - STABLE (e.g. Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]
☐ - NO RIFFLE [Metric=0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2]
☐ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS:

Riffle/Run: 3 Max 8

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

Gradient: 4 Max 10

*Backcrossed with hybrids support populations of riffle-dwelling species.

EPA 4520 7/16/98

AEC 11521

Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 39.5

River Code: NA RM: NA Stream Century Mine, Stream Q
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments Ephemeral / photo 15

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | | | ☑ ☐-GRAVEL [7] | 80 | |
| ☐ ☐-BOULDER [9] | | | ☐ ☐-SAND [6] | 10 | 10 |
| ☐ ☐-COBBLE [8] | 10 | | ☐ ☐-BEDROCK [5] | | |
| ☐ ☐-HARDPAN [4] | | | ☐ ☑-DETRITUS [3] | | 90 |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☐ ☐-SILT [2] | | | | | |

NOTE (Ignores bulgeoriginating from point-sources; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** — Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIPRAP [0]
☐-EAGLESTRINE [0]
☑-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** — Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☑-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☑-NORMAL [0]
☐-NONE [1]

Substrate: 9 Max 20

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]

COMMENTS: Not good habitat

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☑ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☑ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☑ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☑ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☑ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 11 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | L R | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑☑-WIDE > 50m [4] | ☐☑-FOREST, SWAMP [3] | ☐☐-CONSERVATION TILLAGE [1] | ☐☑-NONE/LITTLE [3] |
| ☑☑-MODERATE 10-50m [3] | ☐☐-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] | ☐☐-MODERATE [2] |
| ☐☐-NARROW 5-10 m [2] | ☐☐-RESIDENTIAL PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROWCROP [0] | ☐☐-HEAVY/SEVERE [1] |
| ☐☐-VERY NARROW < 5 m [1] | ☑☑-FENCED PASTURE [1] | ☐☐-MINING/CONSTRUCTION [0] | |
| ☐☐-NONE [0] | | | |

Riparian: 8 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH (Check 1 ONLY!)**
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

**MORPHOLOGY (Check 1 or 2 & AVERAGE)**
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☑ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)**
☐ - EDDIES [1]
☐ - FAST [1]
☐ - MODERATE [1]
☐ - SLOW [1]
☐ - TORRENTIAL [-1]
☐ - INTERSTITIAL [-1]
☑ - INTERMITTENT [-2]

COMMENTS:

Pool/Current: -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

**RIFFLE DEPTH**
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☑ - Best Areas < 5 cm [RIFFLE=0]

**RUN DEPTH**
☐ - MAX > 50 [2]
☑ - MAX < 50 [1]

**RIFFLE/RUN SUBSTRATE**
☐ - STABLE (e.g. Cobble+ Boulder) [2]
☑ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

**RIFFLE/RUN EMBEDDEDNESS**
☐ - NONE [2]
☑ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 3 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): > 40 DRAINAGE AREA (sq.mi.): < 1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Instream cover belongs only to the application of riffle-dwelling species.

EPA 4520 7/16/98

AEC 11523

Impacts (Check All That Apply):
None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

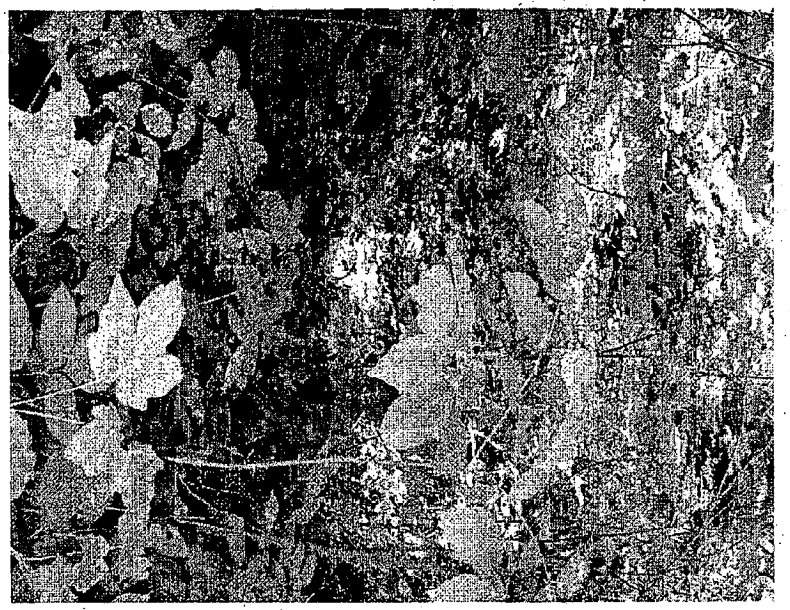
Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

AEC 11524

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 30

River Code: NA RM: NA Stream Century Mine, Stream R
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, M-B Comments Cloudy
Photo 18

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBST [10] | | | ☐☐-GRAVEL [7] | 5 | 5 |
| ☐☐-BOULDER [9] | | | ☐☐-SAND [6] | | |
| ☐☐-COBBLE [8] | 5 | 5 | ☐☐-BEDROCK [5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS [3] | 90 | 80 |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☐☐-SILT [2] | | | | | |

NOTE (Ignores bulge originating from point-sources; score natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILES [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☐-SILT FREE [1]
EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☐-NORMAL [0]
☐-NONE [1]

Substrate: 6 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]
COMMENTS: Not fast-flow

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐-EXTENSIVE > 75% [11]
☐-MODERATE 25-75% [7]
☐-SPARSE 5-25% [3]
☐-NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY |
|---|---|---|---|
| ☐-HIGH [4] | ☐-EXCELLENT [7] | ☐-NONE [6] | ☐-HIGH [3] |
| ☐-MODERATE [3] | ☐-GOOD [5] | ☐-RECOVERED [4] | ☐-MODERATE [2] |
| ☐-LOW [2] | ☐-FAIR [3] | ☐-RECOVERING [3] | ☐-LOW [1] |
| ☐-NONE [1] | ☐-POOR [1] | ☐-RECENT OR NO RECOVERY [1] | |

MODIFICATIONS/OTHER
☐-SNAGGING ☐-IMPOUND.
☐-RELOCATION ☐-ISLANDS
☐-CANOPY REMOVAL ☐-LEVEED
☐-DREDGING ☐-BANK SHAPING
☐-ONE SIDE CHANNEL MODIFICATIONS

Channel: 11 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

RIPARIAN WIDTH — L R (Per Bank)
☐☐-WIDE >50m [4]
☐☐-MODERATE 10-50m [3]
☐☐-NARROW 5-10 m [2]
☐☐-VERY NARROW <5 m [1]
☐☐-NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) — L R (Most Predominant Per Bank)
☐☐-FOREST, SWAMP [3]
☐☐-SHRUB OR OLD FIELD [2]
☐☐-RESIDENTIAL, PARK, NEW FIELD [1]
☐☐-FENCED PASTURE [1]

BANK EROSION — L R (Per Bank)
☐☐-NONE/LITTLE [3]
☐☐-MODERATE [2]
☐☐-HEAVY/SEVERE [1]

Riparian: 8 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐-> 1m [6]
☐-0.7-1m [4]
☐-0.4-0.7m [2]
☐-0.2-0.4m [1]
☐-< 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐-POOL WIDTH > RIFFLE WIDTH [2]
☐-POOL WIDTH = RIFFLE WIDTH [1]
☐-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES] (Check *All* That Apply)
☐-EDDIES [1]
☐-FAST [1]
☐-MODERATE [1]
☐-SLOW [1]
☐-TORRENTIAL [-1]
☐-INTERSTITIAL [-1]
☐-INTERMITTENT [-2]

COMMENTS:

Pool/Current: 2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐-Best Areas >10 cm [2]
☐-Best Areas 5-10 cm [1]
☐-Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐-MAX > 50 [2]
☐-MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐-STABLE (e.g. Cobble, Boulder) [2]
☐-MOD. STABLE (e.g. Large Gravel) [1]
☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐-NONE [2]
☐-LOW [1]
☐-MODERATE [0]
☐-EXTENSIVE [-1]

COMMENTS: ☐-NO RIFFLE [Metric=0]

Riffle/Run: 2 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support a population of riffle-obligate species.

EPA 4520 7/16/98

AEC 11525

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

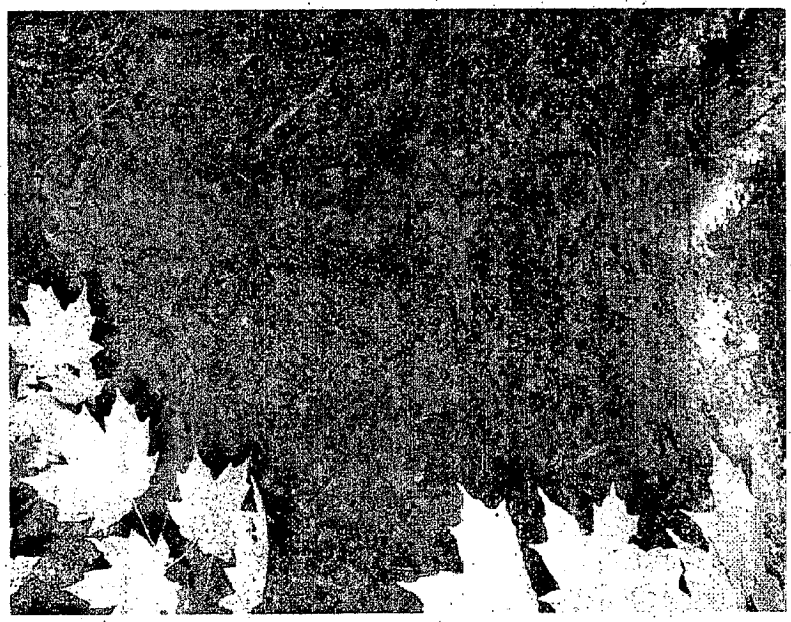
Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| / | | | | | | | | |

Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:



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| Yes/No | |
|---|---|
| ☒ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 59 75

River Code: NA RM: NA Stream Century Mine, Stream 5
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments intermittent photo 22 good

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*)**

| TYPE | POOL | RIFFLE | | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | 10 | | ☑ ☑-GRAVEL [7] | 30 | 60 |
| ☐ ☐-BOULDER [9] | 10 | | ☐ ☐-SAND [6] | 10 | |
| ☑ ☐-COBBLE [8] | 40 | 30 | ☐ ☐-BEDROCK [5] | | |
| ☐ ☐-HARDPAN [4] | | | ☐ ☐-DETRITUS [3] | | |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☐ ☐-SILT [2] | 10 | | | | |

NOTE (Ignores bedrock originating from point sources; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☑-5 or More [2] ☐-4 or Less [0]
COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☑-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT:
☐-SILT HEAVY [-2]
☑-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☐-SILT FREE [1]
EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☑-NORMAL [0]
☐-NONE [1]

Substrate 15 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☑ UNDERCUT BANKS [1]
☑ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☑ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☑ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]
COMMENTS:

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☑ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover 13 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | EXCELLENT [7] | ☑ - NONE [6] | ☑ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☑ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☐ - LOW [2] | ☑ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☑ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☐ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel 15 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

**RIPARIAN WIDTH** L R (Per Bank)
☑ ☑ - WIDE > 50m [4]
☐ ☐ - MODERATE 10-50m [3]
☐ ☐ - NARROW 5-10 m [2]
☐ ☐ - VERY NARROW < 5 m [1]
☐ ☐ - NONE [0]

**FLOOD PLAIN QUALITY** *(PAST 100 Meter RIPARIAN)* L R (Most Predominant Per Bank)
☑ ☐ - FOREST, SWAMP [3]
☑ ☐ - SHRUB OR OLD FIELD [2]
☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☑ - FENCED PASTURE [1]
☐ ☐ - CONSERVATION TILLAGE [1]
☐ ☐ - URBAN OR INDUSTRIAL [0]
☐ ☐ - OPEN PASTURE, ROWCROP [0]
☐ ☐ - MINING/CONSTRUCTION [0]

**BANK EROSION** L R (Per Bank)
☑ ☐ - NONE/LITTLE [3]
☐ ☐ - MODERATE [2]
☐ ☐ - HEAVY/SEVERE [1]

Riparian 8.75 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

**MAX. DEPTH** (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☑ - < 0.2m [POOL=0]

**MORPHOLOGY** (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

**CURRENT VELOCITY [POOLS & RIFFLES]** (Check *All* That Apply)
☐ - EDDIES [1]
☐ - FAST [1]
☐ - MODERATE [1]
☑ - SLOW [1]
☐ - TORRENTIAL [-1]
☑ - INTERSTITIAL [1]
☑ - INTERMITTENT [-2]

COMMENTS:

Pool/Current 1 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

**RIFFLE DEPTH**
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☑ - Best Areas < 5 cm [RIFFLE=0]

**RUN DEPTH**
☐ - MAX > 50 [2]
☑ - MAX < 50 [1]

**RIFFLE/RUN SUBSTRATE**
☐ - STABLE (e.g. Cobble, Boulder) [2]
☑ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

**RIFFLE/RUN EMBEDDEDNESS**
☐ - NONE [2]
☑ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run 3 Max 8

Gradient 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support populations of fish & other aquatic species.



AEC 11527

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

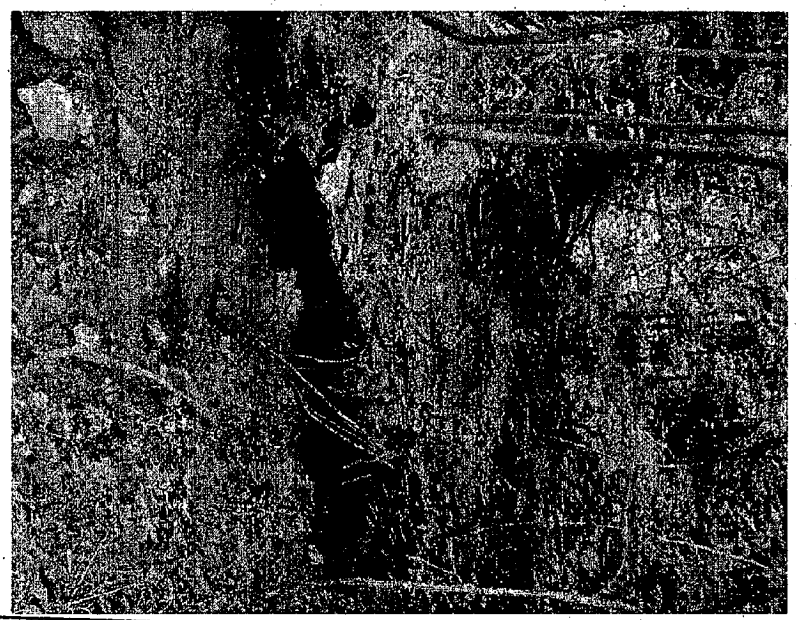
Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench Ratio |
|---|---|---|---|---|---|---|---|---|
| 8 | | | | | | | | |

Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:



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| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 42.5

River Code: NA RM: NA Stream Century Mine, Stream T
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments Documented photo 2-7

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS[10] | | | ☐☐-GRAVEL [7] | 30 | 30 |
| ☐☐-BOULDER [9] | 10 | 20 | ☐☐-SAND [6] | 10 | 10 |
| ☑☑-COBBLE [8] | 50 | 40 | ☐☐-BEDROCK[5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS[3] | | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL[0] | | |
| ☐☐-SILT [2] | | | | | |

NOTE: (Ignores bedrock originating from point-sources; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐5 or More [2] ☑4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☑-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☑-SILT FREE [1]
EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☐-NORMAL [0]
☑-NONE* [1]

Substrate 17 Max 20

COMMENTS

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS >70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [11]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

COMMENTS: None present

Cover 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☑ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☑ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☑ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel 12 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-**(check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑☑-WIDE > 50m [4] | ☐☑-FOREST, SWAMP [3] | ☐☐-CONSERVATION TILLAGE [1] | ☐☐-NONE/LITTLE [3] |
| ☐☐-MODERATE 10-50m [3] | ☑☐-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] | ☑☑-MODERATE [2] |
| ☐☐-NARROW 5-10 m [2] | ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROW CROP [0] | ☐☐-HEAVY/SEVERE [1] |
| ☐☐-VERY NARROW < 5 m [1] | ☐☐-FENCED PASTURE [1] | ☐☐-MINING/CONSTRUCTION [0] | |
| ☐☐-NONE [0] | | | |

Riparian 8.5 Max 10

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

| MAX. DEPTH (Check 1 ONLY!) | MORPHOLOGY (Check 1 or 2 & AVERAGE) | CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply) | |
|---|---|---|---|
| ☐ - >1m [6] | ☐ -POOL WIDTH > RIFFLE WIDTH [2] | ☐ -EDDIES [1] | ☐ -TORRENTIAL [-1] |
| ☐ - 0.7-1m [4] | ☐ -POOL WIDTH = RIFFLE WIDTH [1] | ☐ -FAST [1] | ☐ -INTERSTITIAL [-1] |
| ☐ - 0.4-0.7m [2] | ☑ -POOL WIDTH < RIFFLE W. [0] | ☐ -MODERATE [1] | ☑ -INTERMITTENT [-2] |
| ☐ - 0.2-0.4m [1] | | ☐ -SLOW [1] | |
| ☑ - < 0.2m [POOL=0] | | | |

COMMENTS:

Pool/Current 2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

| RIFFLE DEPTH | RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS |
|---|---|---|---|
| ☐ - Best Areas > 10 cm [2] | ☐ - MAX > 50 [2] | ☐ -STABLE (e.g., Cobble, Boulder) [2] | ☐ - NONE [2] |
| ☐ - Best Areas 5-10 cm [1] | ☑ - MAX < 50 [1] | ☑ -MOD. STABLE (e.g., Large Gravel) [1] | ☐ - LOW [1] |
| ☑ - Best Areas < 5 cm [RIFFLE=0] | | ☐ -UNSTABLE (Fine Gravel, Sand) [0] | ☐ - MODERATE [0] |
| | | | ☐ - EXTENSIVE [-1] |

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run 3 Max 8

Gradient 4 Max 10

GRADIENT (ft/mi): > 40 DRAINAGE AREA (sq.mi.): 5.1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support application of riffle-criteria fish species.

EPA 4520 7/16/98

AEC 11529

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

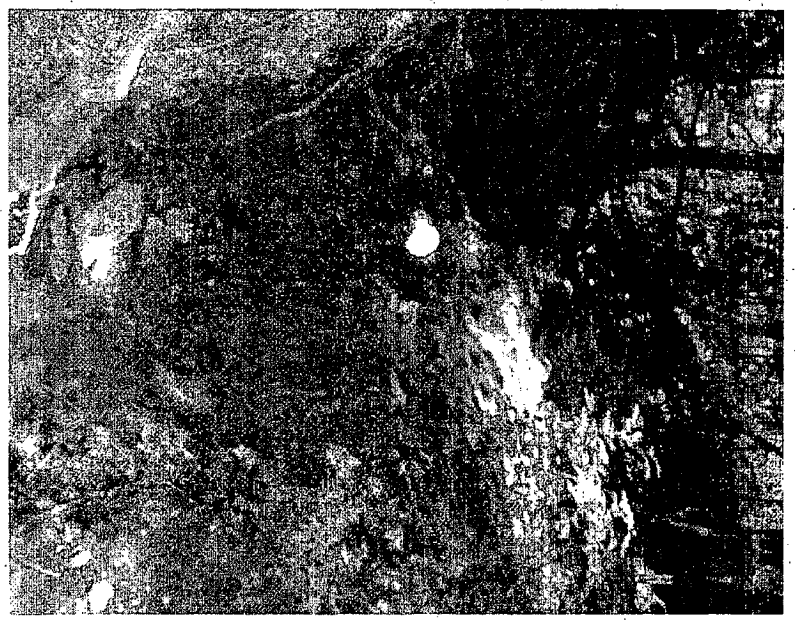
Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 33

River Code: NA RM: NA Stream Century Mine, Stream V
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments of General Photo 2-6

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS [10] | | | ☐☐-GRAVEL [7] | 10 | 40 |
| ☐☐-BOULDER [9] | | | ☐☐-SAND [6] | 20 | 20 |
| ☐☑-COBBLE [8] | | 50 | ☐☐-BEDROCK [5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS [3] | | |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☑☐-SILT [2] | | 70 | | | |

NOTE (Ignores sludge originating from point-sources; scores natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☑-4 or Less [0]

COMMENTS

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☑-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☑-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☑-NORMAL [0]
☐-NONE [1]

Substrate: 9 Max 20

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]

COMMENTS: (not included)

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [7]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☑ - NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* ~~One PER Category OR~~ check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☑ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☐ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☑ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 11 Max 20

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN) L R (Most Predominant Per Bank) | | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☑ ☐ - WIDE > 50m [4] | ☐ ☐ - FOREST, SWAMP [3] | ☐ ☐ - CONSERVATION TILLAGE [1] | ☐ ☐ - NONE/LITTLE [3] |
| ☑ ☑ - MODERATE 10-50m [3] | ☑ ☐ - SHRUB OR OLD FIELD [2] | ☐ ☐ - URBAN OR INDUSTRIAL [0] | ☑ ☐ - MODERATE [2] |
| ☐ ☐ - NARROW 5-10 m [2] | ☐ ☐ - RESIDENTIAL, PARK, NEW FIELD [1] | ☐ ☐ - OPEN PASTURE, ROW CROP [0] | ☐ ☐ - HEAVY/SEVERE [1] |
| ☐ ☐ - VERY NARROW < 5 m [1] | ☑ ☑ - FENCED PASTURE [1] | ☑ ☐ - MINING/CONSTRUCTION [0] | |
| ☐ ☐ - NONE [0] | | | |

Riparian: 7 Max 10

COMMENTS:

**5.] POOL/GLIDE AND RIFFLE/RUN QUALITY**

| MAX. DEPTH (Check 1 ONLY!) | MORPHOLOGY (Check 1 or 2 & AVERAGE) | CURRENT VELOCITY [POOLS & RIFFLES] (Check *All* That Apply) | |
|---|---|---|---|
| ☐ - >1m [6] | ☐ - POOL WIDTH > RIFFLE WIDTH [2] | ☐ - EDDIES [1] | ☐ - TORRENTIAL [-1] |
| ☐ - 0.7-1m [4] | ☐ - POOL WIDTH = RIFFLE WIDTH [1] | ☐ - FAST [1] | ☐ - INTERSTITIAL [-1] |
| ☐ - 0.4-0.7m [2] | ☑ - POOL WIDTH < RIFFLE W. [0] | ☐ - MODERATE [1] | ☑ - INTERMITTENT [-2] |
| ☐ - 0.2-0.4m [1] | | ☐ - SLOW [1] | |
| ☑ - < 0.2m [POOL=0] | | | |

COMMENTS:

Pool/Current: -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

| RIFFLE DEPTH | RUN DEPTH | RIFFLE/RUN SUBSTRATE | RIFFLE/RUN EMBEDDEDNESS |
|---|---|---|---|
| ☐ - Best Areas > 10 cm [2] | ☐ - MAX > 50 [2] | ☐ - STABLE (e.g. Cobble, Boulder) [2] | ☐ - NONE [2] |
| ☐ - Best Areas 5-10 cm [1] | ☑ - MAX < 50 [1] | ☑ - MOD. STABLE (e.g. Large Gravel) [1] | ☑ - LOW [1] |
| ☑ - Best Areas < 5 cm (RIFFLE=0) | | ☐ - UNSTABLE (Fine Gravel, Sand) [0] | ☐ - MODERATE [0] |
| | | | ☐ - EXTENSIVE [-1] |

COMMENTS: ☐ - NO RIFFLE [Metric=0]

Riffle/Run: 3 Max 8

Gradient: 4 Max 10

*GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best in streams that large and/or those supporting populations of riffle-dwelling fish species.

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AEC 11531

Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| / | | | | | | | | |

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 29.5

River Code: NA RM: NA Stream Century Mine, Stream W
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments Fat, Photo 21-5

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS [10] | | | ☐☐-GRAVEL [7] | 20 | 20 |
| ☐☐-BOULDER [9] | | | ☐☐-SAND [6] | 10 | 10 |
| ☐☐-COBBLE [8] | | | ☐☐-BEDRDCK [5] | | |
| ☐☐-HARDPAN [4] | 30 | | ☐☐-DETRITUS [3] | | 10 |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☐☐-SILT [2] | | | | | |
| | 70 | 40 | | | |

NOTE: (Ignores sludge originating from point sources; scores natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☐-NORMAL [0]
☐-NONE [1]

COMMENTS

Substrate: 5 Max 20

**2] INSTREAM COVER (see back for instructions for additional cover scoring method)**

TYPE: (Check *All* That Apply)
☐-UNDERCUT BANKS [1]
☐-OVERHANGING VEGETATION [1]
☐-SHALLOWS (IN SLOW WATER) [1]
☐-ROOTMATS [1]
☐-POOLS > 70 cm [2]
☐-ROOTWADS [1]
☐-BOULDERS [1]
☐-OXBOWS, BACKWATERS [1]
☐-AQUATIC MACROPHYTES [1]
☐-LOGS OR WOODY DEBRIS [1]

COMMENTS: Not fast

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐-EXTENSIVE > 75% [11]
☐-MODERATE 25-75% [7]
☐-SPARSE 5-25% [3]
☐-NEARLY ABSENT < 5% [1]

Cover: 1 Max 20

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY |
|---|---|---|---|
| ☐-HIGH [4] | ☐-EXCELLENT [7] | ☐-NONE [6] | ☐-HIGH [3] |
| ☐-MODERATE [3] | ☐-GOOD [5] | ☐-RECOVERED [4] | ☐-MODERATE [2] |
| ☐-LOW [2] | ☐-FAIR [3] | ☐-RECOVERING [3] | ☐-LOW [1] |
| ☐-NONE [1] | ☐-POOR [1] | ☐-RECENT OR NO RECOVERY [1] | |

MODIFICATIONS/OTHER
☐-SNAGGING ☐-IMPOUND.
☐-RELOCATION ☐-ISLANDS
☐-CANOPY REMOVAL ☐-LEVEED
☐-DREDGING ☐-BANK SHAPING
☐-ONE SIDE CHANNEL MODIFICATIONS

COMMENTS:

Channel: 12 Max 20

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)
☐☐-WIDE > 50m [4]
☐☐-MODERATE 10-50m [3]
☐☐-NARROW 5-10 m [2]
☐☐-VERY NARROW < 5 m [1]
☐☐-NONE [0]

FLOOD PLAIN QUALITY *(PAST 100 Meter RIPARIAN)* L R (Most Predominant Per Bank)
☐☐-FOREST, SWAMP [3]
☐☐-SHRUB OR GRD. FIELD [2]
☐☐-RESIDENTIAL, PARK, NEW FIELD [1]
☐☐-FENCED PASTURE [1]
☐☐-CONSERVATION TILLAGE [1]
☐☐-URBAN OR INDUSTRIAL [0]
☐☐-OPEN PASTURE, ROWCROP [0]
☐☐-MINING/CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐☐-NONE/LITTLE [3]
☐☐-MODERATE [2]
☐☐-HEAVY/SEVERE [1]

COMMENTS:

Riparian: 8.5 Max 10

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐-> 1m [6]
☐-0.7-1m [4]
☐-0.4-0.7m [2]
☐-0.2-0.4m [1]
☐-< 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐-POOL WIDTH > RIFFLE WIDTH [2]
☐-POOL WIDTH = RIFFLE WIDTH [1]
☐-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐-EDDIES [1]
☐-FAST [1]
☐-MODERATE [1]
☐-SLOW [1]
☐-TORRENTIAL [-1]
☐-INTERSTITIAL [-1]
☐-INTERMITTENT [-2]

COMMENTS:

Pool/Current: -2 Max 12

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐-Best Areas > 10 cm [2]
☐-Best Areas 5-10 cm [1]
☐-Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐-MAX > 50 [2]
☐-MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐-STABLE (e.g. Cobble, Boulder) [2]
☐-MOD. STABLE (e.g. Large Gravel) [1]
☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐-NONE [2]
☐-LOW [1]
☐-MODERATE [0]
☐-EXTENSIVE [-1]

COMMENTS: ☐-NO RIFFLE [Metric=0]

Riffle/Run: 1 Max 8

Gradient: 4 Max 10

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support a population of macroinvertebrates or fish. Use ecological judgment.

EPA 4520 7/16/98

AEC 11533

| First Sampling Pass | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

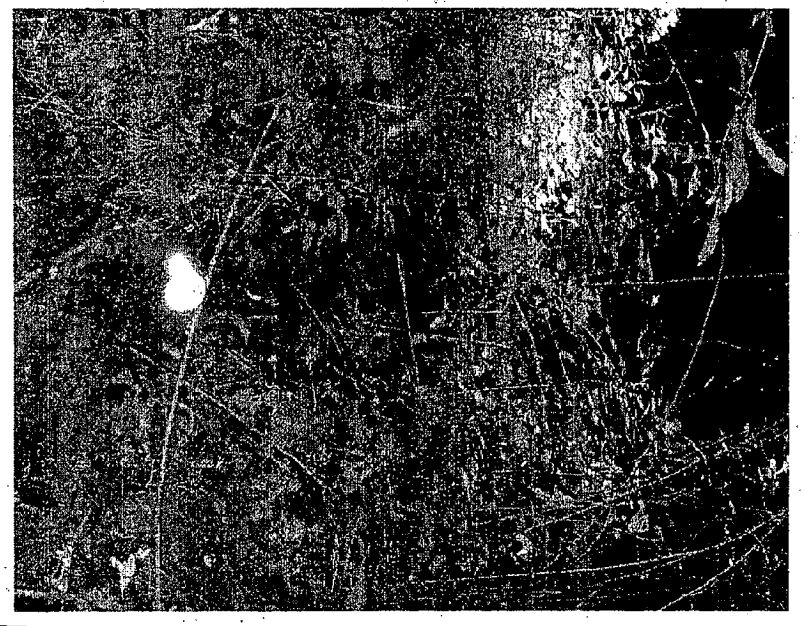
Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

Impacts (Check All That Apply):

- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☐ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far: _____ |
| ☐ ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 34

River Code: NA RM: NA Stream Century Mine Stream X
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments (Int?) photo 2-4

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐ ☐-BLDR/SLBS [10] | | | ☐ ☐-GRAVEL [7] | | 10 |
| ☐ ☐-BOULDER [9] | | | ☐ ☐-SAND [6] | | 10 |
| ☐ ☐-COBBLE [8] | | 10 | ☐ ☐-BEDROCK [5] | 10 | 60 |
| ☐ ☐-HARDPAN [4] | | | ☐ ☐-DETRITUS [3] | | |
| ☐ ☐-MUCK [2] | | | ☐ ☐-ARTIFICIAL [0] | | |
| ☐ ☐-SILT [2] | 90 | 10 | | | |

NOTE (Ignores bedrock originating from point-sources; scores natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SILT:** ☐-SILT-HEAVY [-2] ☐-SILT MODERATE [-1] ☐-SILT NORMAL [0] ☐-SILT FREE [1]

**EMBEDDEDNESS:** ☐-EXTENSIVE [-2] ☐-MODERATE [-1] ☐-NORMAL [0] ☐-NONE [1]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

Substrate: 8 (Max 20)

COMMENTS

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1] ☐ POOLS > 70 cm [2] ☐ OXBOWS, BACKWATERS [1]
☐ OVERHANGING VEGETATION [1] ☐ ROOTWADS [1] ☐ AQUATIC MACROPHYTES [1]
☐ SHALLOWS (IN SLOW WATER) [1] ☐ BOULDERS [1] ☐ LOGS OR WOODY DEBRIS [1]
☐ ROOTMATS [1] COMMENTS: Good for bass

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ - EXTENSIVE > 75% [7]
☐ - MODERATE 25-75% [7]
☐ - SPARSE 5-25% [3]
☐ - NEARLY ABSENT < 5% [1]

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Catagory OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ - HIGH [4] | ☐ - EXCELLENT [7] | ☐ - NONE [6] | ☐ - HIGH [3] | ☐ - SNAGGING ☐ - IMPOUND. |
| ☐ - MODERATE [3] | ☐ - GOOD [5] | ☐ - RECOVERED [4] | ☐ - MODERATE [2] | ☐ - RELOCATION ☐ - ISLANDS |
| ☐ - LOW [2] | ☐ - FAIR [3] | ☐ - RECOVERING [3] | ☐ - LOW [1] | ☐ - CANOPY REMOVAL ☐ - LEVEED |
| ☐ - NONE [1] | ☐ - POOR [1] | ☐ - RECENT OR NO RECOVERY [1] | | ☐ - DREDGING ☐ - BANK SHAPING |
| | | | | ☐ - ONE SIDE CHANNEL MODIFICATIONS |

Channel: 11 (Max 20)

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION** (check ONE box per bank or check 2 and AVERAGE per bank) ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)
☐ ☐-WIDE > 50m [4]
☐ ☐-MODERATE 10-50m [3]
☐ ☐-NARROW 5-10 m [2]
☐ ☐-VERY NARROW < 5 m [1]
☐ ☐-NONE [0]

FLOOD PLAIN QUALITY (PAST 100 Meter RIPARIAN)
L R (Most Predominant Per Bank)
☐ ☐-FOREST, SWAMP [3]
☐ ☐-SHRUB OR OLD FIELD [2]
☐ ☐-RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐-FENCED PASTURE [1]
L R
☐ ☐-CONSERVATION TILLAGE [1]
☐ ☐-URBAN OR INDUSTRIAL [0]
☐ ☐-OPEN PASTURE, ROWCROP [0]
☐ ☐-MINING/CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☐ ☐-NONE/LITTLE [3]
☐ ☐-MODERATE [2]
☐ ☐-HEAVY/SEVERE [1]

Riparian: 9 (Max 10)

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ - >1m [6]
☐ - 0.7-1m [4]
☐ - 0.4-0.7m [2]
☐ - 0.2-0.4m [1]
☐ - < 0.2m [POOLS=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ - POOL WIDTH > RIFFLE WIDTH [2]
☐ - POOL WIDTH = RIFFLE WIDTH [1]
☐ - POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES!] (Check *All* That Apply)
☐ - EDDIES [1] ☐ - TORRENTIAL [-1]
☐ - FAST [1] ☐ - INTERSTITIAL [-1]
☐ - MODERATE [1] ☐ - INTERMITTENT [-2]
☐ - SLOW [1]

Pool/Current: 3 (Max 12)

COMMENTS:

CHECK ONE OR CHECK 2 AND AVERAGE

RIFFLE DEPTH
☐ - Best Areas > 10 cm [2]
☐ - Best Areas 5-10 cm [1]
☐ - Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ - MAX > 50 [2]
☐ - MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐ - STABLE (e.g. Cobble, Boulder) [2]
☐ - MOD. STABLE (e.g. Large Gravel) [1]
☐ - UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ - NONE [2]
☐ - LOW [1]
☐ - MODERATE [0]
☐ - EXTENSIVE [-1]

Riffle/Run: 4 (Max 8)

COMMENTS: ☐ - NO RIFFLE [Metric=0]

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

Gradient: 4 (Max 10)

Best areas must be large enough to support a population of riffle-obligate species.

EPA 4520 7/16/98

AEC 11535

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

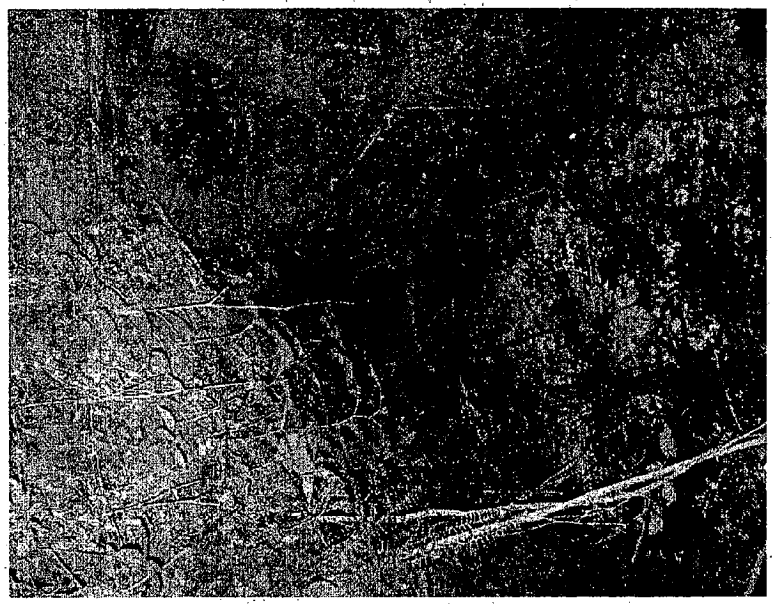
Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other:_____

## Stream Drawing:



Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes | No | |
|---|---|---|
| ☒ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far:_____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 38

River Code: NA RM: NA Stream Century Mine Stream
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments intermittent
Photo 23

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE | TYPE | POOL | RIFFLE |
|---|---|---|---|---|---|
| ☐☐-BLDR/SLBS [10] | | | ☐☐-GRAVEL [7] | 30 | 80 |
| ☐☐-BOULDER [9] | | 10 | ☐☐-SAND [6] | | |
| ☐☐-COBBLE [8] | | | ☐☐-BEDROCK [5] | | |
| ☐☐-HARDPAN [4] | | | ☐☐-DETRITUS [3] | | 10 |
| ☐☐-MUCK [2] | | | ☐☐-ARTIFICIAL [0] | | |
| ☐☐-SILT [2] | 70 | | | | |

NOTE: (Ignore sludge originating from point-sources; score only natural substrates)

NUMBER OF SUBSTRATE TYPES: ☐-5 or More [2] ☐-4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐-LIMESTONE [1]
☐-TILLS [1]
☐-WETLANDS [0]
☐-HARDPAN [0]
☐-SANDSTONE [0]
☐-RIP/RAP [0]
☐-LACUSTRINE [0]
☐-SHALE [-1]
☐-COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)

SILT:
☐-SILT HEAVY [-2]
☐-SILT MODERATE [-1]
☐-SILT NORMAL [0]
☐-SILT FREE [1]

EMBEDDEDNESS:
☐-EXTENSIVE [-2]
☐-MODERATE [-1]
☐-NORMAL [0]
☐-NONE [1]

COMMENTS

Substrate: 8 (Max 20)

**2] INSTREAM COVER** (see back for instructions for additional cover scoring method)

TYPE: (Check *All* That Apply)
☐ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☐ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ EXTENSIVE > 75% [11]
MODERATE 25-75% [7]
☐ SPARSE 5-25% [3]
☐ NEARLY ABSENT < 5% [1]

COMMENTS: poor habitat

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐-HIGH [4] | ☐-EXCELLENT [7] | ☐-NONE [6] | ☐-HIGH [3] | ☐-SNAGGING ☐-IMPOUND. |
| ☐-MODERATE [3] | ☐-GOOD [5] | ☐-RECOVERED [4] | ☐-MODERATE [2] | ☐-RELOCATION ☐-ISLANDS |
| ☐-LOW [2] | ☐-FAIR [3] | ☐-RECOVERING [3] | ☐-LOW [1] | ☐-CANOPY REMOVAL ☐-LEVEED |
| ☐-NONE [1] | ☐-POOR [1] | ☐-RECENT OR NO RECOVERY [1] | | ☐-DREDGING ☐-BANK SHAPING |
| | | | | ☐-ONE SIDE CHANNEL MODIFICATIONS |

COMMENTS:

Channel: 11 (Max 20)

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

| RIPARIAN WIDTH L R (Per Bank) | FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank) | L R | BANK EROSION L R (Per Bank) |
|---|---|---|---|
| ☐☐-WIDE > 50m [4] | ☐☐-FOREST, SWAMP [3] | ☐☐-CONSERVATION TILLAGE [1] | ☐☐-NONE/LITTLE [3] |
| ☐☐-MODERATE 10-50m [3] | ☐☐-SHRUB OR OLD FIELD [2] | ☐☐-URBAN OR INDUSTRIAL [0] | ☐☐-MODERATE [2] |
| ☐☐-NARROW 5-10m [2] | ☐☐-RESIDENTIAL, PARK, NEW FIELD [1] | ☐☐-OPEN PASTURE, ROWCROP [0] | ☐☐-HEAVY/SEVERE [1] |
| ☐☐-VERY NARROW < 5 m [1] | ☐☐-FENCED PASTURE [1] | ☐☐-MINING/CONSTRUCTION [0] | |
| ☐☐-NONE [0] | | | |

COMMENTS:

Riparian: 10 (Max 10)

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐-> 1m [6]
☐-0.7-1m [4]
☐-0.4-0.7m [2]
☐-0.2-0.4m [1]
☐-< 0.2m [POOL=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐-POOL WIDTH > RIFFLE WIDTH [2]
☐-POOL WIDTH = RIFFLE WIDTH [1]
☐-POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY [POOLS & RIFFLES] (Check *All* That Apply)
☐-EDDIES [1]
☐-FAST [1]
☐-MODERATE [1]
☐-SLOW [1]
☐-TORRENTIAL [-1]
☐-INTERSTITIAL [-1]
☐-INTERMITTENT [-2]

COMMENTS:

Pool/Current: -2 (Max 12)

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐-Best Areas > 10 cm [2]
☐-Best Areas 5-10 cm [1]
☐-Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐-MAX > 50 [2]
☐-MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐-STABLE (e.g. Cobble, Boulder) [2]
☐-MOD. STABLE (e.g. Large Gravel) [1]
☐-UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐-NONE [2]
☐-LOW [1]
☐-MODERATE [0]
☐-EXTENSIVE [-1]

COMMENTS: ☐-NO RIFFLE [Metric=0]

Riffle/Run: 3 (Max 8)

GRADIENT (ft/mi): > 40 DRAINAGE AREA (sq.mi.): < 1

%POOL: %GLIDE:
%RIFFLE: %RUN:

Gradient: 4 (Max 10)

*Best areas must be large enough to support a population of riffle-dwelling species.

EPA 4520 7/16/98

AEC 11537

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10) ☐

Aesthetic Rating (1-10) ☐

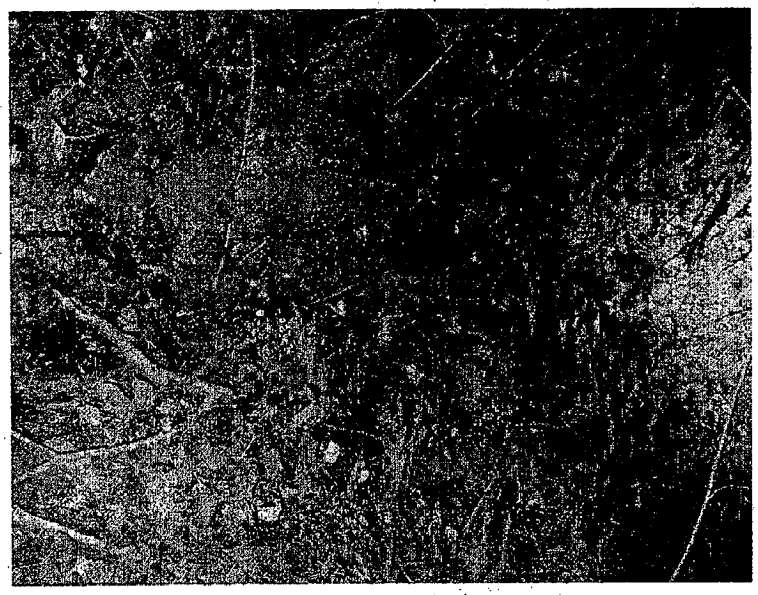
Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 3 | | | | | | | | |

Impacts (Check All That Apply):
- None ☐
- Industrial ☐
- WWTP ☐
- Ag ☐
- Livestock ☐
- Silviculture ☐
- Construction ☐
- Urban Runoff ☐
- CSOs ☐
- Suburban Impacts ☐
- Mining ☐
- Channelization ☐
- Riparian Removal ☐
- Landfills ☐
- Natural ☐
- Dams ☐
- Other Flow Alteration ☐
- Other: _____

## Stream Drawing:



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| Yes | No | |
|---|---|---|
| ☐ | ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ | ☐ | Is there water upstream? How Far: _____ |
| ☐ | ☐ | Is There Water Close Downstream? How Far: _____ |
| ☐ | ☐ | Is Dry Channel Mostly Natural? |

# OhioEPA Qualitative Habitat Evaluation Index Field Sheet QHEI Score: 42.5

River Code: NA RM: NA Stream Century Mine, Stream Z
Date 7/13/01 Location North of Piney Creek just east of confluence with Long Run
Scorers Initials: RC, MB Comments ephemeral
photo 2-1

**1] SUBSTRATE (Check *ONLY* Two Substrate *TYPE BOXES; Estimate % present*);**

| TYPE | POOL | RIFFLE |
|---|---|---|
| ☐ BLDR/SLBS [10] | | |
| ☑ BOULDER [9] | 50 | 10 |
| ☐ COBBLE [8] | 25 | 30 |
| ☐ HARDPAN [4] | | |
| ☐ MUCK [2] | | |
| ☐ SILT [2] | | |
| ☐ GRAVEL [7] | 25 | 50 |
| ☐ SAND [6] | | |
| ☐ BEDROCK [5] | | |
| ☐ DETRITUS [3] | | 10 |
| ☐ ARTIFICIAL [0] | | |

NOTE: (Ignore substrate originating from point-sources; score only natural substrates)
NUMBER OF SUBSTRATE TYPES: ☐ 5 or More [2] ☑ 4 or Less [0]

**SUBSTRATE ORIGIN** Check ONE (OR 2 & AVERAGE)
☐ LIMESTONE [1]
☐ TILLS [1]
☐ WETLANDS [0]
☐ HARDPAN [0]
☐ SANDSTONE [0]
☐ RIP/RAP [0]
☐ LACUSTRINE [0]
☑ SHALE [-1]
☐ COAL FINES [-2]

**SUBSTRATE QUALITY** Check ONE (OR 2 & AVERAGE)
SILT:
☐ SILT HEAVY [-2]
☐ SILT MODERATE [-1]
☑ SILT NORMAL [0]
☐ SILT FREE [1]
EMBEDDEDNESS:
☐ EXTENSIVE [-2]
☐ MODERATE [-1]
☑ NORMAL [0]
☐ NONE [1]

Substrate: 15 (Max 20)

COMMENTS

**2] INSTREAM COVER (see back for instructions for additional cover scoring method).**

TYPE: (Check *All* That Apply)
☑ UNDERCUT BANKS [1]
☐ OVERHANGING VEGETATION [1]
☐ SHALLOWS (IN SLOW WATER) [1]
☑ ROOTMATS [1]
☐ POOLS > 70 cm [2]
☐ ROOTWADS [1]
☐ BOULDERS [1]
☐ OXBOWS, BACKWATERS [1]
☐ AQUATIC MACROPHYTES [1]
☐ LOGS OR WOODY DEBRIS [1]

AMOUNT: (Check *ONLY* One or check 2 and *AVERAGE*)
☐ EXTENSIVE > 75% [11]
☐ MODERATE 25-75% [7]
☐ SPARSE 5-25% [3]
☑ NEARLY ABSENT < 5% [1]

COMMENTS: not

Cover: 1 (Max 20)

**3] CHANNEL MORPHOLOGY: (Check *ONLY* One PER Category OR check 2 and *AVERAGE*)**

| SINUOSITY | DEVELOPMENT | CHANNELIZATION | STABILITY | MODIFICATIONS/OTHER |
|---|---|---|---|---|
| ☐ HIGH [4] | ☑ EXCELLENT [7] | ☑ NONE [6] | ☑ HIGH [3] | ☐ SNAGGING ☐ IMPOUND. |
| ☐ MODERATE [3] | ☐ GOOD [5] | ☐ RECOVERED [4] | ☐ MODERATE [2] | ☐ RELOCATION ☐ ISLANDS |
| ☑ LOW [2] | ☐ FAIR [3] | ☐ RECOVERING [3] | ☐ LOW [1] | ☑ CANOPY REMOVAL ☐ LEVEED |
| ☐ NONE [1] | ☑ POOR [1] | ☐ RECENT, ORIG. RECOVERY [1] | | ☐ DREDGING ☐ BANK SHAPING |
| | | | | ☐ ONE SIDE CHANNEL MODIFICATIONS |

Channel: 12 (Max 20)

COMMENTS:

**4]. RIPARIAN ZONE AND BANK EROSION-(check ONE box per bank or check 2 and AVERAGE per bank)** ★River Right Looking Downstream★

RIPARIAN WIDTH L R (Per Bank)
☑ ☑ WIDE > 50m [4]
☑ ☑ MODERATE 10-50m [3]
☐ ☐ NARROW 5-10m [2]
☐ ☐ VERY NARROW < 5m [1]
☐ ☐ NONE [0]

FLOOD PLAIN QUALITY (*PAST 100 Meter RIPARIAN*) L R (Most Predominant Per Bank)
☑ ☑ FOREST, SWAMP [3]
☐ ☐ SHRUB OR OLD FIELD [2]
☐ ☐ RESIDENTIAL, PARK, NEW FIELD [1]
☐ ☐ FENCED PASTURE [1]
☐ ☐ CONSERVATION TILLAGE [1]
☐ ☐ URBAN OR INDUSTRIAL [0]
☐ ☐ OPEN PASTURE, ROWCROP [0]
☐ ☐ MINING/CONSTRUCTION [0]

BANK EROSION L R (Per Bank)
☑ ☑ NONE/LITTLE [3]
☐ ☐ MODERATE [2]
☐ ☐ HEAVY/SEVERE [1]

Riparian: 10 (Max 10)

COMMENTS:

**5.]POOL/GLIDE AND RIFFLE/RUN QUALITY**

MAX. DEPTH (Check 1 ONLY!)
☐ > 1m [6]
☐ 0.7-1m [4]
☐ 0.4-0.7m [2]
☐ 0.2-0.4m [1]
☑ < 0.2m [POOR=0]

MORPHOLOGY (Check 1 or 2 & AVERAGE)
☐ POOL WIDTH > RIFFLE WIDTH [2]
☐ POOL WIDTH = RIFFLE WIDTH [1]
☑ POOL WIDTH < RIFFLE W. [0]

CURRENT VELOCITY (POOLS & RIFFLES!) (Check *All* That Apply)
☐ EDDIES [1]
☐ FAST [1]
☐ MODERATE [1]
☐ SLOW [1]
☐ TORRENTIAL [-1]
☐ INTERSTITIAL [-1]
☑ INTERMITTENT [-2]

COMMENTS:

Pool/Current: -2 (Max 12)

**CHECK ONE OR CHECK 2 AND AVERAGE**

RIFFLE DEPTH
☐ Best Areas > 10 cm [2]
☐ Best Areas 5-10 cm [1]
☑ Best Areas < 5 cm [RIFFLE=0]

RUN DEPTH
☐ MAX > 50 [2]
☑ MAX < 50 [1]

RIFFLE/RUN SUBSTRATE
☐ STABLE (e.g. Cobble, Boulder) [2]
☐ MOD. STABLE (e.g. Large Gravel) [1]
☑ UNSTABLE (Fine Gravel, Sand) [0]

RIFFLE/RUN EMBEDDEDNESS
☐ NONE [2]
☑ LOW [1]
☐ MODERATE [0]
☐ EXTENSIVE [-1]

COMMENTS: ☐ NO RIFFLE [Metric=0]

Riffle/Run: 8 (Max 8)

Gradient: 4 (Max 10)

GRADIENT (ft/mi): >40 DRAINAGE AREA (sq.mi.): <1

%POOL: %GLIDE:
%RIFFLE: %RUN:

*Best areas must be large enough to support a population of riffle-obligate species.



AEC 11539

| | Gear: | Distance: | Water Clarity: | Water Stage: | Canopy -% Open |
|---|---|---|---|---|---|
| First Sampling Pass | | | | | |

Subjective Rating (1-10)

Aesthetic Rating (1-10)

Gradient: ☐ - Low, ☐ - Moderate, ☐ -High

Stream Measurements:

| Average Width | Average Depth | Maximum Depth | Av. Bankfull Width | Bankfull Mean Depth | W/D Ratio | Bankfull Max Depth | Floodprone Area Width | Entrench. Ratio |
|---|---|---|---|---|---|---|---|---|
| 2 | | | | | | | | |

None ☐
Industrial ☐
WWTP ☐
Ag ☐
Livestock ☐
Silviculture ☐
Construction ☐
Urban Runoff ☐
CSOs ☐
Suburban Impacts ☐
Mining ☐
Channelization ☐
Riparian Removal ☐
Landfills ☐
Natural ☐
Dams ☐
Other Flow Alteration ☐
Other:_____

## Stream Drawing:

Instructions for scoring the alternate cover metric: Each cover type should receive a score of between 0 and 3, Where: 0 - Cover type absent; 1 - Cover type present in very small amounts or if more common of marginal quality; 2 - Cover type present in moderate amounts, but not of highest quality or in small amounts of highest quality; 3 - Cover type of highest quality in moderate or greater amounts. Examples of highest quality include very large boulders in deep or fast water, large diameter logs that are stable, well developed rootwads in deep/fast water, or deep, well-defined, functional pools.

| Yes/No | |
|---|---|
| ☒ ☐ | Is Stream Ephemeral (no pools, totally dry or only damp spots)? |
| ☐ ☐ | Is there water upstream? How Far:_____ |
| ☐ ☐ | Is There Water Close Downstream? How Far:_____ |
| ☐ ☐ | Is Dry Channel Mostly Natural? |

E. RECLAMATION PLAN - PROTECTION OF HYDROLOGIC BALANCE-**Permit and Adjacent Area**

Submit an addendum describing the measures to be taken during and after the proposed mining operations to:

(1) Minimize disturbance to the hydrologic balance, including quality and quantity, within the permit and adjacent areas and to prevent material damage outside the permit area;

(2) protect the rights of present users of surface and ground water;

(3) avoid acid or toxic drainage.

**SEE ADDENDUM TO PART 3, PAGE 26, E(1-3)**

F. GROUND WATER AND SURFACE WATER MONITORING PLAN-**Permit and Shadow Area**

Based upon the probable hydrologic consequences determination and analysis of all baseline hydrologic, geologic, and other information submitted in this application, address the following items in accordance with paragraph (F) of rule 1501:13-4-14 and paragraph (N) of rule 1501:13-9-04 of the Administrative Code.

(1) In addition to the quality and quantity parameters required for quarterly monitoring and NPDES monitoring, will any other parameters be monitored?
_____ Yes, __X__ No. If "yes," indicate the parameter(s) and the site(s) where such monitoring will occur.

(2) Do you propose or anticipate the need for a variation in the required monitoring frequency for ground and surface water sites and monthly monitoring for NPDES?
_____ Yes, __X__ No. If "yes," describe the variation in frequency and the monitoring sites to be affected.

(3) 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.

**Ground and surface water will be monitored prior to refuse disposal. Quality and quantity information will be obtained from CMU-1, CMD-1, CMU-2A, CMD-2, CMD-2A, CMU-2, and CMD-6, and monitoring wells CG-01-3A, CG-01-3B, CG-01-3C, CG-01-4A, CG-01-4B, CG-01-5B, CG-01-5C, CG-01-6B, CG-01-5A, CG-01-1A, CG-01-2A, CG-01-4C, and CG-01-6C for the life of the operation, and reported quarterly to the Division of Mineral Resources Management. Surface water will be monitored in accordance with NPDES requirements. The ponds will be monitored daily for flow, weekly for pH, all of factors, every two weeks when flowing for T.S.S., iron, and manganese. Analytical results and flow data will be reported monthly to the EPA. The Ohio EPA will receive the white copy, all other copies will be sent to ODNR, Division of Mineral Resources Management, appropriate district office. Quarterly monitoring reports will be submitted for approved monitoring sites (copy attached) to the Division of Mineral Resources Management, appropriate district office. Ohio EPA reports will be submitted for monthly pond monitoring (copy attached) to the Division of Mineral Resources Management, appropriate district office. Also see Hydrogeologic Investigation Report, Section 6.0, for detailed monitoring plan.**

ADDENDUM TO PART 3, PAGE 26, ITEM E(1-3)
AMERICAN ENERGY CORPORATION

E(1). Disturbance to the hydrologic balance will be minimized through the use of the following: clay liner, underdrain system to convey groundwater beneath the refuse fill from the project, a three-foot thick minimum clay liner to separate the existing ground surface from the coal refuse, a leachate collection system to isolate and convey leachate to ponds, diversion ditches lined with riprap or grass, and final clay cap, two-feet thick minimum, and cover system.

Temporary erosion and sediment control measures used during construction will include hay bales, silt fence and seeding.

Permanent erosion and control facilities include drainage ditches and sedimentation ponds. These structures will be maintained throughout the life of the facility to insure they function properly.

All drainage from disturbed areas will be controlled and directed to sedimentation ponds at all times during operations. Waters from the site will be treated as required prior to discharge.

E(2). Rights of present groundwater users will be respected and protected by the measures described in Items E 1 and E 3. Should any contamination, diminution, or interruption occur an alternate source will be provided.

E(3). Prior to refuse placement, a three-foot thick re-compacted clay liner will be installed to protect the groundwater. During the operations phase, acid drainage will be avoided by prompt and careful reclamation to minimize oxidation of toxic strata or fill. The active refuse fill surface will be graded to shed storm waters and prevent accumulation. Leachate from the refuse surface and that percolating through the refused fill will be kept isolated from surrounding waters. The leachate will be collected in ditches or trenches and flow by gravity to ponds. These waters will be treated if necessary prior to discharge. Upon completion, the site will be covered with two-feet of re-compacted clay, eighteen inches of inert earthen material and six-inches of soil suitable for vegetation growth. The completed site will be graded for proper surface drainage to inhibit infiltration and therefore the possible formation of acid waters. Elimination of the existing streams, which will be beneath the proposed refuse disposal area, should not greatly impact the hydrologic balance. These streams have been impacted in-part by previous mining activities and refuse placement. Numerous intermittent and perennial streams exist in close proximity to the proposed site which will provide aquatic habitat and wildlife watering sources.

Acid drainage is not expected to be a problem at this site with proper construction and maintenance of the facilities as planned.

ADDENDUM TO PART 3, ITEM F(3)

AMERICAN ENERGY CORPORATION

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee _____, Permit Number _____

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (✓ appropriate bla

____ Pre-mining, ___ Mining, ___ Postmining, (✓ appropriate blank for mine stat

| Monitoring Site ID No. (e.g. S-1, W-3) | | | | | |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X _____ Y _____ | X _____ Y _____ | X _____ Y _____ | X _____ Y _____ | X _____ Y _____ |
| Surface Elevation of Monitoring Site | | | | | |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | | | | | |
| Depth of Well Below Land Surface (feet) | | | | | |
| Static Water Level of Well Below Land Surface (feet) | | | | | |
| Stream or Spring Discharge (cfs or gpm) | | | | | |
| Date Measured | | | | | |
| pH (Standard Units) | | | | | |
| Total Acidity (mg/l $CaCO_3$) | | | | | |
| Total Alkalinity (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 μmhos/cm) | | | | | |

| ermittee's Signature | Date |
|---|---|

| Laboratory Name | |
|---|---|
| Analyst's Signature | Date |

ODNR

ADDENDUM TO PART 3, ITEM F(3),
AMERICAN ENERGY CORPORATION

# MONTHLY REPORT FORM

OHIO DEPARTMENT OF NATURAL RESOURCES

OhioEPA

Ohio Environmental Protection Age

| COMPANY NAME | | | DATE (Mo. Yr.) | Page of Page |
|---|---|---|---|---|
| MINE LOCATION | COUNTY | TOWNSHIP | OEPA PERMIT NO. | IP |
| SECTION | PIT IDENTIFICATION (IF ANY) | | ODNR PERMIT NO. | |

REPORTING LAB

ANALYST

| OUTFALL | DAY | FLOW RATE GALLONS PER DAY REPORTING CODE 00056 | pH STANDARD UNITS REPORTING CODE 00400 | TOTAL SUSPENDED SOLIDS MG/L REPORTING CODE 00530 | IRON TOTAL MG/L REPORTING CODE 74010 | MANGANESE TOTAL MG/L REPORTING CODE 74013 | SPECIFIC CONDUCTANCE MICROMHOS REPORTING CODE 00095 | RAINFALL 24 HR. TOTAL INCHES REPORTING CODE 00045 | REPORTING CODE | REPORTING CODE |
|---|---|---|---|---|---|---|---|---|---|---|
| 001 | | | | | | | | | | |
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NOTE: NUMBER OUTFALL AS NEEDED.
ADDITIONAL REMARKS:

ALL REPORTING CODES MUST BE EXPLAINED
THIS FORM MUST BE TYPED

Discharge of pollutants to waters of the state without an effective permit is prohibited pursuant to 6111.04 and 6111.07 Ohio Revised Code.

| DATE REPORT COMPLETED | SIGNATURE OF REPORTER | TITLE OF REPORTER |
|---|---|---|
| | | |

G. DIVERSIONS AND DRAINAGE CONTROLS-**Permit Area**

(1) Will the proposed coal mining activities result in diversions of overland flow away from the disturbed areas? _____ Yes, __X__ No. If "yes," describe, including maps and cross sections, the diversion to be constructed to achieve compliance with paragraph (I) of rule 1501:13-4-14 of the Administrative Code.

(2) Will the proposed coal mining activities result in the diversion of intermittent or perennial streams within the proposed permit area? _____ Yes, __X__ No. If "yes," describe, including maps and cross sections, the diversions to be constructed to achieve compliance with paragraph (I) of rule 1501:13-4-14 of the Administrative Code.

(3) Will the proposed coal mining activities result in construction of diversions to direct runoff through a sediment pond or a series of sediment ponds? __X__ Yes, _____ No. If "yes," submit an addendum to describe, including maps and cross sections, the diversions to be constructed to achieve compliance with paragraph (I) of rule 1501:13-4-14 of the Administrative Code.

(4) Indicate which of the following are proposed to be constructed within the proposed permit area and submit as an addendum the detailed design plans for each structure in accordance with paragraph (H) of rule 1501:13-4-14 and 1501:13-9-04 of the Administrative Code.

__X__ sedimentation pond(s) (submit Attachment 20)

_____ water impoundment(s) (submit Attachment 20)

_____ Other (specify) _____

(5) Submit an addendum describing the plan for the control of water drainage into, through, and out of the proposed permit area. If applicable, submit as an addendum any request for variances pursuant to paragraphs (B) and (E) of rule 1501:13-9-04 of the Administrative Code.

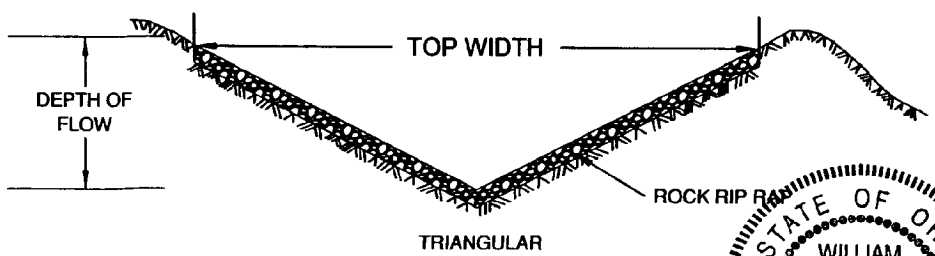
**SEE ENGINEERS REPORT, SECTION 2, AND ADDENDUM TO PART 3, PAGE 27, ITEM G(5), S.A.D.E. AND BZVR.**

(6) Describe the treatment, when required, of ground and surface water drainage from the area to be disturbed by the proposed coal mining activities.

**ALL WATER DISCHARGING FROM THE PERMIT WILL MEET THE EFFLUENT LIMITATIONS AS OUTLINED ON THE ADDENDUM. SEE ADDENDUM TO PART 3, PAGE 27, ITEM G(6). TREATMENT CHEMICALS USED ARE SODA ASH, SULPHURIC ACID FOR pH ADJUSTMENT, AND NALCO 7883 POLYMER BASED FLOXULANT. SEE HYDROLOGIC INVESTIGATION REPORT FOR THE LIST OF MONITORING WELLS INCLUDED IN THE MONITORING PROGRAM.**

*RIPRAP CHANNEL DESIGN*

| DIVERSION DITCH # | DIVERSION DITCH LENGTH | DRAINAGE AREA (ACRES) | STORM DESIGN | DESIGN cfs | SLOPE | SIDE SLOPES | DEPTH OF FLOW (MAXIMUM) | TOP WIDTH | VELOCITY ft/sec (MAXIMUM) |
|---|---|---|---|---|---|---|---|---|---|
| DD-3 | 839' | 3.0 | 10YR/24HR | 6.8 | 8.1% | 2:1 | 1.1' | 4.4' | 5.3 |
| DD-4 | 461' | 1.9 | 10YR/24HR | 4.5 | 10.3% | 2:1 | 1.0' | 3.8' | 5.2 |
| DD-4A | 82' | 4.9 | 10YR/24HR | 11.4 | 2.6% | 2:1 | 1.4' | 5.7' | 4.6 |
| DD-10 | 150' | 61.1 | 10YR/24HR | 90.5 | 12% | 2:1 | 2.4' | 9.7' | 10.1 |
| DD-11 | 110' | 56.4 | 10YR/24HR | 85.3 | 12% | 2:1 | 2.4' | 9.5' | 10.0 |
| DD-12 | 110' | 33.4 | 10YR/24HR | 59.9 | 26% | 2:1 | 1.9' | 7.7' | 11.5 |
| DD-15 | 250' | 16.1 | 10YR/24HR | 31.1 | 17.6% | 2:1 | 1.6' | 6.4' | 9.1 |
| DD-16 | 250' | 37.6 | 10YR/24HR | 58.0 | 18% | 2:1 | 2.0' | 7.9' | 10.3 |
| DD-17 | 100' | 44.5 | 10YR/24HR | 73.7 | 0.5% | 2:1 | 3.2' | 12.7' | 4.5 |
| DD-18 | 230' | 3.4 | 10YR/24HR | 7.9 | 14% | 2:1 | 1.1' | 4.3' | 6.6 |
| DD-19 | 503' | 7.7 | 10YR/24HR | 15.8 | 11% | 2:1 | 1.4' | 5.6' | 6.5 |




NOTE:

COMPUTER PROGRAM USED: SEDCAD 4.0
CURVE NUMBER USED: VARIOUS (SEE RUN SHEETS)

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

ADDENDUM TO PART 3, PAGE 27, ITEM G(3)
AMERICAN ENERGY CORPORATION

**DIVERSION DITCH DESIGN COMPUTATION SHEET**

| SECTIONS: 3 & 4 | TOWNSHIP: 6 | RANGE: 5 |
|---|---|---|
| TOWNSHIP: WAYNE | COUNTY: BELMONT | |

William J. Siplivy

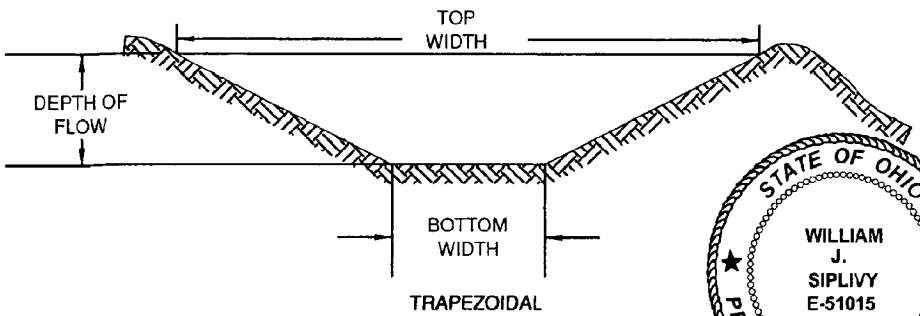
28 Nov 2001
DATE:

SHEET 1 OF 2 DIV-DIT.DWG COM. #01-008

AEC 11546

*VEGETATED CHANNEL DESIGN*

| Diversion Ditch | Length (feet) | Area (acres) | Design Storm | Design (cfs) | Slope (%) | Sideslope | Flow Depth (feet) | Bottom Width (feet) | Top Width (feet) | Velocity (f/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| B1 | 754.0 | 3.0 | 10y / 24h | 7.1 | 0.5 | 2:1 | 2.0 | 2.0 | 11.2 | 0.6 |
| B2 | 914.0 | 6.9 | 10y / 24h | 15.7 | 0.5 | 2:1 | 2.5 | 2.0 | 13.1 | 0.9 |
| B3a | 480.0 | 13.6 | 10y / 24h | 18.7 | 2.8 | 2:1 | 1.6 | 2.0 | 9.6 | 2.3 |
| B3b | 1850.0 | 21.3 | 10y / 24h | 30.2 | 1.8 | 2:1 | 2.1 | 2.0 | 11.4 | 2.4 |
| B4a | 850.0 | 3.2 | 10y / 24h | 7.6 | 2.8 | 2:1 | 1.3 | 2.0 | 8.2 | 1.4 |
| B4b | 820.0 | 6.2 | 10y / 24h | 14.3 | 0.6 | 2:1 | 1.3 | 2.0 | 12.3 | 1.0 |
| B4c | 1889.0 | 12.9 | 10y / 24h | 24.9 | 2.2 | 2:1 | 1.9 | 2.0 | 10.6 | 2.4 |
| B5a 1 | 2599.0 | 9.7 | 10y / 24h | 13.7 | 0.5 | 2:1 | 2.4 | 2.0 | 12.7 | 0.9 |
| B5a 2 | 193.0 | 10.1 | 10y / 24h | 13.8 | 2.3 | 2:1 | 1.6 | 2.0 | 9.4 | 1.7 |
| B5a 3 | 1614.0 | 16.2 | 10y / 24h | 18.9 | 0.3 | 2:1 | 3.0 | 2.0 | 15.0 | 0.8 |
| B5b | 1775.0 | 6.8 | 10y / 24h | 13.4 | 1.3 | 2:1 | 1.8 | 2.0 | 10.5 | 1.3 |
| B6a 1 | 69.0 | 9.5 | 10y / 24h | 22.2 | 0.6 | 2:1 | 2.6 | 2.0 | 13.4 | 1.2 |
| B6a 2 | 3509.0 | 23.0 | 10y / 24h | 44.2 | 0.8 | 2:1 | 2.8 | 2.0 | 14.5 | 2.0 |
| B6b 1 | 1143.0 | 6.9 | 10y / 24h | 10.2 | 1.2 | 2:1 | 1.7 | 2.0 | 10.1 | 1.1 |
| B6b 2 | 386.0 | 10.4 | 10y / 24h | 15.8 | 2.2 | 2:1 | 1.6 | 2.0 | 9.7 | 1.8 |




NOTE:

COMPUTER PROGRAM USED: SEDCAD 4.0
CURVE NUMBER USED: VARIOUS (SEE RUN SHEETS)

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

ADDENDUM TO PART 3, PAGE 27, ITEM G(3)
AMERICAN ENERGY CORPORATION

**DIVERSION DITCH DESIGN COMPUTATION SHEET**

| SECTIONS: 3 & 4 | TOWNSHIP: 6 | RANGE: 5 |
|---|---|---|
| TOWNSHIP: WAYNE | COUNTY: BELMONT | |

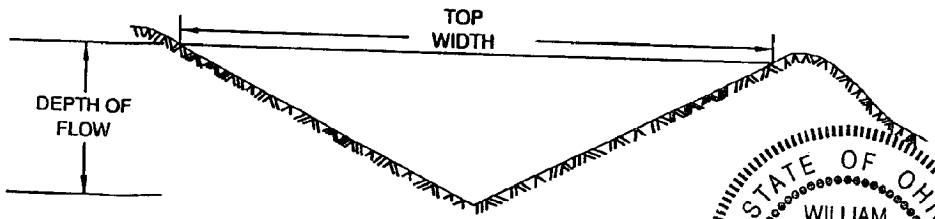
William J. Siplivy 13 AUG 02
DATE:

SHEET 1 OF 2 DIV-DIT.DWG REVISED: 8/9/02 COM. #01-008

AEC 11547

*VEGETATED CHANNEL DESIGN*

| DIVERSION DITCH # | DIVERSION DITCH LENGTH | DRAINAGE AREA (ACRES) | STORM DESIGN | DESIGN cfs | SLOPE | SIDE SLOPES | DEPTH OF FLOW (MAXIMUM) | TOP WIDTH | VELOCITY ft/sec (MAXIMUM) |
|---|---|---|---|---|---|---|---|---|---|
| DD-1A | 504' | 1.8 | 10YR/24HR | 3.9 | 12.5% | 2:1 | 1.3' | 5.3' | 4.4 |
| DD-1 | 2016' | 11.9 | 10YR/24HR | 16.5 | 0.4% | 2:1 | 3.4' | 13.7' | 1.9 |
| DD-2 | 494' | 0.9 | 10YR/24HR | 2.2 | 5.3% | 2:1 | 1.4' | 5.6' | 2.4 |
| DD-5 | 64' | 0.2 | 10YR/24HR | 0.4 | 1.8% | 2:1 | 1.2' | 4.9' | 0.7 |
| DD-6 | 156' | 0.3 | 10YR/24HR | 0.6 | 0.5% | 2:1 | 1.7' | 6.9' | 0.5 |
| DD-7 | 58' | 0.2 | 10YR/24HR | 0.4 | 0.6% | 2:1 | 1.6' | 6.3' | 0.5 |
| DD-8 | 186' | 0.3 | 10YR/24HR | 0.5 | 0.5% | 2:1 | 1.7' | 6.7' | 0.5 |
| DD-9 | 425' | 4.1 | 10YR/24HR | 8.7 | 0.6 - 1.7% | 2:1 | 2.8' | 11.0' | 1.7 |
| DD-13 | 323' | 1.6 | 10YR/24HR | 3.7 | 6.3% | 2:1 | 1.5' | 5.9' | 3.2 |
| DD-14 | 417' | 2.6 | 10YR/24HR | 6.0 | 6.8% | 2:1 | 1.1' | 4.3' | 4.8 |
| DD-20 | 764' | 2.8 | 10YR/24HR | 6.6 | 1.3% | 2:1 | 2.2' | 8.9' | 2.1 |
| DD-21 | 420' | 4.0 | 10YR/24HR | 9.2 | 4.6% | 2:1 | 1.9' | 7.4' | 4.1 |
| DD-22 | 158' | 0.1 | 10YR/24HR | 0.2 | 2.5% | 2:1 | 0.8' | 3.0' | 1.8 |




TRIANGULAR

NOTE: 00425-2

COMPUTER PROGRAM USED: SEDCAD 4.0
CURVE NUMBER USED: VARIOUS (SEE RUN SHEETS)

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

ADDENDUM TO PART 3, PAGE 27, ITEM 6 (3)
AMERICAN ENERGY CORPORATION

**DIVERSION DITCH DESIGN COMPUTATION SHEET**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | TOWNSHIP: 6 | RANGE: 5 |
| TOWNSHIP: WAYNE | COUNTY: BELMONT | |

William J. Siplivy

28 Nov 2001
DATE:

SHEET 1 OF 2 DIV-DIT.DWG COM. #01-008

AEC 11548

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 6.57 cfs | | 6.57 cfs | |
| Depth: | 1.26 ft | 1.56 ft | 1.93 ft | 2.23 ft |
| Top Width: | 5.03 ft | 6.23 ft | 7.72 ft | 8.92 ft |
| Velocity: | 2.08 fps | | 0.88 fps | |
| X-Section Area: | 3.16 sq ft | | 7.45 sq ft | |
| Hydraulic Radius: | 0.562 | | 0.863 | |
| Froude Number: | 0.46 | | 0.16 | |
| Roughness Coefficient: | 0.0556 | | 0.1745 | |

## Structure #14 (Vegetated Channel)

DD 21

Triangular Vegetated Channel Inputs:

Material: Grass mixture

| Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|
| 2.0:1 | 2.0:1 | 4.6 | D, B | 0.30 | | | 5.0 |

Vegetated Channel Results:

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 9.24 cfs | | 9.24 cfs | |
| Depth: | 1.06 ft | 1.36 ft | 1.55 ft | 1.85 ft |
| Top Width: | 4.25 ft | 5.45 ft | 6.20 ft | 7.40 ft |
| Velocity: | 4.09 fps | | 1.93 fps | |
| X-Section Area: | 2.26 sq ft | | 4.80 sq ft | |
| Hydraulic Radius: | 0.475 | | 0.693 | |
| Froude Number: | 0.99 | | 0.39 | |
| Roughness Coefficient: | 0.0476 | | 0.1299 | |

## Structure #15 (Vegetated Channel)

B2

Trapezoidal Vegetated Channel Inputs:

Material: Grass mixture



AEC 11549

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|---|
| 2.00 | 2.0:1 | 2.0:1 | 0.5 | D, B | 0.30 | | | 5.0 |

Vegetated Channel Results:

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 15.70 cfs | | 15.70 cfs | |
| Depth: | 1.55 ft | 1.85 ft | 2.46 ft | 2.76 ft |
| Top Width: | 8.22 ft | 9.42 ft | 11.85 ft | 13.05 ft |
| Velocity: | 1.98 fps | | 0.92 fps | |
| X-Section Area: | 7.94 sq ft | | 17.05 sq ft | |
| Hydraulic Radius: | 0.887 | | 1.310 | |
| Froude Number: | 0.35 | | 0.14 | |
| Roughness Coefficient: | 0.0491 | | 0.1369 | |

## Structure #7 (Vegetated Channel)

DD 1a

Triangular Vegetated Channel Inputs:

Material: Grass mixture

| Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|
| 2.0:1 | 2.0:1 | 12.5 | D, B | 0.30 | | | 5.0 |

Vegetated Channel Results:

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 3.89 cfs | | 3.89 cfs | |
| Depth: | 0.67 ft | 0.97 ft | 1.01 ft | 1.31 ft |
| Top Width: | 2.67 ft | 3.87 ft | 4.05 ft | 5.25 ft |
| Velocity: | 4.37 fps | | 1.89 fps | |
| X-Section Area: | 0.89 sq ft | | 2.05 sq ft | |
| Hydraulic Radius: | 0.298 | | 0.453 | |
| Froude Number: | 1.33 | | 0.47 | |
| Roughness Coefficient: | 0.0538 | | 0.1638 | |

## Structure #8 (Vegetated Channel)

DD 1



AEC 11550

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 12

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

a) Drainage area 7.69 acres
b) Disturbed area 3.20 acres
c) Ave. land slope 20 %
d) Hydrologic soil group C
e) Hydraulic length 1645 ft.
f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

a) Method:

1) Design method (s) including computer programs: SEDCAD 4.0
2) SCS curve number various (see run sheets)

b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 15.8 |
| 2) 25 year, 24 hour = | 4.2 | 18.9 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

a) Dimensions: **N/A Excavated Pond**

1) Dam height _____ ft.
2) Dam width _____ ft. (MIN)
3) Dam length _____ ft.
4) Dam downstream slope _____ % (MAX)
5) Dam upstream slope _____ % (MAX)
6) Core length _____ ft. _____ ft. _____ ft.

b) Sediment storage volume 1.47 ac.ft. is provided below the 991.5 foot elevation.

c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 988.0 | 0.34 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 991.5 | 0.48 | 1.47 |
| 5) Top of embankment: | 994.0 | 0.56 | 2.77 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe _____
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

   a) Base width 12 ft.
   b) Design flow depth 0.3 ft. Depth in level section 0.8 ft.
   c) Exit slope 27.6 %
   d) Exit velocity 5.3 fps
   e) Channel lining Rock Riprap
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 20 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM
J.
SIPLIVY
E-51015
REGISTERED
PROFESSIONAL ENGINEER

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 13

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

a) Drainage area 47.9 acres
b) Disturbed area 40.4 acres
c) Ave. land slope 25 %
d) Hydrologic soil group C
e) Hydraulic length 5144 ft.
f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

a) Method:

1) Design method (s) including computer programs: SEDCAD 4.0
2) SCS curve number various (see run sheets)

b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 79.9 |
| 2) 25 year, 24 hour = | 4.2 | 95.3 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

a) Dimensions: **N/A Excavated Pond**

1) Dam height _____ ft.
2) Dam width _____ ft. (MIN)
3) Dam length _____ ft.
4) Dam downstream slope _____ % (MAX)
5) Dam upstream slope _____ % (MAX)
6) Core length _____ ft. _____ ft. _____ ft.

b) Sediment storage volume 11.31 ac.ft. is provided below the 1083.7 foot elevation.

c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 1073.0 | 0.78 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1083.7 | 1.33 | 11.31 |
| 5) Top of embankment: | 1086.0 | 1.45 | 14.52 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe _____
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

   a) Base width 12 ft.
   b) Design flow depth 1.7 ft. Depth in level section 1.3 ft.
   c) Exit slope 1.4 %
   d) Exit velocity 3.7 fps
   e) Channel lining Vegetative Grass Mix
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 40 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

   A 6" diameter PVC pipe 130 feet long at a slope of 4.6 percent will be used to dewater the pond. The invert will be at the 1080 foot elevation.

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 14

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 65.95 acres
   b) Disturbed area 61.54 acres
   c) Ave. land slope 25 %
   d) Hydrologic soil group C
   e) Hydraulic length 5077 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0

      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 101.9 |
| 2) 25 year, 24 hour = | 4.2 | 121.1 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: N/A Excavated Pond

   1) Dam height 3 ft.
   2) Dam width 12 ft. (MIN)
   3) Dam length 1386 ft.
   4) Dam downstream slope 33 % (MAX)
   5) Dam upstream slope 50 % (MAX)
   6) Core length ___ ft. ___ ft. ___ ft.

   b) Sediment storage volume 13.44 ac. ft. is provided below the 1164.5 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac. ft. |
|---|---|---|---|
| 1) Bottom of Pond: | 1161.0 | 3.59 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1164.5 | 4.06 | 13.44 |
| 5) Top of embankment: | 1167.0 | 4.31 | 23.99 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/EXIT CHANNEL:

   a) Base width 40 ft.
   b) Design flow depth 1.2 ft. Depth in level section 0.8 ft.
   c) Exit slope 2.8 %
   d) Exit velocity 3.1 fps
   e) Channel lining Vegetative Grass Mixture
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50 %
   i) Length of level section 40 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS:

A 6" diameter PVC pipe 140 feet long at a slope of 2.5 percent will be used to dewater the pond. The invert will be at the 1163.5 foot elevation.

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 15

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 6.9 acres
   b) Disturbed area 4.6 acres
   c) Ave. land slope 20 %
   d) Hydrologic soil group C
   e) Hydraulic length 943 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 15.0 |
| 2) 25 year, 24 hour = | 4.2 | 17.8 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

      1) Dam height _____ ft.
      2) Dam width _____ ft.(MIN)
      3) Dam length _____ft.
      4) Dam downstream slope _____% (MAX)
      5) Dam upstream slope _____ % (MAX)
      6) Core length _____ft. _____ft. ____ft.

   b) Sediment storage volume 1.62 ac.ft. is provided below the 1147.8 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac. ft. |
|---|---|---|---|
| 1) Bottom of pond: | 1138.0 | 0.03 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | 1147.8 | 0.29 | 1.62 |
| 4) Emergency Spillway Crest: | 1149.6 | 0.33 | 2.20 |
| 5) Top of embankment: | 1152.0 | 0.40 | 3.06 |

4. PRINCIPAL SPILLWAY:
   a) Pipe length 52 ft.
   b) Pipe diameter 12 in.
   c) Pipe slope 1.54 %
   d) Riser diameter n/a in.
   e) Riser height n/a ft.
   f) Type of pipe PVC
   g) Number of anti-seep collars ____ ; spacing along pipe ____ ft.
   h) Does the design include a trash rack? x Yes, ____ No.
   i) Does the design include an anti-vortex device? ____ Yes, x No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL:**

   a) Base width 12 ft.
   b) Design flow depth 0.7 ft. Depth in level section 0.2 ft.
   c) Exit slope 24.1 %
   d) Exit velocity 3.7 fps
   e) Channel lining Vegetative Grass Mix
   f) Side slopes 2:1
   g) Freeboard 2.2 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 20 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? ____ Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned ____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

28 Nov 2001
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 16

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 90.5 acres
   b) Disturbed area 66.5 acres
   c) Ave. land slope 20 %
   d) Hydrologic soil group C
   e) Hydraulic length 1614 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number varies (See run sheets)

   b)

| Rainfall Amount/Peak Flow | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 135.3 |
| 2) 25 year, 24 hour = | 4.2 | 129.6 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

   1) Dam height _____ ft.
   2) Dam width _____ ft. (MIN)
   3) Dam length _____ ft.
   4) Dam downstream slope _____ % (MAX)
   5) Dam upstream slope _____ % (MAX)
   6) Core length _____ ft. _____ ft. _____ ft.

   b) Sediment storage volume 16.5 ac.-ft. is provided below the 1047.0 foot elevation.

   c)

| Stage/Area Data: | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 1036 | 1.13 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1047 | 1.79 | 16.5 |
| 5) Top of embankment: | 1050 | 1.94 | 22.1 |

PRINCIPAL SPILLWAY: **N/A**

a) Pipe length _____ ft.
b) Pipe diameter _____ in.
c) Pipe slope _____ %
d) Riser diameter _____ in.
e) Riser height _____ ft.
f) Type of pipe _____
g) Number of anti-seep collars _____; spacing along pipe _____ ft.
h) Does the design include a trash rack? _____ Yes, _____ No.
i) Does the design include an anti-vortex device? _____ Yes, ____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

a) Base width 40 ft.
b) Design flow depth 1.6 ft. Depth in level section 1.3 ft.
c) Exit slope 3.2 %
d) Exit velocity 6.6 fps
e) Channel lining Rock Rip Rap
f) Side slopes 2:1
g) Freeboard 1.8 ft.
h) Entrance slope 50.0 %
i) Length of level section 50 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

28 Nov 2001
Date

P.E. SEAL

STATE OF OHIO
WILLIAM
J.
SIPLIVY
E-51015
REGISTERED
PROFESSIONAL ENGINEER

ADDENDUM TO PART 3, PAGE 27, ITEM G(5)
AMERICAN ENERGY CORPORATION

The proposed refuse site will be developed in three phases in an unnamed tributary of Piney Creek. Sediment Pond 016 will be used to control runoff for the first phase of the disposal operation. Phase 2 will require Pond 016 at the toe and Pond 015 in the head of the hollow. Sediment Ponds 012, 013 and 014 will then be constructed to control runoff from Phase 3. Runoff will be directed to these ponds by diversion ditches as shown on Phase Construction drawings, numbers 6, 7 and 8.

Underdrains will collect natural, unaffected ground water that normally forms stream flow in the valley, and are located beneath a three foot thick, compacted clay liner and do not come in contact with the coal refuse material. A Small Area Drainage Exemption (S.A.D.E.) is not applicable to this ground water as the footprint of the S.A.D.E. would be beneath the entire proposed refuse disposal area. Since this subsurface drainage is unaffected by the mining activities, it will not pass through any of the sediment ponds, but will instead become surface drainage discharging into Piney Creek via a diversion channel, upon exiting from beneath the clay liner. Piney Creek flows directly to Captina Creek. See Drawing 11 of the plans. When Phases 1 and 2 are completed, sediment Pond 016 will be backfilled with compacted earthen material and lined with three feet of clay. The ground water collection system will be extended through the Pond 016 site as per plans.

All drainage from the leachate collection system will pass through Pond 008A. Leachate consists of all water that comes in contact with the coal refuse. The leachate collection system is located above the three-foot thick clay liner. See Drawing number 12.

Coal refuse will be placed on a three-foot thick (minimum) re-compacted clay liner. Leachate collected here and runoff from all disturbed surface will pass through Ponds 012, 013, 014, and 016 for treatment, if necessary, before discharge into Piney Creek, as shown on the plans. Pond 015 will discharge northward through a road culvert into a natural drainage channel directed to Captina Creek.

Groundwater drains are to be located beneath the three-foot thick clay liner, as shown on engineering plans drawing number 11. Steady-state seepage collected here is to be discharged at the toe of Phase 3 into a collector trench for discharge into Piney Creek. This drain system can be installed rapidly, with minimal disturbance. During construction, sediment will be contained at the source through use of hay-bales (double row) and/or silt fences. In addition there will be an instream silt retention structure, downstream of the project, in the tributary.

When capping and sealing of the proposed disposal area begins, capping materials will be distributed over the site beginning near the head of hollow in Phases 1 and 2.

Addendum to Part 3, Page 27, Item G(5), American Energy Corporation

Chief
ODNR, Division of Mineral Resources Management
1855 Fountain Square Court
Columbus, Ohio 43224

Re: D-0425-2, Small Area Drainage Exemption

Dear Chief:

American Energy Corporation is hereby requesting Two Small Area Drainage Exemptions containing 6.3 acres at this proposed 154.4 acre refuse site. The S.A.D.E. areas are small relative to the total disturbed area of the proposed permit.

S.A.D.E. #1 is located along the west side of the permit and contains 4.0 acres. S.A.D.E. #2 is located near the center of the south side of the permit and contains 2.3 acres. The only activity to be conducted on the S.A.D.E. areas will be topsoil storage as shown on the enclosed Adjacent Area Permit Application Map. Once the topsoil piles are constructed they will immediately be seeded and mulched so vegetation can be established as soon as possible. The topsoil piles will remain in place and will not be disturbed until reclamation of the refuse site begins. Straw/Hay bales and/or silt fence will be placed near the toe of the topsoil piles to control runoff and trap sediment. A minimum 10' buffer will be maintained between the toe of the topsoil piles and the bales and/or silt fence to enhance the sediment-trapping efficiency. The straw/hay bales and silt fence will be visually monitored on a weekly basis and during inclement weather conditions until vegetation is established. The bales and/or silt fence will be maintained as necessary to assure that they are functioning properly to meet effluent limitations. Maintenance will consist of replacing or reconstructing the bales and/or fence.

00425-2

OPERATOR

Silt fence is one of the recommended practices for small drainage areas of this type. (See Rainwater and Land Development, Ohio's Standards for Stormwater Management Land Development & Urban Stream Protection, Second Edition, 1996, prepared by Dan Mecklenburg, ODNR, Division of Soil & Water Conservation). The construction of the alternate drainage control device will cause less disturbance and take up less space. Based on the slope of the land, the slope length, and the minimal time of actual disturbance, this method of drainage control will meet the appropriate effluent limitations.

Yours truly,

Cathy M Bihlman

APPROVED ☑
DISAPPROVED ☐
DATE: 10-7-02
SIGNED Michael L. [illegible] Chief

D0425-2

OPERATOR

AEC 11563

Chief,
Ohio Department of Natural Resources
Division of Mineral Resources Management
1855 Fountain Square Court
Columbus, Ohio 43224

RE: **Stream Buffer Zone Variance Request**

Dear Chief:

In accordance with O.A.C. Section 1501:13-9-04 (A)(1) and Hydrology/Permitting PPD #98-1, American Energy Corporation is hereby requesting a variance to conduct refuse disposal operations within the buffer zones of Streams "A", "B", "C", "D", "L", "M", "N", "Q", "S", ***"Y" and Piney Creek*** as shown on the enclosed permit application map and described below.

**Specific Activities**:

**Unnamed Stream "A"**

Activities to be conducted within the buffer zone of Stream "A" consists of diversion ditch construction, pond construction and the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channels and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire lengths of these streams will be effected from the head of hollow to the point of discharge, except for streams "A" and "S". The coarse coal refuse fill will remain permanent. ***The area that will be eliminated by the refuse disposal will be between Stations 6+40 and Station 15+00. The portion of the stream that will be disturbed, but not eliminated will be between Station 1+50 and Station 6+40.***

For purposes of this description, the beginning point of Stream "A" is located at the intersection of Streams "A", "B" and "C". Stream"A" flows in a southeasterly direction and discharges into existing Pond 008A. Stream "A" intersects the eastern permit limit approximately 300 feet west of Pond 008B. This intersection is designated as Station 0+00 for Stream "A". Approximately 1500 feet of the stream is located within the permit area. There are no major suspected sources of impacts on this stream except for the limited water shed. ***Stream "A" has been impacted by construction of the existing coal waste disposal and previous mining.***

Pond 012 will be installed ***during Phase 3 of the*** refuse ***disposal operation*** and will take approximately two weeks to construct. Approximately 0.1 acre of this pond encroaches on the buffer zone between Station 0+80 and Station 1+70. Pond 016 will be installed prior to Pond 012 and will take approximately two weeks to construct. Approximately 0.1 acre of this pond encroaches on the buffer zone approximately 100 feet northwest of the intersection of Streams "A", "B" and "C". To protect the downstream portion of Stream "A", construction of the ponds will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fences and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. ***Pond 016 will be removed prior to Phase 3 and*** Pond 012 will be removed following completion of the refuse disposal. Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Stream "A". If removal occurs earlier than Division approval would first be sought and obtained.

Diversion Ditch DD-18 enters the south side of the buffer zone at Station 8+60, 100 feet south of the stream channel and will flow easterly south of the stream to DD-19. The entire diversion ditch encroaches within the buffer zone. Diversion Ditch DD-19 begins at Station 6+60 south of the stream channel and will flow in a easterly direction south of the stream. Diversion Ditch DD-19 will affect the stream channel from Station 2+20 to Station 5+80. The entire diversion ditch is located within the buffer zone. ***Diversion Ditch DD-22 enters the north side of the buffer zone at Station 6+40, 100 feet north of the stream channel and will flow southerly and discharges into Stream "A". Approximately 100 feet of the diversion ditch encroaches within the buffer zone. Coal removal and backfilling will***

***not occur during the refuse operation.*** The diversion ditches will be constructed ***during Phase 3 of the*** refuse ***disposal operation*** and will remain in place until all coal removal, backfilling, grading, resoiling and revegetation has been completed. Removal, grading and seeding of the diversion ditches will be done in a timely manner in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining effects on Stream "A". If removal occurs earlier, then Division approval would first by sought and obtained. The stream channel will not be disturbed by the construction of Diversion Ditch DD-18.

Existing instream physical habitat conditions consist of substrates of boulder and bedrock originating from shale and coal fines with heavy silt and extensive embeddedness. The instream cover is sparse, consisting of undercut banks, overhanging vegetation, shallows and boulders. There is not riparian width and the flood plain consists of forest, swamp and mining/construction, with moderate bank erosion. Maximum depth is <0.2 meter. Pool width is greater than riffle width with slow, intermittent and interstitial velocities. Riffle run substrates are stable cobble and/or boulders with extensive embeddedness. The channel morphology was indicated by moderate to low sinuosity, good to fair development, no channelization recovery and high stability. Modifications such as snagging, relocation and bank shaping have occurred.

Two wetlands were delineated within the buffer zone of Stream "A" from Station 7+50 up through the upper reaches of said stream.

**Unnamed Stream "B"**

Activities to be conducted within the buffer zone of Stream "B" consists of pond construction and the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channels and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "A". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "B" is at the head of hollow in the western portion of the permit area. Stream "B" flows in a southeasterly direction and discharges into Stream "A" approximately 540 feet north of the southern permit limit. This discharge point is designated as Station 0+00 for Stream "B". The entire stream is within the permit area. This stream has been affected by previous mining.

Pond 016 will be installed prior to Pond 012 and will take approximately two weeks to construct. Approximately 1.4 acres of this pond encroach on the buffer zone approximately 100 feet northwest of the intersection of Streams "A", "B" and "C". To protect the downstream portion of Stream "B", construction of the pond will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fence and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. Pond 016 will be removed ***prior to Phase 3 of the refuse disposal operation.*** Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Stream "B". If removal occurs earlier than Division approval would first be sought and obtained.

Existing instream physical habitat conditions consist of substrates of boulder and gravel originating from hardpan and shale, with moderate silt and normal embeddedness. The instream cover may be functional consisting of undercut banks, overhanging vegetation and boulders. The riparian width is wide consisting of forest/swamp with moderate bank erosion. Maximum depth is 0.2-0.4 meter. Pool width is equal to riffle width with slow to moderate and interstitial to intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by having low sinuosity, good development, no channelization recovery and moderate stability. Stream modifications consist of canopy removal.

Two wetlands were delineated within the buffer zone of Stream "B"from between Station 0+00 and Station 9+80

**Unnamed Stream "C"**

Activities to be conducted within the buffer zone of Stream "C" consists of pond construction and the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channels and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "A". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

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For purposes of this description, the beginning point of Stream "C" is at the head of hollow located approximately 290 feet south of T.R. 74. Stream "C" flows in a southerly direction and discharges into Stream "A". This discharge point is designated as Station 0+00 for Stream "C". The entire stream is within the permit area. Portions of this stream have been affected by previous mining.

Approximately 0.8 acres of Pond 016 encroach in the buffer zone in the lower reaches of the stream between Stations 0+00 and 3+25. Pond 016 will be installed prior to Pond 012 and will take approximately two weeks to construct. To protect the downstream portion of Stream "C", construction of the pond will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible, runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fence and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. Pond 016 will be removed following completion of the refuse disposal. Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Stream "C". If removal occurs earlier than Division approval would first be sought and obtained.

Existing instream physical habitat conditions consist of substrates of cobble and sand originating from hardpan with normal silt and embeddedness. The instream cover is not functional and nearly absent. The riparian width is wide with flood plain consisting of fenced pasture and forest/swamp, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width is greater than riffle width, with slow interstitial and intermittent velocities. The channel morphology of the stream is indicated by moderate sinuosity, good development, and no channelization recovery with high stability.

***Four*** wetlands were delineated within the buffer zone of Stream "C" between approximate stations 4+00 to 14+00.

**Unnamed Stream "D"**

Activities to be conducted within the buffer zone of Stream "D" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "C". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "D" is at the head of hollow located approximately 175 feet south of Township Road 74. Stream "D" flows in a southwesterly direction and discharges into Stream "C". Thus, this discharge point is designated as Station 0+00 for Stream "D". The entire stream is within the permit area. This stream may have been impacted by previous mining or silviculture.

Existing instream physical habitat conditions consist of substrates of boulder and silt originating from hardpan with moderate silt and embeddedness. The instream cover is nearly absent but functional, consisting of undercut banks, overhanging vegetation, rootmats and rootwads. The riparian width is wide consisting of forest/swamp and fenced pasture, with none to little bank erosion. Maximum depth is < 0.2 meters. Pool width is equal to riffle width, with slow and interstitial/intermittent velocity. The channel morphology of the stream is indicated by low sinuosity, excellent development, and no channelization recovery with high stability.

One wetland was delineated within the buffer zone of Stream "D", located at the head of hollow.

**Unnamed Stream "L"**

Activities to be conducted within the buffer zone of Stream "L" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "L" is at the head of hollow located approximately 580 feet east of the western most permit limit. Stream "L" flows in a easterly direction and discharges into Stream "B". Thus, this discharge point is designated as Station 0+00 for Stream "L". The entire stream is within the permit area. This stream may have been impacted by canopy removal and agriculture.

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Existing instream physical habitat conditions consist of substrates of hardpan and silt originating from hardpan with normal silt and embeddedness. The instream cover is nearly absent and not functional. The riparian width is wide on the left bank and narrow on the right bank consisting of fenced pasture, with moderate bank erosion. Maximum depth is <0.2 meter. Pool width is less than riffle width, with intermittent velocity. Riffle/run substrates are unstable fine gravel and sand with low embeddedness. The channel morphology of the stream is indicated by low/moderate sinuosity, poor development, and no channelization recovery with moderate stability. Modifications such as canopy removal have occurred.

No wetlands were delineated within the buffer zone of Stream "L".

**Unnamed Stream "M"**

Activities to be conducted within the buffer zone of Stream "M" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "M" is at the head of hollow located approximately 1140 feet east of the westernmost permit limit. Stream "M" flows in a southwesterly direction and discharges into Stream "B". This discharge point is designated as Station 0+00 for Stream "M". The entire stream is within the permit area. This stream has not been affected by previous mining.

Existing instream physical habitat conditions consist of substrates of cobble and hardpan originating from hardpan with normal silt and no embeddedness. The instream cover is nearly absent and not functional. The riparian width is wide consisting of forest/swamp and shrub or old field, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width equals riffle width, with moderate and intermittent velocities. Riffle/run substrates are moderately stable large gravel with no embeddedness. The channel morphology of the stream is indicated by low sinuosity, fair development, and no channelization recovery with moderate stability. Modifications such as canopy removal have occurred.

One wetland was delineated within the buffer zone at the head of hollow.

**Unnamed Stream "N"**

Activities to be conducted within the buffer zone of Stream "N" consist of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "N" is at the head of hollow located approximately 750 feet east of the western permit limit. Stream "N" flows in a northeasterly direction and discharges into Stream "B". This discharge point is designated as Station 0+00 for Stream "N". The entire stream is located within the permit area. Stream "N" has not been affected by previous mining.

Existing instream physical habitat conditions consist of substrates of hardpan originating from hardpan with normal silt and embeddedness. The instream cover is nearly absent and not functional. The riparian width is moderate consisting of forest/swamp and fenced pasture, with none/little bank erosion. Maximum depth is <0.2 meter. Pool width is less than riffle width, with moderate and intermittent velocities. Riffle/run substrates are unstable fine gravel and sand with low embeddedness. The channel morphology of the stream is indicated by low sinuosity, poor development, and no channelization recovery with moderate stability. Modifications such as canopy removal have occurred.

One wetland was delineated within the buffer zone of Stream "N".

**Unnamed Stream "Q"**

Activities to be conducted within the buffer zone of Stream "Q" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown


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on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "Q" is at the head of hollow approximately 380 feet north the southern permit limits. Stream "Q" flows in a northeast direction and discharges into Stream "B". This discharge point is designated as Station 0+00. This stream has not been affected by previous mining.

Existing instream physical habitat conditions consist of a substrate of gravel and detritus, originating from shale with normal silt and embeddedness. The instream cover is nearly absent, and not functional. The riparian width is wide to moderate, consisting of some forest/swamp and fenced pasture, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width is less than riffle width with intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by low sinuosity, poor development, no channelization , and moderate stability. Modifications such as canopy removal have occurred.

One wetland was delineated within the buffer zone of Stream "Q" at Station 0+00..

**Unnamed Stream "S"**

No mining or refuse activities are to be conducted within the buffer zone of Stream "S".

For purposes of this description, the beginning point of Stream "S" is at the head of hollow located approximately 280 feet north of the southern permit. Stream "S" flows in a southeasterly direction, intersects the permit limit and discharges into Piney Creek. This intersect point is designated as Station 0+00. Approximately 300 feet of Stream "S" is located within the permit area. This stream may have been affected by canopy removal.

Existing instream physical habitat conditions consist of substrates of cobble and gravel, originating from shale with moderate silt and normal embeddedness. The instream cover is moderate, with undercut banks, overhanging vegetation, rootmats, rootwads, boulders, and logs or woody debris. The riparian width is wide, consisting of forest/swamp, shrub/old field and fenced pasture with none to little bank erosion. Maximum depth is 0.2-0.4 meter. Pool width is greater than riffle width with slow, interstitial and intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by moderate sinuosity, fair development, no channelization recovery, and high stability. Modifications such as canopy removal have occurred.

The were no wetlands delineated within the buffer zone of this stream.

***Unnamed Stream "Y"***

***No mining or refuse activities are to be conducted within the buffer zone of Stream "Y".***

***For purposes of this description, the beginning point of Stream "Y" is at the head of hollow located approximately 50 feet south of the southern permit line. Stream "Y" flows in a southeasterly direction and discharges into Stream "S". The entire stream is outside of the permit area. Only the upper most part of the buffer zone encroaches on the permit area. This stream may have been affected by canopy removal.***

***Existing instream physical habitat conditions consist of substrates of silt and gravel, originating from shale with normal silt and embeddedness. The instream cover is nearly absent, and not functional. The riparian width is wide, consisting of forest/swamp, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width is lesser than riffle width with slow, interstitial and intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by low sinuosity, poor development, no channelization recovery, and moderate stability. Modifications such as canopy removal may have occurred.***

***One wetland was delineated within the buffer zone of this stream.***

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*Piney Creek*

***Activities to be conducted within the buffer zone of Piney Creek consist of construction of a spillway for Pond 012. No other mining or refuse activities are to be conducted within the buffer zone of Piney Creek. The stream channel will not be disturbed.***

***For purposes of this description, the beginning point of Piney Creek is just south of the southern most permit limit and just north of Pond 011. The buffer zone of Pine Creek encroaches on the permit for a distance of approximately 320 feet. Piney Creek flows in a northeasterly direction and is not located within the permit area. This stream may have been affected by previous mining.***

***Pond 012 will be installed during Phase 3 of the refuse disposal operation and will take approximately two weeks to construct. Only the exit channel will be located withing the buffer zone. Construction of the ponds will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fences and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. Pond 012 will be removed following completion of the refuse disposal. Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Piney Creek. If removal occurs earlier than Division approval would first be sought and obtained.***

***Existing instream physical habitat conditions consist of substrates of gravel and bedrock, originating from sandstone with normal silt and extensive embeddedness. The instream cover is moderate, and consist of overhanging vegetation, undercut banks, shallows, rootmats, pools and logs or woody debris. The riparian width is wide, consisting of forest on the left bank and narrow, with mining/construction on the right bank, with moderate bank erosion. Maximum depth is 0.4-0.7 meter. Pool width is greater than riffle width with fast to intermittent velocities. Riffle run substrates are moderately stable large gravel with moderate embeddedness. The channel morphology of the stream is indicated by moderate sinuosity, good development, recovered channelization, and moderate stability. Modifications such as bank shaping have occurred. Previous mining activities have impacted stream conditions.***

***The were no wetlands delineated within the buffer zone of this stream.***

**Necessity of Activities**

American Energy Corporation cleans coal for use by the electric utility industry. Coal refuse is produced at the annual rate of approximately 2.5 million tons. Currently, there are no economically viable ways to dispose of coal refuse. Mountain top disposal areas have been investigated as have refuse piles in flat land areas. These alternatives do not present any environmental advantages and hold a potential for more unsightly conditions after reclamation.

Other disposal sites were considered on areas owned by the American Energy Corporation remote form the existing disposal area. These sites were eliminated form consideration for several reasons. They would require haulage of refuse along township or county roads. This would create the potential for pollution of streams away from the permit as well as refuse dropping from the haulage vehicles onto the public roads. The construction of the disposal area would require an entirely new and separate system of pollution controls whereas the main pollution controls for the proposed site are in existence already.

**Water Quality/Quantity and Environmental Resources**

Water quality in Stream "A" is fair. Water analysis conducted prior to permit submission at CMD-6 show elevated specific conductance and sulfates. Stream "A" is an intermittent stream and originates at the intersection of Streams "A", "B" and "C". Stream quantities range from 0.004 cfs to 0.1 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "B" is good. Water analysis conducted prior to permit submission at CMU-6C show all parameters well within effluent limitations. Stream "B" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.0005 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.



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Water quality in Stream "C" is good. Water analysis conducted prior to permit submission at CMU-6A show all parameters well within effluent limitations. Stream "C" is an intermittent stream originating from head of hollow. Stream quantities range from dry to 0.001 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "D" is good. Water analysis conducted prior to permit submission at CMU-6 show all parameters well within effluent limitations. Stream "D" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.004 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "L" is good. Water analysis conducted prior to permit submission at CMS-10 show all parameters well within effluent limitations. Stream "L" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.38 GPM during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "M" is good. Water analysis conducted prior to permit submission at CMU-6B show all parameters well within effluent limitations. Stream "M" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.38 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "N" is fair. Water analysis conducted prior to permit submission at CMS-9 show slightly elevated acid. Stream "N" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.29 g.p.m. during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "Q" is fair. Water analysis conducted prior to permit submission at CMS-*8* show slightly elevated acid. Stream "Q" is a small intermittent stream originating from head of hollow. Stream quantities range from 0.065 g.p.m. to 0.22 g.p.m. during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "S" is fair. Water analysis conducted prior to permit submission at CMU-5 show slightly elevated specific conductance and sulfates. Stream "S" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.0007 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

***Water quality in Stream "Y" is fair. Water analysis conducted prior to permit submission at CMS-5 show slightly elevated specific conductance and sulfates. Stream "Y" is a small intermittent stream originating from a wetland. Stream quantities range from 0.75 GPM to 3.0 GPM during high, low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.***

***Water quality in Piney Creek is good. Water analysis conducted prior to permit submission shows all parameters within effluent limitations. Piney Creek is a perennial stream, originating from springs to the south and southeast. Stream quantity ranges from 7.4 cfs during low flow conditions to 47 cfs during high flow conditions. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.***

Riparian vegetation will be disturbed within the entire buffer zones of Streams "B", "C", "D", "L", "M", "N", and "Q" ***and will not be restored.*** Riparian vegetation will be disturbed and will be restored within the buffer zone of Stream "A" between Stations 6+45 and 15+00.

**Sequencing of Operations**

The total life of this mining activity is projected to be approximately 10 years. The sequence of proposed activities is as follows: Construction of sediment ponds and diversion ditches, topsoil removal and stock piling, construction of ground water collection drain, fill area clay liner, construction of leachate collection system, and refuse placement, seal/cap, and revegetation.

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**Stream Reconstruction, Diversion or Relocation**

No stream reconstructions or relocations are planned for this project. All stream and buffer zone affects as well as sequencing of operations, are discussed in the previous sections of this document. Restoration of habitat and environmental conditions to those that existed prior to mining is addressed in the individual stream descriptions in the previous sections of this document. See engineers report for more details.

The Ohio EPA and the Army Corp of Engineers have conducted site inspections of the proposed area, and discussed what will be required for mitigation of wetlands and streams in this area. ***A mitigation plan for the portions of the streams that will be eliminated by the proposed refuse disposal operation will occur along Long Run and Piney Creek. Approval of the plan is pending.*** The 401 certification application has been submitted to the EPA. Upon receipt of an approved 401 certification and approval of the disposal permit by ODNR, the 404 permit application will be submitted. An Ohio EPA approved mitigation plan will be submitted to ODNR via A.R.P. when obtained.

**Revegetation**

The following species and amounts of vegetation and/or tree and shrubs will be planted a minimum of two and ½ times the channel bottom width where disturbance within the buffer zone has occurred.

| Species | | Amount/Rate (lbs./Ac.) |
|---|---|---|
| **Grasses and Legumes** | | |
| Perennial Ryegrass | | 5 lbs./Ac. |
| Foxtail Millet | | 5 lbs./Ac. |
| Red Top | | 3 lbs./Ac. |
| Birdsfoot Trefoil | | 5 lbs./Ac. |
| Appalow Lespedeza | | 15 lbs./Ac. |
| Trees and Shrubs | | |
| Green Ash | 8' o/c | |
| Sycamore | 8' o/c | |
| Button Bush | 8' o/c | |

Trees and shrubs will be planted by hand on approximate eight foot centers. Areas planted with riparian vegetation will not be cut or mowed in order to encourage the development of volunteer vegetation. Species of trees, shrubs, grasses and legumes which appear naturally will not be removed, but will remain in order to enhance the wildlife environment along the streams.

Care will be taken to disturb only that part of the buffer zone necessary to accomplish the objectives of the permit. All work within the buffer zone will be performed in a timely and workmanlike manner to prohibit as best can be accomplished, detrimental effects on the stream.

Yours truly,

Suzie Utter

Suzie Utter, Permitting

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APPROVED ☑
DISAPPROVED ☐
DATE 10-7-02
SIGNED Michael J. Bonsler
by R. Ralph

RECEIVED
JUN 1 2 2002
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AMERICAN ENERGY CORPORATION

**ADDENDUM TO PART 3, ITEM G(6)**

**N.S.P.S.**

**(NEW SOURCE PERFORMANCE STANDARDS)**

## FINAL EFFLUENT LIMITATIONS
## EFFECTIVE AFTER JUNE 3, 1997

| | pH | T.S.S. in mg/l 30 Day/Daily | Fe in mg/l 30 Day/Daily | Mn in mg/l 30 Day/Daily | S.S. in ml/l |
|---|---|---|---|---|---|
| 1. Discharge from underground workings of underground mines - not commingled | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| 2. Discharge from underground workings of underground mines - commingled | | | | | |
| a) less than or equal to 10 Yr/24Hr | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| b) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |
| 3. Controlled surface mine drainage | | | | | |
| a) less than or equal to 10 Yr/24Hr | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| b) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |
| 4. Non-controlled surface mine drainage (except steep slope and mountaintop removal) | | | | | |
| a) no precipitation 24 Hr. | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| b) less than 2 Yr/24 Hr | 6.5-9.0 | | 1.4 / 7.0 | | 0.5 |
| c) greater than 2 Yr/24 Hr less than or equal to 10 Yr/24 Hr | 6.5-9.0 | | 1.4 / | | 0.5 |
| d) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |
| 5. Discharge from coal refuse disposal piles | | | | | |
| a) less than or equal to 1 Yr/24 Hr | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| b) greater than 1 Yr/24 Hr less than or equal to 10 Yr/24 Hr | 6.5-9.0 | | | | 0.5 |
| c) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |
| 6. Discharge from steep slope and mountaintop removal area | | | | | |
| a) no precipitation 24 Hr. | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| b) less than 10 Yr/24 Hr | 6.5-9.0 | | 1.4 / | | 0.5 |
| c) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |
| 7. Discharges from preparation plant associated areas (excluding coal refuse piles) and preparation plants | | | | | |
| a) no precipitation 24 Hr. | 6.5-9.0 | 35.0 / 70.0 | 1.4 / 6.0 | 2.0 / 4.0 | |
| b) less than 10 Yr/24 Hr | 6.5-9.0 | | | | 0.5 |
| c) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |
| 8. Discharges from Reclamation Areas | | | | | |
| a) less than 10 Yr/24 Hr | 6.5-9.0 | | | | 0.5 |
| b) greater than 10 Yr/24 Hr | 6.5-9.0 | | | | |

H. PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES-**Permit and Planned Subsidence Area**

Will the proposed coal mining activities adversely affect any public park and places listed on the National Register of Historic Places? _____ Yes, __X__ No. If "yes," submit an addendum describing the measures to minimize or prevent these impacts.

I. MINING NEAR OR THROUGH A PUBLIC ROAD-**Permit Area**

If the response to Part 1, item D (6) of the permit application is "yes", submit an addendum describing the measures to be used to ensure that the interests of the public and landowners are protected.

1. **BOND WILL BE POSTED ON THE PERMITTED AREA.**
2. **EARTH BARRICADES WILL BE CONSTRUCTED WHERE NECESSARY TO PROHIBIT ENTRY OR ACT AS SAFETY BARRIERS.**
3. **SIGNS HAVE BEEN ERECTED NEAR THE MINE TO PROVIDE INFORMATION FOR THE PUBLIC.**

J. SUBSIDENCE CONTROL SURVEY-**Shadow Area N/A**

(1) Is this a full coal recovery operation?
_____ Yes, _____ No. If "yes," complete Attachment 31, Subsidence Control Survey, and following items J(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 Attachment 32, 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 Attachment 32, Protection of Specific Structures, and specifically identify the areas on the application map.

K. SUBSIDENCE CONTROL PLAN-**Shadow Area N/A**

(1) Submit an addendum which describes the method of coal removal, and indicates the size, sequence, and timing of the development of the underground workings.

(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.

PART 4 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 application's name and indicate to what item the addendum applies. For example, "Addendum to Part 3, Item K(2) Zebco Coal Company."

B. Provide the information requested below for all technical data submitted in the application.

| Identification of Technical Data (1) | Person/Organization that Collected Data and Date | Methodology for Collecting Data | Person/Organization that Analyzed Data and Date | Methodology Used to Analyze Data |
|---|---|---|---|---|
| Part 2, Item C | D. Rucker, Quality environmental Services, Inc. 3/99, 7/01, 10/01 | Grab Samples | I.B.Maniar, Industrial Lab Analysis 3/99, 7/01, 10/01 | Analyze as necessary for parameters |
| Attachment 28 | Wm. Siplivy, P.E. 10/01 | Grab Samples | S. Duke, TraDet, Inc. 11/01 | Analyze as necessary for parameters |

(1) 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); Attachment 14; Part 4, A).

C. Provide the name, address, and position of officials of 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 quality, air quality, and archeological, cultural, and historic features.

| Name and Address of Official | Position of Official | Name of Agency/ Organization | Type of information (e.g. Geology) |
|---|---|---|---|
| Bill Haiker<br>Fountain Square Court<br>Bldg. E,<br>Columbus, Ohio 43224 | Hydrogeologist | Division of Water | Hydrology |
| James Forshey<br>1119 East Main St.<br>Barnesville, Ohio<br>43713 | District Conservationist | Natural Resources Conservation Service | Soils/P.F.L |
| I.B. Maniar<br>2240 Williamsburg Dr.<br>Glen Dale, WV 26038 | Analyst | Industrial Lab Analysis | Hydrology |
| Sharon Duke<br>PO Box 2019<br>Battle Run Road<br>Wheeling, WV 26003 | Analyst | TraDet, Inc. | Attachment 28 |

D. APPLICATION FOR ABANDONED MINED LAND DIRECT NEGOTIATED CONTRACT (IF APPLICABLE) **N/A**

In accordance with Section 1513.27 of the Ohio Revised Code, the chief of the Division of Reclamation has been granted the authority to enter into contracts with licensed operators for reclamation of abandoned mined lands affected by coal mining prior to April 10, 1972 and located adjacent to a permit area. To be eligible for reclamation funding, the abandoned mined land must be causing offsite environmental problems, will not be affected by the operator during the normal course of mining, and is not likely to be mined in the foreseeable future. If such lands exist adjacent to your permit area and you are interested in contracting for reclamation of the lands, complete this application, detach and send directly to:

Robert S. Baker, Manager
Mined Land Reclamation
Division of Reclamation
Fountain Square, H-2
Columbus, Ohio 43224

Upon receipt, a representative from the Mined Land Reclamation section will contact you.

Applicant: _____

Address: _____

City: _____ State _____ Zip _____

Business Telephone: _____

Contact Person: _____

Description of Abandoned Mined Land:

County: _____
Township: _____
Section/Lot: _____
Approximate Acreage: _____

Environmental problems associated with site:

_____

_____

_____

_____

342 High St., Box 471
Flushing, OH 43977
PH: (740) 968-4947
Fax: (740) 968-4225
e-mail: hamilton@1st.net
www.hamiltonandassoc.com

Jack A. HAMILTON & Associates, Inc.

Civil Engineering
Land Surveying
Mine Permitting
GIS Data Services
Land Development
Global Positioning Systems

July 11, 2002

Mr. Scott Stiteler
ODNR, Division of Mineral Resources Management
1855 Fountain Square Court
Columbus, Ohio 43224

Re: American Energy Corporation, Permit Application D-0425-2

Dear Scott,

In response to your letter dated June 25, 2002 requiring revisions to American Energy Corporation's Permit Application D-0425-2, the following revisions have been completed. The letters and numbers to the left of the responses correspond with the letters and numbers in your letter.

**A. Adjacent Area Application Review:**

Page 1, Item 8: Submitting documentation to verify and acknowledge these revisions.

U/G Coal Mining Permit Appli., Pg. 2: Submitting documentation to verify and acknowledge these revisions.

1. Page 3, Item 13: Submitting the required proof of publication as requested.

2. Page 4, Item 14:

   a) Page 3, Item A(4): Submitting updated ownership and control information.

   b) Page 4, Item A(10): Providing Attachment 5's as requested.

   c) Page 4, Item A(11): Revised response and provided Attachment 23's as requested.

   d) Page 4, Item A(14): Submitting an updated Attachment 22 as requested.

   e) Page 8, Item C(4): Submitting updated Attachment 3's as requested.

   f) Page 16, Item A: Page 13, Item A: Per Dr. Jeff Reichwein's direction, the appropriate O.A.I. Form was submitted to him on May 22, 2002. Per Dr. Reichwein, this form is all that will be required for this project site.



Cathy M. Bihlman, P.S. • Donald M. Brafford, P.E. • Jack A. Hamilton, P.S • Paul R. Hamilton • Charles W. Johnson, P.S. • David J. Siembab, P.S. • Terry L. Steffl, P.S

g) Page 17, Item C: Hydrogeologic Investigation Report

i) Revised all maps to show "proposed affected area".

h) Page 17, Item D(2): Streams "T" & "W", and their associated buffer zones are not within the proposed permit area. Due to slight permit limit changes in this area, Wetland #9 is not within the proposed permit limits. A small portion of the Stream "Y" buffer zone is within the permit limits, however, no mining activities will take place within the buffer zone. Stream "Z" is identified as an ephemeral stream on the Q.H.E.I. form submitted with the Wetland Delineation Report, and therefore is not being shown on the application/hydrology map. Stream "Z" was mis-identified as intermittent on the stream table in the wetland report. Please note that none of these streams were shown, or identified during the permitting and review process for Permit D-1159 or D-1159-1, and that the applicant considers all four to be ephemeral in nature.

The stream originating at CMDS-1 is ephemeral in nature. As is the case with Streams "T", "W", "Y", and "Z", no intermittent stream was ever identified at this location during the permitting and review process for Permit D-1159 and D-1159-1.

i) Page 19, Item G(6): Revised location of post-mining cropland area as necessary.

j) Page 22, Item A(12)(a): Provided a response. See addendum to this item.

k) Page 22, Item A(12)(b): Revised to reference the Attachment 28 as requested.

l) Page 23, Item A(14): Attachment 28

1. Item 5: Revised to address total estimated amount of refuse material, in tons.

2. Item 4: Drawing #13 has been revised to show a final elevation of 1288.6 feet or less.

3. Item 8: No refuse disposal will be take place within the limits of D-0425-2. Since the delays anticipated for the review and subsequent approval of this permit were not encountered, it will not be necessary to dispose of coal waste in the #12 pit within the limits of D-0425-2.

4. Item 13: Drawing #9 has been revised to show springs and Pond 012.

5. Item 14: Drawings #9 and #10 have been revised as necessary for consistency.

m) Page 24, Item D(4): As indicated on the revised drawings above, the crown slope shall have a minimum slope of 2%, therefore the contours shown on the final closure plan are correct.

n) Page 25, Item D(9): Revised to address as necessary.

o) Page 27, Item G(3): Submitting table for detailed design for control ditches.

p) Page 27, Item G(5):

*1)* SADE Request: See revised S.A.D.E. request.

*2)* Stream Buffer Zone Variance Request (BZVR)

- Addressed operations to be conducted in the buffer zone of Stream "Y". The permit area does not encroach on the buffer zones of the other streams.

- Revisions to the mitigation plan will not be necessary. The buffer zone of Stream "Y" (only) is within the permit limit, however, there will be no affectment within the stream or the buffer zone.

**Stream "A"**

- Revised accordingly.

- Revised as necessary.

- Revised accordingly.

- Revised as necessary. Also, revised to indicate DD-22 will discharge into Stream "A".

- Revised accordingly.

- Mitigation is addressed under "Reconstruction, Diversion or Relocation" section, second paragraph, of the Buffer Zone Variance Request.

**Streams "B" and "C"**

- Revised as requested. Also, mitigation is addressed under "Reconstruction, Diversion or Relocation"section, second paragraph, of the Buffer Zone Variance Request.

- Revised accordingly.

- Revised to address wetlands accordingly.

**Streams "D", "L", "M", "N", "Q"**

- Revised as requested. Also, mitigation is addressed under "Reconstruction, Diversion or Relocation"section, second paragraph, of the Buffer Zone Variance Request.

- Revised for accuracy.

- Revised accordingly.

• Comment noted, requested revision under review by ODNR.

q) Page 28, Item I: Addressed measures to ensure interests of the public.

**B. Hydrology Review:**

1. See response to A. 2. Page 4, Item 14, l) 3. of this letter. (Also submitting water analysis from the downstream site in Piney Creek, below the Pond 008 series discharge point, and two downstream samples immediately adjacent to the existing refuse disposal site, as an addendum to Part 2, Item E. ).

2. Page 16, Item B: Addressed in Hydrogeologic Investigation Report, Page 10, Section 5.1.

3. Attachment 14B (Ground Water Hydrology Description):

   a) Submitted Attachment 14B.

   b) Revised for consistency and site specific information.

4. Attachment 14C:

   a) Revised CMS-1 elevation to 995.

   b) Revised to inventory monitoring wells, referenced state plane coordinates.

   c) Revised to inventory CMS-13.

5. Attachment 14A:

   a) CMS-1: Revised surface elevation to 995.

   d) Please refer to water quality analyses for the monitoring wells submitted with the "First Annual Report Groundwater Statistical Evaluation".

   e) The "high flow" sample for CMS-7 was lost in transit to the lab. No "high flow" sample exists at this time.

   Also revised Aquifer Zone Identification for all ground water sites (per the Attachment 14B submitted with these revisions).

6. Page 18, Item E:

   a), b), and c) See Addendum to Part 2, Page 18, Item E. (Also submitting water analysis from the downstream site in Piney Creek, below the Pond 008 series discharge point, and two downstream samples immediately adjacent to the existing refuse disposal site, as an addendum to this item).

d) Please refer to the "First Annual Report Groundwater Statistical Evaluation" submitted in May, 2002. Submitting revised tables showing Aquifer and Aquifer Type entries appropriately.

7. Page 25, Item D(11): See revised response to this item.

8. Page 26, Item E: See revised addendum to this item.

9. Page 26, Item F: Included all ground and surface water monitoring sites in this response. Revised Plate 9 to show correct location of CMU-2A.

10. Attachment 28:

a) Item 5: The referenced responses have been reconciled appropriately.

b) Item 6: A wash plant facility has since been constructed at this site, therefore, refuse will in fact be generated from the new facility.

c) Item 10: Revised Tab reference appropriately. The report behind Tab 1 includes the same information.

d) Item 11: Referenced appropriate Appendix in Engineers Report for this data.

e) Item 21: See revised response to this item.

11. Hydrogeologic Investigation Report:

a) Plate 1:

i. Revised to update the status of the IBR areas.

ii. Revised the underground mine limit lines for consistency.

b) Section 2.1:

i. Revised for consistency.

ii. Revised acreage and plates and drawings where necessary for consistency.

iii. Drawings 10 and 13 have been revised for consistency.

c) Section 2.2:

i. See response to 2. Page 4, Item 14, l) 3. of this letter.

ii. Reconciled responses appropriately.

iii. Revised fourth paragraph as necessary.

d) Section 4.0: Revised report appropriately.

e) Section 5.3.1: Revised report to state pond discharge will maintain base flow.

f) Section 5.3.2.2: Addressed as necessary to explain the systems.

g) Sections 6.2, 6.3.2, and 6.3.3.2: Revised to state pH monitored weekly.

h) Section 6.3.3.2: Revised response appropriately.

i) Section 6.3.4: Indicated sampling results will be submitted to ODNR, DMRM.

j) Section 6.4: Revised to include ODNR, DMRM.

k) Section 6.4.2: Revised monitoring per previous comments.

**C. Engineer Review:**

**General** - See Addendum to Engineers Report, Addendum to Section 2.1, General.

**Stability Analysis** - See Addendum to Engineers Report, Adden. to Section 5.1, Stab. Anal.

**Liner and Cap** - See Addendum to Engineers Report, Adden. to Sec. 2.2.1, Liner & Cap.

**Adjacent Area Permit** - See response to 2. Page 4, Item 14, l) 3. of this letter.

**Test Pit 3** - See Addendum to Engineers Report, Adden. to Appen. 3, Test Pit .

**Culverts** - All designed culverts have been changed from CMP to HDPE.

**Subsidence Control Plan** - See Addendum to Engineers Report, Adden. to Appen. 5, Subsidence Evaluation.

**Drawing 2** - Revised to show the limits of the existing coal waste.

**Drawing 11** - Revised as necessary.

**Ponds 13, 14** - Dewatering devices have been added to proposed ponds, see revised Attachment 20's.

**Ponds 8a, 8b, 8c** - These ponds will receive water only from Phase 1 and Phase 2 operations. Pre-mining operations of these phases produce a discharge of 137.6 cfs for the 25 year, 24 hour storm event. Pond 16 is discharging 122 cfs of the same storm event after mining operations due to storage in the pond. Therefore, Ponds 8a, 8b, and 8c will not receive any additional discharge from the proposed area. During Phase 3 of the project, all water is diverted around the Pond 8 series.



AEC 11582

**D. Engineering Report:**

1. Location Map showing Existing Conditions (Drawing #2)

   - Revised to show the limits of the existing waste disposal.
   - Revised to show all intermittent streams.
   - Revised to show all wetlands.
   - Revised to show Streams "B" and "C" up to their point of origin.

**C. Application/Hydrology Map:**

1. Revised the dip as necessary.
2. Revised to show all wetlands as requested.
3. Revised to show abandoned dry oil and gas well as requested. See Addendum to Part 2, Page 18, Item E.
4. Revised as requested. See drawing references on Page 10, Hydrogeologic Report Section 5.1 for location of Borings and Test Pits.
5. Revised to show the intermittent streams and related buffer zone.
6. Revised to show the limits of the existing refuse disposal area.
7. See response to 2. Page 4, Item 14, h).
8. Revised to show all existing structures as requested.
9. Provided a revised map date.

Also submitting revised Attachment 20 for Pond 012; the principal spillway has been revised.

Yours truly,

Jack A. Hamilton & Associates, Inc.
Consultants for American Energy Corporation

Suzie Utter, Permitting

within acceptable effluent limitations. For actual spring quality and quantity data, see Attachment 14 and Tables C.5 through C.8.

Two springs are monitored upstream of the reclaimed refuse disposal area. Spring S-2 is in the right fork of the hollow, while spring S-3 is located in the left fork. The water quality characteristics are very similar and appear to be of the same aquifer. The pH was 6.95, typically basic having a net alkalinity. Total iron and total manganese are normally within acceptable limitations. Suspended solid content is within acceptable limits and the water hardness is within limits making it acceptable for most domestic or industrial purposes.

The natural spring, S-4, north of the reclaimed freshwater pond, is acidic with pH of approximately 4.0, due to its exposure to the Pittsburgh 11 and 12 coal outcrop. The water quality has a net acidity with total iron approximately 7.2 and total manganese approximately 11. For detailed spring water quality and quantity data, see Tables C.5 through C.8.

Ground water is being collected in a sump at the bottom of the mine slope entry and pumped to mine water Pond 002. A portion of the collected mine water was stored in water storage tanks and was used in the washhouse facility. Currently, no mine water is used as the mine is inactive. The ground water had been tested and determined to be acceptable for use in the mine office and washhouse facility after some chlorination treatment. Water had also been collected in the shaft entry water ring and pumped to the surface drainage system in the storage yard area and then discharged into the natural watercourse. This water has also been determined acceptable for direct discharge into the stream channels.

Acid ground water seepage emanates from a reclaimed refuse area constructed prior to the current coal mining and reclamation regulations. The seep is located adjacent the raw coal conveyor and crusher house facility and discharges into Piney Creek. At the latest monitoring series, a seepage flow did not exist.

(2) Provide a list of all wells on the proposed permit and adjacent areas.

Wells W-1 through W-13 are shown on Drawing 82-1862-E2 in Appendix A.

(3) Provide a list of all springs on the proposed permit and adjacent areas.

Springs S-1 through S-4 are shown on Drawing 82-1862-E2 in Appendix A.

(4) Are there any public water supply sources on the permit and adjacent areas? _____ Yes, __X__ No.

9/88

# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION
## ADJACENT AREA COAL MINING PERMIT APPLICATION

1. Applicant AMERICAN ENERGY CORPORATION
   Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88
   City BEALLSVILLE State OHIO Zip 43716
   Telephone No. (740) 926-9152

2. Original Permit No. D-0425

3. Date Original Permit Issued OCTOBER 22, 1984

4. Number of adjacent area applications for the D-permit which were previously:

   a. Submitted 1 b. Issued 1

5. Number of acres in this permit application. 154.4 Acres

6. Number of acres in this permit application that are to be affected during the balance of the current mining year of the original permit identified in item 2. above. N/A

7. 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 Robert D. Moore ; Date _____

   Signature _____ ; Title PRESIDENT

   Sworn before me and subscribed in my presence this 27th day of November, 20 01.

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

   Barbara L. Rush
   Notary Public

8. For Revision Review Only. This item is to be completed after revisions, if any, have been made to the permit application.

   I, the undersigned 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 Robert D. Moore ; Date 07-10-02

   Signature _____ ; Title President

   Sworn before me and subscribed in my presence this 10th day of July, 20 02.

   KATHY J. ROE
   NOTARY PUBLIC, STATE OF OHIO
   MY COMMISSION EXPIRES 12-15-04

   Kathy J. Roe
   Notary Public

F. 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 Robert D. Moore Title President

Signature _____ Date 07-10-02

Sworn before me and subscribed in my presence this 10th day of July, 20 02.

KATHY J. ROE
NOTARY PUBLIC, STATE OF OHIO
MY COMMISSION EXPIRES 12-15-02

Kathy J. Roe
Notary Public

PART 1 LEGAL, FINANCIAL, COMPLIANCE, AND RELATED INFORMATION

A. IDENTIFICATION OF INTERESTS

(1) Applicant's Name AMERICAN ENERGY CORPORATION

Address 43521 MAYHUGH HILL ROAD, TWP. HIGHWAY 88

City BEALLSVILLE State OHIO Zip 43716

Telephone 740 - 926 - 9152

Employer Identification No. (EIN) 31-1550443 or

Social Security No. (SSN) , _____

(2) Indicate business structure of entity and additional information:

____ Single Proprietorship,
____ Partnership (registration no. and date obtained) _____,
X Corporation (charter no. and date incorporated) 00842695 4-12-1993,
____ Association, ____ Other, specify _____

(3) If the entity is a single proprietorship, provide the following:

Owner's Name _____

Address _____

City _____ State _____ Zip _____

Telephone ____ - ____ - ____

EIN _____ , or SSN _____

Beginning date of ownership _____

*PROOF OF PUBLICATION*

The State of Ohio
County of Belmont, ss:

MAR 12 2002

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 except Saturday 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:

Feb. 15, 22,
Mar 1, 8 2002
Audrey Blanco

Subscribed by Affiant and sworn to before me, this 8th day of Mar, A.D. 2002.

Rebecca L Anderson
Notary Public

NOTARIAL SEAL STATE OF OHIO

REBECCA L. ANDERSON
Notary Public, State of Ohio
My Commission Expires Nov. 25, 2006

PUBLIC NOTICE

American Energy Corporation, 43521 Mayhugh Hill Road, Twp. Highway 88, Beallsville, Ohio 43716 has submitted a Coal Mining and Reclamation Permit Application numbered D-0425-2 to the Ohio Department of Natural Resources, Division of Mineral Resources Management. The proposed mining and reclamation operation will be in Sections 3 and 4, Township 6, Range 5, Wayne Township, Belmont County, Ohio. The proposed permit area encompasses 154.4 acres and is located on the Hutner 7 1/2 Minute USGS Quadrangle Map approximately 3.2 miles north of Beallsville, Ohio, and south of Township Road 74 and east of Township Road 87. The activity planned for the proposed application will consist of a coal refuse disposal facility.

This application is on file at the Belmont County Courthouse, Recorder's Office, St. Clairsville, Ohio 43950. Written comments or requests for an informal conference may be sent to: Chief, Ohio Department of Natural Resources, Division of Mineral Resources Management, 1855 Fountain Square Court, Columbus, Ohio 43224, within (30) thirty days of the last date of publication of this notice.

TL - ADV. - FEB. 15, 22, MARCH 1, 8 - 4.FRI.

I hereby certify that this is a true copy of the original.

Ellen M. Greer

2006

Printer's Fee $200.20

Notary's Fee $_____

The Times Leader
Martins Ferry, Ohio

AEC 11587

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 1**
**(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, 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. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity American Energy Corporation

Name Robert D. Moore
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity President & Treasurer
Date position assumed/ended (if applicable) 6-25-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure President & Treasurer

Name Bruce Hill
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity Director
Date position assumed/ended (if applicable) 7-02-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Director

Name Michael O. McKown
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity Secretary
Date position assumed/ended (if applicable) 11-01-99 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Secretary

Submit and identify additional pages necessary to complete response.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 1**
**(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, 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. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity American Energy Corporation

Name Clyde Borrell
Street address 43521 Mayhugh Hill Road
City Beallsville State OH Zip 43716
EIN 31-1550443, or SSN
Title of position within entity Director
Date position assumed/ended (if applicable) 11-01-99 / 7-02-01
Percent of ownership 0% Date of ownership N/A
Location in organizational structure N/A

Name Coal Resources Inc.
Street address 29325 Chagrin Blvd.
City Pepper Pike State OH Zip 44122
EIN 31-1586390, or SSN
Title of position within entity Sole Shareholder
Date position assumed/ended (if applicable) 11-1-99 / 2-23-01
Percent of ownership 100% Date of ownership N/A
Location in organizational structure N/A

Name Murray Energy Corporation
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity Sole Shareholder
Date position assumed/ended (if applicable) N/A /
Percent of ownership 100% Date of ownership 2-23-01
Location in organizational structure Sole Shareholder

Submit and identify additional pages necessary to complete response.

11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**
**ATTACHMENT 1**
**(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, 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. If any person listed is a business entity and not an individual, also complete an Attachment 1 for that person.

Name of business entity Murray Energy Corporation

Name Robert E. Murray
Street address 29325 Chagrin Blvd., Suit 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity President, CEO, Shareholder
Date position assumed/ended (if applicable) N/A /
Percent of ownership 100% Date of ownership 2-23-01
Location in organizational structure President, CEO, Shareholder

Name Michael D. Loiacono
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity Treasurer
Date position assumed/ended (if applicable) 2-23-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Treasurer

Name Michael O. McKown
Street address 29325 Chagrin Blvd., Suite 300
City Pepper Pike State OH Zip 44122
EIN 34-1956752, or SSN
Title of position within entity Secretary
Date position assumed/ended (if applicable) 2-23-01 /
Percent of ownership 0% Date of ownership N/A
Location in organizational structure Secretary

Submit and identify additional pages necessary to complete response.

(8) 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 Attachment 1 for that person.

Name _____

Address _____

City _____ State _____ Zip _____

Telephone _____ - _____ - _____

EIN _____ , or SSN _____

O & C relationship to entity _____

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

_____/_____

Submit and identify additional pages necessary to complete response.

(9) 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.

ROBERT D. MOORE

(10) Has the applicant, any person listed under items A(3), (7), and (8), or any person listed on Attachment 1 who "owned or controlled" or "owns or controls" as defined in 1501: 13-4-03(A), held a coal mining permit in the United States within the five years preceding the date of the application? __X__ Yes, _____ No. If "yes," submit Attachment 5. **SEE ATTACHMENT 5'S**

(11) Does the applicant, any person listed under items A(3), (7), and (8), or any person listed on Attachment 1 have a pending coal mining application in any state of the United States? __X__ Yes, _____ No. Is "yes," submit Attachment 23. **SEE ATTACHMENT 23'S**

(12) Indicate name of mine _____

(13) List below the MSHA identification numbers for the mine and for all mine-associated structures requiring MSHA approval on the proposed permit area.

33-61070

(14) Submit Attachment 22, Certificate of Liability Insurance.

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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**
City **Beallsville** State **Ohio** Zip **43716**
Telephone **740** - **926** - **9152**
EIN **31-1550443** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| D-0425 | OHIO | ODNR, DMR | 33-61070 10-22-84 |
| D-1159 | OHIO | ODNR, DMR | 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:

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 Company**
Address **P.O. Box 146**
City **Powhatan Point** State **Ohio** Zip **43942**
Telephone **714 - 795 - 5200**
EIN **31-1536602** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued | |
|---|---|---|---|---|
| D-1020 | OHIO | ODNR, DMRM | 33-04397 | 07-31-97 |
| D-0241 | OHIO | ODNR, DMRM | 33-03048 | 07-02-93 |
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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%

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **Bentleyville** State **PA** Zip **15314**
Telephone **724 - 258 - 2056**
EIN **25-1755305** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued | |
|---|---|---|---|---|
| 63841302 | PA | DEP | 36-00970 | 06-30-95 |
| 63733706 | PA | DEP | 36-00970 | 06-30-95 |
| 63723707 | PA | DEP | 36-00970 | 06-30-95 |
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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

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **P.O. Box 135 - 1060 Ohio Ave.**
City **Glassport** State **PA** Zip **15045**
Telephone **412 - 673 - 1500**
EIN **25-1490495** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| **02851602** | **PA** | **DEP** | **36-08678 06-08-95** |
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Robert E. Murray - Director

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 Oklahoma Coal Company**
Address **29325 Chagrin Blvd., Suite 300**
City **Pepper Pike** State **OH** Zip **44122**
Telephone **216 - 765 - 1240**
EIN **34-1673480** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| **D-0230** | **OH** | **DMRM** | No MSHA number |
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Robert E. Murray - Director

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 Ohio Valley Coal Company**
Address **56854 Pleasant Ridge Road**
City **Alledonia** State **OH** Zip **43902**
Telephone **740 - 926 - 1351**
EIN **34-1041310** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| D-0360 | OH | DMRM | 33-01159 05-25-88 |
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Robert E. Murray - Director

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **Bentleyville** State **PA** Zip **15314**
Telephone **724** - **258** - **2056**
EIN **52-1615668** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| 63921301 | PA | DEP | 36-08375 06-08-94 |
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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

11/92

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

**ATTACHMENT 5**
**(PERMIT LISTING)**

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 **P.O. Box 187**
City **St.Clairsville** State **OH** Zip **43950**
Telephone **435 - 613 - 0393**
EIN **34-1874726** or SSN

| Permit No. | State | Regulatory Authority | MSHA No. and Date Issued |
|---|---|---|---|
| ACT/007/013 | UT | DOGM | Horse Canyon Mine 42-00100 12/24/78, Lila Canyon Mine 42-02241 4/15/99 |
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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 - Director

11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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-0425-2 | O.D.N.R., DMRM | OHIO |
| D-0425-3 | O.D.N.R., DMRM | OHIO |
| D-0425-4 | O.D.N.R., DMRM | OHIO |
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11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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 BELMONT COAL COMPANY, INC.

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| 10168 | O.D.N.R., DMRM | OHIO |
| 1473 | O.D.N.R., DMRM | OHIO |
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11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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.

| Application No. | Name of Regulatory Authority | State |
|---|---|---|
| 63921301 | PA DEP | PA |
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11/92

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 23**
**(PENDING PERMIT APPLICATIONS)**

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-0360-12 | ODNR, DMRM | OH |
| D-0360-13 | ODNR, DMRM | OH |
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# OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

## ATTACHMENT 22
## (CERTIFICATE OF LIABILITY 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 paragraph (B) of rule 1501:13-7-07 of the Administrative Code stated below.

**Name of Insurer** Federal Insurance Company
**Policy Number** 37104410
**Policy Period** 6/1/02 to 6/1/03
**Name of Underwriting Agent** Karen Williams
**Address of Underwriting Agent** % Reschini Agency, Inc. 922 Phil St., Indiana, PA 1
**Telephone Number 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 Reclamation
Foundation Square
Columbus, OH 43224

6-17-02
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 Reclamation. This certificate does not amend, extend, or alter the coverage afforded by the policy listed above.

---

**1501:13-7-07(B) The Public Liability Insurance Policy shall:**

1.) **Be in effect during the term of the permit or any renewal, inluding 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.**

11/92

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

**ATTACHMENT 3**
**(IDENTIFICATION OF OTHER BUSINESS ENTITIES)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C.(4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity American Energy Corporation

Statutory agent American Energy Corporation

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name Robert D. Moore Position PRES./ TREAS.

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name Michael O. McKown Position Secretary

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name Bruce Hill Position Director

Street Address 43521 Mayhugh Hill Road

City Beallsville State Ohio Zip 43716

Person's Name _____ Position _____

Street Address _____

City _____ State _____ Zip _____

11/92

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

**ATTACHMENT 3**
**(IDENTIFICATION OF OTHER BUSINESS ENTITIES)**

Applicant's Name AMERICAN ENERGY CORPORATION

This attachment is to be completed and submitted with the permit application if the response to item C.(4) in Part 1 of the permit application is "yes." A separate attachment is to be submitted for each business entity.

Name of business entity Murray Energy Corporation

Statutory agent Murray Energy Corporation

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name Robert E. Murray Position PRES., CEO, Shareholder

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name Michael D. Loiacono Position Treasurer

Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name Michael O. McKown Position Secretary

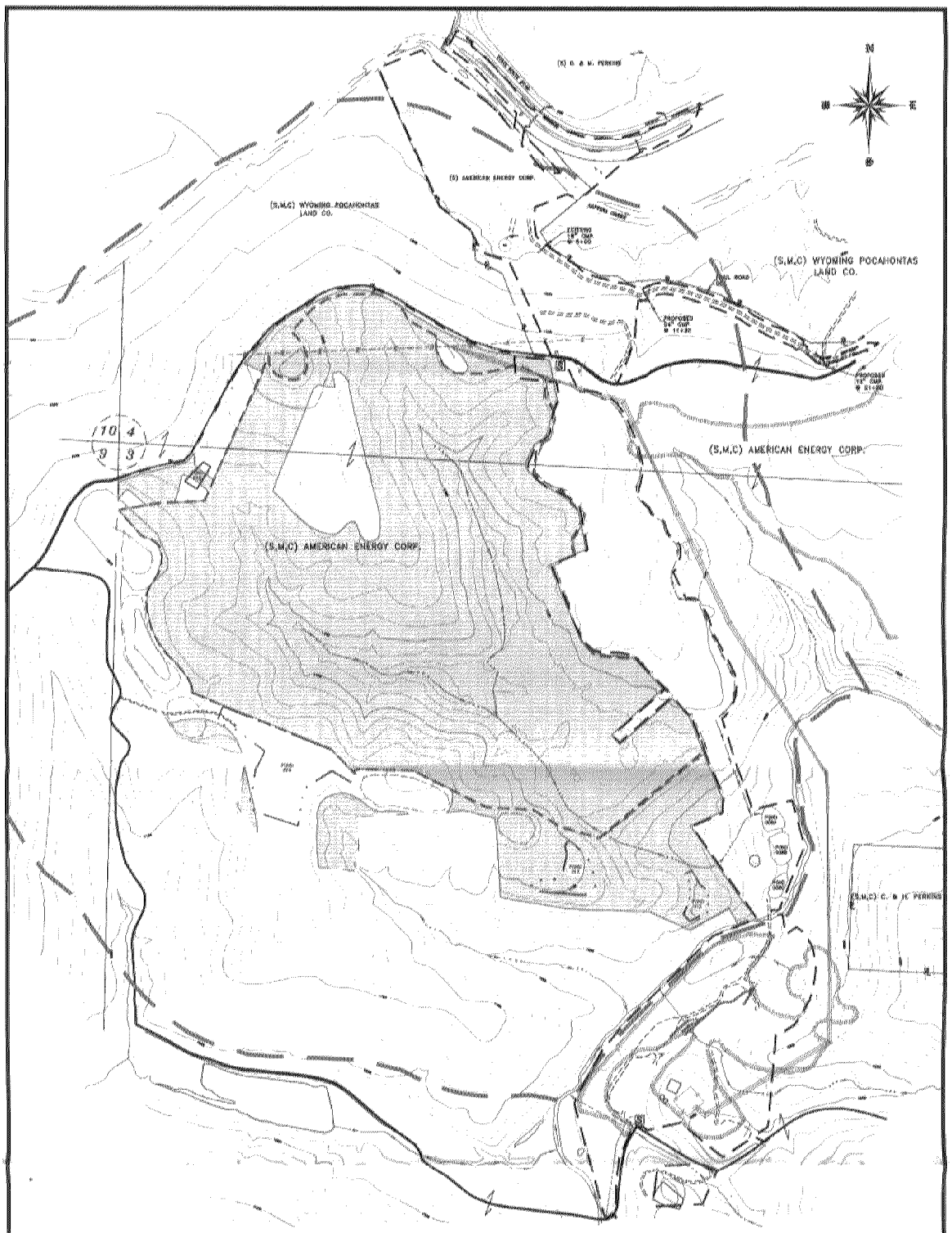
Street Address 29325 Chagrin Blvd., Suite 300

City Pepper Pike State Ohio Zip 44122

Person's Name _____ Position _____

Street Address _____

City _____ State _____ Zip _____

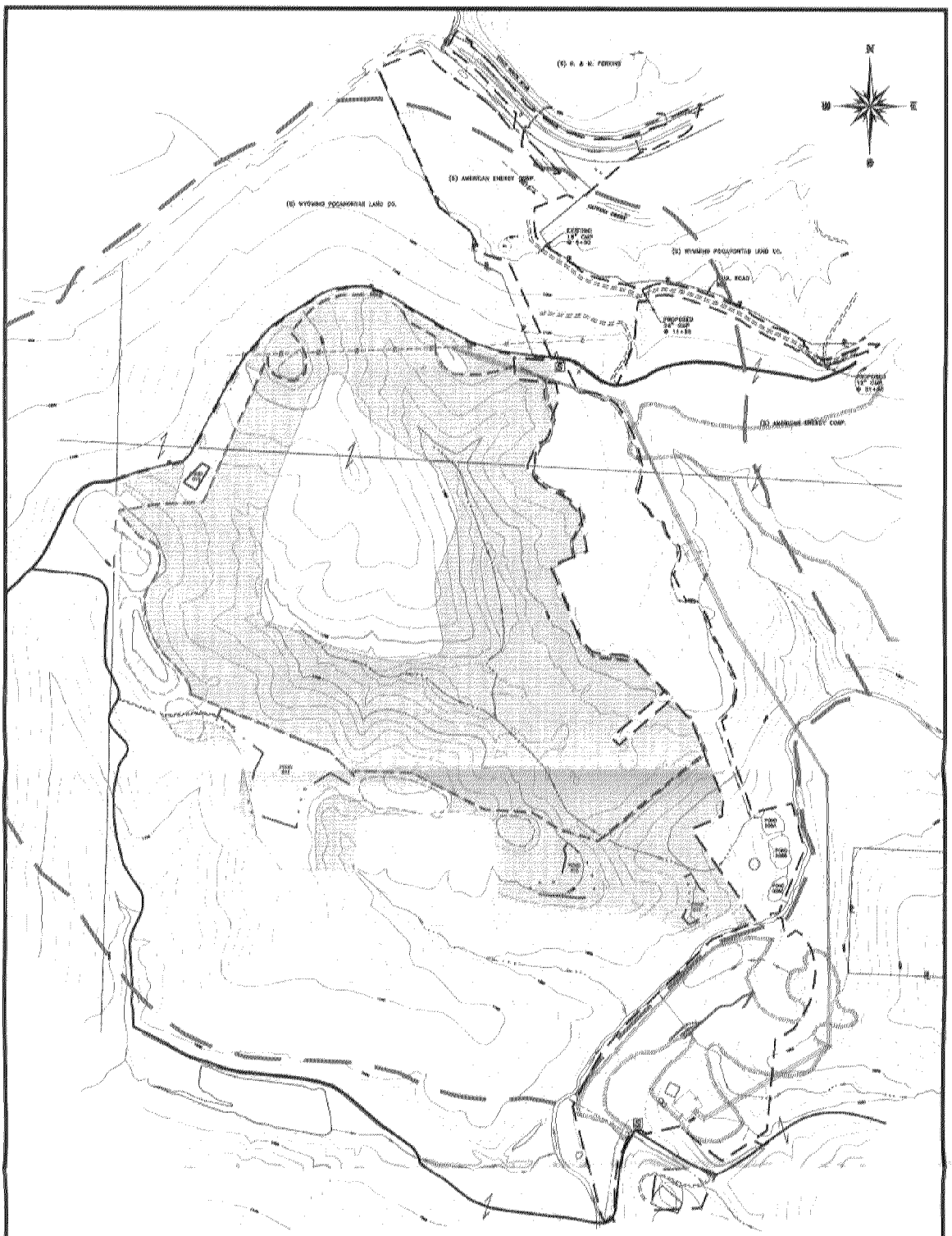



DENOTES PROPOSED PERMIT LIMITS

DENOTES AREA WHERE LAND USE CHANGE IS BEING REQUESTED FROM UNDEVELOPED TO PASTURELAND

NOTE: THE PREMINING LAND USE WILL REMAIN ON ALL AREAS WHERE THE SURFACE IS NOT DISTURBED.

| | |
|---|---|
| ADDENDUM TO PART 2, PAGE 20, ITEM G(11) | |
| AMERICAN ENERGY CORPORATION | |
| LAND USE CHANGE MAP | |
| SECTIONS 3 & 4 | |
| TOWNSHIP: 6 RANGE: 5 | |
| TOWNSHIP: WAYNE | |
| COUNTY : BELMONT | CONTOUR INTERVAL: 20' |
| SCALE: 1" = 500' | COMM. #01008 LANDUSECHNGE.DWG |
| DATE PREPARED: NOVEMBER 6, 2001 | |
| JACK A. HAMILTON & ASSOCIATES, INC. FLUSHING, OHIO DRAWN BY: SEU | DATE REVISED: 7-10-02 DATE REVISED: |




DENOTES PROPOSED PERMIT LIMITS

DENOTES CROPLAND

DENOTES PASTURELAND

NOTE: THE PREMINING LAND USE WILL REMAIN ON ALL AREAS WHERE THE SURFACE IS NOT DISTURBED.

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| ADDENDUM TO PART 2, PAGE 19, ITEM G(6) | |
| AMERICAN ENERGY CORPORATION | |
| POST-MINING LAND USE MAP | |
| SECTIONS 3 & 4 | |
| TOWNSHIP: 6 RANGE: 5 | |
| TOWNSHIP: WAYNE | |
| COUNTY: BELMONT | CONTOUR INTERVAL: 20' |
| SCALE: 1" = 500' | COMM. #01008 POST-MINING.DWG |
| DATE PREPARED: NOVEMBER 5, 2001 | |
| JACK A. HAMILTON & ASSOCIATES, INC. PLUSHNIG, OHIO DRAWN BY: SBU | DATE REVIEWED: DATE REVISED: |

A. **N/A** (9) Will access to the underground workings be gained through a drift entry? ____ Yes, _____ No. If "yes," provide as an addendum sufficient information to determine the location of the entry relative to the highest elevation of the coal reserve. Is the drift entry located so as to eliminate the potential for a gravity discharge? _____ Yes, _____ No. If "no," the applicant must demonstrate that the coal seam is not acid or iron producing. Provide an analysis of the strata immediately above and below the coal, and the coal seam itself, sufficient to demonstrate that the water quality from the entry will meet effluent limitations without treatment.

**N/A** (10) For entries to underground workings other than drift entries, provide as an addendum sufficient information to determine the location of the entry relative to the coal reserve. Are the entries located so as to eliminate the potential for a gravity discharge? _____ Yes, _____ No. If "no," provide the following demonstration:

(a) the gravity discharge will meet effluent limitations without treatment, or

(b) the water will be treated to meet effluent limitations and provisions will be made for consistent maintenance of the treatment facility throughout the anticipated period of gravity discharge.

**N/A** (11) Will the permanent entry seals be designed to withstand the maximum anticipated hydraulic head when the operations are abandoned? _____ Yes, _____ No. If "yes," submit the appropriate information demonstrating that this will be accomplished. If "no," provide a typical plan for the seals to be used to close the mine entries pursuant to applicable state and federal regulations.

(12) Submit an addendum describing the construction, modification, maintenance, and removal (unless to be retained for postmining land use), including the proposed engineering techniques and major equipment to be used, of the following facilities:

(a) dams, embankments, and other impoundments. Do any of the plans for water, sediment, or slurry impoundments meet the requirements of 30 CFR 77.216? _____ Yes, __X__ No. If "Yes," submit as an addendum a plan that addresses each of the requirements in 30 CFR 77.216-2.

(b) overburden and topsoil handling and storage areas and structures.

**SEE ADDENDUM TO PART 3, PAGE 22, ITEM A(12)(a)**

**ALSO SEE ATTACHMENT 28 FOR HANDLING OF MATERIALS TO BE USED FOR THE LINER AND FINAL COVER**

ADDENDUM TO PART 3, PAGE 22, ITEM A(12)(a)

AMERICAN ENERGY CORPORATION

(a) The sediment ponds will be constructed in accordance with the Attachment 20's contained in this permit application using current and prudent engineering practices and shall be certified as such. If the need for field adjustments should arise during construction an "as built" Attachment 20 will be submitted with the certification. Foundation areas will be cleared of all vegetative and organic materials. A core trench will be installed to ensure stability of the embankment. Immediately after construction has been completed the embankment will be seeded and mulched. The sediment ponds will be inspected at least quarterly and maintenance provided when needed. The sediment ponds will be cleaned out when sediment accumulation reaches 60% of design capacity. The sediment ponds will be removed at the appropriate times after revegetation of the affected area. The pond areas will be reclaimed in accordance with procedures outlined in the Addendum to Part 3, Page 24, Item D.

## RESPONSE: ATTACHMENT 28 - COAL WASTE DISPOSAL PLAN
### OHIO DEPARTMENT OF NATURAL RESOURCES - DIVISION OF RECLAMATION

Applicant's Name: The American Energy Corporation

1. *The coal mine waste to be disposed of on the coal mining operation is from:*

**RESPONSE:** ___x___ Wash plant facility
_____ Tipple facility
_____ Other (e.g. large pre-existing gob pile)

2. *Submit an Attachment 12 for the material to include at a minimum: pH, percent of total pyritic sulphur, neutralization potential, potential acidity, and calcium carbonate deficiency.*

**RESPONSE:** Please refer to Attachment 12.

3. *State the size fractions and percentages of the size fractions of the waste material.*

**RESPONSE:** Please refer to Attachment 12.

4. *Submit as an addendum a stability analysis to address how placement of the waste material will not cause instability within the backfilled area. Include all necessary calculations and analyses.*

**RESPONSE:** Please refer to Engineering Report, Section 5.0, Appendix IV and Drawing No. 13.

5. *State the estimated amount of refuse material in tons to be disposed on the proposed permit area:*

**RESPONSE:** Total refuse disposal is estimated to be 19.305 million tons.

6. *State the percent moisture and density of the refuse material, if the coal waste is from a wash plant.*

**RESPONSE:** The estimated values are moisture 11.2 percent and density 106 pcf (dry).
This is the best data available until the Century mine preparation plant, now under construction, becomes operational. The above data was taken from testing the existing refuse site created by Y & O Coal Company's Allison mine. Please refer to Permit D-425, Reclamation Plan submittal, Drawing No. 81-250-E2, prepared by D'Appolonia Consulting Engineers, Inc.
This data is representative of coal refuse from the Pittsburgh (No. 8) coalbed in other area deep mines.

7. *Describe how infiltration of water into the disposal area will be minimized.*

**RESPONSE:** Coal refuse will be compacted daily from disposal operations to increase density and reduce permeability. Refuse will be spread in horizontal lifts, two-feet thick maximum, then compacted by an 11.5 ton D-10 dozer. Further compaction will occur daily from tracking Cat 777 rock trucks over the refuse. Loaded Cat 777 trucks weigh 162 tons. In addition to daily compaction, when refuse is filled to design elevations, the surface will be graded for proper drainage, capped with two-feet of clay compacted to E-07 permeability (maximum) then covered with 1.5 feet of inert earthen material, 0.5 feet of vegetative cover soil

## RESPONSE: ATTACHMENT 28 - COAL WASTE DISPOSAL PLAN
### OHIO DEPARTMENT OF NATURAL RESOURCES - DIVISION OF RECLAMATION

8. *Specifically describe how the disposal plan will comply with paragraph (J) of rule 1501: 13-9-14 of the Administrative Code.*

**RESPONSE:** Upon reaching final elevations, the refuse will be graded for proper drainage, capped with clay and covered with earthen material in accordance with State of Ohio approved plans. Please refer to attached engineering report for details.

9. *Does the disposal plan propose to neutralize wash plant waste with spoil material?*

**RESPONSE:** No.

10. *Does the disposal plan propose to seal the disposal area? If "yes", submit an Attachment 12 for the sealant material which includes pH, percent of total or pyritic sulphur, neutralization potential, potential acidity, calcium carbonate deficiency and lithology.*

**RESPONSE:** Please refer to Attachment 12 and lab report in Appendix 3 of the Engineering Report.

11. *If a sealant material is to be used, submit a permeability analysis of the material to be used as a sealant. Also, address below how the sealant material will be compacted and the anticipated permeability coefficient to be achieved following compaction.*

**RESPONSE:** Please refer to Appendix 3, Engineering Report. Refuse will be covered with a compacted two-foot thick clay cap. The clay will be placed in nine-inch loose lifts, compacted with a 10 ton minimum padfoot compactor, or equivalient, to a density and moisture content which has demonstrated laboratory levels of E-07 cm/sec or less. Field quality control will be monitored against ASTM D-689 (standard proctor) guidelines. Limits for compaction will be established from the laboratory permeability test results, but will not be less than 95 percent optimum density as established by ASTM D-689.

12. *Show the location of the coal mine waste storage and disposal areas and the location of cross-sections on the application map.*

**RESPONSE:** Please refer to attached engineering plans.

13. *Describe how the disposal plan will meet requirements of paragraph (J) (3) of rule 1501: 13-9-04 of the Administrative Code.*

**RESPONSE:** Water will be prevented from contact with coal refuse by construction of: groundwater drainage system, three-foot thick compacted clay liner, fresh water diversion channels and final cap and cover upon reaching design elevations. Please refer to attached engineering plans for details.

14. *Submit a cross-section showing the elevation, final profile, saturated zones, (existing and proposed) and reclaimed surface profile of the disposal area.*

**RESPONSE:** Please refer to attached engineering plans.



AEC 11612

15. *Identify surface and ground water monitoring sites which will specifically determine hydrologic impact which may proximately occur as a result of the disposal plan. If monitoring wells are to be constructed as part of this plan, submit information as to well construction, development, and design.*

**RESPONSE:** Please refer to Hydrogeologic Investigation Report.

16. *Ensure that Part II, item E of the permit application addresses the probable hydrologic consequences of the disposal area on the hydrologic balance of the area. Specifically address changes in ground water and surface water quality in detail.*

**RESPONSE:** Please refer to Hydrogeologic Investigation Report.

17. *Submit a detailed assessment plan for the disposal area and ensure that Part II, items F (1) and F (2) of the permit application identify surface and groundwater supplies which may be adversely affected by the disposal area and acceptable sources.*

**RESPONSE:** Please refer to Hydrogeologic Investigation Report.

18. *If the material to be disposed is slurry, then submit data characterizing soil materials to be utilized in construction, if applicable.*

**RESPONSE:** The disposal material is not slurry.

19. *Describe in detail the monitoring plan and analytical procedures to be followed for this disposal plan.*

**RESPONSE:** Please refer to Hydrogeologic Investigation Report.

20. *Identify the parameter limits and frequencies to be met as set by the OEPA by the disposal area, if different from the NPDES/NSPE requirements.*

**RESPONSE:** N/A

21. *If required per the modified MOA, submit an OEPA Application for Permit to Install or Plan Approval (Form 4309) as an addendum to this attachment.*

**RESPONSE:** The PTI Application fee has been paid and issuance is pending.

D. (6) (b) List the species and amounts per acre of seeds and seedlings to be used.

(c) Describe the methods to be used in planting and seeding.

(d) Describe the mulching techniques.

**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(6b - 7)**

(7) Describe the soil testing plan for evaluation of the results of topsoil handling and reclamation procedures related to revegetation.

**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(6b - 7)**

(8) Submit an addendum describing the measures to be employed to handle and place acid or toxic-forming materials in accordance with paragraph (J) of rule 1501:13-9-04, and paragraph(J) of rule 1501:13-9-14 of the Administrative Code.

**HANDLING AND PLACEMENT OF ACID OR TOXIC FORMING MATERIALS WILL TAKE PLACE WITHIN THE PROPOSED REFUSE DISPOSAL SITE.**

(9) Describe the measures, including appropriate cross-sections and maps, to be used to plug, case or manage mine openings or bore holes other than those entries utilized to gain access to the underground workings, pursuant to rule 1501:13-9-02 of the Administrative Code. **SEE HYDROGEOLOGIC INVESTIGATION, PAGE 19, ITEM 6.1.1.4 FOR CLOSURE OF MONITORING WELLS. ANY EXPLORATION HOLES, BORE HOLES, AND OTHER OPENINGS ENCOUNTERED WILL BE SEALED WITH IMPERIOUS MATERIAL.**

(10) Is the reclamation plan consistent with local physical, environmental, and climatological conditions?
__X__ Yes, _____ No.

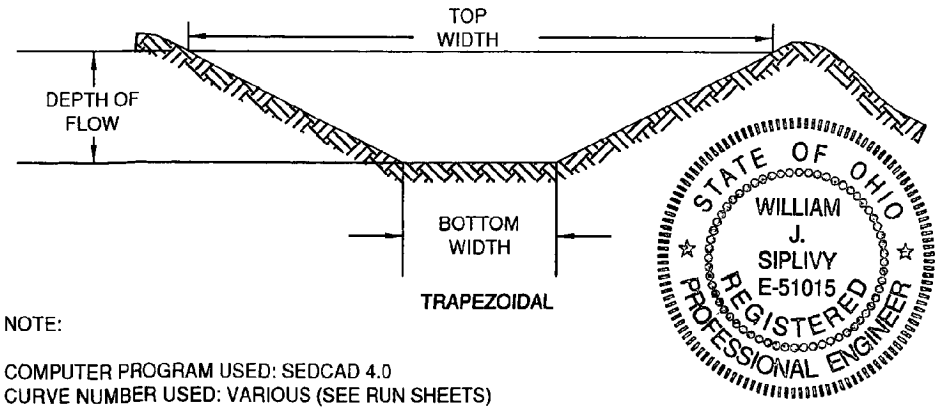
(11) Identify any other applicable air and water quality laws and regulations and health and safety standards and describe the steps to be taken to comply with each.

**APPROPRIATE STEPS HAVE BEEN TAKEN TO COMPLY WITH MSHA, CHAPTER 1521 O.R.C., AND STATE AND FEDERAL EPA REGULATIONS. ISSUANCE OF THE MODIFIED N.P.D.E.S. PERMIT IS PENDING. DUE TO A CHANGE IN REVIEWERS, ISSUANCE OF THE 401 CERTIFICATION IS ALSO PENDING. THE P.T.I. FEE HAS BEEN PAID FOR THE PERMIT TO INSTALL PONDS 012, 013, 014, 015, & 016.**

(12) Submit an addendum describing 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 and achieving enhancement of such resources where practical for the permit, shadow, and adjacent areas.
**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(12)**

*VEGETATED CHANNEL DESIGN*

| Diversion Ditch | Length (feet) | Area (acres) | Design Storm | Design (cfs) | Slope (%) | Sideslope | Flow Depth (feet) | Bottom Width (feet) | Top Width (feet) | Velocity (f/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| B1 | 754.0 | 3.0 | 10y / 24h | 7.1 | 0.5 | 2:1 | 2.0 | 2.0 | 11.2 | 0.6 |
| B2 | 914.0 | 6.9 | 10y / 24h | 15.7 | 0.5 | 2:1 | 2.5 | 2.0 | 13.1 | 0.9 |
| B3a | 480.0 | 13.6 | 10y / 24h | 18.7 | 2.8 | 2:1 | 1.6 | 2.0 | 9.6 | 2.3 |
| B3b | 1850.0 | 21.3 | 10y / 24h | 30.2 | 1.8 | 2:1 | 2.1 | 2.0 | 11.4 | 2.4 |
| B4a | 850.0 | 3.2 | 10y / 24h | 7.6 | 2.8 | 2:1 | 1.3 | 2.0 | 8.2 | 1.4 |
| B4b | 820.0 | 6.2 | 10y / 24h | 14.3 | 0.6 | 2:1 | 1.3 | 2.0 | 12.3 | 1.0 |
| B4c | 1889.0 | 12.9 | 10y / 24h | 24.9 | 2.2 | 2:1 | 1.9 | 2.0 | 10.6 | 2.4 |
| B5a 1 | 2599.0 | 9.7 | 10y / 24h | 13.7 | 0.5 | 2:1 | 2.4 | 2.0 | 12.7 | 0.9 |
| B5a 2 | 193.0 | 10.1 | 10y / 24h | 13.8 | 2.3 | 2:1 | 1.6 | 2.0 | 9.4 | 1.7 |
| B5a 3 | 1614.0 | 16.2 | 10y / 24h | 18.9 | 0.3 | 2:1 | 3.0 | 2.0 | 15.0 | 0.8 |
| B5b | 1775.0 | 6.8 | 10y / 24h | 13.4 | 1.3 | 2:1 | 1.8 | 2.0 | 10.5 | 1.3 |
| B6a 1 | 69.0 | 9.5 | 10y / 24h | 22.2 | 0.6 | 2:1 | 2.6 | 2.0 | 13.4 | 1.2 |
| B6a 2 | 3509.0 | 23.0 | 10y / 24h | 44.2 | 0.8 | 2:1 | 2.8 | 2.0 | 14.5 | 2.0 |
| B6b 1 | 1143.0 | 6.9 | 10y / 24h | 10.2 | 1.2 | 2:1 | 1.7 | 2.0 | 10.1 | 1.1 |
| B6b 2 | 386.0 | 10.4 | 10y / 24h | 15.8 | 2.2 | 2:1 | 1.6 | 2.0 | 9.7 | 1.8 |




NOTE:

COMPUTER PROGRAM USED: SEDCAD 4.0
CURVE NUMBER USED: VARIOUS (SEE RUN SHEETS)

ADDENDUM TO PART 3, PAGE 30, ITEM H(3)
AMERICAN ENERGY CORPORATION

**DIVERSION DITCH DESIGN COMPUTATION SHEET**

| SECTIONS: 3 & 4 | TOWNSHIP: 6 | RANGE: 5 |
|---|---|---|
| TOWNSHIP: WAYNE | COUNTY: BELMONT | |

William J. Siplivy

10 July 2002
DATE:

SHEET 1 OF 2 DIV-DIT.DWG COM. #01-008

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| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 6.57 cfs | | 6.57 cfs | |
| Depth: | 1.26 ft | 1.56 ft | 1.93 ft | 2.23 ft |
| Top Width: | 5.03 ft | 6.23 ft | 7.72 ft | 8.92 ft |
| Velocity: | 2.08 fps | | 0.88 fps | |
| X-Section Area: | 3.16 sq ft | | 7.45 sq ft | |
| Hydraulic Radius: | 0.562 | | 0.863 | |
| Froude Number: | 0.46 | | 0.16 | |
| Roughness Coefficient: | 0.0556 | | 0.1745 | |

## Structure #14 (Vegetated Channel)

DD 21

Triangular Vegetated Channel Inputs:

Material: Grass mixture

| Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|
| 2.0:1 | 2.0:1 | 4.6 | D, B | 0.30 | | | 5.0 |

Vegetated Channel Results:

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 9.24 cfs | | 9.24 cfs | |
| Depth: | 1.06 ft | 1.36 ft | 1.55 ft | 1.85 ft |
| Top Width: | 4.25 ft | 5.45 ft | 6.20 ft | 7.40 ft |
| Velocity: | 4.09 fps | | 1.93 fps | |
| X-Section Area: | 2.26 sq ft | | 4.80 sq ft | |
| Hydraulic Radius: | 0.475 | | 0.693 | |
| Froude Number: | 0.99 | | 0.39 | |
| Roughness Coefficient: | 0.0476 | | 0.1299 | |

## Structure #15 (Vegetated Channel)

B2

Trapezoidal Vegetated Channel Inputs:

Material: Grass mixture



AEC 11616

| Bottom Width (ft) | Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|---|
| 2.00 | 2.0:1 | 2.0:1 | 0.5 | D, B | 0.30 | | | 5.0 |

Vegetated Channel Results:

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 15.70 cfs | | 15.70 cfs | |
| Depth: | 1.55 ft | 1.85 ft | 2.46 ft | 2.76 ft |
| Top Width: | 8.22 ft | 9.42 ft | 11.85 ft | 13.05 ft |
| Velocity: | 1.98 fps | | 0.92 fps | |
| X-Section Area: | 7.94 sq ft | | 17.05 sq ft | |
| Hydraulic Radius: | 0.887 | | 1.310 | |
| Froude Number: | 0.35 | | 0.14 | |
| Roughness Coefficient: | 0.0491 | | 0.1369 | |

## Structure #7 (Vegetated Channel)

DD 1a

Triangular Vegetated Channel Inputs:

Material: Grass mixture

| Left Sideslope Ratio | Right Sideslope Ratio | Slope (%) | Retardance Classes | Freeboard Depth (ft) | Freeboard % of Depth | Freeboard Mult. x (VxD) | Limiting Velocity (fps) |
|---|---|---|---|---|---|---|---|
| 2.0:1 | 2.0:1 | 12.5 | D, B | 0.30 | | | 5.0 |

Vegetated Channel Results:

| | Stability Class D w/o Freeboard | Stability Class D w/ Freeboard | Capacity Class B w/o Freeboard | Capacity Class B w/ Freeboard |
|---|---|---|---|---|
| Design Discharge: | 3.89 cfs | | 3.89 cfs | |
| Depth: | 0.67 ft | 0.97 ft | 1.01 ft | 1.31 ft |
| Top Width: | 2.67 ft | 3.87 ft | 4.05 ft | 5.25 ft |
| Velocity: | 4.37 fps | | 1.89 fps | |
| X-Section Area: | 0.89 sq ft | | 2.05 sq ft | |
| Hydraulic Radius: | 0.298 | | 0.453 | |
| Froude Number: | 1.33 | | 0.47 | |
| Roughness Coefficient: | 0.0538 | | 0.1638 | |

## Structure #8 (Vegetated Channel)

DD 1

Addendum to Part 3, Page 27, Item G(5), American Energy Corporation

Chief
ODNR, Division of Mineral Resources Management
1855 Fountain Square Court
Columbus, Ohio 43224

Re: D-0425-2, Small Area Drainage Exemption

Dear Chief:

American Energy Corporation is hereby requesting Two Small Area Drainage Exemptions containing 6.3 acres at this proposed 154.4 acre refuse site. The S.A.D.E. areas are small relative to the total disturbed area of the proposed permit.

S.A.D.E. #1 is located along the west side of the permit and contains 4.0 acres. S.A.D.E. #2 is located near the center of the south side of the permit and contains 2.3 acres. The only activity to be conducted on the S.A.D.E. areas will be topsoil storage as shown on the enclosed Adjacent Area Permit Application Map. Once the topsoil piles are constructed they will immediately be seeded and mulched so vegetation can be established as soon as possible. The topsoil piles will remain in place and will not be disturbed until reclamation of the refuse site begins. Straw/Hay bales and/or silt fence will be placed near the toe of the topsoil piles to control runoff and trap sediment. A minimum 10' buffer will be maintained between the toe of the topsoil piles and the bales and/or silt fence to enhance the sediment-trapping efficiency. The straw/hay bales and silt fence will be visually monitored on a weekly basis and during inclement weather conditions until vegetation is established. The bales and/or silt fence will be maintained as necessary to assure that they are functioning properly to meet effluent limitations. Maintenance will consist of replacing or reconstructing the bales and/or fence.

Silt fence is one of the recommended practices for small drainage areas of this type. (See Rainwater and Land Development, Ohio's Standards for Stormwater Management Land Development & Urban Stream Protection, Second Edition, 1996, prepared by Dan Mecklenburg, ODNR, Division of Soil & Water Conservation). The construction of the alternate drainage control device will cause less disturbance and take up less space. Based on the slope of the land, the slope length, and the minimal time of actual disturbance, this method of drainage control will meet the appropriate effluent limitations.

Yours truly,

Cathy M Bihlman

Chief,
Ohio Department of Natural Resources
Division of Mineral Resources Management
1855 Fountain Square Court
Columbus, Ohio 43224

RE: **Stream Buffer Zone Variance Request**

Dear Chief:

In accordance with O.A.C. Section 1501:13-9-04 (A)(1) and Hydrology/Permitting PPD #98-1, American Energy Corporation is hereby requesting a variance to conduct refuse disposal operations within the buffer zones of Streams "A", "B", "C", "D", "L", "M", "N", "Q", "S", ***"Y" and Piney Creek*** as shown on the enclosed permit application map and described below.

**Specific Activities**:

**Unnamed Stream "A"**

Activities to be conducted within the buffer zone of Stream "A" consists of diversion ditch construction, pond construction and the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channels and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire lengths of these streams will be effected from the head of hollow to the point of discharge, except for streams "A" and "S". The coarse coal refuse fill will remain permanent. ***The area that will be eliminated by the refuse disposal will be between Stations 6+40 and Station 15+00. The portion of the stream that will be disturbed, but not eliminated will be between Station 1+50 and Station 6+40.***

For purposes of this description, the beginning point of Stream "A" is located at the intersection of Streams "A", "B" and "C". Stream"A" flows in a southeasterly direction and discharges into existing Pond 008A. Stream "A" intersects the eastern permit limit approximately 300 feet west of Pond 008B. This intersection is designated as Station 0+00 for Stream "A". Approximately 1500 feet of the stream is located within the permit area. There are no major suspected sources of impacts on this stream except for the limited water shed. ***Stream "A" has been impacted by construction of the existing coal waste disposal and previous mining.***

Pond 012 will be installed ***during Phase 3 of the*** refuse ***disposal operation*** and will take approximately two weeks to construct. Approximately 0.1 acre of this pond encroaches on the buffer zone between Station 0+80 and Station 1+70. Pond 016 will be installed prior to Pond 012 and will take approximately two weeks to construct. Approximately 0.1 acre of this pond encroaches on the buffer zone approximately 100 feet northwest of the intersection of Streams "A", "B" and "C". To protect the downstream portion of Stream "A", construction of the ponds will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fences and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. ***Pond 016 will be removed prior to Phase 3 and*** Pond 012 will be removed following completion of the refuse disposal. Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Stream "A". If removal occurs earlier than Division approval would first be sought and obtained.

Diversion Ditch DD-18 enters the south side of the buffer zone at Station 8+60, 100 feet south of the stream channel and will flow easterly south of the stream to DD-19. The entire diversion ditch encroaches within the buffer zone. Diversion Ditch DD-19 begins at Station 6+60 south of the stream channel and will flow in a easterly direction south of the stream. Diversion Ditch DD-19 will affect the stream channel from Station 2+20 to Station 5+80. The entire diversion ditch is located within the buffer zone. ***Diversion Ditch DD-22 enters the north side of the buffer zone at Station 6+40, 100 feet north of the stream channel and will flow southerly and discharges into Stream "A". Approximately 100 feet of the diversion ditch encroaches within the buffer zone. Coal removal and backfilling will***



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***not occur during the refuse operation.*** The diversion ditches will be constructed ***during Phase 3 of the*** refuse ***disposal operation*** and will remain in place until all coal removal, backfilling, grading, resoiling and revegetation has been completed. Removal, grading and seeding of the diversion ditches will be done in a timely manner in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining effects on Stream "A". If removal occurs earlier, then Division approval would first by sought and obtained. The stream channel will not be disturbed by the construction of Diversion Ditch DD-18.

Existing instream physical habitat conditions consist of substrates of boulder and bedrock originating from shale and coal fines with heavy silt and extensive embeddedness. The instream cover is sparse, consisting of undercut banks, overhanging vegetation, shallows and boulders. There is not riparian width and the flood plain consists of forest, swamp and mining/construction, with moderate bank erosion. Maximum depth is <0.2 meter. Pool width is greater than riffle width with slow, intermittent and interstitial velocities. Riffle run substrates are stable cobble and/or boulders with extensive embeddedness. The channel morphology was indicated by moderate to low sinuosity, good to fair development, no channelization recovery and high stability. Modifications such as snagging, relocation and bank shaping have occurred.

Two wetlands were delineated within the buffer zone of Stream "A" from Station 7+50 up through the upper reaches of said stream.

**Unnamed Stream "B"**

Activities to be conducted within the buffer zone of Stream "B" consists of pond construction and the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channels and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "A". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "B" is at the head of hollow in the western portion of the permit area. Stream "B" flows in a southeasterly direction and discharges into Stream "A" approximately 540 feet north of the southern permit limit. This discharge point is designated as Station 0+00 for Stream "B". The entire stream is within the permit area. This stream has been affected by previous mining.

Pond 016 will be installed prior to Pond 012 and will take approximately two weeks to construct. Approximately 1.4 acres of this pond encroach on the buffer zone approximately 100 feet northwest of the intersection of Streams "A", "B" and "C". To protect the downstream portion of Stream "B", construction of the pond will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fence and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. Pond 016 will be removed ***prior to Phase 3 of the refuse disposal operation.*** Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Stream "B". If removal occurs earlier than Division approval would first be sought and obtained.

Existing instream physical habitat conditions consist of substrates of boulder and gravel originating from hardpan and shale, with moderate silt and normal embeddedness. The instream cover may be functional consisting of undercut banks, overhanging vegetation and boulders. The riparian width is wide consisting of forest/swamp with moderate bank erosion. Maximum depth is 0.2-0.4 meter. Pool width is equal to riffle width with slow to moderate and interstitial to intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by having low sinuosity, good development, no channelization recovery and moderate stability. Stream modifications consist of canopy removal.

Two wetlands were delineated within the buffer zone of Stream "B"from between Station 0+00 and Station 9+80

**Unnamed Stream "C"**

Activities to be conducted within the buffer zone of Stream "C" consists of pond construction and the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channels and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "A". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "C" is at the head of hollow located approximately 290 feet south of T.R. 74. Stream "C" flows in a southerly direction and discharges into Stream "A". This discharge point is designated as Station 0+00 for Stream "C". The entire stream is within the permit area. Portions of this stream have been affected by previous mining.

Approximately 0.8 acres of Pond 016 encroach in the buffer zone in the lower reaches of the stream between Stations 0+00 and 3+25. Pond 016 will be installed prior to Pond 012 and will take approximately two weeks to construct. To protect the downstream portion of Stream "C", construction of the pond will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fence and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. Pond 016 will be removed following completion of the refuse disposal. Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Stream "C". If removal occurs earlier than Division approval would first be sought and obtained.

Existing instream physical habitat conditions consist of substrates of cobble and sand originating from hardpan with normal silt and embeddedness. The instream cover is not functional and nearly absent. The riparian width is wide with flood plain consisting of fenced pasture and forest/swamp, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width is greater than riffle width, with slow interstitial and intermittent velocities. The channel morphology of the stream is indicated by moderate sinuosity, good development, and no channelization recovery with high stability.

***Four*** wetlands were delineated within the buffer zone of Stream "C" between approximate stations 4+00 to 14+00.

**Unnamed Stream "D"**

Activities to be conducted within the buffer zone of Stream "D" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "C". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "D" is at the head of hollow located approximately 175 feet south of Township Road 74. Stream "D" flows in a southwesterly direction and discharges into Stream "C". Thus, this discharge point is designated as Station 0+00 for Stream "D". The entire stream is within the permit area. This stream may have been impacted by previous mining or silviculture.

Existing instream physical habitat conditions consist of substrates of boulder and silt originating from hardpan with moderate silt and embeddedness. The instream cover is nearly absent but functional, consisting of undercut banks, overhanging vegetation, rootmats and rootwads. The riparian width is wide consisting of forest/swamp and fenced pasture, with none to little bank erosion. Maximum depth is < 0.2 meters. Pool width is equal to riffle width, with slow and interstitial/intermittent velocity. The channel morphology of the stream is indicated by low sinuosity, excellent development, and no channelization recovery with high stability.

One wetland was delineated within the buffer zone of Stream "D", located at the head of hollow.

**Unnamed Stream "L"**

Activities to be conducted within the buffer zone of Stream "L" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "L" is at the head of hollow located approximately 580 feet east of the western most permit limit. Stream "L" flows in a easterly direction and discharges into Stream "B". Thus, this discharge point is designated as Station 0+00 for Stream "L". The entire stream is within the permit area. This stream may have been impacted by canopy removal and agriculture.

Existing instream physical habitat conditions consist of substrates of hardpan and silt originating from hardpan with normal silt and embeddedness. The instream cover is nearly absent and not functional. The riparian width is wide on the left bank and narrow on the right bank consisting of fenced pasture, with moderate bank erosion. Maximum depth is <0.2 meter. Pool width is less than riffle width, with intermittent velocity. Riffle/run substrates are unstable fine gravel and sand with low embeddedness. The channel morphology of the stream is indicated by low/moderate sinuosity, poor development, and no channelization recovery with moderate stability. Modifications such as canopy removal have occurred.

No wetlands were delineated within the buffer zone of Stream "L".

**Unnamed Stream "M"**

Activities to be conducted within the buffer zone of Stream "M" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "M" is at the head of hollow located approximately 1140 feet east of the westernmost permit limit. Stream "M" flows in a southwesterly direction and discharges into Stream "B". This discharge point is designated as Station 0+00 for Stream "M". The entire stream is within the permit area. This stream has not been affected by previous mining.

Existing instream physical habitat conditions consist of substrates of cobble and hardpan originating from hardpan with normal silt and no embeddedness. The instream cover is nearly absent and not functional. The riparian width is wide consisting of forest/swamp and shrub or old field, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width equals riffle width, with moderate and intermittent velocities. Riffle/run substrates are moderately stable large gravel with no embeddedness. The channel morphology of the stream is indicated by low sinuosity, fair development, and no channelization recovery with moderate stability. Modifications such as canopy removal have occurred.

One wetland was delineated within the buffer zone at the head of hollow.

**Unnamed Stream "N"**

Activities to be conducted within the buffer zone of Stream "N" consist of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "N" is at the head of hollow located approximately 750 feet east of the western permit limit. Stream "N" flows in a northeasterly direction and discharges into Stream "B". This discharge point is designated as Station 0+00 for Stream "N". The entire stream is located within the permit area. Stream "N" has not been affected by previous mining.

Existing instream physical habitat conditions consist of substrates of hardpan originating from hardpan with normal silt and embeddedness. The instream cover is nearly absent and not functional. The riparian width is moderate consisting of forest/swamp and fenced pasture, with none/little bank erosion. Maximum depth is <0.2 meter. Pool width is less than riffle width, with moderate and intermittent velocities. Riffle/run substrates are unstable fine gravel and sand with low embeddedness. The channel morphology of the stream is indicated by low sinuosity, poor development, and no channelization recovery with moderate stability. Modifications such as canopy removal have occurred.

One wetland was delineated within the buffer zone of Stream "N".

**Unnamed Stream "Q"**

Activities to be conducted within the buffer zone of Stream "Q" consists of the installation of a foundation drain (See Engineers Report, Section 2.4) in the existing stream channel and a coal refuse fill above the foundation drain as shown

on the enclosed Adjacent Area Application Map. The entire length of this stream will be effected from the head of hollow to the point of discharge into Stream "B". The coarse coal refuse fill will remain permanent. ***The entire stream will be eliminated by the refuse disposal operation.***

For purposes of this description, the beginning point of Stream "Q" is at the head of hollow approximately 380 feet north the southern permit limits. Stream "Q" flows in a northeast direction and discharges into Stream "B". This discharge point is designated as Station 0+00. This stream has not been affected by previous mining.

Existing instream physical habitat conditions consist of a substrate of gravel and detritus, originating from shale with normal silt and embeddedness. The instream cover is nearly absent, and not functional. The riparian width is wide to moderate, consisting of some forest/swamp and fenced pasture, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width is less than riffle width with intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by low sinuosity, poor development, no channelization , and moderate stability. Modifications such as canopy removal have occurred.

One wetland was delineated within the buffer zone of Stream "Q" at Station 0+00..

<u>Unnamed Stream "S"</u>

No mining or refuse activities are to be conducted within the buffer zone of Stream "S".

For purposes of this description, the beginning point of Stream "S" is at the head of hollow located approximately 280 feet north of the southern permit. Stream "S" flows in a southeasterly direction, intersects the permit limit and discharges into Piney Creek. This intersect point is designated as Station 0+00. Approximately 300 feet of Stream "S" is located within the permit area. This stream may have been affected by canopy removal.

Existing instream physical habitat conditions consist of substrates of cobble and gravel, originating from shale with moderate silt and normal embeddedness. The instream cover is moderate, with undercut banks, overhanging vegetation, rootmats, rootwads, boulders, and logs or woody debris. The riparian width is wide, consisting of forest/swamp, shrub/old field and fenced pasture with none to little bank erosion. Maximum depth is 0.2-0.4 meter. Pool width is greater than riffle width with slow, interstitial and intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by moderate sinuosity, fair development, no channelization recovery, and high stability. Modifications such as canopy removal have occurred.

The were no wetlands delineated within the buffer zone of this stream.

***<u>Unnamed Stream "Y"</u>***

***No mining or refuse activities are to be conducted within the buffer zone of Stream "Y".***

***For purposes of this description, the beginning point of Stream "Y" is at the head of hollow located approximately 50 feet south of the southern permit line. Stream "Y" flows in a southeasterly direction and discharges into Stream "S". The entire stream is outside of the permit area. Only the upper most part of the buffer zone encroaches on the permit area. This stream may have been affected by canopy removal.***

***Existing instream physical habitat conditions consist of substrates of silt and gravel, originating from shale with normal silt and embeddedness. The instream cover is nearly absent, and not functional. The riparian width is wide, consisting of forest/swamp, with none to little bank erosion. Maximum depth is <0.2 meter. Pool width is lesser than riffle width with slow, interstitial and intermittent velocities. Riffle run substrates are moderately stable large gravel with low embeddedness. The channel morphology of the stream is indicated by low sinuosity, poor development, no channelization recovery, and moderate stability. Modifications such as canopy removal may have occurred.***

***One wetland was delineated within the buffer zone of this stream.***



AEC 11624

*Piney Creek*

***Activities to be conducted within the buffer zone of Piney Creek consist of construction of a spillway for Pond 012. No other mining or refuse activities are to be conducted within the buffer zone of Piney Creek. The stream channel will not be disturbed.***

***For purposes of this description, the beginning point of Piney Creek is just south of the southern most permit limit and just north of Pond 011. The buffer zone of Pine Creek encroaches on the permit for a distance of approximately 320 feet. Piney Creek flows in a northeasterly direction and is not located within the permit area. This stream may have been affected by previous mining.***

***Pond 012 will be installed during Phase 3 of the refuse disposal operation and will take approximately two weeks to construct. Only the exit channel will be located withing the buffer zone. Construction of the ponds will be conducted during favorable weather conditions. Only that area necessary for pond construction will be affected. Construction will be done in a timely manner, stabilization by seeding and planting will be done as soon as possible after construction is complete and where possible , runoff from offsite areas will be prevented from flowing across disturbed areas. Silt fences and/or straw bales, and if necessary, sumps will be utilized to trap sediment during pond construction. Pond 012 will be removed following completion of the refuse disposal. Removal, grading and seeding will be done in the first appropriate season after successful vegetation has been established for at least two years to prevent post-mining affects on Piney Creek. If removal occurs earlier than Division approval would first be sought and obtained.***

***Existing instream physical habitat conditions consist of substrates of gravel and bedrock, originating from sandstone with normal silt and extensive embeddedness. The instream cover is moderate, and consist of overhanging vegetation, undercut banks, shallows, rootmats, pools and logs or woody debris. The riparian width is wide, consisting of forest on the left bank and narrow, with mining/construction on the right bank, with moderate bank erosion. Maximum depth is 0.4-0.7 meter. Pool width is greater than riffle width with fast to intermittent velocities. Riffle run substrates are moderately stable large gravel with moderate embeddedness. The channel morphology of the stream is indicated by moderate sinuosity, good development, recovered channelization, and moderate stability. Modifications such as bank shaping have occurred. Previous mining activities have impacted stream conditions.***

***The were no wetlands delineated within the buffer zone of this stream.***

**Necessity of Activities**

American Energy Corporation cleans coal for use by the electric utility industry. Coal refuse is produced at the annual rate of approximately 2.5 million tons. Currently, there are no economically viable ways to dispose of coal refuse. Mountain top disposal areas have been investigated as have refuse piles in flat land areas. These alternatives do not present any environmental advantages and hold a potential for more unsightly conditions after reclamation.

Other disposal sites were considered on areas owned by the American Energy Corporation remote form the existing disposal area. These sites were eliminated form consideration for several reasons. They would require haulage of refuse along township or county roads. This would create the potential for pollution of streams away from the permit as well as refuse dropping from the haulage vehicles onto the public roads. The construction of the disposal area would require an entirely new and separate system of pollution controls whereas the main pollution controls for the proposed site are in existence already.

**Water Quality/Quantity and Environmental Resources**

Water quality in Stream "A" is fair. Water analysis conducted prior to permit submission at CMD-6 show elevated specific conductance and sulfates. Stream "A" is an intermittent stream and originates at the intersection of Streams "A", "B" and "C". Stream quantities range from 0.004 cfs to 0.1 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "B" is good. Water analysis conducted prior to permit submission at CMU-6C show all parameters well within effluent limitations. Stream "B" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.0005 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "C" is good. Water analysis conducted prior to permit submission at CMU-6A show all parameters well within effluent limitations. Stream "C" is an intermittent stream originating from head of hollow. Stream quantities range from dry to 0.001 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "D" is good. Water analysis conducted prior to permit submission at CMU-6 show all parameters well within effluent limitations. Stream "D" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.004 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "L" is good. Water analysis conducted prior to permit submission at CMS-10 show all parameters well within effluent limitations. Stream "L" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.38 GPM during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "M" is good. Water analysis conducted prior to permit submission at CMU-6B show all parameters well within effluent limitations. Stream "M" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.38 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "N" is fair. Water analysis conducted prior to permit submission at CMS-9 show slightly elevated acid. Stream "N" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.29 g.p.m. during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "Q" is fair. Water analysis conducted prior to permit submission at CMS-*8* show slightly elevated acid. Stream "Q" is a small intermittent stream originating from head of hollow. Stream quantities range from 0.065 g.p.m. to 0.22 g.p.m. during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

Water quality in Stream "S" is fair. Water analysis conducted prior to permit submission at CMU-5 show slightly elevated specific conductance and sulfates. Stream "S" is a small intermittent stream originating from head of hollow. Stream quantities range from dry to 0.0007 cfs during low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.

***Water quality in Stream "Y" is fair. Water analysis conducted prior to permit submission at CMS-5 show slightly elevated specific conductance and sulfates. Stream "Y" is a small intermittent stream originating from a wetland. Stream quantities range from 0.75 GPM to 3.0 GPM during high, low and intermediate flow periods. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.***

***Water quality in Piney Creek is good. Water analysis conducted prior to permit submission shows all parameters within effluent limitations. Piney Creek is a perennial stream, originating from springs to the south and southeast. Stream quantity ranges from 7.4 cfs during low flow conditions to 47 cfs during high flow conditions. Riparian vegetation within the buffer zone of this stream consist of typical plant life, grasses, shrubs and trees.***

Riparian vegetation will be disturbed within the entire buffer zones of Streams "B", "C", "D", "L", "M", "N", and "Q" ***and will not be restored.*** Riparian vegetation will be disturbed and will be restored within the buffer zone of Stream "A" between Stations 6+45 and 15+00.

**Sequencing of Operations**

The total life of this mining activity is projected to be approximately 10 years. The sequence of proposed activities is as follows: Construction of sediment ponds and diversion ditches, topsoil removal and stock piling, construction of ground water collection drain, fill area clay liner, construction of leachate collection system, and refuse placement, seal/cap, and revegetation.

**Stream Reconstruction, Diversion or Relocation**

No stream reconstructions or relocations are planned for this project. All stream and buffer zone affects as well as sequencing of operations, are discussed in the previous sections of this document. Restoration of habitat and environmental conditions to those that existed prior to mining is addressed in the individual stream descriptions in the previous sections of this document. See engineers report for more details.

The Ohio EPA and the Army Corp of Engineers have conducted site inspections of the proposed area, and discussed what will be required for mitigation of wetlands and streams in this area. ***A mitigation plan for the portions of the streams that will be eliminated by the proposed refuse disposal operation will occur along Long Run and Piney Creek. Approval of the plan is pending.*** The 401 certification application has been submitted to the EPA. Upon receipt of an approved 401 certification and approval of the disposal permit by ODNR, the 404 permit application will be submitted. An Ohio EPA approved mitigation plan will be submitted to ODNR via A.R.P. when obtained.

**Revegetation**

The following species and amounts of vegetation and/or tree and shrubs will be planted a minimum of two and ½ times the channel bottom width where disturbance within the buffer zone has occurred.

| Species | | Amount/Rate (lbs./Ac.) |
|---|---|---|
| **Grasses and Legumes** | | |
| Perennial Ryegrass | | 5 lbs./Ac. |
| Foxtail Millet | | 5 lbs./Ac. |
| Red Top | | 3 lbs./Ac. |
| Birdsfoot Trefoil | | 5 lbs./Ac. |
| Appalow Lespedeza | | 15 lbs./Ac. |
| Trees and Shrubs | | |
| Green Ash | 8' o/c | |
| Sycamore | 8' o/c | |
| Button Bush | 8' o/c | |

Trees and shrubs will be planted by hand on approximate eight foot centers. Areas planted with riparian vegetation will not be cut or mowed in order to encourage the development of volunteer vegetation. Species of trees, shrubs, grasses and legumes which appear naturally will not be removed, but will remain in order to enhance the wildlife environment along the streams.

Care will be taken to disturb only that part of the buffer zone necessary to accomplish the objectives of the permit. All work within the buffer zone will be performed in a timely and workmanlike manner to prohibit as best can be accomplished, detrimental effects on the stream.

Yours truly,

Suzie Utter

Suzie Utter, Permitting

H. PROTECTION OF PUBLIC PARKS AND HISTORIC PLACES-**Permit and Planned Subsidence Area**

Will the proposed coal mining activities adversely affect any public park and places listed on the National Register of Historic Places? _____ Yes, __X__ No. If "yes," submit an addendum describing the measures to minimize or prevent these impacts.

I. MINING NEAR OR THROUGH A PUBLIC ROAD-**Permit Area**

If the response to Part 1, item D (6) of the permit application is "yes", submit an addendum describing the measures to be used to ensure that the interests of the public and landowners are protected.

1. **BOND WILL BE POSTED ON THE PERMITTED AREA.**
2. **EARTH BARRICADES WILL BE CONSTRUCTED WHERE NECESSARY TO PROHIBIT ENTRY OR ACT AS SAFETY BARRIERS.**
3. **SIGNS HAVE BEEN ERECTED NEAR THE MINE TO PROVIDE INFORMATION FOR THE PUBLIC.**

J. SUBSIDENCE CONTROL SURVEY-**Shadow Area N/A**

(1) Is this a full coal recovery operation?
_____ Yes, _____ No. If "yes," complete Attachment 31, Subsidence Control Survey, and following items J(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 Attachment 32, 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 Attachment 32, Protection of Specific Structures, and specifically identify the areas on the application map.

K. SUBSIDENCE CONTROL PLAN-**Shadow Area N/A**

(1) Submit an addendum which describes the method of coal removal, and indicates the size, sequence, and timing of the development of the underground workings.

(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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
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**ATTACHMENT 14B**
**(GROUND WATER HYDROLOGY DESCRIPTION)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Aquifer/Zone Identification | Aquifer/Zone Lithology | Aquifer/Zone Thickness | Aquifer/Zone Elev. (msl) | Aquifer/Zone Horizontal Extent | Aquifer/Zone Known Uses | Approx. Rate of Discharge/Usage of Aquifer/Zone (gpm or cfs) |
|---|---|---|---|---|---|---|
| C | SANDSTONE, SHALE, #11 COAL (WHERE PRESENT) | 58' | 1180' TO 1122' | UPPER RIDGE OUTCROP TO OUTCROP | NONE, DRILLED WELL, UNDEVELOPED SPRINGS | NONE, UP TO 0.38 GPM |
| B | SHALE, #12 COAL | 36' | 1096' TO 1060' | MID-RIDGE OUTCROP TO OUTCROP | NONE, (1) DEVELOPED AND UNDEVELOPED SPRINGS | NONE, UP TO 1.7 GPM |
| A | SANDSTONE, LIMESTONE, SHALE | 118 | 995' TO 877' | LOWER RIDGE OUTCROP TO OUTCROP | NONE, UNDEVELOPED SPRING | NONE, .69 GPM |
| | | | | | | |
| | | | | | | |

Please note that Zones C and A are reversed in order as compared to the original permit D-0425 and Permit D-1159. This attachment is site specific to Application D-0425-2.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14C**
**(WELL/SPRING INVENTORY)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Well/Spring Identification Number | Name of Owner of Well/Spring | Surface Elevation of Well/Spring | Depth of Well in Feet Below Land Surface | Static Water Level of Well in Feet Below Land Surface | Lithology of Supplying Aquifer/ Waterbearing Zone | Known Uses of Well/Spring (if spring give discharge rate) |
|---|---|---|---|---|---|---|
| CMS-1 | AMERICAN ENERGY CORP. | 995 | N/A | N/A | A | NONE, .69 GPM |
| CMS-2 | D.F. WHITE | 1095 | N/A | N/A | B | NONE, .23 GPM |
| CMS-3 | AMERICAN ENERGY CORP. | 1095 | N/A | N/A | B | NONE, 1.6 GPM |
| CMS-4 | AMERICAN ENERGY CORP. | 1095 | N/A | N/A | B | NONE, .72 GPM |
| CMS-5 | AMERICAN ENERGY CORP. | 1095 | N/A | N/A | B | NONE, 1.7 GPM |
| CMS-6 | AMERICAN ENERGY CORP. | 1096 | N/A | N/A | B | NONE, .35 GPM |
| CMS-7 | AMERICAN ENERGY CORP. | 1070 | N/A | N/A | B | NONE, .19 GPM |
| CMS-8 | AMERICAN ENERGY CORP. | 1130 | N/A | N/A | C | NONE, .22 GPM |
| CMS-9 | AMERICAN ENERGY CORP. | 1130 | N/A | N/A | C | NONE, .29 GPM |
| CMS-10 | AMERICAN ENERGY CORP. | 1132 | N/A | N/A | C | NONE, .38 GPM |

**OHIO DEPARTMENT OF NATURAL RESOURCES**
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**ATTACHMENT 14C**
**(WELL/SPRING INVENTORY)**

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Well/Spring Identification Number | Name of Owner of Well/Spring | Surface Elevation of Well/Spring | Depth of Well in Feet Below Land Surface | Static Water Level of Well in Feet Below Land Surface | Lithology of Supplying Aquifer/ Waterbearing Zone | Known Uses of Well/Spring (if spring give discharge rate) |
|---|---|---|---|---|---|---|
| CMS-11 | AMERICAN ENERGY CORP. | 1080 | N/A | N/A | B | NONE, .19 GPM |
| CMS-12 | WYOMING POCAHONTAS LAND CO. | 1080 | N/A | N/A | B | NONE, .34 GPM |
| CMS-13 | AMERICAN ENERGY CORP. | 1080 | N/A | N/A | B | NONE, .13 GPM |
| CMDS-1 | AMERICAN ENERGY CORP. | 1080 | N/A | N/A | B | NONE, .13 GPM |
| CMW-2 | D.F. WHITE | 1190 | 21' | 12' TO 16' | C | NONE |
| CG-01-1A | AMERICAN ENERGY CORP. | *974.92 | **50' | **46.55' to 49' | A | MONITORING WELL |
| CG-01-2A | AMERICAN ENERGY CORP. | *940.33 | **25.03' | **13.28' to 16' | A | MONITORING WELL |
| CG-01-3A | AMERICAN ENERGY CORP. | *1163.04 | **285.95' | **150' to 209.68' | A | MONITORING WELL |
| CG-01-3B | AMERICAN ENERGY CORP. | *1163.22 | **90.3' | **84.5' to 86' | B | MONITORING WELL |
| CG-01-3C | AMERICAN ENERGY CORP. | *1162.35 | **27.2' | **20.15' to 21' | C | MONITORING WELL |

* Top of well casing elevation. ** Measured from top of casing.

OHIO DEPARTMENT OF NATURAL RESOURCES
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ATTACHMENT 14C
(WELL/SPRING INVENTORY)

Applicant's Name AMERICAN ENERGY CORPORATION (D-0425-2)

| Well/Spring Identification Number | Name of Owner of Well/Spring | Surface Elevation of Well/Spring | Depth of Well in Feet Below Land Surface | Static Water Level of Well in Feet Below Land Surface | Lithology of Supplying Aquifer/ Waterbearing Zone | Known Uses of Well/Spring (if spring give discharge rate) |
|---|---|---|---|---|---|---|
| CG-01-4A | AMERICAN ENERGY CORP. | *1154.06 | **259.0' | **121' to 258' | A | MONITORING WELL |
| CG-01-4B | AMERICAN ENERGY CORP. | *1153.58 | **58.60' | **53' to 57.5' | B | MONITORING WELL |
| CG-01-4C | AMERICAN ENERGY CORP. | *1153.26 | **25.8' | **5.65' to 9.5' | C | MONITORING WELL |
| CG-01-5A | AMERICAN ENERGY CORP. | *1161.07 | **267.0' | **51.5' to 208' | A | MONITORING WELL |
| CG-01-5B | AMERICAN ENERGY CORP. | *1160.16 | **84.86' | **77.0' to 77.5' | B | MONITORING WELL |
| CG-01-5C | AMERICAN ENERGY CORP. | *1160.86 | **25.66' | **7.24' to 7.5' | C | MONITORING WELL |
| CG-01-6B | AMERICAN ENERGY CORP. | *1166.70 | **81.22' | **74.64' to 77.5' | B | MONITORING WELL |
| CG-01-6C | AMERICAN ENERGY CORP. | *1167.01 | **44.83' | **27.0' to 40' | C | MONITORING WELL |
| | | | | | | |

Note: State Plane Coordinates for all monitoring wells are shown on the Monitoring Well Installation Logs in the Hydrogeologic Investigation Report.
* Top of well casing elevation. ** Measured from top of casing.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-07-414 | 01-07-415 | 01-07-416 | 01-07-417 | 01-07-418 | 01-07-419 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .69 GPM | .23 GPM | 1.6 GPM | .72 GPM | 1.7 GPM | .35 GPM |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.86 | 8.06 | 7.58 | 7.57 | 7.98 | 6.60 |
| 11 | Total Acidity (mg/l CaCO3) | 6.80 | 7.80 | 6.20 | 16.20 | 10.20 | 55.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | 149.00 | 254.00 | 106.40 | 261.40 | 290.80 | 191.60 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 772.00 | 633.00 | 245.00 | 585.00 | 951.00 | 1470.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.24 | 0.06 | 0.13 | 0.04 | 0.03 | 8.20 |
| 16 | Total Sulfates (mg/l) | 235.00 | 57.00 | <10.00 | 29.00 | 201.00 | 548.00 |
| 17 | Total Iron (mg/l) | 0.15 | 0.21 | 0.20 | 0.08 | 0.11 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 17 | 58 | 53 | 34 | 26 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 396.00 | 320.00 | 116.00 | 300.00 | 400.00 | 800.00 |
| 20 | Nitrates | | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | 01-07-498 | 01-07-499 | 01-07-500 | 01-07-501 | 01-07-502 | 01-07-503 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | .19 GPM | .22 GPM | .29 GPM | .38 GPM | .19 GPM | .34 GPM |
| 8 | Date Above Measurements Made | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | 3.20 | 7.98 | 7.54 | 7.98 | 8.23 | 8.09 |
| 11 | Total Acidity (mg/l CaCO3) | 112.00 | 5.80 | 7.40 | 4.20 | 3.40 | 6.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 0.00 | 220.80 | 112.00 | 123.00 | 224.00 | 207.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1559.00 | 1215.00 | 279.00 | 292.00 | 527.00 | 667.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 10.60 | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 |
| 16 | Total Sulfates (mg/l) | 660.00 | 51.00 | 17.00 | 18.00 | 42.00 | 94.00 |
| 17 | Total Iron (mg/l) | 12.40 | 0.10 | 0.24 | <0.04 | 0.05 | 0.04 |
| 18 | Total Suspended Solids (mg/l) | 22 | 10 | 11 | 4 | 3 | 3 |
| 19 | Total Hardness (mg/l as CaCO3) | 660.00 | 228.00 | 124.00 | 136.00 | 276.00 | 320.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-13 | CMDS-1 | CMW-2 | CMW-2 | CMW-2 | CMD-1 |
| 2 | Identification Number | 01-07-504 | 01-07-413 | 00-03268 | 01-07-373 | -- | 01-07-371 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | H | I | L | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1060 | 1080 | 1190 | 1190 | 1190 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | 21' | 21' | 21' | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | 12' | 16' | DRY | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | .13 GPM | 1.8 GPM | -- | -- | -- | 28.6 CFS |
| 8 | Date Above Measurements Made | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | 10-19-01 | 7-6-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | B | C | C | C | -- |
| 10 | pH (Standard Units) | 8.25 | 8.26 | 6.70 | 7.33 | | 8.33 |
| 11 | Total Acidity (mg/l CaCO3) | 2.20 | 5.00 | 7.10 | 5.00 | | 0.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 227.00 | 212.60 | 22.0 | 57.80 | | 132.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 653.00 | 459.00 | 160.00 | 137.00 | | 426.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | | --- |
| 15 | Total Manganese (mg/l) | 0.02 | 0.10 | <0.02 | <0.02 | | <0.02 |
| 16 | Total Sulfates (mg/l) | 106.00 | 20.00 | 42.00 | <10.00 | | 48.00 |
| 17 | Total Iron (mg/l) | 0.41 | 0.10 | 0.23 | 0.42 | | 0.09 |
| 18 | Total Suspended Solids (mg/l) | 4 | 60 | <1 | 9 | | 7 |
| 19 | Total Hardness (mg/l as CaCO3) | 324.00 | 228.00 | 60.00 | 64.00 | | 188.00 |
| 20 | Nitrates | --- | --- | 0.09 | --- | | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | | 7-6-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-5-01 | 3-14-99 | 7-5-01 | 10-16-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-10-705 | | 01-10-709 | | 01-10-713 | 01-10-696 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .02 GPM | DRY | .09 GPM | DRY | .75 GPM | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.37 | | 7.80 | | 7.14 | 7.33 |
| 11 | Total Acidity (mg/l CaCO3) | 10.80 | | 13.60 | | 14.00 | 40.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 18.60 | | 207.80 | | 273.80 | 356.20 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1259 | | 450.00 | | 945.00 | 1320.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | | --- | | --- | --- |
| 15 | Total Manganese (mg/l) | 2.66 | | 0.02 | | <0.02 | 0.09 |
| 16 | Total Sulfates (mg/l) | 526.00 | | 17.00 | | 188.00 | 261.00 |
| 17 | Total Iron (mg/l) | 0.65 | | 0.11 | | <0.04 | 0.44 |
| 18 | Total Suspended Solids (mg/l) | 60 | | 92 | | 3 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 640.00 | | 220.00 | | 400.00 | 440.00 |
| 20 | Nitrates | --- | | --- | | --- | --- |
| 21 | Date Sampled for Analysis | 10-19-01 | | 10-19-01 | | 10-19-01 | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | | 01-10-697 | | | | 01-10-722 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | DRY | .05 GPM | DRY | DRY | DRY | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | | 7.53 | | | | 8.12 |
| 11 | Total Acidity (mg/l CaCO3) | | 8.40 | | | | 13.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | | 57.20 | | | | 240.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | | 1176 | | | | 756 |
| 14 | Total Dissolved Solids (mg/l) | | --- | | | | --- |
| 15 | Total Manganese (mg/l) | | 2.16 | | | | <0.02 |
| 16 | Total Sulfates (mg/l) | | 529.0 | | | | 122.00 |
| 17 | Total Iron (mg/l) | | 0.05 | | | | 0.33 |
| 18 | Total Suspended Solids (mg/l) | | <2.0 | | | | 4 |
| 19 | Total Hardness (mg/l as CaCO3) | | 560 | | | | 370.00 |
| 20 | Nitrates | | --- | | | | --- |
| 21 | Date Sampled for Analysis | | 10-19-01 | | | | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-5 | CMS-6 | CMS-8 |
| 2 | Identification Number | 02-02-833 | 02-02-846 | 02-02-837 | 02-02-838 | 02-02-852 | 02-02-841 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1096 | 1130 |
| 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) | 1.1 GPM | 9.1 GPM | 1.9 GPM | 3 GPM | .37 GPM | .63 GPM |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | C |
| 10 | pH (Standard Units) | 7.84 | 7.97 | 7.59 | 8.26 | 6.77 | 7.87 |
| 11 | Total Acidity (mg/l CaCO3) | 6.20 | 1.80 | 4.60 | 1.20 | 64.00 | 5.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 116.00 | 108.20 | 97.20 | 312.80 | 201.80 | 176.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 837 | 341 | 278 | 1042 | 1592 | 453 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.51 | 0.02 | 0.08 | <0.02 | 0.95 | <0.02 |
| 16 | Total Sulfates (mg/l) | 297.0 | 43.00 | 29.00 | 220.0 | 692.0 | 38.0 |
| 17 | Total Iron (mg/l) | 0.17 | 0.19 | 0.54 | <0.04 | 0.59 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 2 | <2 | 53 | 4 | 42 | 6 |
| 19 | Total Hardness (mg/l as CaCO3) | 388.00 | 148.00 | 124.00 | 470.00 | 860.00 | 208.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-9 | CMS-10 | CMS-12 | CMW-2 | CMDS-1 | CMD-1 |
| 2 | Identification Number | 02-02-857 | 02-02-842 | 02-02-849 | 02-02-831 | 02-02-836 | 02-02-828 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 1130 | 1132 | 1080 | 1190 | 1080 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | -- | 21' | -- | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 16.5' | -- | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | 1.9 GPM | 3.9 GPM | 1.8 GPM | --- | 6 GPM | 74 CFS |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | C | B | C | B | --- |
| 10 | pH (Standard Units) | 7.31 | 7.71 | 8.18 | 8.93 | 7.72 | 8.13 |
| 11 | Total Acidity (mg/l CaCO3) | 18.60 | 2.60 | 3.20 | 0.00 | 7.80 | 2.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 101.00 | 71.00 | 147.60 | 277.80 | 219.00 | 116.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 895 | 207 | 485 | 715 | 507 | 421 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | <0.02 | <0.02 | 0.04 | <0.02 | <0.02 | 0.02 |
| 16 | Total Sulfates (mg/l) | 350.0 | 21.00 | 82.00 | 25.0 | 24.0 | 55.0 |
| 17 | Total Iron (mg/l) | 0.06 | 0.05 | 1.20 | 1.43 | <0.04 | 0.06 |
| 18 | Total Suspended Solids (mg/l) | <2 | 5 | 34 | 4 | <2 | <2 |
| 19 | Total Hardness (mg/l as CaCO3) | 428.00 | 84.00 | 220.00 | <10.00 | 240.00 | 172.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

D. (3) Based on the data listed on Attachment 14A, and other information submitted with this application, identify the seasonal variations in water quality and quantity for the streams identified in Part 2, D(2).

**SEE ATTACHMENT 14A**

E. HYDROLOGIC DETERMINATION-**Permit, Shadow Area, and Adjacent Area**

Based on the information submitted in response to items B, C, and D in this part of the permit application, submit an addendum describing the probable hydrologic consequences of this proposed underground mining operation on the hydrologic regime of the proposed permit area, shadow area, and adjacent area. The description shall include findings on each of the following items:

(1) The consequences of the proposed operation on the contents of total suspended and dissolved solids, total iron, total manganese, acidity, and pH.

(2) Whether adverse impacts may occur to the hydrologic balance;

(3) The impact the proposed operation will have on:

(a) sediment yield from the disturbed area,

(b) flooding and stream flow alteration or diminution,

(c) ground water and surface water availability.

**SEE HYDROGEOLOGIC INVESTIGATION REPORT, SECTION 5.3, POND ANALYSIS SUMITTED WITH APPROVED ARP R-0425-5, ORIGINAL PERMIT D-0425, AND ADDENDUM TO THIS ITEM.**

F. ALTERNATIVE WATER SUPPLY INFORMATION-**Permit, Shadow Area and Adjacent Area**

(1) Based on the response in Part 2, item E, submit an addendum identifying the extent to which the proposed coal mining activities may proximately result in contamination, diminution, or interruption of an underground or surface source of water within the proposed permit area, shadow area, and adjacent area that is used for domestic, agricultural, industrial, or other legitimate use.

**SEE ADDENDUM TO PART 2, F(1&2) IN APPROVED ARP R-0425-5**

(2) If contamination, diminution, or interruption may result, submit an addendum identifying the alternative sources of water supply that could be developed to replace the existing sources including information on water availability and suitability of alternative sources for existing pre-mining uses and postmining land uses.

**SEE ADDENDUM TO PART 2, F(1&2) IN APPROVED ARP R-0425-5**

ADDENDUM TO PART 2, PAGE 18, ITEM E.
AMERICAN ENERGY CORPORATION

The probable hydrologic consequences of constructing an additional refuse disposal area on top of an existing reclaimed refuse disposal area should be negligible. Please note that the existing refuse disposal area has been reclaimed and vegetated for some time. Surface water sample analyses conducted for Permit D-1159 and A.R.P. R-1159-4, which include three separate sites, D-8, D-8A, and D-10, are included in this application to illustrate the absence of hydrologic impacts due to the existing refuse disposal area. A location map has been included to show the sample sites in relation to the existing disposal area. According to these analyses, surface water has not been affected by previous refuse disposal at this site. Monitoring well sample analyses are included in the "First Annual Report Groundwater Statistical Evaluation" submitted in May, 2002. No additional information, other than what has been addressed in the Hydrogeological Investigation, can be assessed from this report. The above referenced report is the basis for background data on groundwater at this site

Spring CMS-7 discharges intermittently from the existing refuse disposal area. Any flow originating from the existing refuse disposal area will be collected and handled by the leachate collection system. All water from the leachate collection system will flow to Pond 012 where it can be treated, if necessary, before it is released to the stream system. No water discharge from within the existing or proposed refuse disposal areas will be commingled with the flow in the ground water collection system.

The probable hydrologic consequences of not extending the additional refuse disposal area completely over the existing refuse will be negligible. The existing refuse disposal area is reclaimed and revegetated. Infiltration of water into and out of the existing refuse disposal area will not be affected by the proposed refuse disposal area covering the site due to the proposed leachate collection system. This refuse disposal operation should have no impact on the hydrologic balance.

The proposed refuse disposal area should have no impact on the abandoned gas well. According to Division of Oil and Gas records, this well was dry, and plugged when abandoned. No excavation will take place near the well. No evidence of the well can be found in the field.

ADDENDUM TO PART 2, PAGE 18, ITEM E.
AMERICAN ENERGY CORPORATION

The probable hydrologic consequences of constructing an additional refuse disposal area on top of an existing reclaimed refuse disposal area should be negligible. Please note that the existing refuse disposal area has been reclaimed and vegetated for some time. Surface water sample analyses conducted for Permit D-1159 and A.R.P. R-1159-4, which include three separate sites, D-8, D-8A, and D-10, are included in this application to illustrate the absence of hydrologic impacts due to the existing refuse disposal area. A location map has been included to show the sample sites in relation to the existing disposal area. According to these analyses, surface water has not been affected by previous refuse disposal at this site.

Spring CMS-7 discharges intermittently from the existing refuse disposal area. Any flow originating from the existing refuse disposal area will be collected and handled by the leachate collection system. All water from the leachate collection system will flow to Pond 012 where it can be treated, if necessary, before it is released to the stream system. No water discharge from within the existing or proposed refuse disposal areas will be commingled with the flow in the ground water collection system.

The probable hydrologic consequences of not extending the additional refuse disposal area completely over the existing refuse will be negligible. The existing refuse disposal area is reclaimed and revegetated. Infiltration of water into and out of the existing refuse disposal area will not be affected by the proposed refuse disposal area covering the site due to the proposed leachate collection system. This refuse disposal operation should have no impact on the hydrologic balance.

The proposed refuse disposal area should have no impact on the abandoned gas well. According to Division of Oil and Gas records, this well was dry, and plugged when abandoned. No excavation will take place near the well. No evidence of the well can be found in the field.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

**ADDENDUM TO PART 2, PAGE 18, ITEM E. AMERICAN ENERGY CORP.**

APPLICANT BENNOC, INC. (D-1159-1)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | D-2 | D-3 | D-6 | D-8 | D-9 | D-30 |
| 2 | Identification Number | 279406 | 279407 | 279426 | 279427 | 279428 | 279430 |
| 3 | High (H)/Low (L) Designation (if applicable) | SUPPLE MENTAL | SUPPLE MENTAL | SUPPLE MENTAL | SUPPLE MENTAL | SUPPLE MENTAL | H |
| 4 | Surface Elevation for Sampling Station (msl) | 960 | 935 | 940 | 940 | 940 | 920 |
| 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) | 1.08 CFS | 35 CFS | 0.2 CFS | 1.19 CFS | 5 GPM | 27 GPM |
| 8 | Date Above Measurements Made | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 7.87 | 7.65 | 7.56 | 7.54 | 7.33 | 7.74 |
| 1 | Total Acidity (mg/l CaCO3) | 8.00 | 8.00 | 12.00 | 6.00 | 12.00 | 8.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 70.00 | 60.00 | 232.00 | 70.00 | 122.00 | 114.00 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 255.00 | 179.00 | 433.00 | 503.00 | 423.00 | 308.00 |
| 14 | Total Dissolved Solids (mg/l) | -- | -- | -- | -- | -- | -- |
| 15 | Total Manganese (mg/l) | 0.023 | 0.017 | <0.008 | 0.295 | <0.008 | <0.008 |
| 16 | Total Sulfates (mg/l) | 44.45 | 37.87 | 98.78 | 171.23 | 100.43 | 62.56 |
| 17 | Total Iron (mg/l) | 2.12 | 1.33 | 0.099 | 0.148 | 0.221 | 0.287 |
| 18 | Total Suspended Solids (mg/l) | 47.00 | 30.00 | 10.00 | 7.00 | 21.00 | 43.00 |
| 19 | Total Hardness (mg/l as CaCO3) | 85.83 | 70.20 | 253.21 | 229.99 | 173.64 | 149.52 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 |
| 22 | Date Last Precipitation Event Occurred | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 | 4-9-99 |

Laboratory Name Ream & Haager Laboratories, Inc.
Address 1226 Kaderly Street NW City New Philadelphia
State Ohio Zip 44663

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.

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**ADDENUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.**

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. (ALLISON)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | Identification No. of sampling Station from Hydrology Map | D-3 | D-4 | D-5 | D-6 | D-7 | D-8 |
| 2. | Lab Identification Number 94- | 03-464 | 03-463 | 03-466 | 03-467 | 03-468 | 03-469 |
| 3. | High (H) / Low (L) Designation (if applicable) | H | H | H | H | H | H |
| 4. | Surface Elevation for Sampling Station (msl) | 935 | 940 | 940 | 940 | 938 | 940 |
| 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) | 12.3 CFS | .13 CFS | .12 CFS | .26 CFS | .26 CFS | 1.08 CFS |
| 8. | Date Above Measurements Made | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 |
| 9. | Aquifer/Zone Identification for Well/Spring | -- | -- | -- | -- | -- | -- |
| 10. | pH (Standard Units) | 7.90 | 7.88 | 7.92 | 8.16 | 8.09 | 8.04 |
| 11. | Total Acidity (mg/1 $CaCO_3$) | 8.40 | 7.80 | 9.20 | 4.40 | 3.60 | 4.60 |
| 12. | Total Alkalinity (mg/1 $CaCO_3$) | 97.60 | 86.60 | 119.60 | 198.20 | 172.00 | 124.20 |
| 13. | Specific Conductivity (umho/cm at 25,) | 200 | 170 | 290 | 392 | 519 | 700 |
| 14. | Total Dissolved Solids (mg/1) | -- | -- | -- | -- | -- | -- |
| 15. | Total Manganese (mg/1) | 0.04 | < 0.02 | < 0.02 | < 0.02 | 0.10 | 0.36 |
| 16. | Total Sulfates (mg/1) | 30.0 | 34.0 | 34.0 | 78.0 | 103.0 | 270.0 |
| 17. | Total Iron (mg/1) | 0.18 | 0.21 | 0.12 | 0.13 | 0.21 | 0.83 |
| 18. | Total Suspended Solids (mg/1) | 6.0 | 4.0 | 2.0 | 5.0 | 3.0 | 9.0 |
| 19. | Total Hardness (mg/1 as $CaCO_3$) | 124.0 | 124.0 | 120.0 | 168.0 | 249.0 | 259.0 |
| 20. | Date Sampled for Analysis | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 | 3-9-94 |
| 21. | Date Last Precipitation Event | 3-7-94 | 3-7-94 | 3-7-94 | 3-7-94 | 3-7-94 | 3-7-94 |

Laboratory Name Industrial Lab Analysis, Inc.
Address 2240 Williamsburg Drive City Glen Dale
State West Virginia Zip 26083

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 item 14.

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**ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.**

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT BENNOC, INC. (ALLISON)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. | Identification No. of sampling Station from Hydrology Map | D-3 | D-4 | D-5 | D-6 | D-7 | D-8 |
| 2. | Lab Identification Number 93- | 12-1117 | 12-1118 | 12-1119 | 12-1120 | 12-1121 | 12-1122 |
| 3. | High (H) / Low (L) Designation (if applicable) | L | L | L | L | L | L |
| 4. | Surface Elevation for Sampling Station (msl) | 935 | 940 | 940 | 940 | 938 | 940 |
| 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) | 3.4 CFS | .05 CFS | .03 CFS | .1 CFS | .07 CFS | .25 CFS |
| 8. | Date Above Measurements Made | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 |
| 9. | Aquifer/Zone Identification for Well/Spring | -- | -- | -- | -- | -- | -- |
| 10. | pH (Standard Units) | 7.93 | 7.82 | 7.83 | 7.97 | 7.98 | 7.50 |
| 1. | Total Acidity (mg/1 $CaCO_3$) | 6.60 | 8.00 | 7.60 | 6.40 | 6.60 | 14.00 |
| 12. | Total Alkalinity (mg/1 $CaCO_3$) | 113.60 | 83.00 | 134.80 | 199.60 | 190.00 | 171.00 |
| 13. | Specific Conductivity (umho/cm at 25.) | 273 | 222 | 333 | 589 | 621 | 963 |
| 14. | Total Dissolved Solids (mg/1) | -- | -- | -- | -- | -- | -- |
| 15. | Total Manganese (mg/1) | 0.02 | < 0.02 | < 0.02 | < 0.02 | < 0.02 | 0.73 |
| 16. | Total Sulfates (mg/1) | 33.0 | 39.0 | 47.0 | 120.0 | 104.0 | 404.0 |
| 17. | Total Iron (mg/1) | 0.05 | < 0.04 | < 0.04 | 0.04 | 0.07 | 0.73 |
| 18. | Total Suspended Solids (mg/1) | 4.0 | 7.0 | 6.0 | 3.0 | 2.0 | 5.0 |
| 19. | Total Hardness (mg/1 as $CaCO_3$) | 143.0 | 121.0 | 173.0 | 256.0 | 301.0 | 462.0 |
| 20. | Date Sampled for Analysis | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 | 12-29-93 |
| 21. | Date Last Precipitation Event | 12-25-93 | 12-25-93 | 12-25-93 | 12-25-93 | 12-29-93 | 12-29-93 |

Laboratory Name Industrial Lab Analysis, Inc.
Address 2240 Williamsburg Drive City Glen Dale
State West Virginia Zip 26083

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 item 14.

ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

Quarterly Monitoring Report Sheet
(Submit in Quadruplicate)

Permitee: American Energy Corp. Permit Number: D-1159

_____1st Qtr. ___X___ 2nd Qtr. _____ 3rd Qtr. _____ 4th Qtr.

_____ Pre-Mining, ___X___ Mining, _____, Post mining (X appropriate blank for mine status)

| Monitoring Site Id No. (e.g. S-1 , W-3 ) | S-23 | D-10 | D-8A | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X2,411,937 Y 696,728 | X2,417,484 Y 696,454 | X 2,413,624 Y 695,395 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 1125 | 898 | 1080 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality , Quantity , or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Water Surface (Feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 53' | 21' |
| Stream or spring Discharge (CFS or GPM) | 6.4 gpm | 1.7 cfs | 0.1 cfs | -- | -- |
| Date Measured | 05-16-02 | 05-16-02 | 05-16-02 | 05-16-02 | 05-16-02 |
| pH Standard Units | 7.61 | 7.49 | 7.90 | 7.41 | 7.62 |
| Total Acidity mg/l as CaCO3 | 1.60 | 3.80 | 2.80 | 7.20 | 4.80 |
| Total Alkalinity mg/l as CaCO3 | 27.20 | 60.00 | 71.40 | 275.20 | 232.00 |
| Total Iron mg/l | 0.28 | 0.30 | 1.42 | <0.04 | 0.05 |
| Total Manganese mg/l | 0.03 | <0.02 | 0.44 | <0.02 | 0.02 |
| Total Suspended Solids mg/l | 3.0 | 8.0 | 6.0 | <2.0 | <2.0 |
| Total Hardness mg/l | 56.0 | 72.0 | 220.0 | 390.0 | 300.0 |
| Total Sulfate mg/l | 24.0 | 19.0 | 111.0 | 73.0 | 70.0 |
| Specific Conductance @25 "C umho/cm | 131 | 170 | 552 | 852 | 7.03 |

Permitee's Signature: Date: June 25, 2002

Laboratory Name: Industrial Lab Analysis

Analyst's Signature: [illegible] Date: 6-5-02

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee AMERICAN ENERGY CORPORATION Permit Number Allison D-1159

X 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | ★ D - 10 | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696.454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 52' | 20.1' |
| Stream or Spring Discharge (cfs or gpm) | 4.9 cfs | 2 cfs | 3 cfs | -- | -- |
| Date Measured | 2/15/02 | 2/15/02 | 2/15/02 | 2/15/02 | 2/15/02 |
| pH (Standard Units) | 7.62 | 7.53 | 7.49 | 7.37 | 7.59 |
| Total Acidity (mg/l CaCo3) | 4.00 | 2.00 | 2.00 | 8.00 | 6.00 |
| Total Alkalinity (mg/l CaCo3) | 84.00 | 84.00 | 70.00 | 280.00 | 240.00 |
| Total Iron (mg/l) | 0.057 | 0.054 | 0.051 | 0.031 | 0.035 |
| Total Manganese (mg/l) | < 0.01 | 0.014 | < 0.01 | < 0.01 | < 0.01 |
| Total Suspended Solids (mg/l) | < 1.0 | < 1.0 | < 1.0 | 9 | < 1.0 |
| Total Hardness (mg/l CaCo3) | 119.33 | 107.65 | 85.20 | 188.30 | 206.44 |
| Total Sulfates (mg/l) | 46.09 | 128.41 | 101.25 | 186.04 | 112.77 |
| Specific Conductance (at 25° C in µmhos/cm) | 303.00 | 267.00 | 230.00 | 1,010.00 | 709.00 |

| Permittee's Signature | Date March 22, 2002 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. |
|---|---|
| Analyst's Signature | Date February 27, 2002 |

*Ream & Haager Lab. #'s 322286 thru 322290*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., X 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D - 10 ★ | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 56' | 25' |
| Stream or Spring Discharge (cfs or gpm) | 1.85 cfs | 0.22 cfs | 0.8 cfs | -- | -- |
| Date Measured | 11/15/01 | 11/15/01 | 11/15/01 | 11/15/01 | 11/15/01 |
| pH (Standard Units) | 7.16 | 7.26 | 7.02 | 6.98 | 7.31 |
| Total Acidity (mg/l CaCo3) | 6.00 | 6.00 | 4.00 | 14.00 | 12.00 |
| Total Alkalinity (mg/l CaCo3) | 126.00 | 120.00 | 106.00 | 294.00 | 262.00 |
| Total Iron (mg/l) | < 0.03 | < 0.03 | < 0.03 | < 0.03 | < 0.03 |
| Total Manganese (mg/l) | < 0.01 | < 0.01 | 0.036 | < 0.01 | 0.013 |
| Total Suspended Solids (mg/l) | 14 | 6 | < 1.0 | 8 | 4 |
| Total Hardness (mg/l CaCo3) | 276.15 | 273.52 | 212.67 | 161.59 | 280.27 |
| Total Sulfates (mg/l) | 79.02 | 34.57 | 14.81 | 115.24 | 58.44 |
| Specific Conductance (at 25° C in µmhos/cm) | 547.00 | 434.00 | 537.00 | 3,190.00 | 2,830.00 |

| | |
|---|---|
| Permittee's Signature | Date December 4, 2001 |

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date November 26, 2001 |

*Ream & Haager Lab. #'s 317699 thru 317703*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., ____ 2nd Qtr., X 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D - 10 ★ | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 684,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 55.8' | 23.4' |
| Stream or Spring Discharge (cfs or gpm) | 19 cfs | 0.3 cfs | 17.5 cfs | -- | -- |
| Date Measured | 8/30/01 | 8/30/01 | 8/30/01 | 8/30/01 | 8/30/01 |
| pH (Standard Units) | 7.79 | 7.58 | 7.63 | 7.45 | 7.52 |
| Total Acidity (mg/l CaCo3) | 4.00 | 8.00 | 4.00 | 14.00 | 12.00 |
| Total Alkalinity (mg/l CaCo3) | 102.00 | 120.00 | 80.00 | 304.00 | 230.00 |
| Total Iron (mg/l) | 0.173 | 0.130 | 0.075 | 0.055 | 0.065 |
| Total Manganese (mg/l) | 0.011 | 0.279 | 0.012 | < 0.01 | 0.014 |
| Total Suspended Solids (mg/l) | 1 | 1 | < 1.0 | < 1.0 | 1 |
| Total Hardness (mg/l CaCo3) | 154.42 | 174.87 | 110.54 | 241.64 | 161.59 |
| Total Sulfates (mg/l) | 23.04 | 37.04 | 41.16 | 102.90 | 54.33 |
| Specific Conductance (at 25° C in µmhos/cm) | 357.00 | 356.00 | 265.00 | 1,050.00 | 864.00 |

| | |
|---|---|
| Permittee's Signature | Date September 18, 2001 |

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date September 12, 2001 |

*Ream & Haager Lab. #'s 313686 thru 313690*
*Hamilton & Associates*
*1 of 2*

AEC 11649

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., X 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D - 10 ☆ | U - 3 | U - 10 | W - 2 | W - 3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696.454 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 | X 2,416,692 Y 694,256 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 55.7' | 16' |
| Stream or Spring Discharge (cfs or gpm) | 33 cfs | 20.3 cfs | 31.6 cfs | -- | -- |
| Date Measured | 5/22/01 | 5/22/01 | 5/22/01 | 5/22/01 | 5/22/01 |
| pH (Standard Units) | 7.98 | 7.78 | 7.73 | 7.36 | 7.60 |
| Total Acidity (mg/l CaCo3) | 14.00 | 10.00 | 14.00 | 40.00 | 28.00 |
| Total Alkalinity (mg/l CaCo3) | 120.00 | 80.00 | 100.00 | 394.00 | 264.00 |
| Total Iron (mg/l) | 0.048 | 0.268 | 0.923 | 0.152 | < 0.03 |
| Total Manganese (mg/l) | < 0.01 | < 0.01 | 0.011 | < 0.01 | < 0.01 |
| Total Suspended Solids (mg/l) | 65 | 145 | 33 | 9 | 4 |
| Total Hardness (mg/l CaCo3) | 724.04 | 183.25 | 120.54 | 122.42 | 299.48 |
| Total Sulfates (mg/l) | 148.17 | 97.13 | 46.09 | 93.84 | 121.83 |
| Specific Conductance (at 25° C in µmhos/cm) | 342.00 | 199.00 | 231.00 | 1,050.00 | 730.00 |

| Permittee's Signature | Date June 29, 2001 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | Joseph W. Smith | Date June 7, 2001 |

*Ream & Haager Lab. #'s 309109 thru 309113*
*Hamilton & Associates*
*1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159

X 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | U-10 | W-2 | U-3 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,413,435 Y 691,110 | X 2,416,692 Y 694,256 | X 2,411,287 Y 693,468 | X 2,416,577 Y 692,385 |
| Surface Elevation of Monitoring Site | 898 | 942 | 1235 | 960 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | 103' | -- | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | 54.4' | -- | 22' |
| Stream or Spring Discharge (cfs or gpm) | 43.2 cfs | 34.3 cfs | -- | 9.24 cfs | -- |
| Date Measured | 2/1/01 | 2/1/01 | 2/1/01 | 2/1/01 | 2/1/01 |
| pH (Standard Units) | 7.04 | 7.15 | 7.32 | 7.96 | 7.17 |
| Total Acidity (mg/l CaCo3) | 6.00 | 8.00 | 28.00 | 8.00 | 32.00 |
| Total Alkalinity (mg/l CaCo3) | 54.00 | 38.00 | 256.00 | 52.00 | 226.00 |
| Total Iron (mg/l) | 0.339 | 0.179 | < 0.03 | 0.191 | < 0.03 |
| Total Manganese (mg/l) | 0.067 | < 0.01 | < 0.01 | < 0.1 | < 0.01 |
| Total Suspended Solids (mg/l) | 14 | 3 | < 1.0 | < 1.0 | < 1.0 |
| Total Hardness (mg/l CaCo3) | 106.62 | 65.73 | 209.99 | 77.42 | 172.93 |
| Total Sulfates (mg/l) | 39.51 | 23.04 | 80.67 | 39.51 | 99.87 |
| Specific Conductance (at 25° C in µmhos/cm) | 255.00 | 181.00 | 900.00 | 200.00 | 1,080.00 |

| Permittee's Signature | Date April 10, 2001 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | | Date February 13, 2001 |

*Ream & Haager Lab. #'s 303491 thru 303495*
*Hamilton & Associates*
*1 of 2*

04/94

**ADDENDUM, TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.**

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159 (Allison)

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., X 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | W-2 | W-3 | W-7 | U-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X2,417,484<br>Y 696,454 | X2,416,692<br>Y 594,256 | X2,416,577<br>Y 692,370 | X2,417,692<br>Y 697,385 | X2,411,287<br>Y 693,468 |
| Surface Elevation of Monitoring Site | 898 | 1235 | 1260 | 1062 | 960 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | 103' | 115' | UNKNOWN | -- |
| Static Water Level of Well Below Land Surface (feet) | -- | 59.2' | 26.8' | 64.3' | -- |
| Stream or Spring Discharge (cfs or gpm) | 6 cfs | -- | -- | -- | 2 cfs |
| Date Measured | 11/10/00 | 11/10/00 | 11/10/00 | 11/10/00 | 11/10/00 |
| pH (Standard Units) | 6.87 | 7.44 | 7.51 | 8.17 | 7.75 |
| Total Acidity (mg/l CaCo3) | 8.00 | 30.00 | 24.00 | 12.00 | 12.00 |
| Total Alkalinity (mg/l CaCo3) | 142.00 | 346.00 | 296.00 | 430.00 | 146.00 |
| Total Iron (mg/l) | 0.119 | < 0.05 | 0.080 | < 0.05 | 0.077 |
| Total Manganese (mg/l) | < 0.008 | < 0.008 | 0.011 | < 0.008 | 0.010 |
| Total Suspended Solids (mg/l) | 2 | 1 | < 1.0 | < 1.0 | < 1.0 |
| Total Hardness (mg/l CaCo3) | 170.07 | 522.46 | 454.64 | 70.32 | 161.94 |
| Total Sulfates (mg/l) | 47.74 | 82.32 | 74.08 | 153.93 | 54.33 |
| Specific Conductance (at 25° C in µmhos/cm) | 423.00 | 1,240.00 | 1,080.00 | 1,010.00 | 378.00 |

| Permittee's Signature | Date |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | [signature] | Date November 24, 2000 |

*Ream & Haager Lab. #'s 300555 thru 300559*
*Hamilton & Associates*
*1 of 2*

AEC 11652

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison - D-1159

____ 1st Qtr., ____ 2nd Qtr., X 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | U-10 | U-3 | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 | X 2,413,435 | X 2,411,287 | X 2,416,692 | X 2,416,577 |
| | Y 696,454 | Y 691,110 | Y 693,468 | Y 594,256 | Y 692,370 |
| Surface Elevation of Monitoring Site | 898 | 942 | 960 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | Access Denied | Inaccess-ible |
| Stream or Spring Discharge (cfs or gpm) | 1.44 cfs | 0.45 cfs | 0,08 cfs | -- | -- |
| Date Measured | 8/14/00 | 8/14/00 | 8/14/00 | 8/14/00 | 8/14/00 |
| pH (Standard Units) | 8.14 | 7.94 | 7.85 | 7.42 | 7.80 |
| Total Acidity (mg/l CaCo3) | 4.00 | 18.00 | 4.00 | 6.00 | 4.00 |
| Total Alkalinity (mg/l CaCo3) | 130.00 | 104.00 | 130.00 | 270.00 | 224.00 |
| Total Iron (mg/l) | < 0.05 | < 0.05 | < 0.05 | < 0.05 | < 0.05 |
| Total Manganese (mg/l) | < 0.008 | < 0.008 | <0.008 | <0.008 | < 0.008 |
| Total Suspended Solids (mg/l) | 1.0 | 1.0 | 5.0 | 1.0 | 1.0 |
| Total Hardness (mg/l CaCo3) | 209.06 | 130.27 | 154.09 | 536.43 | 368.16 |
| Total Sulfates (mg/l) | 446.17 | 35.40 | 172.05 | 244.49 | 211.56 |
| Specific Conductance (at 25° C in µmhos/cm) | 470.00 | 297.00 | 362.00 | 1,360.00 | 1,040.00 |

| Permittee's Signature | Date |
|---|---|

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date August 30, 2000 |

*Ream & Haager Lab. #'s 296788 thru 296792*
*Hamilton & Associates*
*1 of 2*

AEC 11653

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number Allison D-1159

____ 1st Qtr., X 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 D | U-3 | U-10 | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 | X 2,411,287 | X 2,413,435 | X 2,416,692 | X 2,416,577 |
| | Y 696,454 | Y 693,468 | Y 691,110 | Y 594,256 | Y 692,370 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | Access Denied | Inaccessible |
| Stream or Spring Discharge (cfs or gpm) | 4.8 cfs | 0.78 cfs | 0.9 cfs | -- | -- |
| Date Measured | 5/15/00 | 5/15/00 | 5/15/00 | 5/15/00 | 5/15/00 |
| pH (Standard Units) | 8.42 | 8.25 | 8.21 | 8.16 | 8.31 |
| Total Acidity (mg/l CaCo3) | 14.00 | 22.00 | 18.00 | 42.00 | 34.00 |
| Total Alkalinity (mg/l CaCo3) | 108.00 | 110.00 | 92.00 | 294.00 | 242.00 |
| Total Iron (mg/l) | 0.157 | <0.05 | <0.05 | <0.05 | <0.05 |
| Total Manganese (mg/l) | <0.008 | <0.008 | 0.009 | <0.008 | <0.008 |
| Total Suspended Solids (mg/l) | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Total Hardness (mg/l CaCo3) | 188.19 | 163.05 | 134.06 | 226.25 | 332.52 |
| Total Sulfates (mg/l) | 90.55 | 116.07 | 80.67 | 125.60 | 141.59 |
| Specific Conductance (at 25° C in µmhos/cm) | 396.00 | 333.00 | 287.00 | 1,090.00 | 987.00 |

| Permittee's Signature | Date |
|---|---|

| | |
|---|---|
| Laboratory Name | Ream & Haager Laboratories, Inc. |
| Analyst's Signature | Date May 23, 2000 |

*Ream & Haager Lab. #'s 293271 thru 293275*
*Hamilton & Assoc.*
*Page 1 of 2*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159

X 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | W-2 | W-7 | U-3 | U-10 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 Y 696,454 | X 2,416,692 Y 694,256 | X 2,417,692 Y 697,385 | X 2,411,287 Y 693,468 | X 2,413,435 Y 691,110 |
| Surface Elevation of Monitoring Site | 898 | 1235 | 1062 | 960 | 942 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | 103' | Unknown | -- | -- |
| Static Water Level of Well Below Land Surface (feet) | -- | Access Denied | 53.3' | -- | -- |
| Stream or Spring Discharge (cfs or gpm) | 8.4 cfs | -- | -- | 2.4 cfs | 6.1 cfs |
| Date Measured | 2/9/00 | 2/9/00 | 2/9/00 | 2/9/00 | 2/9/00 |
| pH (Standard Units) | 7.66 | 7.26 | 7.96 | 7.51 | 7.57 |
| Total Acidity (mg/l CaCo3) | 10.00 | 52.00 | 36.00 | 20.00 | 14.00 |
| Total Alkalinity (mg/l CaCo3) | 94.00 | 274.00 | 254.00 | 92.00 | 84.00 |
| Total Iron (mg/l) | 0.085 | <0.05 | <0.05 | <0.05 | <0.05 |
| Total Manganese (mg/l) | 0.076 | <0.008 | <0.008 | <0.008 | <0.008 |
| Total Suspended Solids (mg/l) | 2.00 | 1.00 | 3.00 | 1.00 | 1.00 |
| Total Hardness (mg/l CaCo3) | 179.16 | 254.25 | 166.98 | 141.72 | 114.46 |
| Total Sulfates (mg/l) | 98.78 | 118.54 | 142.41 | 79.85 | 65.03 |
| Specific Conductance (at 25° C in µmhos/cm) | 301.00 | 1,029.00 | 638.00 | 273.00 | 218.00 |

Resident @ W-3 not home, Could not collect sample

| Permittee's Signature | Date February 25, 2000 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. | |
|---|---|---|
| Analyst's Signature | | Date February 18, 2000 |

*Ream & Haager Lab. #'s 289846 thru 289850*
*Hamilton & Assoc.*
*Page 1 of 1*

04/94

# ADDENDUM TO PART 2, PAGE 18, ITEM E., AMERICAN ENERGY CORP.

## OHIO DEPARTMENT OF NATURAL RESOURCES
## DIVISION OF RECLAMATION

**Quarterly Monitoring Report Sheet**
**(Submit in Quadruplicate)**

Permittee Bennoc, Inc. Permit Number D-1159

____ 1st Qtr., ____ 2nd Qtr., ____ 3rd Qtr., ____ 4th Qtr., (X appropriate blank)

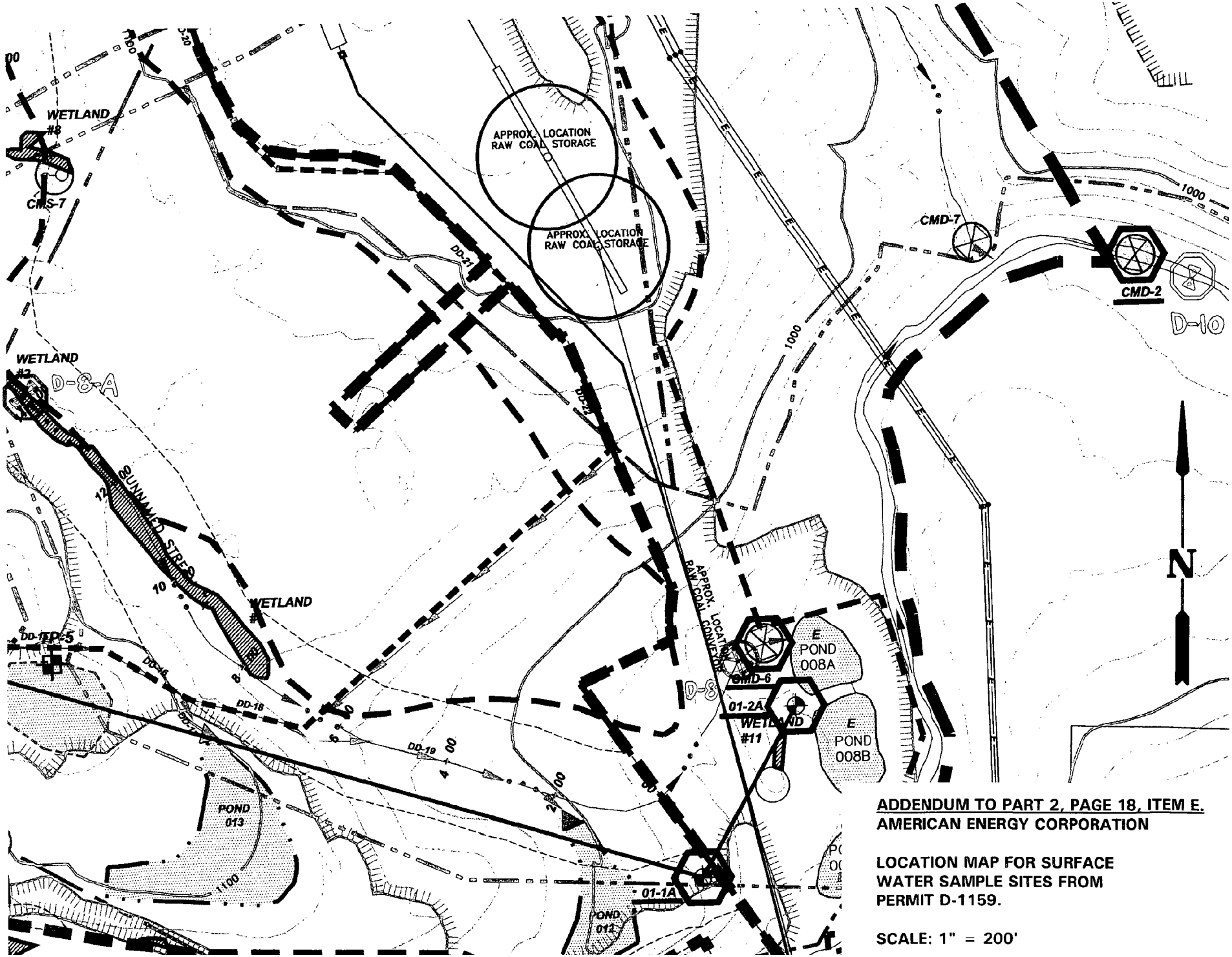
____ Pre-mining, X Mining, ____ Postmining, (X appropriate blank for mine status)

| Monitoring Site ID No. (e.g. S-1, W-3) | D-10 ★ | U-3 | U-10 | W-2 | W-3 |
|---|---|---|---|---|---|
| State Plane X-Y Coordinates | X 2,417,484 | X 2,411,287 | X 2,413,435 | X 2,416,692 | X 2,416,577 |
| | Y 696,454 | Y 693,468 | Y 691,110 | Y 594,256 | Y 692,370 |
| Surface Elevation of Monitoring Site | 898 | 960 | 942 | 1235 | 1260 |
| Indicate Whether Site was Monitored for Quality, Quantity, or Both | BOTH | BOTH | BOTH | BOTH | BOTH |
| Depth of Well Below Land Surface (feet) | -- | -- | -- | 103' | 115' |
| Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | Access Denied | Access Denied |
| Stream or Spring Discharge (cfs or gpm) | 2.6 cfs | 1.9 cfs | 0.54 cfs | -- | -- |
| Date Measured | 12/7/99 | 12/7/99 | 12/7/99 | 12/7/99 | 12/7/99 |
| pH (Standard Units) | 7.75 | 7.49 | 7.46 | 7.44 | 7.59 |
| Total Acidity (mg/l CaCo3) | 12.00 | 8.00 | 10.00 | 28.00 | 28.00 |
| Total Alkalinity (mg/l CaCo3) | 98.00 | 102.00 | 76.00 | 278.00 | 192.00 |
| Total Iron (mg/l) | 0.119 | <0.05 | 0.053 | <0.05 | <0.05 |
| Total Manganese (mg/l) | <0.008 | <0.008 | <0.008 | <0.008 | <0.008 |
| Total Suspended Solids (mg/l) | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 |
| Total Hardness (mg/l CaCo3) | 186.69 | 155.02 | 121.52 | 526.19 | 434.69 |
| Total Sulfates (mg/l) | 78.20 | 74.08 | 46.92 | 147.35 | 91.38 |
| Specific Conductance (at 25° C in µmhos/cm) | 323.00 | 273.00 | 259.00 | 967.00 | 846.00 |

| Permittee's Signature | Date January 4, 2000 |
|---|---|

| Laboratory Name | Ream & Haager Laboratories, Inc. |
|---|---|
| Analyst's Signature | Date December 21, 1999 |

*Ream & Haager Lab. #'s 287902 thru 287906*
*Hamilton & Assoc.*
*Page 1 of 2*




**ADDENDUM TO PART 2, PAGE 18, ITEM E.**
**AMERICAN ENERGY CORPORATION**

**LOCATION MAP FOR SURFACE WATER SAMPLE SITES FROM PERMIT D-1159.**

**SCALE: 1" = 200'**

AEC 11657

D. (6) (b) List the species and amounts per acre of seeds and seedlings to be used.

(c) Describe the methods to be used in planting and seeding.

(d) Describe the mulching techniques.

**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(6b - 7)**

(7) Describe the soil testing plan for evaluation of the results of topsoil handling and reclamation procedures related to revegetation.

**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(6b - 7)**

(8) Submit an addendum describing the measures to be employed to handle and place acid or toxic-forming materials in accordance with paragraph (J) of rule 1501:13-9-04, and paragraph(J) of rule 1501:13-9-14 of the Administrative Code.

**HANDLING AND PLACEMENT OF ACID OR TOXIC FORMING MATERIALS WILL TAKE PLACE WITHIN THE PROPOSED REFUSE DISPOSAL SITE.**

(9) Describe the measures, including appropriate cross-sections and maps, to be used to plug, case or manage mine openings or bore holes other than those entries utilized to gain access to the underground workings, pursuant to rule 1501:13-9-02 of the Administrative Code. **SEE HYDROGEOLOGIC INVESTIGATION, PAGE 19, ITEM 6.1.1.4 FOR CLOSURE OF MONITORING WELLS. ANY EXPLORATION HOLES, BORE HOLES, AND OTHER OPENINGS ENCOUNTERED WILL BE SEALED WITH IMPERIOUS MATERIAL.**

(10) Is the reclamation plan consistent with local physical, environmental, and climatological conditions?
__X__ Yes, _____ No.

(11) Identify any other applicable air and water quality laws and regulations and health and safety standards and describe the steps to be taken to comply with each.

**APPROPRIATE STEPS HAVE BEEN TAKEN TO COMPLY WITH MSHA, CHAPTER 1521 O.R.C., AND STATE AND FEDERAL EPA REGULATIONS. ISSUANCE OF THE MODIFIED N.P.D.E.S. PERMIT IS PENDING. DUE TO A CHANGE IN REVIEWERS, ISSUANCE OF THE 401 CERTIFICATION IS ALSO PENDING. THE P.T.I. FEE HAS BEEN PAID FOR THE PERMIT TO INSTALL PONDS 012, 013, 014, 015, & 016.**

(12) Submit an addendum describing 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 and achieving enhancement of such resources where practical for the permit, shadow, and adjacent areas.
**SEE ADDENDUM TO PART 3, PAGE 25, ITEM D(12)**

ADDENDUM TO PART 3, PAGE 26, ITEM E(1-3)
AMERICAN ENERGY CORPORATION

E(1). Disturbance to the hydrologic balance will be minimized through the use of the following: clay liner, underdrain system to convey groundwater beneath the refuse fill from the project, a three-foot thick minimum clay liner to separate the existing ground surface from the coal refuse, a leachate collection system to isolate and convey leachate to ponds, diversion ditches lined with riprap or grass, and final clay cap, two-feet thick minimum, and cover system.

Temporary erosion and sediment control measures used during construction will include hay bales, silt fence and seeding.

Permanent erosion and control facilities include drainage ditches and sedimentation ponds. These structures will be maintained throughout the life of the facility to insure they function properly.

All drainage from disturbed areas will be controlled and directed to sedimentation ponds at all times during operations. Waters from the site will be treated as required prior to discharge.

E(2). Rights of present groundwater users will be respected and protected by the measures described in Items E 1 and E 3. Should any contamination, diminution, or interruption occur an alternate source will be provided.

E(3). Prior to refuse placement, a three-foot thick re-compacted clay liner will be installed to protect the groundwater. During the operations phase, acid drainage will be avoided by prompt and careful reclamation to minimize oxidation of toxic strata or fill. The active refuse fill surface will be graded to shed storm waters and prevent accumulation. Leachate from the refuse surface and that percolating through the refused fill will be kept isolated from surrounding waters. The leachate will be collected in ditches or trenches and flow by gravity to ponds. These waters will be treated if necessary prior to discharge. Upon completion, the site will be covered with two-feet of re-compacted clay, eighteen inches of inert earthen material and six-inches of soil suitable for vegetation growth. The completed site will be graded for proper surface drainage to inhibit infiltration and therefore the possible formation of acid waters. Elimination of the existing streams, which will be beneath the proposed refuse disposal area, should not greatly impact the hydrologic balance. These streams have been impacted in-part by previous mining activities and refuse placement. Numerous intermittent and perennial streams exist in close proximity to the proposed site which will provide aquatic habitat and wildlife watering sources.

Acid drainage is not expected to be a problem at this site with proper construction and maintenance of the facilities as planned.

E. RECLAMATION PLAN - PROTECTION OF HYDROLOGIC BALANCE-**Permit and Adjacent Area**

Submit an addendum describing the measures to be taken during and after the proposed mining operations to:

(1) Minimize disturbance to the hydrologic balance, including quality and quantity, within the permit and adjacent areas and to prevent material damage outside the permit area;

(2) protect the rights of present users of surface and ground water;

(3) avoid acid or toxic drainage.

**SEE ADDENDUM TO PART 3, PAGE 26, E(1-3)**

F. GROUND WATER AND SURFACE WATER MONITORING PLAN-**Permit and Shadow Area**

Based upon the probable hydrologic consequences determination and analysis of all baseline hydrologic, geologic, and other information submitted in this application, address the following items in accordance with paragraph (F) of rule 1501:13-4-14 and paragraph (N) of rule 1501:13-9-04 of the Administrative Code.

(1) In addition to the quality and quantity parameters required for quarterly monitoring and NPDES monitoring, will any other parameters be monitored?
_____ Yes, __X__ No. If "yes," indicate the parameter(s) and the site(s) where such monitoring will occur.

(2) Do you propose or anticipate the need for a variation in the required monitoring frequency for ground and surface water sites and monthly monitoring for NPDES?
_____ Yes, __X__ No. If "yes," describe the variation in frequency and the monitoring sites to be affected.

(3) 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.

**Ground and surface water will be monitored prior to refuse disposal. Quality and quantity information will be obtained from CMU-1, CMD-1, CMU-2A, CMD-2, CMD-2A, CMU-2, and CMD-6, and monitoring wells CG-01-3B, CG-01-5B, CG-01-6B, CG-01-5A, CG-01-1A, CG-01-2A, CG-01-4C, and CG-01-6C for the life of the operation, and reported quarterly to the Division of Mineral Resources Management. Surface water will be monitored in accordance with NPDES requirements. The ponds will be monitored daily for flow, all of factors, once every two weeks. Analytical results and flow data will be reported monthly to the EPA. The Ohio EPA will receive the white copy, all other copies will be sent to ODNR, Division of Mineral Resources Management, appropriate district office. Quarterly monitoring reports will be submitted for approved monitoring sites (copy attached) to the Division of Mineral Resources Management, appropriate district office. Ohio EPA reports will be submitted for monthly pond monitoring (copy attached) to the Division of Mineral Resources Management, appropriate district office.**

**Also see Hydrogeologic Investigation Report, Section 6.0, for detailed monitoring plan.**

## 2.0 SITE BACKGROUND

### 2.1 Location

The Century mine is located approximately four miles northeast of Beallsville, between State Routes 145 and 148, in south-central Belmont County (Plate 1). The proposed refuse disposal site is a valley-fill type structure located on Company owned property, in an unnamed tributary of Piney Creek, adjacent to the north of the mine plant and offices. The projected area of the refuse fill site is approximately **154.4** acres. The ultimate height is approximately **324** feet, as measured from the toe of the existing refuse fill, elevation **965** feet, to the maximum crest elevation of **1,288.6** mean sea level. The maximum fill thickness within the proposed refuse disposal area is about **220** feet (**1,260** feet - **1040** feet), occurring in the middle of the structure.

### 2.2 History of Operation

The Century mine produces coal from the Pittsburgh (No. 8) coalbed by the underground mining method. The mine was originally opened as the Allison mine, by the Y & O Coal Company, in the early 1970's. The mine operated continuously till the early 1980's when it closed and abandoned due to poor market conditions for high sulfur coal. In the early 1990's, the mine, related facilities, and coal reserves were acquired by The American Energy Corporation.

In the interim, the surface and coal reserves in the Washington (No. 12) coalbed have been leased to Bennoc, Inc., for surface mining. The proposed refuse site is currently permitted for surface mining by Bennoc under ODNR permit D-1159 (Plate 1). Bennoc is actively mining east of the projected refuse area. To date, there has been no surface mining in the projected refuse area.

The Allison mine operated for approximately ten years. Raw coal from the mine was cleaned in the preparation plant, with the reject placed in the ODNR and MSHA permitted valley-fill disposal area, adjacent west of the plant. The projected Century mine coal refuse site is an expansion of this same valley-fill disposal site utilized by the Allison mine.

The Century mine is tentatively expected to generate **2.45** million tons of coarse coal refuse annually. Refuse densities will range from 100 to 120 pounds per cubic foot. The final site design has not been completed as of this writing therefore the ultimate storage capacity has not yet been determined. The anticipated operating life of the site is expected to be approximately ten years.



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### 3.3 Monitor Well Development and Field Permeability Tests

After a minimum of twenty-four hours following well installation the wells were surged and bailed several times to remove sediment and restore the natural hydraulic conductivity of the formation.

Field permeability (slug) tests were performed after development of each well by Mr. Paul Painter, geologist, DLZ-Ohio, Inc. Field data and calculated permeability from the slug tests are in Appendix 4. Calculated permeabilities are summarized in Table 3, Appendix 1. Permeabilities ranged from 1.06 E-04 cm/sec in well CG-01-4C to 2.70 E-09 cm/sec in well CG-01-3A. The deep wells in the "A" horizon, under the ridges at sites 3, 4 and 5, all had very low permeabilities in the E-09 range. These low permeabilities suggest groundwater in the study area occurs as zones of saturation and not aquifers. Well yield is expected to range from 0.10 to 3 gallons per minute. These yields are too low for the internal needs of Century for any purpose.

### 3.4 Survey

Each well location was surveyed by Mr. Steve Hill, P.S., a professional surveyor licensed in the State of Ohio, of St. Clairsville, Ohio. Each well was surveyed horizontally and vertically to the nearest hundredth of a foot. Survey data is summarized in Table 1, Appendix 1.

### 3.5 Water Level Measurements

Static water level measurements to the nearest hundredth of a foot were made in each well when the level had stabilized following development. Water level elevation data for the wells installed during this investigation are summarized in Table 4, Appendix 1.

## 4.0 WELL AND SPRING INVENTORY SURVEY

Developed wells and springs within 2,000 feet of the project permit area were inventoried by Quality Environmental Services, Inc. and mapped by Jack A. Hamilton and Associates (Plate 9). The field survey shows eight undeveloped springs are present within the proposed fill area (CMU 6, 6A, 6B, 6C, and **CMS 7, 8, 9 and 10**). The down-stream sampling point for the project is CMD 6. The upstream/downstream sampling points for Piney Creek are CMU 2A and CMD-2; and for Captina Creek CMU-1 and CMD-1. Results of initial ODNR required sampling of springs and related downstream sampling points (ODNR Attachment 14A) are contained in Appendix 6.

Quality Environmental Services has been sampling springs and streams locally for various mining operations since 1990. According to Fred Blackman, President, spring flow is seasonal. During the months of August through October approximately 15



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percent of springs are dry and cannot be sampled. Similar observations have been made by the author since 1997, where intermittent streams are typically dry from mid-July to November, except during periods of rainfall.

## 5.0 SUMMARY AND CONCLUSIONS

### 5.1 Site Geology

Site geology has been interpreted on the basis of observations of soil and core samples obtained during this investigation. The structural contour map of the Pittsburgh (No. 8) coalbed (Plate 3, Appendix 8) was used as datum to correlate overlying stratigraphy.

Surface elevations range from approximately 930 feet, mean sea level, in Piney Creek to 1,235 feet on the northwest knob within the catchment area. Average elevation of the Pittsburgh Coalbed here is 800 feet. Rocks outcropping in the study area therefore occupy an interval from 165 to 585 feet overlying the Pittsburgh coalbed. Referring to Plate 2, Generalized Stratigraphic Column, Belmont County, Ohio, these stratigraphic units range, in ascending order from shales and claystones overlying the Gilboy sandstone of the Monongahela Formation, to shales and claystones overlying the Lower Marietta sandstone of the Dunkard Group. Within this interval are alternating sequences of limestone, shale, claystone, sandstone and coal. Principal coalbeds include the Waynesburg (No. 11), Waynesburg "A", and Washington (No. 12). The ridge tops are typically covered with 5 to 10 feet of red clay.

Interpreted geologic relationships are shown on cross-section A-A', Plate 8. The cross-section location is shown on Plate 5.

There is little structure present at the site. Stratigraphic units dip gently to the southeast at 18 feet per mile.

**An existing reclaimed refuse disposal area is present at this site. A portion of the existing disposal area underlies the proposed disposal area. The existing refuse disposal currently exist between approximate elevations of 1093 to 944. Test drilling within the existing refuse disposal area was conducted by D'Appolonia in 1981 which characterized the refuse, as well as conditions in and beneath the refuse. Results of this test drilling are detailed in the D'Appolonia drawings as follows;**

**Dwg. No. 81-250-E1, sheet 2 of 21, Figure 3 = Existing Conditions**
**Dwg. No. 81-250-E10, Sheet 13 of 21, Figure 4 = Boring Logs**
**Dwg. No. 81-250-E11, Sheet 14 of 21, Figure 5 = Boring Logs**
**Dwg. No. 81-250-E12, Sheet 15 of 21, Figure 6 = Test Pits**
**Dwg. No. 81-250-E13, Sheet 16 of 21, Figure 7 = Test Pits**
**Dwg. No. 81-250-E2, Sheet 17 of 21, Figure 9 = Laboratory Data**
**Dwg. No. 81-250-E7, Sheet 18 of 21, Figure 8 = Piezometers**

**Results of D'Appolonia's testing is summarized in Section 5.1 of the Engineers Report.**



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## 5.2 Site Hydrogeology

Site hydrogeology is interpreted on the basis of:

1. Soil surveys,
2. Rock core characteristics,
3. Structural orientation of local rock strata,
4. Results of field permeability tests including gross water quality measurements,
5. Measured water levels.
6. Field survey of wells and springs

In the study area soft rocks form approximately 60 to 80 percent of the outcropping strata. Soft rocks are shale, claystone, sandy shale and limey shale. This high percentage of soft rock is significant as these units have limited primary permeability, deform in a plastic manner, and tend to self-heal after fracturing. Aquifers in these units have low yields. This was confirmed by field permeability tests conducted on the ten monitor wells installed for this project. Results of this testing show calculated permeabilities of the measured water bearing zones to range from E-04 to E-09 cm/sec (Table 3).

In addition, the geologic record of rocks indicates horizontal and vertical variability of the rock units. With the exception of major coalbeds and limestones, few lithologies are laterally persistent. These horizontal facies changes with their corresponding changes in hydrologic properties tend to produce localized subsurface flow systems.

Precipitation is the source of all ground and surface water here. Water reaching the land surface that is not part of direct runoff or evapotranspiration infiltrates into the subsurface. This becomes part of the groundwater flow system or soil moisture. Shallow subsurface water is important to soil moisture and plant growth. In the study area no shallow unconsolidated aquifers have been identified.

Groundwater in the bedrock system occurs in primary and secondary openings. Primary openings are pore spaces between sand, silt and clay grains formed at the time of deposition. Primary permeability is the ability of water to move between pore spaces. Primary permeability here is very low and limited groundwater movement occurs as a result of primary openings.

Secondary porosity and permeability results from fractures or rock partings. Most usable groundwater in the study area occurs in secondary openings. These fractures are not interconnected over large areas, as a result it is difficult to identify aquifers over large areas. Groundwater flow systems here tend to be made up of small, localized fracture controlled entities. Fractures in hard rock (limestone and sandstone) tend to stay open better than soft rock. Locally, the horizontal and vertical variability of these hard rock units tend to produce hydraulically isolated areas. Fractures at depth, greater than 100 feet, tend to close due to lithostatic pressure, thereby limiting



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the effective depth groundwater flow systems. This is evident from observations made locally of underground mines in the Pittsburgh (No. 8) coalbed. These mines are relatively dry throughout where overburden thicknesses range from 200 to 550 feet.

In this study perched groundwater or saturation zones above the valley bottom were identified primarily in the Washington (No.12) coalbed, and to a lesser extent in the shales and claystones overlying the Lower Marietta sandstone. The first project-wide aquifer identified was below drainage in the zone that including the Morningview sandstone, Arnoldsburg limestone and Gilboy sandstone.

Well sites 1 and 2 are located at the lowest topographic point of the project, southeast and down-gradient of the existing refuse site. The water level in well CG-01-1A was 46 feet below the surface at an elevation of 928 feet, mean sea level (msl). This is approximately the level of Piney Creek. The water level in well CG-01-2A was 13 feet below the surface at an elevation of 927 feet, mean sea level (msl), which is also at the approximately level of Piney Creek.

The preliminary results of this investigation were reviewed in the field with Mr. Michael Dillman, Scott Steitler and Kevin Ricks of ODNR on April 10.

**5.2.1 Significant Zone of Saturation**

Wells CG-01-3B, 4B, 5B and 6B identified the Washington (No. 12) coalbed as the first zone of saturation, at elevations ranging from 1078 to 1096 feet msl. Contours of the piezometric surface are shown on Plate 6. Groundwater flow direction is south-southeast at a gradient of 1 foot per 85 feet.

CG-01-04B is designated up-gradient well. The down-gradient wells are CG-01-3B, 5B and 6B.

**5.2.2 Continuous Zone of Saturation**

The "A" horizon wells at locations 1, 2, 3, 4, and 5 established the first continuous significant zone of saturation project-wide. CG-01-4A, located on the northwest ridge was developed in the Morningview sandstone and Arnoldsburg limestone at a depth of 259 feet. The static water level was 1009 feet, msl on April 16. Based on its position, this is the designated up-gradient well for the first continuous zone of saturation.

Other monitoring wells developed in the Morningview sandstone-Arnoldsburg limestone interval, down-gradient of the project are CG-01-3A and 5A at elevations of 953 and 957 feet, respectively. Wells 1A and 2A are located in the Gilboy sandstone, down-gradient in the project. The designated down-gradient wells to be sampled are 1A, 2A and 5A.

The piezometric surface is presented on Plate 7. Flow direction is southeasterly at a gradient of 10 feet per 400 feet.

Saturation zones of the study area are summarized graphically on cross-section A-A' in Plate 8. Based on geology, hydrogeologic setting, and testing, the results of this study indicate local groundwater occurrence and flow is low and seasonal.



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## 5.3 Probable Hydrologic Consequences

The proposed facility has the potential to produce acid drainage as well as high concentrations of suspended and dissolved solids, and metals such as iron and manganese. The construction, operation, maintenance, water monitoring and reclamation proposed are designed to mitigate or eliminate these effects. Consequently, there are no significant adverse impacts on the surface water, groundwater regime or hydrologic balance either on or off the site.

### 5.3.1 Surface Water

5.3.1.1 Surface Water Quantity

The proposed operation is expected to reduce base flows and peak flows in the downstream section of Piney Creek, due to the retention characteristics of the proposed sediment and quality control ponds. Runoff from the project or disturbed areas, which presently contributes to stream flow will be directed to sediment ponds. **All sediment ponds will discharge to Piney Creek which will maintain base flow.** Piney Creek has no downstream users. Piney Creek discharges into Captina Creek. Since the project drainage area represents a small percentage of the Captina Creek drainage basin, there should not be any recognizable difference in quantity flow in Captina Creek. It is predicted that the proposed operation will not result in any significant adverse impacts on surface water quantity in the area.

5.3.1.2 Surface Water Quality

The proposed operation could have both short-term and long-term impacts on the surface water quality in the receiving stream, especially during the early stages of construction. For instance, sediment loads to the drainage system will be increased. These impacts will be mitigated through proper execution of construction, operations, maintenance, water monitoring and reclamation. The quantity of sediment reaching surface waters should be minimized by directing all runoff through the proposed sedimentation pond and other erosion control facilities.

Diversion ditches will be installed to direct runoff away from the coarse coal refuse area. Runoff entering the refuse pile and leachate, if any, collected by the underdrain system may be high in iron and low in pH. This drainage will be directed to the sediment pond for treatment, if necessary, flow to the polishing pond, checked for quality, if the water meets permit compliance standards it will then be released to the receiving stream.

Long-term impacts are mitigated through implementation of the reclamation plan. The refuse surface will be graded, capped with two-feet of clay, compacted to achieve a permeability of less than E-07 , covered with up to an additional two-feet of earthen material and seeded. This cap and cover system is designed to minimize or eliminate



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the formation of leachate. The surface will be graded to promote immediate drainage. Water will not pond or accumulate on the reclaimed surface. Further, the clay cap will minimize infiltration and prevent oxidation of the coal refuse.

### 5.3.2 Groundwater

5.3.2.1 Groundwater Quantity

The proposed operation may locally reduce the groundwater recharge capabilities due to the following factors. First, the valley is to be filled with coal refuse, which is largely composed of claystone that becomes relatively impervious when compacted. Second, upon completion, approximately **112.2** acres will be capped with two-feet of impervious clay. Third, underdrains will be installed to intercept the majority of seepage through the fill area.

There are no down-gradient groundwater users in the immediate area. Since the affected area is small, there should be no short-term or long-term adverse impacts on regional groundwater availability.

5.3.2.2 Groundwater Quality

Based on the refuse characteristics, there is the potential that the proposed operation could produce high iron, acidic drainage. The impact is mitigated or eliminated through proper construction, engineering, maintenance, water monitoring and final reclamation. The proposed facility incorporates the following preventative measures. First, a groundwater underdrain system will be installed to collect, and convey down-gradient all seepage beneath the structure. Second, an impervious clay liner will be installed to separate the groundwater underdrain system from the coal refuse. The liner will be three-feet thick minimum, and compacted to permeability less than E-07. Along the valley bottom, the liner will be graded to slope 1% eastward and down the valley at existing grades to allow for leachate collection. Third, a leachate collection drain will be installed over the liner to convey leachate, if any, to the toe of the structure where it will drain to a clay lined pond for possible treatment. Fourth, coal refuse will be compacted to reduce oxidation of the acid producing constituents, mainly pyritic sulphur, and seepage through the refuse material. Fifth, an impervious clay cap will be installed, as cited in Section 5.3.1.2, to prevent surface water from migrating into and through the refuse fill, thereby eliminating or reducing the chance for leachate generation.

Through proper construction of the control features cited above, the proposed facility is not expected to have significant short-term or long-term adverse affects on groundwater quality in the area.



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6.1.1.3 Surveying

All monitoring wells were surveyed upon installation by a surveyor, licensed in the State of Ohio, to insure consistent groundwater data. The top of the PVC casing are surveyed and tied into a site datum. Elevation of the site datum is referenced to mean sea level. Elevations are recorded in 0.01 feet. The PVC is marked where all taped readings are to be obtained.

6.1.1.4 Well Closure

Wells will be decommissioned in accordance with OAC 3745-09-10, by removing the protective steel casing, the PVC casing and grouting the remaining PVC casing from the bottom with a cement/bentonite grout mixture. All monitoring wells will be closed in this manner following completion of the post closure monitoring period. The criteria for determining when these wells may be closed is described in Section 6.4, Post-Closure Maintenance.

## 6.2 Effluent Monitoring Plan

The purpose of the Effluent Monitoring Plan is to reduce the potential for chemical degradation of off-site surface water as a direct result of effluent discharge from the coarse coal refuse disposal facility. All storm water from beyond the perimeter of the facility is directed away from the facility by perimeter diversion ditches. This water will not be monitored. All precipitation falling within the affected area of this facility will drain to proposed sediment ponds. Similarly, leachate from the leachate collection system will flow to the sediment ponds for treatment, if necessary, then flow to a polishing pond before discharge to Piney Creek. The effluent discharge point will be at a pond located downstream of the proposed refuse structure.

The proposed plan includes monitoring the water retained by the polishing pond as follows: daily for flow, **weekly for pH**, and every two weeks when flowing for total suspended solids, iron and manganese.

## 6.3 Sampling and Analysis Plan

The following narrative describes Century's proposed Sampling and Analysis Plan for groundwater and effluent water associated with the operational and post-closure periods of the coarse coal refuse disposal facility. The plan was prepared to meet the requirements of Ohio EPA Policy 2.05, which references effluent limitations specified in the Federal Register, under 40 CFR 434, and Ohio EPA Policy GD 0303.010 for groundwater monitoring.

The proposed frequency for groundwater sampling is set forth in Section 6.3.3.2. beginning with the first sampling event occurring within 30 days of well installation,



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the samples to the laboratory on the same day as collected, or transferred to an overnight carrier that will deliver the samples to the laboratory on the next business morning.

### 6.3.2 Procedure for Sampling Effluent Water

The effluent sampling frequency is established by the NPDES permit. Flow is sampled daily. **pH is sampled weekly, and** iron, total suspended solids (TSS), and manganese are sampled every two weeks, when there is flow. Testing for pH, iron and manganese will be performed in the field, the TSS sample will be submitted to the lab for each monitoring event.

The same precautions required in the groundwater sampling procedure will apply to all effluent water samples collected. The effluent water sample will be collected from the proposed polishing pond, at a point where it is allowed to discharge to the Piney Creek outfall. Sample containers will be filled from a cleaned beaker that is used to collect water directly from the pond. The attached log sheet is to be used to record all field activities associated with collection of the surface water sample.

Equipment cleaning, record keeping, field measurements, and sample shipping and custody will be as described in Section 6.3.1, "Procedure for Groundwater Sampling".

The effluent sampling event that coincides with the annual groundwater sampling event will be submitted for review. Flow rate, pH, and TSS data as measured during discharge will be incorporated into annual reports. Copies of all field log sheets, chain of custody, sampling and analysis results, and previous reports will be filed on site.

### 6.3.3 Sample Containers and Sample Analysis

6.3.3.1 Sample Containers

Sample containers for all groundwater and effluent water samples will be provided by the laboratory. All containers will be compatible with intended analysis and preservatives used, if any. A list of container types, preservative quantity and type, minimum container size, and holding times are summarized as follows:



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**SAMPLING AND PRESERVATION PROCEDURES FOR DETECTION MONITORING**

| Parameter | Recommended Container | Preservative | Maximum Holding Time | Minimum Volume Required |
|---|---|---|---|---|
| pH | Plastic or glass | Field Determined | None | 25 ml |
| Temperature | Plastic or glass | Field Determined | None | 100 ml |
| Total Mercury | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Iron | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Manganese | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Dissolved Solids | Plastic or glass | Cool, 4 deg. C | 2 days | 100 ml |
| Sulfate | Plastic or glass | Cool, 4 deg. C | 28 days | 100 ml |
| Total Lead | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Selenium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Alkalinity | Plastic or glass | HN03 to pH<2 | 14 days | 50 ml |
| Total Magnesium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Barium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Calcium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Chloride | Plastic or glass | None Required | 28 days | 50 ml |
| Total Sodium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Zinc | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Arsenic | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Aluminum | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Cadmium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Total Chromium | Plastic or glass | HN03 to pH<2 | 6 months | 100 ml |
| Specific Conductivity | Plastic or glass | HN03 to pH<2 | 28 days | 25 ml |

6.3.3.2 Analysis of Groundwater and Effluent Water Samples

Groundwater and effluent samples from the coarse coal refuse disposal facility will be analyzed in the field or laboratory, as appropriate. When the facility is discharging to Perkins Run Stream, the effluent will be analyzed for the following parameters:

Flow - daily
pH – **once weekly**
Total Suspended Solids - once every two weeks, when flowing
Total Iron - once every two weeks, when flowing
Total Manganese - once every two weeks, when flowing

Groundwater will be analyzed four times per year, in the initial year, to establish background concentrations for the following parameters:

| | |
|---|---|
| * Specific Conductivity | Barium |
| * pH | Calcium |
| Total Dissolved Solids (TDS) | Chloride |
| * Sulfate | Cadmium |
| * Alkalinity | Chromium |
| * Iron | Lead |
| Magnesium | * Manganese |
| Selenium | Sodium |
| Aluminum | Mercury |
| Arsenic | Zinc |

**Groundwater will be analyzed quarterly for the life of the permit for the above parameters marked with an asterisk, as well as Acidity, T.S.S., and Hardness.**



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After the initial sampling year, samples collected to establish ground water quality will be obtained and analyzed at least annually for the following parameters:

| | |
|---|---|
| pH | Chloride |
| Iron | Cadmium |
| Magnesium | Chromium |
| Selenium | Lead |
| Barium | Manganese |
| Calcium | Sodium |
| Aluminum | Mercury |
| Arsenic | Zinc |

After the initial sampling year, samples collected to indicate ground water contamination (indicator parameters) will be obtained and analyzed at least semi-annually for the following parameters:

| | |
|---|---|
| Specific Conductivity | Sulfate |
| Total Dissolved Solids | Alkalinity |
| pH | |

6.3.3.3 Sample Labels

Waterproof sample labels will be provided by the laboratory and shall contain sample identification, type, date, internal laboratory identification (if any), and any special instructions.

### 6.3.4 Reporting

Results of all analyses performed on groundwater samples will be submitted to the Ohio EPA **and ODNR, Division of Mineral Resources Management, appropriate District office.** Analytical results will be presented in tabular form that will include the results, method detection limit, and any applicable limits of allowable concentration for a given parameter.

All ground water and statistical analysis/data analysis results generated in accordance with sections 4, 5, 6, 7, 8, and 9 of Attachment D, OEPA Policy GD0303.010 will be submitted to the Ohio EPA, Southeast District Office (SEDO), within 75 days after sampling the wells. All ground water data, with accompanying text, will be submitted to the Ohio EPA, SEDO, Division of Surface Water, **and ODNR, Division of Mineral Resources Management, appropriate District office,** within 75 days after sampling the wells.

The minimum frequency of sampling used to establish background and down-gradient (after initial year) ground water quality for parameters used to indicate ground water contamination will be consistent with the statistical procedure utilized pursuant to Attachment E, OEPA Policy GD0303.010. The minimum frequency of sampling will be as often as necessary to ensure, with reasonable confidence, that a contaminant release to the ground water from the facility will be detected.



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A determination will be made whether or not there is a significant increase over background values for indicator parameters (specific conductivity, total dissolved solids, sulfate, alkalinity) using an approved statistical/data evaluation method chosen from Attachment E, OEPA Policy GD0303.010. Determinations will be made semi-annually. The ground water quality of each indicator parameter at each down-gradient well will be compared to the background value of that indicator parameter according to approved evaluation procedures specified in Attachment E.

If at any monitoring well there has been a statistically significant increase (or decrease in the case of pH) from the background values according to the statistical method specified pursuant to Attachment E, for the indicator parameters listed in Section 6.3.3.2, the Director shall be notified not later than 15 days after receiving the statistical results which indicate a statistically significant change. This notification will also indicate which parameters have shown a statistically significant change from background levels.

Where appropriate, The Century mine may demonstrate that a source other than the regulated unit causes the contamination or that the statistically significant increase resulted from an error in sampling, analysis, statistical evaluation or natural variation in ground water quality. A report documenting this demonstration requires approval by Ohio EPA, SEDO, Division of Drinking and Groundwater through the Division of Surface Water. If a successful demonstration is made and documented, **American Energy Corporation** may continue detection monitoring as earlier specified.

### 6.3.5 Groundwater Quality Assessment

The proposed sampling plan will be initiated before the placement of any coal refuse. The data generated from this first sampling event, along with groundwater quality data presented in the hydrogeological investigation section of this document, will be considered to be representative of existing conditions and will represent a baseline evaluation of the parameters being tested. Most of the parameters being tested may be naturally occurring, or be present due to a pre-existing environmental condition. This baseline data will be tabulated and submitted.

Within 90 days of obtaining the final sample which completes the initial year of ground water monitoring, Century will specify a statistical procedure to be used in analyzing ground water quality data. The statistical method chosen will be conducted separately for each of the appropriate indicator parameters specified in Section 6.3.3.2. of this Report. The method chosen will be protective of human health and the environment and will comply with the standards outlined in OEPA Policy GW0303.010, Attachment E, Section 2. The method selected will be taken from those listed in Attachment E, Section 1 of Policy Gw0303.010.



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## 6.4 Post-Closure Maintenance Plan

The coarse coal refuse disposal facility is being designed to accommodate coarse coal refuse disposal through the year 2010, and possibly longer. The Century mine proposes to terminate all monitoring of this facility after the final cap is constructed, and final bond is release by the Ohio Department of Natural Resources for Permit D-0425-2, the permit assigned to this project. Length of monitoring following closure will be determined at the time of cap construction. The monitoring wells will be maintained until deemed necessary by the Ohio EPA **and the Division of Mineral Resources Management** to evaluate the impact of the coarse coal refuse disposal facility on groundwater. The period between the placement of the final cap and termination of monitoring the facility is termed the Post-Closure Maintenance Period. Post-Closure Maintenance, and the work to be performed during this period is described in the following sections.

### 6.4.1 Visual Inspection

The Century mine will complete a visual inspection of the disposal facility on a semi-annual basis for two years after completion of the clay cap or until final bond release by ODNR for this permit. If there is evidence of undue subsidence or erosion of the cover, appropriate maintenance will be undertaken. The physical condition of the leachate collection system, ponds, and monitoring wells will also be documented. If leachate is observed exiting the site, or if undue accumulation is noted in the collection system, remedial activity will be initiated to correct the problem. Documentation of these inspections will be submitted to the Ohio EPA.

### 6.4.2 Groundwater Sampling

As described in Section 6.1, "Groundwater Monitoring Plan", the monitoring wells will be sampled four times per year **for the life of the permit.** Two complete groundwater sampling rounds will be performed following the placement of the final clay cap. **Quarterly Monitoring Reports will be submitted to ODNR, Division of Mineral Resources Management, appropriate District office.** The final two monitoring reports will be submitted to the Ohio EPA as described in the plan.

### 6.4.3 Effluent Sampling

Although the effluent from the facility should decrease significantly after completion of coal refuse disposal and the clay cap, some leachate may still be generated and storm water will continue to collect in the ponds. Effluent sampling will continue throughout the post-closure maintenance period (until final bond release). Effluent sampling will be performed as described in Section 6.3.3.2.



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### 6.4.4 Closure

After the post-closure maintenance period is completed, if no groundwater degradation as evidenced by the sampling and analysis has resulted, and no leachate migration is observed, then the disposal facility will be permanently closed. Closure will consist of pressure grouting all groundwater monitoring wells per OAC Rule 3745-09-10, and re-grading the facility to eliminate the ponds. A final closure report describing the closure of these activities will be submitted to the Ohio EPA.



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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-07-414 | 01-07-415 | 01-07-416 | 01-07-417 | 01-07-418 | 01-07-419 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .69 GPM | .23 GPM | 1.6 GPM | .72 GPM | 1.7 GPM | .35 GPM |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.86 | 8.06 | 7.58 | 7.57 | 7.98 | 6.60 |
| 11 | Total Acidity (mg/l CaCO3) | 6.80 | 7.80 | 6.20 | 16.20 | 10.20 | 55.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | 149.00 | 254.00 | 106.40 | 261.40 | 290.80 | 191.60 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 772.00 | 633.00 | 245.00 | 585.00 | 951.00 | 1470.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.24 | 0.06 | 0.13 | 0.04 | 0.03 | 8.20 |
| 16 | Total Sulfates (mg/l) | 235.00 | 57.00 | <10.00 | 29.00 | 201.00 | 548.00 |
| 17 | Total Iron (mg/l) | 0.15 | 0.21 | 0.20 | 0.08 | 0.11 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 17 | 58 | 53 | 34 | 26 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 396.00 | 320.00 | 116.00 | 300.00 | 400.00 | 800.00 |
| 20 | Nitrates | | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | 01-07-498 | 01-07-499 | 01-07-500 | 01-07-501 | 01-07-502 | 01-07-503 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | .19 GPM | .22 GPM | .29 GPM | .38 GPM | .19 GPM | .34 GPM |
| 8 | Date Above Measurements Made | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | 3.20 | 7.98 | 7.54 | 7.98 | 8.23 | 8.09 |
| 11 | Total Acidity (mg/l CaCO3) | 112.00 | 5.80 | 7.40 | 4.20 | 3.40 | 6.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 0.00 | 220.80 | 112.00 | 123.00 | 224.00 | 207.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1559.00 | 1215.00 | 279.00 | 292.00 | 527.00 | 667.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 10.60 | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 |
| 16 | Total Sulfates (mg/l) | 660.00 | 51.00 | 17.00 | 18.00 | 42.00 | 94.00 |
| 17 | Total Iron (mg/l) | 12.40 | 0.10 | 0.24 | <0.04 | 0.05 | 0.04 |
| 18 | Total Suspended Solids (mg/l) | 22 | 10 | 11 | 4 | 3 | 3 |
| 19 | Total Hardness (mg/l as CaCO3) | 660.00 | 228.00 | 124.00 | 136.00 | 276.00 | 320.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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NOTE: For each sample provide data for either item 13 or 14.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-13 | CMDS-1 | CMW-2 | CMW-2 | CMW-2 | CMD-1 |
| 2 | Identification Number | 01-07-504 | 01-07-413 | 00-03268 | 01-07-373 | -- | 01-07-371 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | H | I | L | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1060 | 1080 | 1190 | 1190 | 1190 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | 21' | 21' | 21' | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | 12' | 16' | DRY | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | .13 GPM | 1.8 GPM | -- | -- | -- | 28.6 CFS |
| 8 | Date Above Measurements Made | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | 10-19-01 | 7-6-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | B | C | C | C | -- |
| 10 | pH (Standard Units) | 8.25 | 8.26 | 6.70 | 7.33 | | 8.33 |
| 11 | Total Acidity (mg/l CaCO3) | 2.20 | 5.00 | 7.10 | 5.00 | | 0.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 227.00 | 212.60 | 22.0 | 57.80 | | 132.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 653.00 | 459.00 | 160.00 | 137.00 | | 426.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | | --- |
| 15 | Total Manganese (mg/l) | 0.02 | 0.10 | <0.02 | <0.02 | | <0.02 |
| 16 | Total Sulfates (mg/l) | 106.00 | 20.00 | 42.00 | <10.00 | | 48.00 |
| 17 | Total Iron (mg/l) | 0.41 | 0.10 | 0.23 | 0.42 | | 0.09 |
| 18 | Total Suspended Solids (mg/l) | 4 | 60 | <1 | 9 | | 7 |
| 19 | Total Hardness (mg/l as CaCO3) | 324.00 | 228.00 | 60.00 | 64.00 | | 188.00 |
| 20 | Nitrates | --- | --- | 0.09 | --- | | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | | 7-6-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-5-01 | 3-14-99 | 7-5-01 | 10-16-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
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NOTE: For each sample provide data for either item 13 or 14.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-10-705 | | 01-10-709 | | 01-10-713 | 01-10-696 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .02 GPM | DRY | .09 GPM | DRY | .75 GPM | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.37 | | 7.80 | | 7.14 | 7.33 |
| 11 | Total Acidity (mg/l CaCO3) | 10.80 | | 13.60 | | 14.00 | 40.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 18.60 | | 207.80 | | 273.80 | 356.20 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1259 | | 450.00 | | 945.00 | 1320.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | | --- | | --- | --- |
| 15 | Total Manganese (mg/l) | 2.66 | | 0.02 | | <0.02 | 0.09 |
| 16 | Total Sulfates (mg/l) | 526.00 | | 17.00 | | 188.00 | 261.00 |
| 17 | Total Iron (mg/l) | 0.65 | | 0.11 | | <0.04 | 0.44 |
| 18 | Total Suspended Solids (mg/l) | 60 | | 92 | | 3 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 640.00 | | 220.00 | | 400.00 | 440.00 |
| 20 | Nitrates | --- | | --- | | --- | --- |
| 21 | Date Sampled for Analysis | 10-19-01 | | 10-19-01 | | 10-19-01 | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | | 01-10-697 | | | | 01-10-722 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | DRY | .05 GPM | DRY | DRY | DRY | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | | 7.53 | | | | 8.12 |
| 11 | Total Acidity (mg/l CaCO3) | | 8.40 | | | | 13.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | | 57.20 | | | | 240.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | | 1176 | | | | 756 |
| 14 | Total Dissolved Solids (mg/l) | | --- | | | | --- |
| 15 | Total Manganese (mg/l) | | 2.16 | | | | <0.02 |
| 16 | Total Sulfates (mg/l) | | 529.0 | | | | 122.00 |
| 17 | Total Iron (mg/l) | | 0.05 | | | | 0.33 |
| 18 | Total Suspended Solids (mg/l) | | <2.0 | | | | 4 |
| 19 | Total Hardness (mg/l as CaCO3) | | 560 | | | | 370.00 |
| 20 | Nitrates | | --- | | | | --- |
| 21 | Date Sampled for Analysis | | 10-19-01 | | | | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
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State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-5 | CMS-6 | CMS-8 |
| 2 | Identification Number | 02-02-833 | 02-02-846 | 02-02-837 | 02-02-838 | 02-02-852 | 02-02-841 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1096 | 1130 |
| 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) | 1.1 GPM | 9.1 GPM | 1.9 GPM | 3 GPM | .37 GPM | .63 GPM |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | C |
| 10 | pH (Standard Units) | 7.84 | 7.97 | 7.59 | 8.26 | 6.77 | 7.87 |
| 11 | Total Acidity (mg/l CaCO3) | 6.20 | 1.80 | 4.60 | 1.20 | 64.00 | 5.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 116.00 | 108.20 | 97.20 | 312.80 | 201.80 | 176.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 837 | 341 | 278 | 1042 | 1592 | 453 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.51 | 0.02 | 0.08 | <0.02 | 0.95 | <0.02 |
| 16 | Total Sulfates (mg/l) | 297.0 | 43.00 | 29.00 | 220.0 | 692.0 | 38.0 |
| 17 | Total Iron (mg/l) | 0.17 | 0.19 | 0.54 | <0.04 | 0.59 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 2 | <2 | 53 | 4 | 42 | 6 |
| 19 | Total Hardness (mg/l as CaCO3) | 388.00 | 148.00 | 124.00 | 470.00 | 860.00 | 208.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-9 | CMS-10 | CMS-12 | CMW-2 | CMDS-1 | CMD-1 |
| 2 | Identification Number | 02-02-857 | 02-02-842 | 02-02-849 | 02-02-831 | 02-02-836 | 02-02-828 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 1130 | 1132 | 1080 | 1190 | 1080 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | -- | 21' | -- | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 16.5' | -- | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | 1.9 GPM | 3.9 GPM | 1.8 GPM | --- | 6 GPM | 74 CFS |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | C | B | C | B | --- |
| 10 | pH (Standard Units) | 7.31 | 7.71 | 8.18 | 8.93 | 7.72 | 8.13 |
| 11 | Total Acidity (mg/l CaCO3) | 18.60 | 2.60 | 3.20 | 0.00 | 7.80 | 2.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 101.00 | 71.00 | 147.60 | 277.80 | 219.00 | 116.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 895 | 207 | 485 | 715 | 507 | 421 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | <0.02 | <0.02 | 0.04 | <0.02 | <0.02 | 0.02 |
| 16 | Total Sulfates (mg/l) | 350.0 | 21.00 | 82.00 | 25.0 | 24.0 | 55.0 |
| 17 | Total Iron (mg/l) | 0.06 | 0.05 | 1.20 | 1.43 | <0.04 | 0.06 |
| 18 | Total Suspended Solids (mg/l) | <2 | 5 | 34 | 4 | <2 | <2 |
| 19 | Total Hardness (mg/l as CaCO3) | 428.00 | 84.00 | 220.00 | <10.00 | 240.00 | 172.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
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**TABLE 1**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** CG-01-01A
**Aquifer:** Gilboy Sandstone, Arnoldburg Limestone, & Morningview Sandstone
**Aquifer Zone:** First Continuous Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Quarter, 2002 | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | First | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.5 | 7.2 | 7.47 | 7.22 | 7.42 | | | | |
| Total Alkalinity | mg/l | 320 | 301.60 | 307.80 | 266.80 | 255.20 | 290.28 | 320 | 255.2 | 24.901 |
| Iron | mg/l | 0.11 | 0.30 | 0.24 | 4.100 | 0.1200 | 0.97 | 4.1 | 0.11 | 1.565 |
| Manganese | mg/l | 0.05 | 0.09 | 0.05 | 0.040 | 0.0530 | 0.06 | 0.09 | 0.04 | 0.017 |
| TDS | mg/l | 960 | 1300.0 | 1200.0 | 1200.0 | 1200 | 1172.00 | 1300 | 960 | 112.854 |
| Sulfate | mg/l | 470 | 664.0 | 696.0 | 593.0 | 599.0 | 604.40 | 696 | 470 | 77.673 |
| Spec. Cond. | umhos/cm | 1500 | 1821 | 1841.0 | 1674 | 1685 | 1704.20 | 1841 | 1500 | 122.748 |
| Calcium | mg/l | 190 | 150.10 | 180.20 | 100.20 | 177.4 | 159.58 | 190 | 100.2 | 32.508 |
| Magnesium | mg/l | 100 | 88.20 | 87.20 | 29.20 | 72.2 | 75.36 | 100 | 29.2 | 24.710 |
| Sodium | mg/l | 250 | 117.50 | 109.40 | 75.5 | 67.0 | 123.88 | 250 | 67 | 65.928 |
| Chloride | mg/l | 24.0 | 37.0 | 39.0 | 31.9 | 32.8 | 32.94 | 39 | 24 | 5.181 |
| Mercury | mg/l | 0.0060 | <0.0002 | <0.0002 | <0.002 | <0.0020 | 0.00 | 0.006 | 0.0002 | 0.002 |
| Zinc | mg/l | <0.01 | 0.029 | 0.0015 | 0.034 | 0.0100 | 0.02 | 0.034 | 0.0015 | 0.012 |
| Barium | mg/l | < 0.5 | <0.10 | <0.10 | < 0.1000 | < 0.1000 | 0.18 | 0.5 | 0.1 | 0.160 |
| Selenium | mg/l | 0.0012 | < 0.05 | < 0.010 | <0.010 | < 0.0100 | 0.02 | 0.05 | 0.0012 | 0.017 |
| Lead | mg/l | < 0.05 | 0.059 | <0.005 | < 0.050 | < 0.0500 | 0.04 | 0.059 | 0.005 | 0.019 |
| Arsenic | mg/l | 0.0010 | 0.05 | 0.0010 | 0.010 | 0.0100 | 0.01 | 0.05 | 0.001 | 0.018 |
| Aluminum | mg/l | 0.11 | < 0.20 | < 0.20 | 0.00134 | < 0.2000 | 0.14 | 0.2 | 0.00134 | 0.079 |
| Chromium | mg/l | 0.02 | < 0.06 | < 0.060 | < 0.060 | < 0.0600 | 0.05 | 0.06 | 0.02 | 0.016 |

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**TABLE 2**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** CG-01-02A
**Aquifer:** Gilboy Sandstone, Arnoldburg Limestone, & Morningview Sandstone
**Aquifer Zone:** First Continuous Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Quarter, 2002 | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | First | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.9 | 7.6 | 7.58 | 7.75 | 7.71 | | | | |
| Total Alkalinity | mg/l | 160 | 189.80 | 193.00 | 190.80 | 199.00 | 186.52 | 199 | 160 | 13.639 |
| Iron | mg/l | 0.09 | 1.6 | 0.160 | 5.30 | 0.2500 | 1.48 | 5.3 | 0.09 | 1.990 |
| Manganese | mg/l | 0.07 | 0.06 | 0.040 | 0.050 | 0.0420 | 0.05 | 0.07 | 0.04 | 0.011 |
| TDS | mg/l | 550 | 860.0 | 770.0 | 800.0 | 900.0 | 776.00 | 900 | 550 | 121.754 |
| Sulfate | mg/l | 200 | 317.0 | 339.0 | 257.0 | 344.0 | 291.40 | 344 | 200 | 55.182 |
| Spec. Cond. | umhos/cm | 900 | 1171 | 1173 | 1153 | 1252 | 1129.80 | 1252 | 900 | 119.869 |
| Calcium | mg/l | 96 | 104.70 | 108.8 | 174.6 | 105.2 | 117.86 | 174.6 | 96 | 28.680 |
| Magnesium | mg/l | 25 | 34.30 | 33.0 | 64.40 | 31.8 | 37.70 | 64.4 | 25 | 13.731 |
| Sodium | mg/l | 160 | 89.20 | 84.80 | 88.0 | 68.2 | 98.04 | 160 | 68.2 | 31.886 |
| Chloride | mg/l | 47 | 53.0 | 46.0 | 60.2 | 59.4 | 53.12 | 60.2 | 46 | 5.962 |
| Mercury | mg/l | 0.0056 | <0.0002 | <0.0002 | <0.0020 | <0.0020 | 0.00 | 0.0056 | 0.0002 | 0.002 |
| Zinc | mg/l | <0.01 | 0.018 | 0.0090 | <0.0080 | 0.0320 | 0.02 | 0.032 | 0.008 | 0.009 |
| Barium | mg/l | <0.5 | <0.10 | <0.10 | <0.10 | <0.1000 | 0.18 | 0.5 | 0.1 | 0.160 |
| Selenium | mg/l | 0.0024 | <0.05 | <0.0100 | <0.0100 | <0.0100 | 0.02 | 0.05 | 0.0024 | 0.017 |
| Lead | mg/l | <0.05 | 0.084 | 0.0090 | <0.0500 | <0.0500 | 0.05 | 0.084 | 0.009 | 0.024 |
| Arsenic | mg/l | 0.0013 | <0.05 | <0.0100 | <0.0100 | <0.0100 | 0.02 | 0.05 | 0.0013 | 0.017 |
| Aluminum | mg/l | 0.16 | <0.20 | 0.21 | 0.00024 | <0.2000 | 0.15 | 0.21 | 0.00024 | 0.079 |
| Chromium | mg/l | <0.02 | <0.06 | <0.0600 | <0.0600 | <0.0600 | 0.05 | 0.06 | 0.02 | 0.016 |

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**TABLE 3**
**GROUNDWATER STATISTICAL EVALUATION**
**PERKINS RUN COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** **CG-01-3A**
**Aquifer:** **Gilboy Sandstone, Arnoldburg Limestone, & Morningview Sandstone**
**Aquifer Zone:** **First Continuous Zone**
**Well Type:** **Background**

| | | Quarter, 2001 | | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | MDL | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.9 | | | | | | | | |
| Total Alkalinity | mg/l | 210 | | | | 1.2 | 210.00 | 210 | 210 | 0.000 |
| Iron | mg/l | 0.12 | | | | 0.05 | 0.12 | 0.12 | 0.12 | 0.000 |
| Manganese | mg/l | 0.04 | | | | 0.02 | 0.04 | 0.04 | 0.04 | 0.000 |
| TDS | mg/l | 270 | | | | 10 | 270.00 | 270 | 270 | 0.000 |
| Sulfate | mg/l | 57 | | | | 1.5 | 57.00 | 57 | 57 | 0.000 |
| Spec. Cond. | umhos/cm | 460 | | | | 1.5 | 460.00 | 460 | 460 | 0.000 |
| Calcium | mg/l | 80 | | | | 0.02 | 80.00 | 80 | 80 | 0.000 |
| Magnesium | mg/l | 14 | | | | 0.02 | 14.00 | 14 | 14 | 0.000 |
| Sodium | mg/l | 53 | | | | 0.02 | 53.00 | 53 | 53 | 0.000 |
| Chloride | mg/l | 1.5 | | | | 0.50 | 1.50 | 1.5 | 1.5 | 0.000 |
| Mercury | mg/l | < 0.0001 | | | | 0.0001 | 0.00 | 0.0001 | 0.0001 | 0.000 |
| Zinc | mg/l | <0.01 | | | | 0.01 | 0.01 | 0.01 | 0.01 | 0.000 |
| Barium | mg/l | <0.5 | | | | 0.50 | 0.50 | 0.5 | 0.5 | 0.000 |
| Selenium | mg/l | 0.0031 | | | | 0.001 | 0.00 | 0.0031 | 0.0031 | 0.000 |
| Lead | mg/l | < 0.05 | | | | 0.05 | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | 0.0019 | | | | 0.001 | 0.00 | 0.0019 | 0.0019 | 0.000 |
| Aluminum | mg/l | 0.19 | | | | 0.10 | 0.19 | 0.19 | 0.19 | 0.000 |
| Chromium | mg/l | < 0.02 | | | | 0.02 | 0.02 | 0.02 | 0.02 | 0.000 |

Note: No 2nd, 3rd, or 4th Quarter Data

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TABLE 5
GROUNDWATER STATISTICAL EVALUATION
COARSE COAL REFUSE DISPOSAL FACILITY
CENTURY MINE
MARCH 2002

**Well No.:** CG-01-3C
**Aquifer:** Shales & Sandstones Near Ridgetops
**Aquifer Zone:** First Aquifer Encountered
**Well Type:** Background

| | | Quarter, 2001 | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.4 | | | | | | | |
| Total Alkalinity | mg/l | 120 | | | | 120.00 | 120 | 120 | 0.000 |
| Iron | mg/l | 0.19 | | | | 0.19 | 0.19 | 0.19 | 0.000 |
| Manganese | mg/l | 0.04 | | | | 0.04 | 0.04 | 0.04 | 0.000 |
| TDS | mg/l | 170 | | | | 170.00 | 170 | 170 | 0.000 |
| Sulfate | mg/l | 33 | | | | 33.00 | 33 | 33 | 0.000 |
| Spec. Cond. | umhos/cm | 280 | | | | 280.00 | 280 | 280 | 0.000 |
| Calcium | mg/l | 67 | | | | 67.00 | 67 | 67 | 0.000 |
| Magnesium | mg/l | 6.8 | | | | 6.80 | 6.8 | 6.8 | 0.000 |
| Sodium | mg/l | 9.7 | | | | 9.70 | 9.7 | 9.7 | 0.000 |
| Chloride | mg/l | < 0.5 | | | | 0.50 | 0.5 | 0.5 | 0.000 |
| Mercury | mg/l | 0.0046 | | | | 0.00 | 0.0046 | 0.0046 | 0.000 |
| Zinc | mg/l | 0.02 | | | | 0.02 | 0.02 | 0.02 | 0.000 |
| Barium | mg/l | < 0.5 | | | | 0.50 | 0.5 | 0.5 | 0.000 |
| Selenium | mg/l | 0.0012 | | | | 0.00 | 0.0012 | 0.0012 | 0.000 |
| Lead | mg/l | < 0.05 | | | | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | < 0.001 | | | | 0.00 | 0.001 | 0.001 | 0.000 |
| Aluminum | mg/l | 0.10 | | | | 0.10 | 0.1 | 0.1 | 0.000 |
| Chromium | mg/l | < 0.02 | | | | 0.02 | 0.02 | 0.02 | 0.000 |

Note: No 2nd, 3rd, or 4th Quarter Data

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TABLE 6
GROUNDWATER STATISTICAL EVALUATION
COARSE COAL REFUSE DISPOSAL FACILITY
CENTURY MINE
MARCH 2002

**Well No.:** CG-01-4A
**Aquifer:** Gilboy Sandstone, Arnoldburg Limestone, & Morningview Sandstone
**Aquifer Zone:** First Continuous Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 9.9 | 9.7 | | | | | | |
| Total Alkalinity | mg/l | 300 | 317.00 | | | 308.50 | 317 | 300 | 8.500 |
| Iron | mg/l | 23 | 58.0 | | | 40.50 | 58 | 23 | 17.500 |
| Manganese | mg/l | 0.31 | 0.533 | | | 0.42 | 0.533 | 0.31 | 0.112 |
| TDS | mg/l | 1400 | 1288.0 | | | 1344.00 | 1400 | 1288 | 56.000 |
| Sulfate | mg/l | 220 | 205.0 | | | 212.50 | 220 | 205 | 7.500 |
| Spec. Cond. | umhos/cm | 830 | 1535 | | | 1182.50 | 1535 | 830 | 352.500 |
| Calcium | mg/l | 28 | 28.5 | | | 28.25 | 28.5 | 28 | 0.250 |
| Magnesium | mg/l | 7.1 | 19.40 | | | 13.25 | 19.4 | 7.1 | 6.150 |
| Sodium | mg/l | 330 | 359.00 | | | 344.50 | 359 | 330 | 14.500 |
| Chloride | mg/l | 7.3 | 116.3 | | | 61.80 | 116.3 | 7.3 | 54.500 |
| Mercury | mg/l | 0.0007 | <0.0002 | | | 0.00 | 0.0007 | 0.0002 | 0.000 |
| Zinc | mg/l | 0.08 | 0.176 | | | 0.13 | 0.176 | 0.08 | 0.048 |
| Barium | mg/l | <0.5 | 0.473 | | | 0.49 | 0.5 | 0.473 | 0.013 |
| Selenium | mg/l | 0.0022 | <0.05 | | | 0.03 | 0.05 | 0.0022 | 0.024 |
| Lead | mg/l | <0.05 | 0.108 | | | 0.08 | 0.108 | 0.05 | 0.029 |
| Arsenic | mg/l | 0.0019 | <0.05 | | | 0.03 | 0.05 | 0.0019 | 0.024 |
| Aluminum | mg/l | 22 | 61.9 | | | 41.95 | 61.9 | 22 | 19.950 |
| Chromium | mg/l | 0.06 | 0.073 | | | 0.07 | 0.073 | 0.06 | 0.007 |

Note: No 3rd or 4th Quarter Data

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TABLE 8
GROUNDWATER STATISTICAL EVALUATION
COARSE COAL REFUSE DISPOSAL FACILITY
CENTURY MINE
MARCH 2002

**Well No.:** CG-01-4C
**Aquifer:** Shales & Sandstones Near Ridgetops
**Aquifer Zone:** First Aquifer Encountered
**Well Type:** Background

| | | Quarter, 2001 | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.7 | 7.3 | | | | | | |
| Total Alkalinity | mg/l | 120 | 106.00 | | | 113.00 | 120 | 106 | 7.000 |
| Iron | mg/l | 1.0 | 0.43 | | | 0.72 | 1 | 0.43 | 0.285 |
| Manganese | mg/l | 0.07 | 0.03 | | | 0.05 | 0.07 | 0.03 | 0.020 |
| TDS | mg/l | 170 | 180.0 | | | 175.00 | 180 | 170 | 5.000 |
| Sulfate | mg/l | 46 | 21.0 | | | 33.50 | 46 | 21 | 12.500 |
| Spec. Cond. | umhos/cm | 270 | 265 | | | 267.50 | 270 | 265 | 2.500 |
| Calcium | mg/l | 45 | 30.20 | | | 37.60 | 45 | 30.2 | 7.400 |
| Magnesium | mg/l | 8.5 | 9.20 | | | 8.85 | 9.2 | 8.5 | 0.350 |
| Sodium | mg/l | 20 | 6.40 | | | 13.20 | 20 | 6.4 | 6.800 |
| Chloride | mg/l | 1.5 | < 5.0 | | | 3.25 | 5 | 1.5 | 1.750 |
| Mercury | mg/l | 0.0003 | <0.0002 | | | 0.00 | 0.0003 | 0.0002 | 0.000 |
| Zinc | mg/l | 0.03 | 0.023 | | | 0.03 | 0.03 | 0.023 | 0.004 |
| Barium | mg/l | < 0.5 | < 0.10 | | | 0.30 | 0.5 | 0.1 | 0.200 |
| Selenium | mg/l | 0.0014 | < 0.05 | | | 0.03 | 0.05 | 0.0014 | 0.024 |
| Lead | mg/l | < 0.05 | < 0.05 | | | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | < 0.001 | < 0.05 | | | 0.03 | 0.05 | 0.001 | 0.025 |
| Aluminum | mg/l | 1.2 | 0.33 | | | 0.77 | 1.2 | 0.33 | 0.435 |
| Chromium | mg/l | 0.02 | < 0.06 | | | 0.04 | 0.06 | 0.02 | 0.020 |

Note: No 3rd or 4th Quarter Data

WJS

AEC 11687

**TABLE 9**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** CG-01-5A
**Aquifer:** Gilboy Sandstone, Arnoldburg Limestone, & Morningview Sandstone
**Aquifer Zone:** First Continuous Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Quarter, 2002 | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | First | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 9.3 | 9.7 | | | 8.31 | | | | |
| Total Alkalinity | mg/l | 270 | 317.00 | | | 1015.80 | 534.27 | 1015.80 | 270 | 341.036 |
| Iron | mg/l | 19 | 58.0 | | | 12.4000 | 29.80 | 58 | 12.4 | 20.122 |
| Manganese | mg/l | 0.24 | 0.533 | | | 0.1790 | 0.32 | 0.533 | 0.179 | 0.155 |
| TDS | mg/l | 1600 | 2980.0 | | | 2000.0 | 2193.33 | 2980 | 1600 | 579.732 |
| Sulfate | mg/l | 180 | 205.0 | | | 550.0 | 311.67 | 550.0 | 180 | 168.836 |
| Spec. Cond. | umhos/cm | 610 | 1535 | | | 2790 | 1645.00 | 2790 | 610 | 893.374 |
| Calcium | mg/l | 30 | 28.5 | | | 20.4 | 26.30 | 30 | 20.4 | 4.217 |
| Magnesium | mg/l | 8.3 | 19.40 | | | 9.4 | 12.37 | 19.4 | 8.3 | 4.994 |
| Sodium | mg/l | 390 | 359.00 | | | 477.0 | 408.67 | 477.0 | 359 | 49.949 |
| Chloride | mg/l | 6.0 | 116.3 | | | 105.5 | 75.93 | 116.3 | 6 | 49.647 |
| Mercury | mg/l | 0.0001 | < 0.0002 | | | < 0.0020 | 0.00 | 0.002 | 0.0001 | 0.001 |
| Zinc | mg/l | 0.10 | 0.176 | | | 0.0550 | 0.11 | 0.176 | 0.055 | 0.050 |
| Barium | mg/l | <0.5 | 0.473 | | | 0.1290 | 0.37 | 0.5 | 0.129 | 0.169 |
| Selenium | mg/l | 0.0021 | < 0.05 | | | < 0.0100 | 0.02 | 0.05 | 0.0021 | 0.021 |
| Lead | mg/l | <0.05 | 0.108 | | | <0.0500 | 0.07 | 0.108 | 0.05 | 0.027 |
| Arsenic | mg/l | 0.0024 | <0.05 | | | <0.0100 | 0.02 | 0.05 | 0.0024 | 0.021 |
| Aluminum | mg/l | 250 | 61.9 | | | 14.5900 | 108.83 | 250 | 14.59 | 101.674 |
| Chromium | mg/l | 0.11 | 0.073 | | | <0.0600 | 0.08 | 0.11 | 0.06 | 0.021 |

Note: No 3rd or 4th Quarter Data

WJS

AEC 11688

TABLE 11
GROUNDWATER STATISTICAL EVALUATION
COARSE COAL REFUSE DISPOSAL FACILITY
CENTURY MINE
MARCH 2002

**Well No.:** CG-01-5C
**Aquifer:** Shales & Sandstones Near Ridgetops
**Aquifer Zone:** First Aquifer Encountered
**Well Type:** Background

| | | Quarter, 2001 | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.4 | | | | | | | |
| Total Alkalinity | mg/l | 77 | | | | 77.00 | 77 | 77 | 0.000 |
| Iron | mg/l | <0.05 | | | | 0.05 | 0.05 | 0.05 | 0.000 |
| Manganese | mg/l | <0.02 | | | | 0.02 | 0.02 | 0.02 | 0.000 |
| TDS | mg/l | 120 | | | | 120.00 | 120 | 120 | 0.000 |
| Sulfate | mg/l | 24 | | | | 24.00 | 24 | 24 | 0.000 |
| Spec. Cond. | umhos/cm | 140 | | | | 140.00 | 140 | 140 | 0.000 |
| Calcium | mg/l | 39 | | | | 39.00 | 39 | 39 | 0.000 |
| Magnesium | mg/l | 8.8 | | | | 8.80 | 8.8 | 8.8 | 0.000 |
| Sodium | mg/l | 720 | | | | 720.00 | 720 | 720 | 0.000 |
| Chloride | mg/l | <0.5 | | | | 0.50 | 0.5 | 0.5 | 0.000 |
| Mercury | mg/l | 0.0010 | | | | 0.00 | 0.001 | 0.001 | 0.000 |
| Zinc | mg/l | <0.01 | | | | 0.01 | 0.01 | 0.01 | 0.000 |
| Barium | mg/l | <0.5 | | | | 0.50 | 0.5 | 0.5 | 0.000 |
| Selenium | mg/l | 0.0017 | | | | 0.00 | 0.0017 | 0.0017 | 0.000 |
| Lead | mg/l | <0.05 | | | | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | 0.0013 | | | | 0.00 | 0.0013 | 0.0013 | 0.000 |
| Aluminum | mg/l | <0.1 | | | | 0.10 | 0.1 | 0.1 | 0.000 |
| Chromium | mg/l | 0.02 | | | | 0.02 | 0.02 | 0.02 | 0.000 |

Note: No 2nd, 3rd, or 4th Quarter Data

WJS

AEC 11689

**TABLE 13**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** CG-01-6C
**Aquifer:** Shales & Sandstones Near Ridgetops
**Aquifer Zone:** First Aquifer Encountered
**Well Type:** Background

| | | Quarter, 2001 | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 8.1 | 7.5 | | | | | | |
| Total Alkalinity | mg/l | 170 | 176.40 | | | 173.20 | 176.4 | 170 | 3.200 |
| Iron | mg/l | 0.39 | 0.18 | | | 0.29 | 0.39 | 0.18 | 0.105 |
| Manganese | mg/l | 0.02 | 0.08 | | | 0.05 | 0.08 | 0.02 | 0.030 |
| TDS | mg/l | 790 | 800.0 | | | 795.00 | 800 | 790 | 5.000 |
| Sulfate | mg/l | 370 | 309.0 | | | 339.50 | 370 | 309 | 30.500 |
| Spec. Cond. | umhos/cm | 1100 | 1118 | | | 1109.00 | 1118 | 1100 | 9.000 |
| Calcium | mg/l | 67 | 92.9 | | | 79.95 | 92.9 | 67 | 12.950 |
| Magnesium | mg/l | 10.4 | 52.80 | | | 31.60 | 52.8 | 10.4 | 21.200 |
| Sodium | mg/l | 240 | 79.00 | | | 159.50 | 240 | 79 | 80.500 |
| Chloride | mg/l | 13 | 25.8 | | | 19.40 | 25.8 | 13 | 6.400 |
| Mercury | mg/l | 0.0007 | < 0.0002 | | | 0.00 | 0.0007 | 0.0002 | 0.000 |
| Zinc | mg/l | 0.08 | 0.495 | | | 0.29 | 0.495 | 0.08 | 0.208 |
| Barium | mg/l | < 0.5 | < 0.10 | | | 0.30 | 0.5 | 0.1 | 0.200 |
| Selenium | mg/l | 0.0021 | < 0.05 | | | 0.03 | 0.05 | 0.0021 | 0.024 |
| Lead | mg/l | < 0.05 | < 0.05 | | | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | 0.0017 | < 0.05 | | | 0.03 | 0.05 | 0.0017 | 0.024 |
| Aluminum | mg/l | 0.66 | 0.27 | | | 0.47 | 0.66 | 0.27 | 0.195 |
| Chromium | mg/l | < 0.02 | < 0.06 | | | 0.04 | 0.06 | 0.02 | 0.020 |

Note: No 2nd or 3rd Quarter Data

WJS

AEC 11690

# ADDENDUM TO ENGINEERS REPORT
AMERICAN ENERGY CORPORATION

**Addendum to Section 2.1, General:**

The existing refuse disposal site is a pre-law structure from operations of the former Allison mine of the Y & O Coal Company. Refuse was placed on native ground. Leachate from the refuse surface and sediment from the disturbed grounds were collected in Ponds 008A, 008B, and 008C, downstream of the structure, for treatment, if necessary, before discharge to Piney Creek. To date, treatment has never been required to meet effluent limitations set forth by the NPDES permit.

Stability is not a factor, construction appears to have been performed according to accepted industry standards at the time. Other similar installations in this area, all much more extensive than the Allison mine site, have no problems with instability.

The site was re-soiled and seeded in the early 1980's in accordance with ODNR approved plans.

**Addendum to Section 5.1, Stability Analysis:**

The D'Appolonia report was submitted to ODNR as part of Application D-0425. The underdrains were grouted as per Drawing #81-250-E18, Sheet 19 of 21, Figure 20. The geotechnical testing and input data are included in the D'Appolonia report. Resultant stability analyses indicate the factors of safety for static and dynamic loading met regulatory requirements set by MSHA and ODNR, as discussed in the Application D-0425-2 Engineering Report, Section 5.1.

**Addendum to Section 2.2.1, Liner and Cap:**

The soils report and field testing indicate clay is present in the project area that is suitable for liner and cap construction. The clay is to be re-compacted according to the specifications set forth in the D-0425 engineering Report. Geotechnical test results of this clay are contained in the Report. Liner and cap construction is planned for the months having favorable weather. Normally, this kind of construction is not conducted during cold weather months. Moisture is controlled by using water trucks in dry conditions, and disking in wet conditions, to achieve the required moisture/density and permeability relationship.

In Phase 3, where applicable, the re-soiled Allison refuse pile will be stripped to the refuse surface . The soil will be removed and either used elsewhere on the project for cover or stockpiled in the designated areas for future cover needs. New refuse construction in Phase 3 will be keyed into the Allison refuse surface. The clay liner system will not be installed over the existing Allison refuse pile.

Addendum to Engineers Report, Section 2.2.1, Liner and Cap continued;

The leachate collector system will be installed on top of the clay liner along the valley bottom, as per the plan. Any visible seepage from the Allison refuse pile will be conveyed to the leachate collector trunk line via rock filled finger drains. All rock used in these drains will be washed river gravel.

**Addendum to Appendix 3.0, Field Exploration, Test Pit 3**

Test Pit 3 is located along the valley bottom on the upstream end of the Allison refuse pile. Materials excavated in valley bottoms are normally expected to be wet. The presence of coal in this location appears isolated and does not represent conditions found elsewhere throughout the valley.

**Addendum to Appendix 5.0, Subsidence Evaluation, Subsidence Control Plan**

The 50 percent extraction rate was taken from Application D-0425, signed by an officer of the Y & O Coal Company, in response to the plan to prevent surface subsidence caused by deep mining.

Relative to the project area, the old works of the Allison Mine are essentially limited to the overlying Allison Refuse pile. From field observations, as stated in the Engineering Report of d-0425-2, there are no indications of impact to the refuse pile from deep mining, which occurred approximately 30 years ago. Since the interburden between the Allison mine and the refuse pile is approximately 250 feet, coupled with the fact that several sandstone and limestone units are present, little, if any influence from the mine is expected.

The vast majority of this project, as shown in the plans, is located over unmined coal reserves in the Pittsburgh (No. 8) coalbed.

The design of the new site is very conservative, considering such key factors as refuse compaction, surface grades, and drainage. The stability analysis submitted in D-0425-2 is more than adequate for the given site conditions. A revision is not necessary.

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 12

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 7.69 acres
   b) Disturbed area 3.20 acres
   c) Ave. land slope 20 %
   d) Hydrologic soil group C
   e) Hydraulic length 1645 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 15.8 |
| 2) 25 year, 24 hour = | 4.2 | 18.9 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

      1) Dam height _____ ft.
      2) Dam width _____ ft.(MIN)
      3) Dam length _____ft.
      4) Dam downstream slope _____% (MAX)
      5) Dam upstream slope _____ % (MAX)
      6) Core length _____ft. _____ft. _____ft.

   b) Sediment storage volume 1.47 ac.ft. is provided below the 991.5 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 988.0 | 0.34 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 991.5 | 0.48 | 1.47 |
| 5) Top of embankment: | 994.0 | 0.56 | 2.77 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe _____
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

   a) Base width 12 ft.
   b) Design flow depth 0.3 ft. Depth in level section 0.8 ft.
   c) Exit slope 27.6 %
   d) Exit velocity 5.3 fps
   e) Channel lining Rock Riprap
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 20 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM
J.
SIPLIVY
E-51015
REGISTERED
PROFESSIONAL ENGINEER

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 13

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 47.9 acres
   b) Disturbed area 40.4 acres
   c) Ave. land slope 25 %
   d) Hydrologic soil group C
   e) Hydraulic length 5144 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 79.9 |
| 2) 25 year, 24 hour = | 4.2 | 95.3 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

      1) Dam height _____ ft.
      2) Dam width _____ ft.(MIN)
      3) Dam length _____ft.
      4) Dam downstream slope _____% (MAX)
      5) Dam upstream slope _____ % (MAX)
      6) Core length _____ft. _____ft. ____ft.

   b) Sediment storage volume 11.31 ac.ft. is provided below the 1083.7 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 1073.0 | 0.78 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1083.7 | 1.33 | 11.31 |
| 5) Top of embankment: | 1086.0 | 1.45 | 14.52 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe _____
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, ____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

   a) Base width 12 ft.
   b) Design flow depth 1.7 ft. Depth in level section 1.3 ft.
   c) Exit slope 1.4 %
   d) Exit velocity 3.7 fps
   e) Channel lining Vegetative Grass Mix
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 40 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

   A 6" diameter PVC pipe 130 feet long at a slope of 4.6 percent will be used to dewater the pond. The invert will be at the 1080 foot elevation.

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM
J.
SIPLIVY
E-51015
REGISTERED
PROFESSIONAL ENGINEER

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 14

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 65.95 acres
   b) Disturbed area 61.54 acres
   c) Ave. land slope 25 %
   d) Hydrologic soil group C
   e) Hydraulic length 5077 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0

      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 101.9 |
| 2) 25 year, 24 hour = | 4.2 | 121.1 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: N/A Excavated Pond

      1) Dam height 3 ft.
      2) Dam width 12 ft. (MIN)
      3) Dam length 1386 ft.
      4) Dam downstream slope 33 % (MAX)
      5) Dam upstream slope 50 % (MAX)
      6) Core length ___ ft. ___ ft. ___ ft.

   b) Sediment storage volume 13.44 ac. ft. is provided below the 1164.5 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac. ft. |
|---|---|---|---|
| 1) Bottom of Pond: | 1161.0 | 3.59 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1164.5 | 4.06 | 13.44 |
| 5) Top of embankment: | 1167.0 | 4.31 | 23.99 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/EXIT CHANNEL:

   a) Base width 40 ft.
   b) Design flow depth 1.2 ft. Depth in level section 0.8 ft.
   c) Exit slope 2.8 %
   d) Exit velocity 3.1 fps
   e) Channel lining Vegetative Grass Mixture
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50 %
   i) Length of level section 40 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS:

A 6" diameter PVC pipe 140 feet long at a slope of 2.5 percent will be used to dewater the pond. The invert will be at the 1163.5 foot elevation.

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM
J.
SIPLIVY
E-51015
REGISTERED
PROFESSIONAL ENGINEER

# FIRST ANNUAL REPORT
# GROUNDWATER STATISTICAL EVALUATION

## CENTURY MINE COARSE COAL REFUSE DISPOSAL FACILITY
## AMERICAN ENERGY CORPORATION
## SECTIONS 3 AND 4, WAYNE TOWNSHIP
## BELMONT COUNTY, OHIO

**Prepared For:**

**THE OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**
**1855 FOUNTAIN SQUARE COURT**
**COLUMBUS, OHIO 43224-1360**

**by:**

**William J. Siplivy, P.E., Inc.**
**50 Munroe Falls Avenue**
**Munroe Falls, Ohio 44262**

April, 2002

AEC 11699

WILLIAM J. SIPLIVY, P.E., INC.

Geotechnical Engineer

29 April 2002

Mr. Michael Dillman, Hydrogeologist
The Ohio Department of Natural Resources
Division of Mineral Resources Management
1855 Fountain Square Court
Columbus, Ohio 43224-1360

Re: FIRST ANNUAL REPORT-GROUNDWATER STATISTICAL EVALUATION
CENTURY MINE COARSE COAL REFUSE DISPOSAL FACILITY
WAYNE TOWNSHIP, BELMONT COUNTY, OHIO

Dear Mr. Dillman:

Attached for your review please find subject report summarizing the first five quarters of pre-construction groundwater monitoring for the proposed Century mine coarse coal refuse disposal facility. Monitoring was conducted from the first quarter of 2001 through the first quarter of 2002. Testing was performed on the two zones of saturation for the twenty-one analytes specified in the Hydrogeologic Investigation Report, submitted to this office in August 2001. Please refer to Plate 5, in the Hydrogeologic Investigation Report, for well locations, and Plate 8, for the geologic cross-section.

The first significant zone of saturation is the Washington (No. 12) coalbed. Wells monitoring this horizon are 3B, 4B, 5B and 6B. Well depths range from 58 to 90 feet. Well 4B is hydrologically up-gradient of the project; the remaining wells are down-gradient of the project (Plate 6, Hydrogeologic Investigation Report).

The first continuous zone of saturation, project wide, is the interval from the Morningview sandstone to Gilboy sandstone. Wells monitoring this zone include: 1A, 2A, 4A and 5A. Well depths range from 25 to 267 feet. The up-gradient well, 4A, is 259 feet deep; the remainder are down-gradient (Plate 7, Hydrogeologic Investigation Report). Well depths are 50 feet for 1A, 25 feet for 2A and 267 feet for 5A.

The procedures and protocol specified in the Hydrogeologic Investigation Report were followed throughout the quarterly monitoring program. Samples were available for analysis in all five quarters for wells 3B, 5B, 1A and 2A. These wells are 25 to 90 feet deep and have sufficient recharge area to provide the necessary well volumes for sampling each quarter. In some cases, however, well samples were not available due to seasonally dry conditions, or low volume due to very limited recharge area. Site conditions are partly responsible. Wells 4B and 6B, in the Washington coalbed, have

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small recharge areas. These were consequently dry during the third and fourth quarters of 2001. Wells 4A and 5A were also dry during the third and fourth quarters. These are the deepest wells, 259 and 267 feet, respectively. Low volumes are due to the tight geologic formations lacking sufficient fracture or secondary porosity.

This report contains the available quarterly analyses for the designated eight monitoring wells, in addition to partial sampling of the other five wells developed for the hydrogeologic investigation. Included are tabulations of the twenty-one analytes and statistical summary for each well (Tables 1 through 13). Table 14 summarizes the MCL exceedence, if any, for each well per sampling event.

The EPA National Primary Drinking Water Standards were randomly exceeded for Mercury, Lead and Chromium.

Initial sampling (first quarter, 2001) was analyzed by Tra-Det Labs, Wheeling, West Virginia. In all thirteen wells sampled, six wells (1A, 2A, 3B, 3C, 4A and 6C) had Mercury levels ranging from 0.0046 to 0.007 mg/l; exceeding the 0.002 mg/l MCL. The recordings were random, coming from three saturation zones located both up-gradient and down-gradient of the project. The remaining sampling events (second quarter, 2001, through first quarter, 2002) were analyzed by Industrial Lab Analysis, Glen Dale, West Virginia. Mercury was below detection limits over these last four quarters.

Elevated levels for Lead were noted only in the second quarter, 2001 for wells 1A, 2A, 3B, 4A and 5A. The range was 0.051 to 0.108 mg/l.

Chromium was slightly elevated, 0.11 mg/l, in well 5A for the first quarter, 2001. The MCL is 0.1 mg/l.

The EPA National Secondary Drinking Water Standards were elevated for Iron, Sulfate, Manganese, Total Dissolved Solids (TDS), and Aluminum. Anomalous values were found in wells 4A and 5A due to low volume, sediment contamination. Elevated levels were random for the other wells (see Table 14 for summary).

Monitor wells 1A and 2A are possibly the most significant sampling points in the program. These shallow wells are located in the first zone of continuous saturation, down-gradient of the proposed project, and down-gradient of the abandoned Allison mine refuse disposal facility. The groundwater quality found here is considered indicative of the impact made from coarse coal refuse disposal. During this testing period, Iron, Manganese and Aluminum were randomly elevated, while Sulfate and TDS generally exceeded the MCL in all quarters.

In well 1A, MCL's were exceeded as follows: Iron, 4.1 mg/l, in the 4th quarter; Manganese, 0.09 mg/l, 2nd quarter, 0.059 mg/l, 1st quarter, 2002; Sulfates ranges from 490 to 696 mg/l; and TDS, ranged from 960 to 1300 mg/l.

In well 2A, MCL's were exceeded as follows: Iron, 1.6 mg/l, 2nd quarter, 5.3 mg/l, 4th quarter; Manganese, 0.07 mg/l, 1st quarter, 2001, 0.06 mg/l, 2nd quarter; Aluminum, 0.21 mg/l, 3rd quarter; Sulfates ranged from 200 to 344 mg/l; and TDS ranged from 550 to 900 mg/l.

Please feel free to call if there are any questions.

Respectfully submitted,

William J. Siplivy

William J. Siplivy, P.E., C.P.G.
President

Attachment

cc: R. Desko – Century mine

# APPENDIX 1

# TABLES

# LIST OF TABLES


| Table No. | | Appendix 1 |
|---|---|---|
| 1 | Well CG-01-1A: | Summary of Quarterly Analysis and Statistics |
| 2 | Well CG-01-2A: | Summary of Quarterly Analysis and Statistics |
| 3 | Well CG-01-3A: | Summary of Quarterly Analysis and Statistics |
| 4 | Well CG-01-3B: | Summary of Quarterly Analysis and Statistics |
| 5 | Well CG-01-3C: | Summary of Quarterly Analysis and Statistics |
| 6 | Well CG-01-4A: | Summary of Quarterly Analysis and Statistics |
| 7 | Well CG-01-4B: | Summary of Quarterly Analysis and Statistics |
| 8 | Well CG-01-4C: | Summary of Quarterly Analysis and Statistics |
| 9 | Well CG-01-5A: | Summary of Quarterly Analysis and Statistics |
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| 13 | Well CG-01-6C: | Summary of Quarterly Analysis and Statistics |
| 14 | Quarterly Groundwater Monitoring Well Quality Summary | |




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**TABLE 4**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** **CG-01-3B**
**Aquifer:** **Washington No. 12 Coalbed**
**Aquifer Zone:** **First Significant Zone**
**Well Type:** **Background**

| | | Quarter, 2001 | | | | Quarter, 2002 | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | First | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.5 | 7.40 | 7.45 | 7.29 | 7.42 | | | | |
| Total Alkalinity | mg/l | 250 | 228.40 | 250.40 | 278.20 | 286.20 | 258.64 | 286.2 | 228.4 | 20.972 |
| Iron | mg/l | 0.07 | 1.05 | 0.080 | 0.090 | 0.2700 | 0.31 | 1.05 | 0.07 | 0.376 |
| Manganese | mg/l | 0.10 | 0.123 | 0.0500 | 0.10 | 0.1390 | 0.10 | 0.139 | 0.05 | 0.030 |
| TDS | mg/l | 340 | 630.0 | 480.0 | 520.0 | 600.0 | 514.00 | 630 | 340 | 102.294 |
| Sulfate | mg/l | 57 | 186.0 | 125.0 | 105.0 | 127.0 | 120.00 | 186 | 57 | 41.531 |
| Spec. Cond. | umhos/cm | 610 | 855 | 716 | 724 | 804 | 741.80 | 855 | 610 | 83.710 |
| Calcium | mg/l | 110 | 84.60 | 94.20 | 82.7 | 84.2 | 91.14 | 110 | 82.7 | 10.269 |
| Magnesium | mg/l | 19 | 22.00 | 20.00 | 15.30 | 18.6 | 18.98 | 22 | 15.3 | 2.184 |
| Sodium | mg/l | 51 | 47.70 | 23.60 | 29.0 | 34.4 | 37.14 | 51 | 23.6 | 10.590 |
| Chloride | mg/l | 1.5 | 6.9 | 7.0 | 5.0 | 16.8 | 7.44 | 16.8 | 1.5 | 5.086 |
| Mercury | mg/l | 0.0070 | < 0.0002 | < 0.00020 | < 0.0020 | < 0.0020 | 0.00 | 0.007 | 0.0002 | 0.002 |
| Zinc | mg/l | 0.01 | 0.01 | 0.0080 | 0.0240 | 0.0140 | 0.01 | 0.024 | 0.008 | 0.006 |
| Barium | mg/l | < 0.5 | < 0.10 | < 0.10 | < 0.1000 | < 0.1000 | 0.18 | 0.5 | 0.1 | 0.160 |
| Selenium | mg/l | 0.0038 | < 0.05 | < 0.0100 | < 0.0100 | < 0.0100 | 0.02 | 0.05 | 0.0038 | 0.017 |
| Lead | mg/l | < 0.05 | 0.051 | < 0.0050 | < 0.0500 | < 0.0500 | 0.04 | 0.051 | 0.005 | 0.018 |
| Arsenic | mg/l | 0.0017 | < 0.05 | < 0.0100 | < 0.0100 | < 0.0100 | 0.02 | 0.05 | 0.0017 | 0.017 |
| Aluminum | mg/l | 0.30 | 0.74 | < 0.20 | < 0.2000 | < 0.2000 | 0.33 | 0.74 | 0.2 | 0.210 |
| Chromium | mg/l | 0.03 | < 0.06 | < 0.060 | < 0.0600 | < 0.0600 | 0.05 | 0.06 | 0.03 | 0.012 |

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TABLE 7
GROUNDWATER STATISTICAL EVALUATION
COARSE COAL REFUSE DISPOSAL FACILITY
CENTURY MINE
MARCH 2002

**Well No.:** CG-01-4B
**Aquifer:** Washington No. 12 Coalbed
**Aquifer Zone:** First Significant Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 8.5 | | | | | | | |
| Total Alkalinity | mg/l | 160 | | | | 160.00 | 160 | 160 | 0.000 |
| Iron | mg/l | 1.9 | | | | 1.90 | 1.9 | 1.9 | 0.000 |
| Manganese | mg/l | 0.02 | | | | 0.02 | 0.02 | 0.02 | 0.000 |
| TDS | mg/l | 600 | | | | 600.00 | 600 | 600 | 0.000 |
| Sulfate | mg/l | 240 | | | | 240.00 | 240 | 240 | 0.000 |
| Spec. Cond. | umhos/cm | 850 | | | | 850.00 | 850 | 850 | 0.000 |
| Calcium | mg/l | 24 | | | | 24.00 | 24 | 24 | 0.000 |
| Magnesium | mg/l | 4.9 | | | | 4.90 | 4.9 | 4.9 | 0.000 |
| Sodium | mg/l | 280 | | | | 280.00 | 280 | 280 | 0.000 |
| Chloride | mg/l | 4.4 | | | | 4.40 | 4.4 | 4.4 | 0.000 |
| Mercury | mg/l | 0.0012 | | | | 0.00 | 0.0012 | 0.0012 | 0.000 |
| Zinc | mg/l | 0.02 | | | | 0.02 | 0.02 | 0.02 | 0.000 |
| Barium | mg/l | <0.5 | | | | 0.50 | 0.5 | 0.5 | 0.000 |
| Selenium | mg/l | 0.0044 | | | | 0.00 | 0.0044 | 0.0044 | 0.000 |
| Lead | mg/l | <0.05 | | | | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | 0.0025 | | | | 0.00 | 0.0025 | 0.0025 | 0.000 |
| Aluminum | mg/l | 4.6 | | | | 4.60 | 4.6 | 4.6 | 0.000 |
| Chromium | mg/l | 0.03 | | | | 0.03 | 0.03 | 0.03 | 0.000 |

Note: No 2nd, 3rd, or 4th Quarter Data

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**TABLE 10**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** CG-01-5B
**Aquifer:** Washington No. 12 Coalbed
**Aquifer Zone:** First Significant Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Quarter, 2002 | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | First | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 7.6 | 7.6 | 7.27 | 7.08 | 7.29 | | | | |
| Total Alkalinity | mg/l | 360 | 299.40 | 22.40 | 223.40 | 241.40 | 229.32 | 360 | 22.4 | 114.005 |
| Iron | mg/l | 0.59 | 2.19 | 0.31 | 1.02 | 0.230 | 0.87 | 2.19 | 0.23 | 0.716 |
| Manganese | mg/l | 0.16 | 0.18 | 0.28 | 0.25 | 0.188 | 0.21 | 0.28 | 0.16 | 0.046 |
| TDS | mg/l | 770 | 730.0 | 520.0 | 600.0 | 650.0 | 654.00 | 770 | 520 | 89.577 |
| Sulfate | mg/l | 230 | 145.0 | 176.0 | 171.0 | 181.0 | 180.60 | 230 | 145 | 27.645 |
| Spec. Cond. | umhos/cm | 1200 | 1024 | 812 | 846 | 912 | 958.80 | 1200 | 812 | 140.636 |
| Calcium | mg/l | 37 | 23.10 | 33.20 | 36.4 | 32.8 | 32.50 | 37 | 23.1 | 4.988 |
| Magnesium | mg/l | 6.2 | 5.20 | 3.80 | 3.80 | 3.8 | 4.56 | 6.2 | 3.8 | 0.983 |
| Sodium | mg/l | 380 | 215.00 | 143.40 | 116.5 | 127.6 | 196.50 | 380 | 116.5 | 97.961 |
| Chloride | mg/l | 13 | <5.0 | <5.0 | <5.0 | 24.0 | 10.40 | 24 | 5 | 7.473 |
| Mercury | mg/l | 0.0001 | <0.0002 | <0.0002 | <0.0020 | <0.0020 | 0.00 | 0.002 | 0.0001 | 0.001 |
| Zinc | mg/l | 0.05 | 0.02 | 0.0140 | 0.0090 | 0.027 | 0.02 | 0.05 | 0.009 | 0.014 |
| Barium | mg/l | <0.5 | <0.10 | <0.10 | <0.1000 | <0.1000 | 0.18 | 0.5 | 0.1 | 0.160 |
| Selenium | mg/l | 0.0030 | <0.05 | <0.0100 | <0.0100 | <0.0100 | 0.02 | 0.05 | 0.003 | 0.017 |
| Lead | mg/l | <0.05 | <0.05 | <0.0050 | <0.0500 | <0.0500 | 0.04 | 0.05 | 0.005 | 0.018 |
| Arsenic | mg/l | 0.0040 | <0.05 | <0.0100 | <0.0100 | <0.0100 | 0.02 | 0.05 | 0.004 | 0.017 |
| Aluminum | mg/l | 1.0 | 1.98 | <0.20 | 0.70 | <0.2000 | 0.82 | 1.98 | 0.2 | 0.657 |
| Chromium | mg/l | <0.02 | <0.06 | <0.0600 | <0.0600 | <0.0600 | 0.05 | 0.06 | 0.02 | 0.016 |

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**TABLE 12**
**GROUNDWATER STATISTICAL EVALUATION**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**MARCH 2002**

**Well No.:** CG-01-6B
**Aquifer:** Washington No. 12 Coalbed
**Aquifer Zone:** First Significant Zone
**Well Type:** Background

| | | Quarter, 2001 | | | | Quarter, 2002 | Statistical Analysis | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Parameter | Unit | First | Second | Third | Fourth | First | Average | Maxima | Minima | Std. Dev. |
| pH | S.U. | 8.3 | 6.4 | | | 7.27 | | | | |
| Total Alkalinity | mg/l | 260 | 230.20 | | | 166.00 | 218.73 | 260 | 166 | 39.223 |
| Iron | mg/l | 0.56 | 1.54 | | | 0.1800 | 0.76 | 1.54 | 0.18 | 0.573 |
| Manganese | mg/l | 0.03 | 0.07 | | | 0.0880 | 0.06 | 0.088 | 0.03 | 0.024 |
| TDS | mg/l | 460 | 420.0 | | | 760.0 | 546.67 | 760 | 420 | 151.731 |
| Sulfate | mg/l | 100 | 204.0 | | | 305.0 | 203.00 | 305 | 100 | 83.694 |
| Spec. Cond. | umhos/cm | 740 | 574 | | | 1057 | 790.33 | 1057 | 574 | 200.370 |
| Calcium | mg/l | 42 | 19.60 | | | 30.4 | 30.67 | 42 | 19.6 | 9.147 |
| Magnesium | mg/l | 11 | 6.80 | | | 6.8 | 8.20 | 11 | 6.8 | 1.980 |
| Sodium | mg/l | 170 | 174.8 | | | 165.4 | 170.07 | 174.8 | 165.4 | 3.838 |
| Chloride | mg/l | 10 | 12.1 | | | 18.6 | 13.57 | 18.6 | 10 | 3.661 |
| Mercury | mg/l | 0.0002 | < 0.0002 | | | 0.0020 | 0.00 | 0.002 | 0.0002 | 0.001 |
| Zinc | mg/l | 0.02 | 0.016 | | | 0.0140 | 0.02 | 0.02 | 0.014 | 0.002 |
| Barium | mg/l | < 0.5 | < 0.10 | | | 0.1000 | 0.23 | 0.5 | 0.1 | 0.189 |
| Selenium | mg/l | 0.0031 | < 0.05 | | | 0.0100 | 0.02 | 0.05 | 0.0031 | 0.021 |
| Lead | mg/l | < 0.05 | < 0.05 | | | 0.0500 | 0.05 | 0.05 | 0.05 | 0.000 |
| Arsenic | mg/l | 0.0011 | < 0.05 | | | 0.0100 | 0.02 | 0.05 | 0.0011 | 0.021 |
| Aluminum | mg/l | 1.1 | 4.0 | | | 0.2000 | 1.77 | 4 | 0.2 | 1.621 |
| Chromium | mg/l | < 0.02 | < 0.06 | | | 0.0600 | 0.05 | 0.06 | 0.02 | 0.019 |

Note: No 3rd or 4th Quarter Data

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TABLE 14
QUARTERLY GROUNDWATER MONITORING WELL QUALITY SUMMARY
CENTURY MINE
WAYNE TOWNSHIP, BELMONT COUNTY, OHIO
10 APRIL 2002

OBSERVATION PERIOD: 1Q, 2001 through 1Q, 2002
GROUNDWATER MONITORING WELLS: CG-01 Series

| Well | Analyte | Notes (MCL exceedence) |
|---|---|---|
| 1A | Iron | 4.1 mg/l, 4Q, 2001 |
| | Manganese | 0.09 mg/l, 2Q, 2001; 0.059 mg/l, 1Q, 2002 |
| | TDS | Exceeded 500 mg/l (secondary standard) all 5 quarters; ave. 1172 mg/l. |
| | Sulfate | Exceeded 250 mg/l (secondary standard) all 5 quarters; ave. 604 mg/l. |
| | Mercury | 0.006 mg/l, 1Q, 2001 |
| | Lead | 0.059 mg/l, 2Q, 2001 |
| 2A | Iron | 1.6 mg/l, 2Q, 2001; 5.3 mg/l, 4Q, 2001 |
| | Manganese | 0.07 mg/l, 1Q, 2001; 0.06 mg/l, 2Q, 2001 |
| | TDS | Exceeded 500 mg/l (secondary standard) all 5 quarters; ave. 776 mg/l. |
| | Sulfate | Exceeded 250 mg/l (secondary standard) last 4 quarters; ave. 291 mg/l. |
| | Mercury | 0.0056 mg/l, 1Q, 2001 |
| | Lead | 0.084 mg/l, 2Q, 2001 |
| | Aluminum | 0.021 mg/l, 3Q, 2001 |
| 3A | | Sampled only 1Q, 2001 |
| | TDS | 270 mg/l |
| 3B | Manganese | 0.10 mg/l, 1 & 4Q, 2001; 0.123 mg/l, 2Q, 2001; 0.139 mg/l, 1Q, 2002 |
| | TDS | Exceeded 500 mg/l (secondary standard) all 5 quarters; ave. 514 mg/l. |
| | Mercury | 0.007 mg/l, 1Q, 2001 |
| | Lead | 0.051 mg/l, 2Q, 2001 |
| | Aluminum | 0.03 mg/l, 1Q, 2001; 0.74 mg/l, 2Q, 2001 |
| 3C | | Sampled only 1Q, 2001 |
| | Mercury | 0.0046 mg/l |
| 4A | | Sampled only 1 & 2Q, 2001 |
| | Iron | 23 mg/l, 1Q, 2001; 58 mg/l, 2Q, 2001 |
| | Manganese | 0.31 mg/l, 1Q, 2001; 0.533 mg/l, 2Q, 2001 |
| | TDS | Exceeded 500 mg/l (secondary standard) both quarters; ave. 1344 mg/l. |
| | Mercury | 0.007 mg/l, 1Q, 2001 |
| | Lead | 0.108 mg/l, 2Q, 2001 |
| | Aluminum | 22 mg/l, 1Q, 2001; 61.9 mg/l, 2Q, 2001 |
| 4B | | Sampled only 1Q, 2001 |
| | Iron | 1.9 mg/l |
| | TDS | 600 mg/l |
| | Aluminum | 4.6 mg/l |
| 4C | | Sampled only 1 & 2Q, 2001 |
| | Iron | 1.0 mg/l, 1Q, 2001; 0.43 mg/l, 2Q, 2001 |
| | Manganese | 0.07 mg/l, 1Q, 2001 |
| | Aluminum | 1.2 mg/l, 1Q, 2001; 0.33 mg/l, 2Q, 2001 |



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**TABLE 14**
**QUARTERLY GROUNDWATER MONITORING WELL QUALITY SUMMARY**
**CENTURY MINE**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**10 APRIL 2002**

**OBSERVATION PERIOD: 1Q, 2001 through 1Q, 2002**
**GROUNDWATER MONITORING WELLS: CG-01 Series**

| Well | Analyte | Notes (MCL exceedence) |
|---|---|---|
| 5A | | Sampled 1 & 2Q, 2001 and 1Q, 2002 |
| | Iron | 19 mg/l, 1Q, 2001; 58 mg/l, 2Q, 2001; 12.4 mg/l, 1Q, 2002 |
| | Manganese | 0.24 mg/l, 1Q, 2001; 0.533 mg/l, 2Q, 2001; 0.179 mg/l, 1Q, 2002 |
| | TDS | Exceeded 500 mg/l (secondary standard) all 3 quarters; ave. 2193 mg/l. |
| | Sulfate | 550 mg/l, 1Q, 2002 |
| | Lead | 0.108 mg/l, 2Q, 2001 |
| | Aluminum | 250 mg/l, 1Q, 2001; 61.9 mg/l, 2Q, 2001; 14.59 mg/l, 1Q, 2002 |
| | Chromium | 0.11 mg/l, 1Q, 2001 |
| 5B | Iron | 0.59 mg/l, 1Q, 2001; 2.19 mg/l, 2Q, 2001; 0.31 mg/l, 3Q, 2001; 1.02 mg/l, 4Q |
| | Manganese | Exceeded 0.05 mg/l (secondary standard) all 5 quarters; ave. 0.21 mg/l. |
| | TDS | Exceeded 500 mg/l (secondary standard) all 5 quarters; ave. 654 mg/l. |
| | Aluminum | 1.0 mg/l, 1Q, 2001; 1.98 mg/l, 2Q, 2001; 0.70 mg/l 4Q, 2001 |
| 5C | | Sampled only 1Q, 2001 |
| | | No exceedence in all parameters |
| 6B | | Sampled 1 & 2Q, 2001, 1Q, 2002 |
| | Iron | 0.56 mg/l, 1Q, 2001; 1.54 mg/l, 2Q, 2001; 0.18 mg/l, 1Q, 2002 |
| | Manganese | 0.07 mg/l, 2Q; 0.088 mg/l, 1Q, 2002 |
| | TDS | Exceeded 500 mg/l (secondary standard) all 3 quarters; ave. 546 mg/l. |
| | Sulfate | 305 mg/l, 1Q, 2002 |
| | Aluminum | 1.1 mg/l, 1Q, 2001; 4.0 mg/l, 2Q, 2001 |
| 6C | | Sampled 1 & 2Q, 2001 |
| | Iron | 0.39 mg/l, 1Q, 2001 |
| | Manganese | 0.08 mg/l, 2Q, 2001 |
| | TDS | Exceeded 500 mg/l (secondary standard) both quarters; ave. 795 mg/l. |
| | Sulfate | Exceeded 250 mg/l (secondary standard) both quarters; ave. 339 mg/l. |
| | Mercury | 0.007 mg/l, 1Q, 2001 |
| | Aluminum | 0.66 mg/l, 1Q, 2001; 0.27 mg/l, 2Q, 2001 |



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# APPENDIX 2

# WATER QUALITY

# 1ST QUARTER, 2001

# Chain of Custody Record

Customer Name: Century Mine ~~OHIO VALLEY COAL COMPANY~~ Telephone: 614-926-1351 (OVCC)

Address: ~~58854 PLEASANT RIDGE ROAD~~ 614-782-1767 (QES)

~~ALLEDONIA, OHIO 43902~~ 614-782-1905 (QES Fax)

Person to Contact: ~~[redacted]~~ Bill Sidney

Billing Address: SAME

Date of Sample Shipment: 4-2-01 Sampler: QES 3306780027

How Shipped: QES To Fridge @ Mine picked up by lab Cleveland

## SAMPLE LOG AND ANALYSIS REQUEST

| Sample ID | | Containers # and Type | Date | Time | pH, S.U. | |
|---|---|---|---|---|---|---|
| | | 4-500 NP | 3/30/01 | | | 8°C |
| CW-01-5A | ~~4010~~ 4009 | | | 0800 | 9.3 | |
| CW-01-5B | 4011 | 4010 | | 0805 | 7.6 | 7°C |
| CW-01-5C | 4012 | 4011 | | 0815 | 7.4 | 6°C |
| CW-01-01 | 4013 | 4012 | | 0825 | 7.5 | 8°C |
| CW-01-02 | 4014 | 4013 | | 0800 | 7.9 | 7°C |
| CW-01-3A | 4015 | 4014 | | 0930 | 7.9 | 7°C |
| CW-01-3B | 4016 | 4015 | | 0940 | 7.5 | 8°C |
| CW-01-3C | 4017 | 4016 | | 0950 | 7.4 | 8°C |
| CW-01-4A | 4018 | 4017 | | 1020 | 9.9 | 10°C |
| CW-01-4B | 4019 | 4018 2-500 NP | | 1030 | 8.5 | 10°C |
| CW-01-4C | 4020 | 4019 4-500 NP | | 1040 | 7.7 | 8°C |
| CW-01-6B | 4021 | 4020 3-500 NP | | 1310 | 8.3 | 11°C |

**Analysis Requested**

| ANALYSIS |
|---|
| SPECIFIC CONDUCTIVITY ✓ |
| pH ✓ |
| TOTAL DISSOLVED SOLIDS ✓ |
| TOTAL SUSPENDED SOLIDS ✓ |
| TOTAL SULFATE ✓ |
| TOTAL ALKALINITY ✓ |
| TOTAL IRON ✓ |
| TOTAL MAGNESIUM ✓ |
| TOTAL SELENIUM ✓ |
| TOTAL ALUMINUM ✓ |
| TOTAL ARSENIC ✓ |
| TOTAL BARIUM ✓ |
| TOTAL CALCIUM ✗ |
| TOTAL CHLORIDE ✓ |
| TOTAL CHROMIUM ✓ |
| TOTAL LEAD ✓ |
| TOTAL MANGANESE ✓ |
| TOTAL SODIUM ✓ |
| TOTAL MERCURY ✓ |
| TOTAL ZINC ✓ |

| Relinquished by: (signature) | Date & Time | Relinquished by: (signature) | Date & Time |
|---|---|---|---|
| David [illegible] | 1700 4-2-01 | | |
| Relinquished by: (signature) | Date & Time | Relinquished by: (signature) | Date & Time |
| [illegible] | 4-2-01 | | |
| Received for Laboratory by: (signature) | | Date & Time | |
| [illegible] | | 4/3/01 1006 | |

# Chain of Custody Record

| | | | |
|---|---|---|---|
| Customer Name: | Century Mine ~~OHIO VALLEY COAL COMPANY~~ | Telephone: | 614-926-1351 (OVCC) |
| Address: | 56854 PLEASANT RIDGE ROAD | | 614-782-1767 (QES) |
| | ALLEDONIA, OHIO 43902 | | 614-782-1905 (QES Fax) |
| Person to Contact: | ~~DAVE BARTSCH~~ Bill Sipley | | 740- |
| Billing Address: | SAME | | |
| Date of Sample Shipment: | 4-4-01 | Sampler: | QES |
| How Shipped: | QES To Cooler @ Mine, picked up by lab | | |

## SAMPLE LOG AND ANALYSIS REQUEST

Anlaysis Requested

| Sample ID | Containers # and Type | Date | Time | pH, S.U. | | |
|---|---|---|---|---|---|---|
| CW-01-6A 104087 | 4-500 NP | 3/30/01 | 1145 | 8.1 8° | | |
| CW-01-6B | 1-500 NP | | 1310 | 8.3 11° | | |
| CW-01-4B 104088 | 2-500 NP | | 1030 | 8.5 10° | | |
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ANALYSIS FOR NO. 1-8:

SPECIFIC CONDUCTIVITY
pH
TOTAL DISSOLVED SOLIDS
TOTAL SUSPENDED SOLIDS
TOTAL SULFATE
TOTAL ALKALINITY
TOTAL IRON
TOTAL MAGNESIUM
TOTAL SELENIUM
TOTAL ALUMINUM
TOTAL ARSENIC
TOTAL BARIUM
TOTAL CALCIUM
TOTAL CHLORIDE
TOTAL CHROMIUM
TOTAL LEAD
TOTAL MANGANESE
TOTAL SODIUM
TOTAL MERCURY
TOTAL ZINC

| Relinquished by: (signature) | Date & Time | Relinquished by: (signature) | Date & Time |
|---|---|---|---|
| David Rah | 1500 4-4-01 | John Clay | 4-4-01 |
| Relinquished by: (signature) | Date & Time | Relinquished by: (signature) | Date & Time |
| | | | |

| Received for Laboratory by: (signature) | Date & Time |
|---|---|
| [signature] | 4/5/01 0900 |

AEC 11713

## Century Mine Monitoring Well Project

| Well I.D. # | Depth | 1st. SWL | vol. In feet | vol. In gallons | 2nd. SWL | Date | Ph | Temp |
|---|---|---|---|---|---|---|---|---|
| CG-01-1A | 50' | 47' | 3' | 0.5 | 49.5' | 3/27/2001 | 7.5 | 8 c. |
| CG-01-2A | 24' | 16' | 8' | 1.3 | 23' | 3/27/2001 | 7.9 | 7 c. |
| CG-01-3A | 281' 280' | 150' | 130' | 21.2 | 280' | 3/27/2001 | 7.9 | 7 c. |
| CG-01-3B | 88' | 86' | 2' | 0.3 | 87.5' | 3/27/2001 | 7.5 | 8 c. |
| CG-01-3C | 25' | 21' | 4' | 0.7 | 23.5' | 3/27/2001 | 7.4 | 8 c. |
| CG-01-4A | 259' | 121' | 138' | 22.5 | 259' | 3/27/2001 | 9.9 | 10 c. |
| CG-01-4B | 57' 59' | 53' | 6' | 1 | 59' | 3/27/2001 | 8.5 | 10 c. |
| CG-01-4C | 24' | 9.5' | 14.5' | 2.4 | 12.5' | 3/27/2001 | 7.2 | 8 c. |
| CG-01-5A | 283' 270' | 51.5' | 218.5' | 35.6 | 270' | 3/27/2001 | 9.3 | 8 c. |
| CG-01-5B | 82' | 77.5' | 4.5' | 0.7 | 78.5' | 3/27/2001 | 7.6 | 7 c. |
| CG-01-5C | 25' 23.5' | 7.5' | 16' | 2.6 | 10.5' | 3/27/2001 | 7.4 | 6 c. |
| CG-01-6B | 79' | 75' | 4' | 0.7 | 78.5' | 3/27/2001 | 8.3 | 11 c. |
| CG-01-6C | 44' | 40' | 4' | 0.7 | 43.5' | 3/27/2001 | 7.7 | 8 c. |

| Well I.D. # | Gal. Bailed | Turbidity |
|---|---|---|
| CG-01-1A | 2 | cloudy |
| CG-01-2A | 8 | cloudy |
| CG-01-3A | 63.6 | cloudy |
| CG-01-3B | 1 | cloudy |
| CG-01-3C | 2 | cloudy |
| CG-01-4A | 67 | cloudy |
| CG-01-4B | 3 | cloudy |
| CG-01-4C | 7.5 | cloudy |
| CG-01-5A | 106 | cloudy |
| CG-01-5B | 2.5 | cloudy |
| CG-01-5C | 8 | cloudy |
| CG-01-6B | 2.1 | cloudy |
| CG-01-6C | 2.1 | cloudy |

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

01-May-01


By: Andrew R Westfall
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-01 | Date & Time Sampled: | 03-30-01 0825 |
| Analysis Number: | 104012 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.5 | S.U. | 03-30-01 0825 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.45 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 960 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 1.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 470 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 320 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.11 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 100 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0012 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 0.11 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | <0.0010 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 190 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-01
Analysis Number: 104012



| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 24 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | 0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.05 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 250 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0060 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | <0.01 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 1500 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
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BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

27-Apr-01


By: Andrew R Walker II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-02 | Date & Time Sampled: | 03-30-01 0800 |
| Analysis Number: | 104013 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.9 | S.U. | 03-30-01 0800 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.99 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 550 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | <1.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 200 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 160 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.09 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 25 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0024 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 0.16 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0013 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 96 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
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BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-02
Analysis Number: 104013



| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 47 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.07 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 160 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0056 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | <0.01 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 900 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
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BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

01-May-01


By: Andrew R. Walter II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-3A | Date & Time Sampled: | 03-30-01 0930 |
| Analysis Number: | 104014 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.9 | S.U. | 03-30-01 0930 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.98 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 270 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | <1.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 57 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 210 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.12 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 14 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0031 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 0.19 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0019 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 80 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-3A
Analysis Number: 104014

01-May-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 1.5 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.04 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 53 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | <0.0001 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | <0.01 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 460 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

27-Apr-01


By: Andrew R. Weber II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-3B | Date & Time Sampled: | 03-30-01 0940 |
| Analysis Number: | 104015 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.5 | S.U. | 03-30-01 0940 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.96 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 340 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 4.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 57 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 250 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.07 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 19 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0038 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 0.30 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0017 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 110 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.

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(304) 547-9094
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-3B
Analysis Number: 104015

27-Apr-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 1.5 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | 0.03 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.10 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 51 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0070 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.01 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 610 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

01-May-01


By: Andrew R. Walker II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-3C | Date & Time Sampled: | 03-30-01 0950 |
| Analysis Number: | 104016 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.4 | S.U. | 03-30-01 0950 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.34 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 170 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 4.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 33 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 120 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.19 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 6.8 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0012 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 0.10 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | <0.001 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 67 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-3C
Analysis Number: 104016



| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | <0.5 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.04 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 9.7 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0046 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.02 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 280 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
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BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

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LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

02-May-01
Page 1 of 2

By: _____
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-4A | Date & Time Sampled: | 03-30-01 1020 |
| Analysis Number: | 104017 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 9.9 | S.U. | 03-30-01 1020 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 9.66 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 1400 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 120 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 220 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 300 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 23 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 7.1 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0022 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 22 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0019 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 28 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-4A
Analysis Number: 104017

02-May-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 7.3 | mg/l. | 05-01-01 1400 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | 0.06 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.31 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 330 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0007 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.08 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 830 | µmhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 µmhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

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LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

02-May-01
Page 1 of 2

By: Andrew R. Krabill II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-4B | Date & Time Sampled: | 03-30-01 1030 |
| Analysis Number: | 104018 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 8.5 | S.U. | 03-30-01 1030 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 8.52 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 600 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 22 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 240 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 160 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 1.9 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 4.9 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0044 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 4.6 | mg/l. | 04-06-01 1800 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0025 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 24 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-4B
Analysis Number: 104018

02-May-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 4.4 | mg/l. | 05-01-01 1400 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | 0.03 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.02 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 280 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0012 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.02 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 850 | µmhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 µmhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
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SHIPPING ADDRESS
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BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

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LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

02-May-01
Page 1 of 2

By: Andrew R. Weber II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-4C | Date & Time Sampled: | 03-30-01 1040 |
| Analysis Number: | 104019 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.7 | S.U. | 03-30-01 1040 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.16 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 170 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 44 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 46 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 120 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 1.0 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 8.5 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0014 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 1.2 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | <0.001 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 45 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] *Standard Methods*, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

IRA-LET INC.
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-4C
Analysis Number: 104019

02-May-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 1.5 | mg/l. | 05-01-01 1400 | WB | 4500 ClB | [1] | 0.50 mg/l. |
| Total Chromium | 0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.07 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 20 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0003 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.03 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 270 | µmhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 µmhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

27-Apr-01


By: Andrew R Walton II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-5A | Date & Time Sampled: | 03-30-01 0800 |
| Analysis Number: | 104009 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 9.3 | S.U. | 03-30-01 0800 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 8.85 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 1600 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 200 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 180 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 270 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 19 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 8.3 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0021 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 250 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0024 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 30 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-5A
Analysis Number: 104009



| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 6.0 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | 0.11 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.24 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 390 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0001 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.10 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 610 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
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SHIPPING ADDRESS
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BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

27-Apr-01


By: Andrew R Weber II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-5B | Date & Time Sampled: | 03-30-01 0805 |
| Analysis Number: | 104010 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.6 | S.U. | 03-30-01 0805 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.73 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 770 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | <1.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 230 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 360 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.59 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 6.2 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0030 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 1.0 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0040 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 37 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.

P. O. BOX 2019
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-5B
Analysis Number: 104010



| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 13 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.16 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 380 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0001 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.05 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 1200 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
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SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

27-Apr-01


By: Andrew R Weber II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-5C | Date & Time Sampled: | 03-30-01 0815 |
| Analysis Number: | 104011 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 7.4 | S.U. | 03-30-01 0815 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 7.28 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 120 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | <1.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 24 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 77 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | <0.05 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 8.8 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0017 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | <0.1 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0013 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 39 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-5C
Analysis Number: 104011



| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | <0.5 | mg/l. | 04-09-01 1300 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | <0.02 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 720 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0010 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | <0.01 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 140 | umhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 umhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

15-May-01
Page 1 of 2

By: Andrew R. Walter II
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Century Mine | Sampled By: | QES (DR) |
| Source: | CG-01-6A C WJS | Date & Time Sampled: | 03-30-01 1145 |
| Analysis Number: | 104087 | Date & Time Received: | 04-05-01 0900 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 8.1 | S.U. | 03-30-01 1145 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 8.23 | S.U. | 05-01-01 1600 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 790 | mg/l. | 04-24-01 0930 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | <1.0 | mg/l. | 04-24-01 0930 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 370 | mg/l. | 05-01-01 0945 | BL | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 170 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.39 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 10.4 | mg/l. | 04-11-01 1815 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0021 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 0.66 | mg/l. | 04-26-01 1620 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0017 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 67 | mg/l. | 04-26-01 1600 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Century Mine
Source: CG-01-6A
Analysis Number: 104087

15-May-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 13 | mg/l. | 05-01-01 1400 | WB | 4500 ClB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | RW | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-30-01 1600 | AC | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.02 | mg/l. | 04-17-01 1430 | RW | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 240 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0007 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.08 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 1100 | µmhos/cm | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 µmhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

LABORATORY ANALYSES

02-May-01


Century Mine
P.O. Box 5
Alledonia, OH 43902
Attn: Mr. Bill Siplivy

By: _____
TraDet, Inc.

| | | | |
|---|---|---|---|
| Company: | Ohio Valley Coal Company | Sampled By: | QES (DR) |
| Source: | CW-01-6B | Date & Time Sampled: | 03-30-01 1310 |
| Analysis Number: | 104020 | Date & Time Received: | 04-03-01 1000 |

| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| pH, Field | 8.3 | S.U. | 03-30-01 1310 | QES (DR) | 150.1 | [2] | |
| pH, Lab | 8.10 | S.U. | 04-06-01 1400 | WB | 150.1 | [2] | |
| Total Dissolved Solids | 460 | mg/l. | 04-04-01 1000 | WB | 160.1 | [2] | 10 mg/l. |
| Total Suspended Solids | 8.0 | mg/l. | 04-04-01 1000 | WB | 160.2 | [2] | 1.0 mg/l. |
| Total Sulfate (as SO4) | 100 | mg/l. | 04-05-01 1430 | RW | 375.4 | [2] | 1.5 mg/l. |
| Total Alkalinity (as CACO3) | 260 | mg/l. | 04-06-01 1330 | WB | 310.1 | [2] | 1.2 mg/l. |
| Total Iron | 0.56 | mg/l. | 04-20-01 1145 | RW | 236.1 | [2] | 0.05 mg/l. |
| Total Magnesium | 11 | mg/l. | 04-05-01 1700 | AC | 242.1 | [2] | 0.02 mg/l. |
| Total Selenium | 0.0031 | mg/l. | 04-07-01 1300 | AC | 3114B | [1] | 0.001 mg/l. |
| Total Aluminum | 1.1 | mg/l. | 04-06-01 1600 | AC | 202.1 | [2] | 0.10 mg/l. |
| Total Arsenic | 0.0011 | mg/l. | 04-07-01 1530 | AC | 206.3 | [2] | 0.001 mg/l. |
| Total Barium | <0.5 | mg/l. | 04-08-01 1215 | AC | 200.7 | [2] | 0.5 mg/l. |
| Total Calcium | 42 | mg/l. | 04-05-01 1845 | AC | 215.1 | [2] | 0.02 mg/l. |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

TRA-DET INC.
P. O. BOX 2019
WHEELING, WV 26003-0219
(304) 547-9094
FAX: (304) 547-9097

SHIPPING ADDRESS
RD #2, BOX 227A
BATTLE RUN ROAD
TRIADELPHIA, WV 26059-9609

Company: Ohio Valley Coal Company - Century Mine
Source: CW-01-6B
Analysis Number: 104020

02-May-01


| PARAMETER | CONCENTRATION | | DATE & TIME ANALYZED | ANALYST | METHOD | | MDL |
|---|---|---|---|---|---|---|---|
| Chloride | 10 | mg/l. | 05-01-01 1400 | WB | 4500 CIB | [1] | 0.50 mg/l. |
| Total Chromium | <0.02 | mg/l. | 04-25-01 1515 | AC | 218.1 | [2] | 0.02 mg/l. |
| Total Lead | <0.05 | mg/l. | 04-13-01 1300 | SK | 239.1 | [2] | 0.05 mg/l. |
| Total Manganese | 0.03 | mg/l. | 04-17-01 1430 | SK | 243.1 | [2] | 0.02 mg/l. |
| Total Sodium | 170 | mg/l. | 04-11-01 1710 | AC | 273.1 | [2] | 0.02 mg/l. |
| Mercury | 0.0002 | mg/l. | 04-19-01 1345 | AC | 245.1 | [2] | 0.0001 mg/l. |
| Total Zinc | 0.02 | mg/l. | 04-11-01 1600 | AC | 289.1 | [2] | 0.01 mg/l. |
| Specific Conductance | 740 | µmhos | 04-05-01 1415 | RW | 120.1 | [2] | 1.5 µmhos |

MDL: Method Detection Limit
[1] Standard Methods, 18th Edition [2] US EPA [3] ASTM [4] EPA SW846

# APPENDIX 3

# WATER QUALITY

# 2ND QUARTER, 2001

| Well I.D. # | Gal. Bailed | Turbidity | |
|---|---|---|---|
| CG-01-1A | 1.5 | cloudy | |
| CG-01-2A | 5.1 | cloudy | |
| CG-01-3A | | | |
| CG-01-3B | 1.8 | cloudy | bailed on 6-21-01 |
| CG-01-3C | | | |
| CG-01-4A | 34 | cloudy | bailed on 6-14-01 |
| CG-01-4B | 59' | cloudy | |
| CG-01-4C | | | |
| CG-01-5A | 18 | cloudy | bailed on 6-21-01 |
| CG-01-5B | 2.4 | cloudy | |
| CG-01-5C | | | |
| CG-01-6B | 2 | cloudy | |
| CG-01-6C | 8.3 | cloudy | |

## Century Mine Monitoring Well Project

| Well I.D. # | Depth | 1st. SWL | vol. In feet | vol. In gallons | 2nd. SWL | Date | Ph | Temp |
|---|---|---|---|---|---|---|---|---|
| CG-01-1A | 50' | 47' | 3' | 0.5 | 47' | 6/21/2001 | 7.2 | 13 c |
| CG-01-2A | 24' | 13.5 | 10.5' | 1.7 | 23' | 6/21/2001 | 7.6 | 13 c |
| CG-01-3A | 280' | | | | | | | |
| CG-01-3B | 88' | 84.5 | 3.5' | 0.6 | 85' | 6/29/2001 | 7 | 13 c |
| CG-01-3C | 25' | | | | | | | |
| CG-01-4A | 259' | 148' | 111' | 18.1 | 148' | 6/21/2001 | 9.7 | 13 c |
| CG-01-4B | 59' | 57' | 2' | 0.33 | 59' | 6/14/2001 | ball dry | |
| CG-01-4C | 24' | | | | | | | |
| CG-01-5A | 270' | 208' | 62' | 10.1 | 270' | 6/22/2001 | 9.3 | 13 c |
| CG-01-5B | 82' | 77' | 5' | 0.8 | 77.5' | 6/21/2001 | 7.6 | 13 c |
| CG-01-5C | 23.5' | | | | | | | |
| CG-01-6B | 79' | 75' | 4' | 0.65 | 77' | 6/14/2001 | 1/7/1900 | 12 c |
| CG-01-6C | 44' | 27' | 17' | 2.8 | 42' | 6/14/2001 | 7.3 | 13 c |

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

| | | |
|---|---|---|
| Facility Name: Century Mine | **Lab ID #: 01-06-576**<br>Monitoring Point: MW CG-01-01A | |
| Sample collected by: QES | Date of Sample Collection: 06-21-01<br>Sampling Depth: | Temperature: 13°C<br>Depth of Water Level: |

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 7.46 | Std. Units | 0.1 |
| Alkalinity | 301.60 | mg/l | 1.0 |
| Sulfate | 664.0 | mg/l | 10.0 |
| Conductance | 1821 | µmho/cm | 1 |
| T D S | 1300.0 | mg/l | 20.0 |
| Chlorides | 37.0 | mg/l | 5.0 |
| Calcium | 150.10 | mg/l | 0.1 |
| Magnesium | 88.20 | mg/l | 0.1 |
| Sodium | 117.50 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | <200.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | 59.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 29.0 | µg/l | 8 |
| Iron | 300.0 | µg/l | 40 |
| Manganese | 90.0 | µg/l | 20 |
| Field pH | 7.2 | mg/l | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

| | | |
|---|---|---|
| Facility Name: Century Mine | **Lab ID #: 01-06-577**<br>Monitoring Point: MW CG-01-2A | |
| Sample collected by: QES | Date of Sample Collection: 06-21-01<br>Sampling Depth: | Temperature: 13°C<br>Depth of Water Level: |

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 7.75 | Std. Units | 0.1 |
| Alkalinity | 189.80 | mg/l | 1.0 |
| Sulfate | 317.0 | mg/l | 10.0 |
| Conductance | 1171 | µmho/cm | 1 |
| T D S | 860.0 | mg/l | 20.0 |
| Chlorides | 53.0 | mg/l | 5.0 |
| Calcium | 104.70 | mg/l | 0.1 |
| Magnesium | 34.30 | mg/l | 0.1 |
| Sodium | 89.20 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | <200.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | 84.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 18.0 | µg/l | 8 |
| Iron | 1600 | µg/l | 40 |
| Manganese | 60.0 | µg/l | 20 |
| Field pH | 7.6 | mg/l | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

Facility Name: Century Mine
Sample collected by: QES

**Lab ID #: 01-06-688**
Monitoring Point: CG-01-3B
Date of Sample Collection: 07-2-01
Temperature:

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 7.40 | Std. Units | 0.1 |
| Alkalinity | 228.40 | mg/l | 1.0 |
| Sulfate | 186.0 | mg/l | 10.0 |
| Conductance | 855 | µmho/cm | 1 |
| T D S | 630.0 | mg/l | 20.0 |
| Chlorides | 6.9 | mg/l | 5.0 |
| Calcium | 84.60 | mg/l | 0.1 |
| Magnesium | 22.00 | mg/l | 0.1 |
| Sodium | 47.70 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 740.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | 51.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 10.0 | µg/l | 8 |
| Iron | 1050.0 | µg/l | 40 |
| Manganese | 123.0 | µg/l | 20 |
| Field pH | | mg/l | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

Facility Name: Century Mine
Sample collected by: QES

**Lab ID #: 01-06-686**
Monitoring Point: CG-01-4A
Date of Sample Collection: 06-22-01
Temperature: 13°C

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 8.66 | Std. Units | 0.1 |
| Alkalinity | 317.00 | mg/l | 1.0 |
| Sulfate | 205.0 | mg/l | 10.0 |
| Conductance | 1535 | µmho/cm | 1 |
| T D S | 1288.0 | mg/l | 20.0 |
| Chlorides | 116.3 | mg/l | 5.0 |
| Calcium | 28.5 | mg/l | 0.1 |
| Magnesium | 19.40 | mg/l | 0.1 |
| Sodium | 359.00 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 61900.0 | µg/l | 200 |
| Barium | 473.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | 73.0 | µg/l | 60 |
| Lead | 108.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 176.0 | µg/l | 8 |
| Iron | 58000.0 | µg/l | 40 |
| Manganese | 533.0 | µg/l | 20 |
| Field pH | 9.7 | Std. Units | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

| | | |
|---|---|---|
| Facility Name: Century Mine | **Lab ID #: 01-06-511**<br>Monitoring Point: CG-01-4C | |
| Sample collected by: QES | Date of Sample Collection: 06-14-01<br>Sampling Depth: | Temperature: 13°C<br>Depth of Water Level: |

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 7.10 | Std. Units | 0.1 |
| Alkalinity | 106.00 | mg/l | 1.0 |
| Sulfate | 21.0 | mg/l | 10.0 |
| Conductance | 265 | µmho/cm | 1 |
| T D S | 180.0 | mg/l | 20.0 |
| Chlorides | <5.0 | mg/l | 5.0 |
| Calcium | 30.20 | mg/l | 0.1 |
| Magnesium | 9.20 | mg/l | 0.1 |
| Sodium | 6.40 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 330.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | <50.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 23.0 | µg/l | 8 |
| Iron | 430.0 | µg/l | 40 |
| Manganese | 30.0 | µg/l | 20 |
| Field pH | 7.3 | Std. Units | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

| | | |
|---|---|---|
| Facility Name: Century Mine | **Lab ID #: 01-06-687**<br>Monitoring Point: CG-01-5A | |
| Sample collected by: QES | Date of Sample Collection: 06-14-01<br>Sampling Depth: | Temperature: 13°C<br>Depth of Water Level: |

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 8.66 | Std. Units | 0.1 |
| Alkalinity | 317.00 | mg/l | 1.0 |
| Sulfate | 205.0 | mg/l | 10.0 |
| Conductance | 1535 | µmho/cm | 1 |
| T D S | 2980.0 | mg/l | 20.0 |
| Chlorides | 116.3 | mg/l | 5.0 |
| Calcium | 28.5 | mg/l | 0.1 |
| Magnesium | 19.40 | mg/l | 0.1 |
| Sodium | 359.00 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 61900.0 | µg/l | 200 |
| Barium | 473.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | 73.0 | µg/l | 60 |
| Lead | 108.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 176.0 | µg/l | 8 |
| Iron | 58000.0 | µg/l | 40 |
| Manganese | 533.0 | µg/l | 20 |
| Field pH | 9.7 | Std. Units | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

Facility Name: Century Mine

Sample collected by: QES

**Lab ID #: 01-06-578**
Monitoring Point: MW CG-01-5B
Date of Sample Collection: 06-21-01

Temperature: 13°C

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 7.73 | Std. Units | 0.1 |
| Alkalinity | 299.40 | mg/l | 1.0 |
| Sulfate | 145.0 | mg/l | 10.0 |
| Conductance | 1024 | µmho/cm | 1 |
| T D S | 730.0 | mg/l | 20.0 |
| Chlorides | <5.0 | mg/l | 5.0 |
| Calcium | 23.10 | mg/l | 0.1 |
| Magnesium | 5.20 | mg/l | 0.1 |
| Sodium | 215.00 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 1980.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | <50.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 20.0 | µg/l | 8 |
| Iron | 2190.0 | µg/l | 40 |
| Manganese | 180.0 | µg/l | 20 |
| Field pH | 7.6 | mg/l | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

| | | |
|---|---|---|
| Facility Name: Century Mine | **Lab ID #: 01-06-512**<br>Monitoring Point: CG-01-6B | |
| Sample collected by: QES | Date of Sample Collection: 06-14-01<br>Sampling Depth: | Temperature: 11°C<br>Depth of Water Level: |

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 8.15 | Std. Units | 0.1 |
| Alkalinity | 230.20 | mg/l | 1.0 |
| Sulfate | 204.0 | mg/l | 10.0 |
| Conductance | 574 | µmho/cm | 1 |
| T D S | 420.0 | mg/l | 20.0 |
| Chlorides | 12.1 | mg/l | 5.0 |
| Calcium | 19.60 | mg/l | 0.1 |
| Magnesium | 6.80 | mg/l | 0.1 |
| Sodium | 174.8 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 4000.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | <50.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 16.0 | µg/l | 8 |
| Iron | 1540.0 | µg/l | 40 |
| Manganese | 70.0 | µg/l | 20 |
| Field pH | 6.4 | Std. Units | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# ILA REPORT

Industrial Lab Analysis
2240 Williamsburg Drive
Glen Dale, WV 26038
304-233-5595

| | | |
|---|---|---|
| Facility Name: Century Mine | **Lab ID #: 01-06-513**<br>Monitoring Point: CG-01-6C | |
| Sample collected by: QES | Date of Sample Collection: 06-14-01<br>Sampling Depth: | Temperature: 12°C<br>Depth of Water Level: |

| Parameters | Results | UNITS | MDL |
|---|---|---|---|
| pH | 7.92 | Std. Units | 0.1 |
| Alkalinity | 176.40 | mg/l | 1.0 |
| Sulfate | 309.0 | mg/l | 10.0 |
| Conductance | 1118 | µmho/cm | 1 |
| T D S | 800.0 | mg/l | 20.0 |
| Chlorides | 25.8 | mg/l | 5.0 |
| Calcium | 92.9 | mg/l | 0.1 |
| Magnesium | 52.80 | mg/l | 0.1 |
| Sodium | 79.00 | mg/l | 0.01 |
| Arsenic | <50.0 | µg/l | 50 |
| Selenium | <50.0 | µg/l | 50 |
| Aluminum | 270.0 | µg/l | 200 |
| Barium | <100.0 | µg/l | 100 |
| Cadmium | <10.0 | µg/l | 10 |
| Chromium | <60.0 | µg/l | 60 |
| Lead | <50.0 | µg/l | 50 |
| Mercury | <0.20 | µg/l | 0.2 |
| Zinc | 495.0 | µg/l | 8 |
| Iron | 180.0 | µg/l | 40 |
| Manganese | 80.0 | µg/l | 20 |
| Field pH | 7.5 | Std. Units | 0.1 |

Ref. MC : Standard Methods for Examination of Water and Wastewater , 18th Edition , and US EPA Methods for Chemical Analysis of Water and Waste.

# APPENDIX 4

# WATER QUALITY

# 3RD QUARTER, 2001

## Century Mine Monitoring Well Project

| Well I.D. # | Depth | 1st. SWL | vol. In feet | vol. In gallons | 2nd. SWL | Date | Ph | Temp |
|---|---|---|---|---|---|---|---|---|
| CG-01-1A | 50' | 49' | 1' | .2 gal. | 49.5' | 9/8/2001 | 7.2 | 13 c |
| CG-01-2A | 24' | 14.5' | 9.5' | 1.5 gal. | 24' | 9/8/2001 | 7.5 | 13 c |
| CG-01-3B | 88' | 86' | 2' | .3 gal. | 88' | 9/8/2001 | 7.4 | 13 c |
| CG-01-4A | 259' | 258' | 1' | .2 gal. | na | 9/8/2001 | na | na |
| CG-01-4B | 59' | 57.5' | 1.5' | .2 gal. | na | 9/8/2001 | na | na |
| CG-01-5A | 270' | 268.5' | 1.5' | .2 gal. | na | 9/8/2001 | na | na |
| CG-01-5B | 82' | 77.5' | 4.5' | .7 gal. | 82' | 9/8/2001 | 7.2 | 13 c |
| CG-01-6B | 79' | 77.5' | 1.5' | .2 gal. | na | 9/8/2001 | na | na |

# ILA REPORT

Facility Name : Century Mining
Location of Facility
Lab Id # 01-09-329

Monitoring Point Designation No.: CG-01-1A
Date of Sample Collection : 09-08-01 Temp : 13
Sampling Depth: 50' Depth of Water Level : 49'

| Parameters | UNITS | MDL | Results |
|---|---|---|---|
| pH | Std. Units | 0.1 | 7.47 |
| Alkalinity | mg/l | 1.0 | 307.80 |
| Sulfate | mg/l | 10.0 | 696.0 |
| Conductance | mg/l | 1 | 1841.0 |
| T D S | mg/l | 20.0 | 1200.0 |
| Chlorides | mg/l | 5.0 | 39.0 |
| Calcium | mg/l | 0.01 | 180.20 |
| Magnesium | mg/l | 0.01 | 87.20 |
| Sodium | mg/l | 0.01 | 109.40 |
| Arsenic | ug/l | 10 | <10.0 |
| Selenium | ug/l | 10 | <10.0 |
| Aluminum | ug/l | 200 | <200.0 |
| Barium | ug/l | 100 | <100.0 |
| Cadmium | ug/l | 10 | <10.0 |
| Chromium | ug/l | 60 | <60.0 |
| Lead | ug/l | 5 | <5.0 |
| Mercury | ug/l | 0.2 | <0.20 |
| Zinc | ug/l | 8 | 15.0 |
| Iron | ug/l | 40 | 240.0 |
| Manganese | ug/l | 20 | 50.0 |

# ILA REPORT

Facility Name : Century Mining
Location of Facility
Lab Id # 01-09-327

Monitoring Point Designation No.: CG-01-5B
Date of Sample Collection : 09-08-01 Temp : 13
Sampling Depth: 82' Depth of Water Level : 77.5'

| Parameters | UNITS | MDL | Results |
|---|---|---|---|
| pH | Std. Units | 0.1 | 7.27 |
| Alkalinity | mg/l | 1.0 | 22.40 |
| Sulfate | mg/l | 10.0 | 176.0 |
| Conductance | mg/l | 1 | 812 |
| T D S | mg/l | 20.0 | 520.0 |
| Chlorides | mg/l | 5.0 | <5.0 |
| Calcium | mg/l | 0.01 | 33.20 |
| Magnesium | mg/l | 0.01 | 3.80 |
| Sodium | mg/l | 0.01 | 143.40 |
| Arsenic | ug/l | 10 | <10.0 |
| Selenium | ug/l | 10 | <10.0 |
| Aluminum | ug/l | 200 | <200.0 |
| Barium | ug/l | 100 | <100.0 |
| Cadmium | ug/l | 10 | <10.0 |
| Chromium | ug/l | 60 | <60.0 |
| Lead | ug/l | 5 | <5.0 |
| Mercury | ug/l | 0.2 | <0.20 |
| Zinc | ug/l | 8 | 14.0 |
| Iron | ug/l | 40 | 310.0 |
| Manganese | ug/l | 20 | 280.0 |

# APPENDIX 5

# WATER QUALITY

# 4TH QUARTER, 2001

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #01-12-336**
Monitoring Point: **CG-01-1A**
Date of Sample Collection: 12-11-01 Temp: 13
Sampling Depth Depth of Water Level: **48'**

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.22 | | | |
| Alkalinity | mg/l | 1.0 | 266.80 | | | |
| Sulfate | mg/l | 10.0 | 593.0 | | | |
| Conductance | mg/l | 1 | 1674 | | | |
| T D S | mg/l | 20.0 | 1200.0 | | | |
| Chlorides | mg/l | 5.0 | 31.9 | | | |
| Calcium | mg/l | 0.1 | 100.20 | | | |
| Magnesium | mg/l | 0.1 | 29.20 | | | |
| Sodium | mg/l | 10 | 75.5 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | 1.34 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 34.0 | | | |
| Iron | ug/l | 40 | 4100.0 | | | |
| Manganese | ug/l | 20 | 40.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #01-12-335**
Monitoring Point: **CG-01-2A**
Date of Sample Collection: 12-11-01 Temp:
Sampling Depth Depth of Water Level:

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.75 | | | |
| Alkalinity | mg/l | 1.0 | 190.80 | | | |
| Sulfate | mg/l | 10.0 | 257.0 | | | |
| Conductance | mg/l | 1 | 1153 | | | |
| T D S | mg/l | 20.0 | 800.0 | | | |
| Chlorides | mg/l | 5.0 | 60.2 | | | |
| Calcium | mg/l | 0.1 | 174.6 | | | |
| Magnesium | mg/l | 0.1 | 64.40 | | | |
| Sodium | mg/l | 10 | 88.0 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | 0.24 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | <8.0 | | | |
| Iron | ug/l | 40 | 5300.0 | | | |
| Manganese | ug/l | 20 | 50.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #01-12-334**
Monitoring Point: **CG-01-3B**
Date of Sample Collection: 12-11-01 Temp: 13
Sampling Depth Depth of Water Level: 86'

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.29 | | | |
| Alkalinity | mg/l | 1.0 | 278.20 | | | |
| Sulfate | mg/l | 10.0 | 105.0 | | | |
| Conductance | mg/l | 1 | 724 | | | |
| T D S | mg/l | 20.0 | 520.0 | | | |
| Chlorides | mg/l | 5.0 | <5.0 | | | |
| Calcium | mg/l | 0.1 | 82.7 | | | |
| Magnesium | mg/l | 0.1 | 15.30 | | | |
| Sodium | mg/l | 10 | 29.0 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | <200.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 24.0 | | | |
| Iron | ug/l | 40 | 90.0 | | | |
| Manganese | ug/l | 20 | 100.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #01-12-333**
Monitoring Point: **CG-01-5B**
Date of Sample Collection: 12-11-01 Temp: 13
Sampling Depth Depth of Water Level: 77.5'

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.08 | | | |
| Alkalinity | mg/l | 1.0 | 223.40 | | | |
| Sulfate | mg/l | 10.0 | 171.0 | | | |
| Conductance | mg/l | 1 | 846 | | | |
| T D S | mg/l | 20.0 | 600.0 | | | |
| Chlorides | mg/l | 5.0 | <5.0 | | | |
| Calcium | mg/l | 0.1 | 36.4 | | | |
| Magnesium | mg/l | 0.1 | 3.80 | | | |
| Sodium | mg/l | 10 | 116.5 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | 700.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 9.0 | | | |
| Iron | ug/l | 40 | 1020.0 | | | |
| Manganese | ug/l | 20 | 250.0 | | | |

# APPENDIX 6

# WATER QUALITY

# 1ST QUARTER, 2002

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #02-02-581**
Monitoring Point: **CG-01-1A**
Date of Sample Collection: 02-15-02 Temp: 10
Sampling Depth Depth of Water Level:

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.42 | | | |
| Alkalinity | mg/l | 1.0 | 255.20 | | | |
| Sulfate | mg/l | 10.0 | 599.0 | | | |
| Conductance | mg/l | 1 | 1685 | | | |
| T D S | mg/l | 20.0 | 1200.0 | | | |
| Chlorides | mg/l | 5.0 | 32.8 | | | |
| Calcium | mg/l | 0.1 | 177.4 | | | |
| Magnesium | mg/l | 0.1 | 72.2 | | | |
| Sodium | mg/l | 10 | 67.0 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | <200.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 10.0 | | | |
| Iron | ug/l | 40 | 120.0 | | | |
| Manganese | ug/l | 20 | 53.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #02-02-580**
Monitoring Point: **CG-01-2A**
Date of Sample Collection: 02-15-02 Temp: 9
Sampling Depth Depth of Water Level:

| **Parameters** | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.71 | | | |
| Alkalinity | mg/l | 1.0 | 199.00 | | | |
| Sulfate | mg/l | 10.0 | 344.0 | | | |
| Conductance | mg/l | 1 | 1252 | | | |
| T D S | mg/l | 20.0 | 900.0 | | | |
| Chlorides | mg/l | 5.0 | 59.4 | | | |
| Calcium | mg/l | 0.1 | 105.2 | | | |
| Magnesium | mg/l | 0.1 | 31.8 | | | |
| Sodium | mg/l | 10 | 68.2 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | <200.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 32.0 | | | |
| Iron | ug/l | 40 | 250.0 | | | |
| Manganese | ug/l | 20 | 42.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #02-02-584**
Monitoring Point: **CG-01-3B**
Date of Sample Collection: 02-15-02 Temp: 10
Sampling Depth Depth of Water Level:

| **Parameters** | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.42 | | | |
| Alkalinity | mg/l | 1.0 | 286.20 | | | |
| Sulfate | mg/l | 10.0 | 127.0 | | | |
| Conductance | mg/l | 1 | 804 | | | |
| T D S | mg/l | 20.0 | 600.0 | | | |
| Chlorides | mg/l | 5.0 | 16.8 | | | |
| Calcium | mg/l | 0.1 | 84.2 | | | |
| Magnesium | mg/l | 0.1 | 18.6 | | | |
| Sodium | mg/l | 10 | 34.4 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | <200.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 14.0 | | | |
| Iron | ug/l | 40 | 270.0 | | | |
| Manganese | ug/l | 20 | 139.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

Lab Id #02-02-582
Monitoring Point: **CG-01-5A**
Date of Sample Collection: 02-15-02 Temp: 11
Sampling Depth Depth of Water Level:

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 8.31 | | | |
| Alkalinity | mg/l | 1.0 | 1015.80 | | | |
| Sulfate | mg/l | 10.0 | 550.0 | | | |
| Conductance | mg/l | 1 | 2790 | | | |
| T D S | mg/l | 20.0 | 2000.0 | | | |
| Chlorides | mg/l | 5.0 | 105.5 | | | |
| Calcium | mg/l | 0.1 | 20.4 | | | |
| Magnesium | mg/l | 0.1 | 9.4 | | | |
| Sodium | mg/l | 10 | 477.0 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | 14590.0 | | | |
| Barium | ug/l | 100 | 129.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 55.0 | | | |
| Iron | ug/l | 40 | 12400.0 | | | |
| Manganese | ug/l | 20 | 179.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #02-02-583**
Monitoring Point: **CG-01-5B**
Date of Sample Collection: 02-15-02 Temp: 10
Sampling Depth Depth of Water Level:

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.29 | | | |
| Alkalinity | mg/l | 1.0 | 241.40 | | | |
| Sulfate | mg/l | 10.0 | 181.0 | | | |
| Conductance | mg/l | 1 | 912 | | | |
| T D S | mg/l | 20.0 | 650.0 | | | |
| Chlorides | mg/l | 5.0 | 24.0 | | | |
| Calcium | mg/l | 0.1 | 32.8 | | | |
| Magnesium | mg/l | 0.1 | 3.8 | | | |
| Sodium | mg/l | 10 | 127.6 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | <200.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 27.0 | | | |
| Iron | ug/l | 40 | 230.0 | | | |
| Manganese | ug/l | 20 | 188.0 | | | |

# ILA REPORT

Facility Name: Century Mining
Location of Facility:
Collected By: QES

**Lab Id #02-02-585**
Monitoring Point: **CG-01-6B**
Date of Sample Collection: 02-15-02 Temp: 10
Sampling Depth Depth of Water Level:

| Parameters | UNITS | MDL | | | | |
|---|---|---|---|---|---|---|
| pH | Std. Units | 0.1 | 7.27 | | | |
| Alkalinity | mg/l | 1.0 | 166.00 | | | |
| Sulfate | mg/l | 10.0 | 305.0 | | | |
| Conductance | mg/l | 1 | 1057 | | | |
| T D S | mg/l | 20.0 | 760.0 | | | |
| Chlorides | mg/l | 5.0 | 18.6 | | | |
| Calcium | mg/l | 0.1 | 30.4 | | | |
| Magnesium | mg/l | 0.1 | 6.8 | | | |
| Sodium | mg/l | 10 | 165.4 | | | |
| Arsenic | ug/l | 10 | <10.0 | | | |
| Selenium | ug/l | 10 | <10.0 | | | |
| Aluminum | ug/l | 200 | <200.0 | | | |
| Barium | ug/l | 100 | <100.0 | | | |
| Cadmium | ug/l | 10 | <10.0 | | | |
| Chromium | ug/l | 60 | <60.0 | | | |
| Lead | ug/l | 50 | <50.0 | | | |
| Mercury | ug/l | 2.0 | <2.0 | | | |
| Zinc | ug/l | 8 | 14.0 | | | |
| Iron | ug/l | 40 | 180.0 | | | |
| Manganese | ug/l | 20 | 88.0 | | | |

AEC 11770

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 12

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 7.69 acres
   b) Disturbed area 3.20 acres
   c) Ave. land slope 20 %
   d) Hydrologic soil group C
   e) Hydraulic length 1645 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 15.8 |
| 2) 25 year, 24 hour = | 4.2 | 18.9 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

      1) Dam height _____ ft.
      2) Dam width _____ ft. (MIN)
      3) Dam length _____ ft.
      4) Dam downstream slope _____ % (MAX)
      5) Dam upstream slope _____ % (MAX)
      6) Core length _____ ft. _____ ft. _____ ft.

   b) Sediment storage volume 1.47 ac.ft. is provided below the 991.5 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 988.0 | 0.34 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 991.5 | 0.48 | 1.47 |
| 5) Top of embankment: | 994.0 | 0.56 | 2.77 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe _____
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

   a) Base width 12 ft.
   b) Design flow depth 0.3 ft. Depth in level section 0.8 ft.
   c) Exit slope 27.6 %
   d) Exit velocity 5.3 fps
   e) Channel lining Rock Riprap
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 20 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? _____ Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

Revision # 1
July 10, 2002

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 13

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 47.9 acres
   b) Disturbed area 40.4 acres
   c) Ave. land slope 25 %
   d) Hydrologic soil group C
   e) Hydraulic length 5144 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 79.9 |
| 2) 25 year, 24 hour = | 4.2 | 95.3 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

      1) Dam height _____ ft.
      2) Dam width _____ ft. (MIN)
      3) Dam length _____ ft.
      4) Dam downstream slope _____ % (MAX)
      5) Dam upstream slope _____ % (MAX)
      6) Core length _____ ft. _____ ft. _____ ft.

   b) Sediment storage volume 11.31 ac.ft. is provided below the 1083.7 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 1073.0 | 0.78 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1083.7 | 1.33 | 11.31 |
| 5) Top of embankment: | 1086.0 | 1.45 | 14.52 |

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe _____
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

   a) Base width 12 ft.
   b) Design flow depth 1.7 ft. Depth in level section 1.3 ft.
   c) Exit slope 1.4 %
   d) Exit velocity 3.7 fps
   e) Channel lining Vegetative Grass Mix
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 40 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

   A 6" diameter PVC pipe 130 feet long at a slope of 4.6 percent will be used to dewater the pond. The invert will be at the 1080 foot elevation.

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

Revision # 1
July 10, 2002

9-88

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 14

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 65.95 acres
   b) Disturbed area 61.54 acres
   c) Ave. land slope 25 %
   d) Hydrologic soil group C
   e) Hydraulic length 5077 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2002 JUL 11 AM 11:34
OEPA
SEDO

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0

      2) SCS curve number various (see run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 101.9 |
| 2) 25 year, 24 hour = | 4.2 | 121.1 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: N/A Excavated Pond
      1) Dam height 3 ft.
      2) Dam width 12 ft. (MIN)
      3) Dam length 1386 ft.
      4) Dam downstream slope 33 % (MAX)
      5) Dam upstream slope 50 % (MAX)
      6) Core length ___ft.___ ft.___ ft.

   b) Sediment storage volume 13.44 ac. ft. is provided below the 1164.5 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac. ft. |
|---|---|---|---|
| 1) Bottom of Pond: | 1161.0 | 3.59 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1164.5 | 4.06 | 13.44 |
| 5) Top of embankment: | 1167.0 | 4.31 | 23.99 |

POND # 14

4. PRINCIPAL SPILLWAY: N/A
   a) Pipe length _____ ft.
   b) Pipe diameter _____ in.
   c) Pipe slope _____ %
   d) Riser diameter _____ in.
   e) Riser height _____ ft.
   f) Type of pipe
   g) Number of anti-seep collars _____; spacing along pipe _____ ft.
   h) Does the design include a trash rack? _____ Yes, _____ No.
   i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/EXIT CHANNEL:

   a) Base width 40 ft.
   b) Design flow depth 1.2 ft. Depth in level section 0.8 ft.
   c) Exit slope 2.8 %
   d) Exit velocity 3.1 fps
   e) Channel lining Vegetative Grass Mixture
   f) Side slopes 2:1
   g) Freeboard 1.7 ft.
   h) Entrance slope 50 %
   i) Length of level section 40 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS:

A 6" diameter PVC pipe 140 feet long at a slope of 2.5 percent will be used to dewater the pond. The invert will be at the 1163.5 foot elevation.

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

10 July 2002
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

2002 JUL 11 AM 11:34
O.E.P.A.
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9-88

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

O.E.P.A.
S.E.D.O.

2002 JUN -7 AM 9:18

ATTACHMENT 20
(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)

Applicant's Name American Energy Corporation Pond # 15

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

a) Drainage area 6.9 acres
b) Disturbed area 4.6 acres
c) Ave. land slope 20 %
d) Hydrologic soil group C
e) Hydraulic length 943 ft.
f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

a) Method:

1) Design method (s) including computer programs: SEDCAD 4.0
2) SCS curve number various (see run sheets)

b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 15.0 |
| 2) 25 year, 24 hour = | 4.2 | 17.8 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

a) Dimensions: **N/A Excavated Pond**

1) Dam height _____ ft.
2) Dam width _____ ft.(MIN)
3) Dam length _____ft.
4) Dam downstream slope _____% (MAX)
5) Dam upstream slope _____ % (MAX)
6) Core length _____ft. _____ft.
ft.

b) Sediment storage volume 1.62 ac.ft. is provided below the 1147.8 foot elevation.

c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac. ft. |
|---|---|---|---|
| 1) Bottom of pond: | 1138.0 | 0.03 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | 1147.8 | 0.29 | 1.62 |
| 4) Emergency Spillway Crest: | 1149.6 | 0.33 | 2.20 |
| 5) Top of embankment: | 1152.0 | 0.40 | 3.06 |

POND #15

4. PRINCIPAL SPILLWAY:
   a) Pipe length 52 ft.
   b) Pipe diameter 12 in.
   c) Pipe slope 1.54 %
   d) Riser diameter n/a in.
   e) Riser height n/a ft.
   f) Type of pipe PVC
   g) Number of anti-seep collars ____; spacing along pipe ____ ft.
   h) Does the design include a trash rack? x Yes; ____ No.
   i) Does the design include an anti-vortex device? ____ Yes, x No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:
   a) Base width 12 ft.
   b) Design flow depth 0.7 ft. Depth in level section 0.2 ft.
   c) Exit slope 24.1 %
   d) Exit velocity 3.7 fps
   e) Channel lining Vegetative Grass Mix
   f) Side slopes 2:1
   g) Freeboard 2.2 ft.
   h) Entrance slope 50.0 %
   i) Length of level section 20 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? ____ Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned ____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

28 Nov 2001
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 20**
**(SEDIMENTATION POND/IMPOUNDMENT DATA SHEET)**

Applicant's Name American Energy Corporation Pond # 16

Type of impoundment Excavated Permanent _____ Temporary X

1. POND DRAINAGE AREA DATA:

   a) Drainage area 90.5 acres
   b) Disturbed area 66.5 acres
   c) Ave. land slope 20 %
   d) Hydrologic soil group C
   e) Hydraulic length 1614 ft.
   f) Cover/condition of the undisturbed area Pasture/Fair

2. DESIGN STORM CRITERIA:

   a) Method:

      1) Design method (s) including computer programs: SEDCAD 4.0
      2) SCS curve number varies (See run sheets)

   b) Rainfall Amount/Peak Flow

| | Rainfall, in. | Peak flow, cfs. |
|---|---|---|
| 1) 10 year, 24 hour = | 3.7 | 135.3 |
| 2) 25 year, 24 hour = | 4.2 | 129.6 |
| 3) 50 year, 6 hour = (if permanent) | | |
| 4) 100 year, 6 hour = (if 20/20 size) | | |

3. POND SIZE:

   a) Dimensions: **N/A Excavated Pond**

      1) Dam height _____ ft.
      2) Dam width _____ ft. (MIN)
      3) Dam length _____ ft.
      4) Dam downstream slope _____ % (MAX)
      5) Dam upstream slope _____ % (MAX)
      6) Core length _____ ft. _____ ft. _____ ft.

   b) Sediment storage volume 16.5 ac.-ft. is provided below the 1047.0 foot elevation.

   c) Stage/Area Data:

| | Elevation ft. | Surface Area ac. | Volume ac.-ft. |
|---|---|---|---|
| 1) Bottom of pond | 1036 | 1.13 | 0 |
| 2) Streambed at upstream toe: | N/A | N/A | N/A |
| 3) Principal spillway inlet: | N/A | N/A | N/A |
| 4) Exit Channel Crest: | 1047 | 1.79 | 16.5 |
| 5) Top of embankment: | 1050 | 1.94 | 22.1 |

PRINCIPAL SPILLWAY: **N/A**

a) Pipe length _____ ft.
b) Pipe diameter _____ in.
c) Pipe slope _____ %
d) Riser diameter _____ in.
e) Riser height _____ ft.
f) Type of pipe _____
g) Number of anti-seep collars _____; spacing along pipe _____ ft.
h) Does the design include a trash rack? _____ Yes, _____ No.
i) Does the design include an anti-vortex device? _____ Yes, _____ No.

5. EMERGENCY SPILLWAY/**EXIT CHANNEL**:

a) Base width 40 ft.
b) Design flow depth 1.6 ft. Depth in level section 1.3 ft.
c) Exit slope 3.2 %
d) Exit velocity 6.6 fps
e) Channel lining Rock Rip Rap
f) Side slopes 2:1
g) Freeboard 1.8 ft.
h) Entrance slope 50.0 %
i) Length of level section 50 ft.

6. The minimum static factor of safety for this impoundment is 1.5

7. Provide as an addendum to this attachment a detailed plan view or 2 cross sections of the impoundment.

8. COMMENTS

9. Is this an MSHA structure? _____Yes, X No. If "yes," provide the MSHA ID. number if one has been assigned _____.

10. If this is to be retained as a permanent impoundment, submit an addendum to this attachment demonstrating compliance with rule 1501:13-9-04(H) (2) of the Administrative Code.

11. I hereby certify that this impoundment is designed to comply with the applicable requirements of rule 1501:13-9-04 of the Administrative Code using current, prudent engineering practices.

William J. Siplivy
Signature

28 Nov 2001
Date

P.E. SEAL

STATE OF OHIO
WILLIAM J. SIPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

# HYDROGEOLOGIC INVESTIGATION

## COARSE COAL REFUSE DISPOSAL FACILITY
## CENTURY MINE
## AMERICAN ENERGY CORPORATION
## SECTIONS 3 AND 4, WAYNE TOWNSHIP
## BELMONT COUNTY, OHIO

**Prepared For:**

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF MINERAL RESOURCES MANAGEMENT**
**1855 FOUNTAIN SQUARE COURT**
**COLUMBUS, OHIO 43224-1360**

OPERATOR

**by:**

**William J. Siplivy, P.E., Inc.**
**50 Munroe Falls Avenue**
**Munroe Falls, Ohio 44262**

00485-2

**May, 2001**

AEC 11781

WILLIAM J. SIPLIVY, P.E., INC.

Geotechnical Engineer

7 August 2001

Mr. Michael Dillman, Hydrogeologist
Ohio Department of Natural Resources
Fountain Square, Building H
Columbus, Ohio 43224

Dear Mr. Dillman:

Attached please find a copy of the Hydrogeologic Investigation Report for the proposed coarse coal refuse disposal facility of the American Energy Corporation's Century mine.

The Report identifies the Washington (No. 12) coalbed as the first significant zone of saturation, and strata between the Morningview and Gilboy sandstones as the first continuous zone of saturation over the entire project. Groundwater monitoring was initiated in the first quarter of this year.

If there are any questions, please feel free to call.

Sincerely,

William J. Siplivy, P.E., C.P.G.

Attachment
WJS/ces

cc: S. Jane Jacobs, OEPA-SEDO
R. Desko, Century
File

50 Munroe Falls Avenue • Munroe Falls, Ohio 44262 • 330-686-8911 • wjsiplivy@aol.com

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AEC 11786

# HYDROGEOLOGIC INVESTIGATION
# COARSE COAL REFUSE DISPOSAL FACILITY
# CENTURY MINE

## 1.0 INTRODUCTION

A hydrogeologic investigation was performed for the proposed Century mine coarse coal refuse disposal facility, located in Sections 3 and 4, Wayne Township, Belmont County, Ohio. The purpose was to provide an assessment of the site and regional hydrogeologic conditions, and to evaluate the potential for leachate migration from the site and its possible impact on water quality.

The site has been designed in an environmentally acceptable manner, in accordance with Ohio EPA Policies 2.05, 4.16, GD 0303.010 and guidelines of the OEPA Division of Surface Water and Ohio Department of Natural Resources Division of Mineral Resources Management. Please refer to the PTI and ODNR Application D-0425-2 for the engineering design details.

This report consists of the following:

1. A review of existing geologic data and reports relative to the Century mine and Belmont County.

2. Obtaining additional geologic data through rock core drilling.

3. An analysis of thirteen groundwater monitoring wells installed to determine groundwater levels, zones of significant saturation, formation permeabilities and quality.

4. A review of the Belmont County SCS report to identify on-site soils, particularly clays, which are to be used as leachate migration barriers and restrictions to groundwater flow when used as a liner and final cap.

5. A well and spring inventory survey within a 2,000 foot radius of the site.

6. Analysis of the above data to assess site hydrogeology.



AEC 11787

## 2.1 Location

The Century mine is located approximately four miles northeast of Beallsville, between State Routes 145 and 148, in south-central Belmont County (Plate 1). The proposed refuse disposal site is a valley-fill type structure located on Company owned property, in an unnamed tributary of Piney Creek, adjacent to the north of the mine plant and offices. The projected area of the refuse fill site is approximately 154.4 acres. The ultimate height is approximately 324 feet, as measure from the toe of the existing refuse fill, elevation 965 feet, to the maximum crest elevation of 1,288.6 feet, mean sea level. The maximum fill thickness is about 220 feet (1,260 feet - 1040 feet), occurring in the middle of the structure.

## 2.2 History of Operation

The Century mine produces coal from the Pittsburgh (No. 8) coalbed by the underground mining method. The mine was originally opened as the Allison mine, by the Y & O Coal Company, in the early 1970's. The mine operated continuously till the early 1980's when it closed and abandoned due to poor market conditions for high sulphur coal. In the early 1990's, the mine, related facilities, and coal reserves were acquired by The American Energy Corporation.

In the interim, the surface and coal reserves in the Washington (No. 12) coalbed have been leased to Bennoc, Inc., for surface mining. The proposed refuse site is currently permitted for surface mining by Bennoc under ODNR permit D-1159 (Plate 1). Bennoc is actively mining east of the projected refuse area. To date, there has been no surface mining in the projected refuse area.

The Allison mine operated for approximately ten years. Raw coal from the mine was cleaned in the preparation plant, with the reject placed in the ODNR and MSHA permitted valley-fill disposal area, adjacent west of the plant. The projected Century mine coal refuse site is an expansion of this same valley-fill disposal site utilized by the Allison mine.

The Century mine is tentatively expected to generate 2.45 million tons of coarse coal refuse annually. Refuse densities will range from 100 to 120 pounds per cubic foot. The anticipated operating life of the site is expected to be approximately ten years.

The final design was completed and submitted to ODNR on November 30, 2001. Site capacity is an estimated 19.305 million tons. The clay liner and groundwater collection system apply only to the new refuse disposal structure. Leachate, if any, from the existing refuse pile will be conveyed to the leachate collection system shown on Drawing No. 12 and described in Section 2.2 of the Engineering Report. **Also see addendum to this item.**



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September 5, 2002

ADDENDUM TO HYDROGEOLOGIC INVESTIGATION REPORT,
SECTION 2.2 AND SUBSECTION 5.3.2.2
AMERICAN ENERGY CORPORATION

Commingling will not occur between the groundwater and leachate collection systems. The groundwater collection system is designed to intersect visible seeps in the projected refuse fill area west of the existing Allison mine refuse disposal site. This groundwater is to be collected via a gravel filled trench and pipe system for conveyance directly to Piney Creek. The groundwater collection system will be protected by three-feet, minimum, of re-compacted clay liner. The clay liner will not tie into the existing Allison coarse coal refuse site. A gravel filled trench and pipe leachate collection is designed on top of the clay liner. This system will collect leachate percolating into and through the new refuse area as well as leachate, if any, emerging from the Allison refuse site. Leachate collected in this system will be conveyed to ponds for treatment, if necessary, before discharging into Piney Creek.

## 2.3 Topographic Setting

The Century mine is in the Appalachian Plateau physiographic province. The topography of Belmont County is typically hilly with narrow rounded ridges and deep v-shaped valleys. Total topographic relief within Belmont County is 800 feet. Maximum relief in the project area is about 340 feet. Elevations range from 930 feet, mean sea level, in Piney Creek, to ridge elevations of nearly 1,270 feet surrounding the project.

Surface water from the project area drains into Piney Creek, a tributary of Captina Creek. Captina Creek is the main drainage system for southern Belmont County. Captina Creek flows eastward to the Ohio River. The confluence is located at Powhatan Point, approximately 16 miles east of the mine.

## 2.4 Geology

### 2.4.1 Stratigraphy

Bedrock underlying the project area consists of an alternating sequence of coal, limestone, claystone, shale and sandstone of Permian and Pennsylvanian geologic age. Permian Age rocks consist of the Dunkard Group, a sequence covering the higher elevations of the project area. Below the Dunkard lies the Monongahela formation of the Pennsylvanian System. The Monongahela outcrops along the stream valleys.

The Dunkard Group is 250 to 300 feet thick. Locally it occupies the interval from the Waynesburg No. 11 Coalbed, at an elevation of 980 feet, to the ridge tops. Its primary rock units are shale and claystone. These soft rock units form about 85 percent of the stratigraphic interval. Coalbeds here include Waynesburg "A" and Washington No. 12.

The Monongahela Formation ranges from 240 to 260 feet in thickness. In ascending order it occupies the interval from the Pittsburgh No. 8 Coalbed to the Waynesburg No. 11 Coalbed. The primary rock units are limestone, claystone, shale and sandstone. Limestone forms 44 to 68 percent of this stratigraphic interval. Coalbeds included are the Redstone No. 8A, Fishpot, Sewickley No. 9, and Uniontown No. 10.

The relationship of these rock units is presented in Plate 2, General Stratigraphic Column, Belmont County, Ohio (Berryhill, 1963, USGS Professional Paper 380).

### 2.4.2 Structure

In Belmont County the rock strata forms a gentle monocline that dip southeasterly at an average rate of 18 feet per mile or 0.34 percent (Berryhill, 1963), using the Pittsburgh No. 8 Coalbed as datum (Plate 3). Locally, strata surrounding the project area dips



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south to southeasterly at 0.7 to 1.5 percent based on core drilling and surveyed elevations of the Washington (No. 12) coalbed (Plate 4).

Jointing is a prominent feature in most sedimentary rocks. Joint planes are recurrent geologic planes of weakness, generally vertical, along which no appreciable movement has taken place. In coalbeds the joints are called cleats. Based on readings taken by the author in area deep mines in the Pittsburgh (No. 8) coalbed, the dominant fracture set, face cleat, is oriented N $75^0$ W, while the minor set, butt cleat, is oriented N $15^0$ E.

## 2.5 Soils

Soils in the study area are primarily of the Westmoreland-Lowell association. These are deep, moderate sloping to steep, well-drained and moderately well drained soils formed in residium of siltstone, sandstone, shale and limestone bedrock on uplands.

The soil is silt loam in the upper eight inches and is classified as CL-ML under the Unified Classification System. The interval from 8 to 50 inches is clay loam to silty clay loam, also classified as CL-ML. This horizon is relatively impermeable when compacted. It is targeted in this project to be the source material for the clay liner and cap. The SCS hydrologic grouping for these soils is B and C. The soils are inherently acidic ranging in pH from 4.5 to 6.0.

Appendix 5 contains a soils map of the project area, a detailed listing of soil types, and their physical, chemical and engineering properties. Based on the author's experience from previous studies of similar soils locally, sufficient clays are expected to be present for the required clay liner and cap. The results of on-site geotechnical testing of the clays will be presented in ODNR Application D-0425-2.

## 2.6 Climate

Belmont County has a continental climate with wide annual and daily ranges in temperature. Rainfall is well distributed throughout the year. Fall is the driest season. Average temperature in the winter is 28 degrees Farenheit, the average daily minimum temperature is 18 degrees. The lowest temperature on record is -25 degrees, which occurred in Barnesville on January 29, 1963. Average summer temperature is 68 degrees, the average daily maximum temperature is 81 degrees. The highest recorded temperature is 102 degrees, at Barnesville on August 4, 1955 (SCS, 1981).
Total annual precipitation is 38.33 inches. Approximately 60 percent of this or 23 inches falls in April through September. The heaviest one-day rainfall was 5 inches at Shadyside, in June, 1990. Average seasonal snowfall is 32 inches.



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## 2.7 Previous Hydrogeologic Studies

The author has been associated with several locally conducted hydrogeologic studies relevant to the Century mine. These were based on groundwater monitoring well observations and quality analyses, well and spring inventories, geologic drill hole logs, and observations made of underground and surface mines. The purpose was to site other coal refuse disposal facilities, and assess the possible impact and probable hydrogeologic consequences of mining for ODNR mine permitting. A summary of findings from these studies are as follows:

### 2.7.1 Generalized Hydrogeologic Setting

In the Captina Creek basin the geologic formations that yield groundwater comprise two general classes:

1. Consolidated beds: Sandstone, shale, limestone, claystone and coal.
2. Unconsolidated sediments: Sand, gravel and clay.

The Captina Creek flood plain consists of thin, erratic deposits of clay, silt, sand and gravel. It is generally a poor source of groundwater. The yield of some large diameter wells, several miles down-stream of Century, has been no more than 25 gallons per minute.

In Piney Creek the potential yield of groundwater decreases. Through numerous test pits and soil borings, the area is generally found to contain up to 50 inches of silty clay loam (Lowell-Westmoreland soil group) overlying stratified deposits, primarily limestone, shale and sandstone. The occurrence of groundwater or seepage is frequently found from 1 to 10 feet below the ground surface.

Presently there is no significant usage of groundwater in or down-gradient of the proposed coal refuse disposal site.

### 2.7.2 Groundwater Use

1. Municipal – No public supplies within the mine area (ODNR).
2. Industrial – No known industrial supplies in the mine area.
3. Domestic – A total of 52 domestic well logs were obtained for Smith and Washington Townships to review general groundwater use and characteristics of rock supplying water to the wells. The following trends were noted:
    A. Average well depth is 80 feet.
    B. Average yield is 3 gallons per minute.
    C. Seventy percent of the wells had yields of 2 gallons per minute or less.



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D. Shale was the aquifer in 29% of the wells.
E. Limestone was the aquifer in 44% of the wells.
F. Sandstone was the aquifer in 27% of the wells.
G. There was no single widespread aquifer supplying these wells.
H. Average transmissivity is expected to be less than 1,000 gallons per day per foot for area rock wells.

### 2.7.3 Aquifer Properties

1. Unconsolidated aquifers – Very thin, erratic alluvial deposits exist along and under Captina Creek. The extent and thickness of these deposits rarely make them useful for more than domestic supplies.
2. Rock aquifers – Rock aquifers show limited potential in this area.

Based on domestic well records and the general hydrologic setting, groundwater is expected to occur in semi-confined and confined conditions. Storage coefficients are expected to range from E-02 to E-04, with transmissivities less than 1,000 gallons per day per foot (B. Waite, P.G., Moody and Associates 1988). Localized fractures in shallow rocks near streams may show higher production.

The primary permeability and porosity of rock units is generally low. Most available groundwater occurs in association with secondary fractures such as joints, in rock, and cleats, in coal. Dry conditions in the mine coupled with limited production of domestic wells indicate that secondary porosity and permeability decrease with depth, as fractures at depth are tight or closed.

Geologic structure in the study area is not a significant controlling factor of ground water flow. Subsurface rock is nearly horizontal with a dip of less than one-degree to the southeast.

In this report information has been gathered information on the quality of surface waters in Captina Creek and Piney Creek. An inventory of wells and springs was taken within a 2000 foot radius of the site. The hydraulic measurements and analyses of these are contained in Appendix 6. The location map is Plate 9 in Appendix 8.



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## 3.0 FIELD INVESTIGATIONS

A field investigation was conducted in March, 2001. This included a gathering of data from boreholes, groundwater monitoring wells and field observations. The following tasks were performed by or under the supervision of the author:

1. Meetings with OEPA and ODNR geologists and engineers to review scope of project, agency requirements, and recommended well locations and depths prior to initiating this hydrogeological investigation.

2. A total of thirteen boreholes were drilled at six different locations to determine local stratigraphy and structure. The contractor was McKay and Gould Drilling, Inc.(McKay and Gould), Darlington, Pennsylvaina.

3. A groundwater monitoring well was installed in each borehole by McKay and Gould. The wells were developed by Quality Environmental Services (QES), Belmont, Ohio. Hydraulic conductivity tests were performed by DLZ – Ohio, Inc., consulting geotechnical engineers, Columbus, Ohio.

4. The monitoring well locations and elevations were surveyed by Steve Hill, P.S., St. Clairsville, Ohio.

5. Water wells and springs located within 2000 feet of the site were field located by QES.

6. Water samples from all wells and springs within 2,000 feet of the project area were tested by QES.

7. Core drilling the middle ridge (CG-01-5A) to identify rock usable for site construction, (McKay and Gould, Inc.). Construction materials include clay for the liner and final cap, sandstone and limestone to be used as rip rap for drainage channels and roadways, and shales for common fill and embankments.

### 3.1 Drilling and Sampling

The thirteen boreholes were drilled in six locations (Plate 5). The borings are six-inches in diameter produced from a truck mounted air rotary drilling rig. Drill logs of the soil and rock for each hole are contained in Appendix 2. These were used to construct geologic cross-section A-A', Plate 8 in Appendix 8.



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## 3.2 Monitor Well Installations

A groundwater monitoring well was installed in each borehole. The wells are designated as the CG-01 series. Wells are identified according project, year installed, site location and aquifer. The identification system is as follows: CG stands for Century Groundwater, 01 for the installation year, 2001. In the CG -01 series, six sites were drilled that identified three water bearing horizons. The sites are numbered one through six. The water bearing strata are designated as zones A, B and C. A well designated as CG-01-4A therefore represents a Century Groundwater well installed in the year 2001, at location four in the "A" aquifer.

The "A" horizon is the project-wide aquifer located below drainage within the Gilboy sandstone, Arnoldsburg limestone and Morningview sandstones. Sites one and two, located at the toe of the existing refuse site, near Piney Creek, were shallow at 50 and 25 feet respectively. The deeper wells were found under the ridges at sites three, four and five. These were 286, 259 and 267 feet deep, respectively.

Horizon "B", located in the Washington (No. 12) coalbed is the first significant aquifer identified. These wells are 90 feet deep at site three, 59 feet deep at site four, 85 feet deep at site five and 81 feet at site six.

Horizon "C" was the first aquifer encountered. These were found in shales and sandstones near the ridge tops. These are considered more intermittent in nature, subject to seasonal dryness. The wells are 27 feet deep at site three, 26 feet deep at sites four and five, and 45 feet deep at site six.

All monitor wells were constructed from two-inch schedule 40 flush threaded PVC with teflon tape used to seal each joint. The bottom ten-foot section is screened with 0.010 inch slots with a threaded bottom cap. The bottom of the borehole was filled with one-foot of coarse silica sand. The PVC well was then installed. Coarse silica sand filter pack was poured into the borehole to at least two-feet above the top of the screened section. A three to five foot bentonite plug was placed over the sand pack. A Portland Type I cement and sodium bentonite grout admixture was tremied into the remaining annulus to the surface. A ten foot long, six-inch diameter steel casing was then placed over the PVC monitoring well. This permanent steel casing was grouted in-place to the surface. An expansion plug cap was placed at the top of each PVC well. The steel casing was fitted with a locking cap and lock.

A schematic of typical well construction is shown on Plate 5. Construction logs for each monitor well are contained in Appendix 3.



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### 3.3 Monitor Well Development and Field Permeability Tests

After a minimum of twenty-four hours following well installation the wells were surged and bailed several times to remove sediment and restore the natural hydraulic conductivity of the formation.

Field permeability (slug) tests were performed after development of each well by Mr. Paul Painter, geologist, DLZ-Ohio, Inc. Field data and calculated permeability from the slug tests are in Appendix 4. Calculated permeabilities are summarized in Table 3, Appendix 1. Permeabilities ranged from 1.06 E-04 cm/sec in well CG-01-4C to 2.70 E-09 cm/sec in well CG-01-3A. The deep wells in the "A" horizon, under the ridges at sites 3, 4 and 5, all had very low permeabilities in the E-09 range. These low permeabilities suggest groundwater in the study area occurs as zones of saturation and not aquifers. Well yield is expected to range from 0.10 to 3 gallons per minute. These yields are too low for the internal needs of Century for any purpose.

### 3.4 Survey

Each well location was surveyed by Mr. Steve Hill, P.S., a professional surveyor licensed in the State of Ohio, of St. Clairsville, Ohio. Each well was surveyed horizontally and vertically to the nearest hundredth of a foot. Survey data is summarized in Table 1, Appendix 1.

### 3.5 Water Level Measurements

Static water level measurements to the nearest hundredth of a foot were made in each well when the level had stabilized following development. Water level elevation data for the wells installed during this investigation are summarized in Table 4, Appendix 1.

## 4.0 WELL AND SPRING INVENTORY SURVEY

Developed wells and springs within 2,000 feet of the project permit area were inventoried by Quality Environmental Services, Inc. and mapped by Jack A. Hamilton and Associates (Plate 9). The field survey shows eight undeveloped springs are present within the proposed fill area (CMU 6, 6A, 6B, 6C, and CMS 7, 8, 9 and 10). The down-stream sampling point for the project is CMD 6. The upstream/downstream sampling points for Piney Creek are CMU 2A and CMD-2; and for Captina Creek CMU-1 and CMD-1. Results of initial ODNR required sampling of springs and related downstream sampling points (ODNR Attachment 14A) are contained in Appendix 6.

Quality Environmental Services has been sampling springs and streams locally for various mining operations since 1990. According to Fred Blackman, President, spring flow is seasonal. During the months of August through October approximately 15 percent of springs are dry and cannot be sampled. Similar observations have been made by the author since 1997, where intermittent streams are typically dry from mid-July to November, except during periods of rainfall.



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## 5.0 SUMMARY AND CONCLUSIONS

### 5.1 Site Geology

Site geology has been interpreted on the basis of observations of soil and core samples obtained during this investigation. The structural contour map of the Pittsburgh (No. 8) coalbed (Plate 3, Appendix 8) was used as datum to correlate overlying stratigraphy.

Surface elevations range from approximately 930 feet, mean sea level, in Piney Creek to 1,235 feet on the northwest knob within the catchment area. Average elevation of the Pittsburgh Coalbed here is 800 feet. Rocks outcropping in the study area therefore occupy an interval from 165 to 585 feet overlying the Pittsburgh coalbed. Referring to Plate 2, Generalized Stratigraphic Column, Belmont County, Ohio, these stratigraphic units range, in ascending order from shales and claystones overlying the Gilboy sandstone of the Monongahela Formation, to shales and claystones overlying the Lower Marietta sandstone of the Dunkard Group. Within this interval are alternating sequences of limestone, shale, claystone, sandstone and coal. Principal coalbeds include the Waynesburg (No. 11), Waynesburg "A", and Washington (No. 12). The ridge tops are typically covered with 5 to 10 feet of red clay.

Interpreted geologic relationships are shown on cross-section A-A', Plate 8. The cross-section location is shown on Plate 5.

There is little structure present at the site. Stratigraphic units dip gently to the southeast at 18 feet per mile.

An existing reclaimed refuse disposal area is present at this site. A portion of the existing disposal area underlies the proposed disposal area. The existing refuse disposal currently exist between approximate elevations of 1093 to 944. Test drilling within the existing refuse disposal area was conducted by D'Appolonia in 1981 which characterized the refuse, as well as conditions in and beneath the refuse. Results of this test drilling are detailed in the D'Appolonia drawings as follows;

Dwg. No. 81-250-E1, Sheet 2 of 21, Figure 3 = Existing Conditions
Dwg. No. 81-250-E10, Sheet 13 of 21, Figure 4 = Boring Logs
Dwg. No. 81-250-E11, Sheet 14 of 21, Figure 5 = Boring Logs
Dwg. No. 81-250-E12, Sheet 15 of 21, Figure 6 = Test Pits
Dwg. No. 81-250-E13, Sheet 16 of 21, Figure 7 = Test Pits
Dwg. No. 81-250-E2, Sheet 17 of 21, Figure 9 = Laboratory Data
Dwg. No. 81-250-E7, Sheet 18 of 21, Figure 8 = Piezometers

Results of D'Appolonia's testing is summarized in Section 5.1 of the Engineers Report.



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## 5.2 Site Hydrogeology

Site hydrogeology is interpreted on the basis of:

1. Soil surveys,
2. Rock core characteristics,
3. Structural orientation of local rock strata,
4. Results of field permeability tests including gross water quality measurements,
5. Measured water levels.
6. Field survey of wells and springs

In the study area soft rocks form approximately 60 to 80 percent of the outcropping strata. Soft rocks are shale, claystone, sandy shale and limey shale. This high percentage of soft rock is significant as these units have limited primary permeability, deform in a plastic manner, and tend to self-heal after fracturing. Aquifers in these units have low yields. This was confirmed by field permeability tests conducted on the ten monitor wells installed for this project. Results of this testing show calculated permeabilities of the measured water bearing zones to range from E-04 to E-09 cm/sec (Table 3).

In addition, the geologic record of rocks indicates horizontal and vertical variability of the rock units. With the exception of major coalbeds and limestones, few lithologies are laterally persistent. These horizontal facies changes with their corresponding changes in hydrologic properties tend to produce localized subsurface flow systems.

Precipitation is the source of all ground and surface water here. Water reaching the land surface that is not part of direct runoff or evapotranspiration infiltrates into the subsurface. This becomes part of the groundwater flow system or soil moisture. Shallow subsurface water is important to soil moisture and plant growth. In the study area no shallow unconsolidated aquifers have been identified.

Groundwater in the bedrock system occurs in primary and secondary openings. Primary openings are pore spaces between sand, silt and clay grains formed at the time of deposition. Primary permeability is the ability of water to move between pore spaces. Primary permeability here is very low and limited groundwater movement occurs as a result of primary openings.

Secondary porosity and permeability results from fractures or rock partings. Most usable groundwater in the study area occurs in secondary openings. These fractures are not interconnected over large areas, as a result it is difficult to identify aquifers over large areas. Groundwater flow systems here tend to be made up of small, localized fracture controlled entities. Fractures in hard rock (limestone and sandstone) tend to stay open better than soft rock. Locally, the horizontal and vertical variability of these hard rock units tend to produce hydraulically isolated areas. Fractures at depth, greater than 100 feet, tend to close due to lithostatic pressure, thereby limiting the effective depth groundwater flow systems. This is evident from observations made locally of underground mines in the Pittsburgh (No. 8) coalbed. These mines are relatively dry throughout where overburden thicknesses range from 200 to 550 feet.



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In this study perched groundwater or saturation zones above the valley bottom were identified primarily in the Washington (No.12) coalbed, and to a lesser extent in the shales and claystones overlying the Lower Marietta sandstone. The first project-wide aquifer identified was below drainage in the zone that including the Morningview sandstone, Arnoldsburg limestone and Gilboy sandstone.

Well sites 1 and 2 are located at the lowest topographic point of the project, southeast and down-gradient of the existing refuse site. The water level in well CG-01-1A was 46 feet below the surface at an elevation of 928 feet, mean sea level (msl). This is approximately the level of Piney Creek. The water level in well CG-01-2A was 13 feet below the surface at an elevation of 927 feet, mean sea level (msl), which is also at the approximately level of Piney Creek.

The preliminary results of this investigation were reviewed in the field with Mr. Michael Dillman, Scott Steitler and Kevin Ricks of ODNR on April 10.

### 5.2.1 Significant Zone of Saturation

Wells CG-01-3B, 4B, 5B and 6B identified the Washington (No. 12) coalbed as the first zone of saturation, at elevations ranging from 1078 to 1096 feet msl. Contours of the piezometric surface are shown on Plate 6. Groundwater flow direction is south-southeast at a gradient of 1 foot per 85 feet.

CG-01-04B is designated up-gradient well. The down-gradient wells are CG-01-3B, 5B and 6B.

### 5.2.2 Continuous Zone of Saturation

The "A" horizon wells at locations 1, 2, 3, 4, and 5 established the first continuous significant zone of saturation project-wide. CG-01-4A, located on the northwest ridge was developed in the Morningview sandstone and Arnoldsburg limestone at a depth of 259 feet. The static water level was 1009 feet, msl on April 16. Based on its position, this is the designated up-gradient well for the first continuous zone of saturation.

Other monitoring wells developed in the Morningview sandstone-Arnoldsburg limestone interval, down-gradient of the project are CG-01-3A and 5A at elevations of 953 and 957 feet, respectively. Wells 1A and 2A are located in the Gilboy sandstone, down-gradient in the project. The designated down-gradient wells to be sampled are 1A, 2A and 5A.

The piezometric surface is presented on Plate 7. Flow direction is southeasterly at a gradient of 10 feet per 400 feet.

Saturation zones of the study area are summarized graphically on cross-section A-A' in Plate 8. Based on geology, hydrogeologic setting, and testing, the results of this study indicate local groundwater occurrence and flow is low and seasonal.



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## 5.3 Probable Hydrologic Consequences

The proposed facility has the potential to produce acid drainage as well as high concentrations of suspended and dissolved solids, and metals such as iron and manganese. The construction, operation, maintenance, water monitoring and reclamation proposed are designed to mitigate or eliminate these effects. Consequently, there are no significant adverse impacts on the surface water, groundwater regime or hydrologic balance either on or off the site.

### 5.3.1 Surface Water

5.3.1.1 Surface Water Quantity

The proposed operation is expected to reduce base flows and peak flows in the downstream section of Piney Creek, due to the retention characteristics of the proposed sediment and quality control ponds. Runoff from the project or disturbed areas, which presently contributes to stream flow will be directed to sediment ponds. All sediment ponds will discharge to Piney Creek which will maintain base flow. Piney Creek has no downstream users. Piney Creek discharges into Captina Creek. Since the project drainage area represents a small percentage of the Captina Creek drainage basin, there should not be any recognizable difference in quantity flow in Captina Creek. It is predicted that the proposed operation will not result in any significant adverse impacts on surface water quantity in the area.

5.3.1.2 Surface Water Quality

The proposed operation could have both short-term and long-term impacts on the surface water quality in the receiving stream, especially during the early stages of construction. For instance, sediment loads to the drainage system will be increased. These impacts will be mitigated through proper execution of construction, operations, maintenance, water monitoring and reclamation. The quantity of sediment reaching surface waters should be minimized by directing all runoff through the proposed sedimentation pond and other erosion control facilities.

Diversion ditches will be installed to direct runoff away from the coarse coal refuse area. Runoff entering the refuse pile and leachate, if any, collected by the underdrain system may be high in iron and low in pH. This drainage will be directed to the sediment pond for treatment, if necessary, flow to the polishing pond, checked for quality, if the water meets permit compliance standards it will then be released to the receiving stream.

Long-term impacts are mitigated through implementation of the reclamation plan. The refuse surface will be graded, capped with two-feet of clay, compacted to achieve a permeability of less than E-07 , covered with up to an additional two-feet of earthen material and seeded. This cap and cover system is designed to minimize or eliminate the formation of leachate. The surface will be graded to promote immediate drainage. Water will not pond or accumulate on the reclaimed surface. Further, the clay cap will minimize infiltration and prevent oxidation of the coal refuse.



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### 5.3.2 Groundwater

5.3.2.1 Groundwater Quantity

The proposed operation may locally reduce the groundwater recharge capabilities due to the following factors. First, the valley is to be filled with coal refuse, which is largely composed of claystone that becomes relatively impervious when compacted. Second, upon completion, approximately 112.2 acres will be capped with two-feet of impervious clay. Third, underdrains will be installed to intercept the majority of seepage through the fill area.

There are no down-gradient groundwater users in the immediate area. Since the affected area is small, there should be no short-term or long-term adverse impacts on regional groundwater availability.

5.3.2.2 Groundwater Quality

Based on the refuse characteristics, there is the potential that the proposed operation could produce high iron, acidic drainage. The impact is mitigated or eliminated through proper construction, engineering, maintenance, water monitoring and final reclamation. The proposed facility incorporates the following preventative measures. First, a groundwater underdrain system will be installed to collect, and convey down-gradient all seepage beneath the structure. Second, an impervious clay liner will be installed to separate the groundwater underdrain system from the coal refuse. The liner will be three-feet thick minimum, and compacted to permeability less than E-07. Along the valley bottom, the liner will be graded to slope 1% eastward and down the valley at existing grades to allow for leachate collection. Third, a leachate collection drain will be installed over the liner to convey leachate, if any, to the toe of the structure where it will drain to a clay lined pond for possible treatment. Fourth, coal refuse will be compacted to reduce oxidation of the acid producing constituents, mainly pyritic sulphur, and seepage through the refuse material. Fifth, an impervious clay cap will be installed, as cited in Section 5.3.1.2, to prevent surface water from migrating into and through the refuse fill, thereby eliminating or reducing the chance for leachate generation.

Through proper construction of the control features cited above, the proposed facility is not expected to have significant short-term or long-term adverse affects on groundwater quality in the area.

Relative to ODNR revision request, dated August 7, 2002, flow from the existing refuse pile will be conveyed into the leachate collection system as described and shown on maps contained in the Engineering Report submitted November 30, 2001. There will be no commingling of groundwater with leachate from the existing refuse structure. **Also see Addendum to this item.**



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## 5.4 Response: OEPA Siting Criteria

The following is in response to Attachment C, OEPA Groundwater Monitoring Program Requirements for Wastewater Facilities:

1. *Within one-thousand feet of a public water supply well that is part of a public water supply system or within fifteen-hundred feet of a water supply well that is part of a public water supply well field supplying more than 75,000 gallons per day to a public water supply system or within an established and Ohio EPA approved well head production area.*

   **Response:** There is no public water supply system within 1,500 feet of the proposed coarse coal refuse area.

2. *An aquifer system declared by the Federal Government under the "Safe Drinking Water Act" to be a sole source aquifer.*

   **Response:** The proposed facility is not located over a federally declared sole source aquifer.

3. *An area of potential subsidence due to an underground mine in existence on the the date of receipt of the permit to install.*

   **Response:** The proposed facility is located over abandoned mine workings of the former Allison mine. Subsidence is not expected to occur due to the overburden thickness, geologic strata containing thick units of limestone, low extraction rate of the coal, firm bottom rock supporting the coal pillars, strength of coal pillars, and calculated factor of safety against pillar failure. See attached Subsidence Evaluation Report in ODNR Application D-0425-2.

4. *Above an unconsolidated aquifer system capable of sustaining a yield of one-hundred gallons per minute for a twenty-four hour period to an existing or future water supply well head located within one thousand feet of the limits of waste placement.*

   **Response:** The proposed facility is not located above an unconsolidated aquifer system, nor future water supply well head within one-thousand feet of limits of waste placement.

5. *Within one-thousand feet of a water supply well or a developed spring in existence on the date of permit-to-install application was received by Ohio EPA.*

   **Response:** The proposed facility is not located within 1,000 feet of a water supply well or developed spring.

6. *Where the isolation distance between the uppermost aquifer system and the bottom of the disposal unit is less than five feet of insitu geologic material.*

**Response:** The isolation distance between the bottom of the proposed coarse coal refuse and uppermost aquifer will be no less than five feet. Under the worst scenario, assuming the valley bottom is saturated, the engineered drainage and clay liner systems provide a minimum isolation distance of five feet. Please refer to Application D-0425-2 for design details.



AEC 11803

# 6.0 GROUNDWATER AND EFFLUENT MONITORING PLANS

## 6.1 Groundwater Monitoring Plan

The following narrative describes the Groundwater Monitoring Plan for the Century mine coarse coal refuse disposal facility during its operational and post-closure maintenance periods. The purpose of the monitoring plan is to detect potential chemical degradation of the uppermost aquifer system and significant zones of saturation above the uppermost aquifer system beneath the coal refuse disposal facility. The monitoring program was developed to meet the requirements set forth in Ohio EPA Policy 2.05: *Permits to Install – Procedures for submittal of Plans for Coal Preparation Plants* and Policy GD 0303.010: *Groundwater Monitoring Program Plan Requirements for Wastewater Facilities*, and ODNR Rules 1501: 13-4-14 and 13-9-04. The plan proposed is based upon accepted industry standards.

### 6.1.1 Groundwater Monitoring System

A total of thirteen groundwater monitoring wells were installed to identify significant zones of saturation within the project area. These wells are shown on Plate 5, entitled Groundwater Monitoring Well Location Map.

The first significant zone of saturation is the Washington (No. 12) coalbed. The up-gradient monitoring well proposed is CG-01-4B. The proposed down-gradient monitoring wells are CG-01-3B, 5B and 6B.

The first continuous zone of saturation is in the interval from the Morningview sandstone, Arnoldsburg limestone, to Gilboy sandstone. The designated up-gradient monitoring well is CG-01-4A. The down-gradient wells are CG-01-1A, 2A and 5A.

Interpreted groundwater flow patterns and sampling depths are detailed in Section 5.2 of this Report.

#### 6.1.1.1 Well Installation

All groundwater monitoring wells at the site are installed in accordance with industry standards as set forth by ASTM D-5092-90: *Standard Practice for Design and Installation of Ground Water Monitoring Wells in Aquifers*; ASTM D-4448-85a: *Standard Guide for Sampling Groundwater Monitoring Wells*; and ASTM D-4750-87: *Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well.*

Nominal 6 to 8 inch diameter borings were advanced using air rotary drilling. All wells are set into rock.



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Well locations and depths were reviewed with OEPA and ODNR prior to initiating this program. Placement of the wells was based on information obtained from soil and rock core drilling. Copies of the groundwater well logs for each well installed were submitted to the ODNR – Division of Water upon completion of the wells.

6.1.1.2 Monitoring Well Construction

Monitoring well casings consist of 2-inch diameter Schedule 40 polyvinylchloride (PVC) flush joint riser and factory-slotted 0.01-inch screen. A threaded PVC bottom cap was placed on the bottom of the screen section and a PVC slip cap placed on the top of the well. The screened section is 10 feet in length. A filter pack was established in the annular space between the boring wall and well casing using washed, graded silica sand. The sand filter pack extends approximately two feet above the top of the screened section. Bentonite pellets were then added to approximately three to five feet above the top of the sand pack, then hydrated to seal the annular space. A Portland Type I and sodium bentonite grout admixture was used to grout the remaining annular space to the ground surface. A six-inch diameter thin wall steel protective casing was placed over the PVC casing, extending 2.5 feet minimum, above existing grade. The PVC wells are fitted with expansion plugs and locked with a locking device. A typical monitoring well diagram is shown on Plate 5.

Barriers are placed around the monitoring wells to help prevent damage from equipment and vehicles.

The wells will be inspected at each sampling event by the sampling team. The sampling team will perform routine maintenance on the wells as required. Among the items to be checked include:

- General surface conditions, such as surface seals, hinges in well covers, locks, and surface casing.

- Condition of the underground casing as can be determined from the ground surface.

All problems noted with the well casing will be documented and repaired as necessary. Wells that cannot be repaired will be plugged, abandoned and replaced.

Newly installed monitoring wells are developed to restore the natural hydraulic conductivity of the formation and to remove sediment. Wells are developed by pumping formation water from the well and surging the water several times during development to facilitate sediment removal. Equipment used to develop the wells are to be cleaned prior to its use in each well.

Following well development, slug tests are performed to determine hydraulic parameters at each location.

6.1.1.3 Surveying

All monitoring wells were surveyed upon installation by a surveyor, licensed in the State of Ohio, to insure consistent groundwater data. The top of the PVC casing are surveyed and tied into a site datum. Elevation of the site datum is referenced to mean sea level. Elevations are recorded in 0.01 feet. The PVC is marked where all taped readings are to be obtained.

6.1.1.4 Well Closure

Wells will be decommissioned in accordance with OAC 3745-09-10, by removing the protective steel casing, the PVC casing and grouting the remaining PVC casing from the bottom with a cement/bentonite grout mixture. All monitoring wells will be closed in this manner following completion of the post closure monitoring period. The criteria for determining when these wells may be closed is described in Section 6.4, Post-Closure Maintenance.

## 6.2 Effluent Monitoring Plan

The purpose of the Effluent Monitoring Plan is to reduce the potential for chemical degradation of off-site surface water as a direct result of effluent discharge from the coarse coal refuse disposal facility. All storm water from beyond the perimeter of the facility is directed away from the facility by perimeter diversion ditches. This water will not be monitored. All precipitation falling within the affected area of this facility will drain to proposed sediment ponds. Similarly, leachate from the leachate collection system will flow to the sediment ponds for treatment, if necessary, then flow to a polishing pond before discharge to Piney Creek. The effluent discharge point will be at a pond located downstream of the proposed refuse structure.

The proposed plan includes monitoring the water retained by the polishing pond as follows: daily for flow, weekly for pH, and every two weeks when flowing for total suspended solids, iron and manganese.

Please refer to the Engineering Report, Section 2.4, submitted November 30, 2001, for description of surface water management. Temporary diversions will be constructed as shown on Phase 1 & 2 development plans. The completed refuse structure, Phase 3, consists of filling the entire valley, ridge to ridge from east to west.

## 6.3 Sampling and Analysis Plan

The following narrative describes Century's proposed Sampling and Analysis Plan for groundwater and effluent water associated with the operational and post-closure periods of the coarse coal refuse disposal facility. The plan was prepared to meet the requirements of Ohio EPA Policy 2.05, which references effluent limitations specified



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in the Federal Register, under 40 CFR 434, and Ohio EPA Policy GD 0303.010 for groundwater monitoring.

The proposed frequency for groundwater sampling is set forth in Section 6.3.3.2. beginning with the first sampling event occurring within 30 days of well installation, before placement of any coarse coal refuse. Effluent sampling will be performed in accordance with Policy 2.05, as detailed in Section 6.3.3.2.

### 6.3.1 Procedures for Sampling Groundwater

The following procedure will be followed as closely as possible when collecting samples from groundwater monitoring wells. This procedure is suitable for the collection of samples for conventional pollutants and metals only. If samples are to be analyzed for other parameters not specified in this plan, then the procedures may require modification.

6.3.1.1 Log sheets and QA/QC

Log sheets will be used to record those measurements and observations made in the field during each sampling event. One log sheet will be completed for each well. Copies of this information will be available for inspection or reference when required.

6.3.1.2 Equipment Needed

Equipment needed may include:

| | |
|---|---|
| Sample bottles | Waste containers |
| Preservatives | pH meter |
| Bailer and inert line | Thermometer |
| Log sheets | Keys for well locks |
| Plastic sheeting | Inert well depth measuring device |
| Distilled water | Labels and markers |
| Paper towels | Plastic gloves |
| Calculator | Sample filters |
| Tools: knife, screwdriver, etc. | Spare hose and fittings |
| 5 gallon pail(s) | Equipment manuals |

In addition, the sampling team will have a plot plan showing the location of the wells on the site along with the well numbering system. A cross section of each well showing the well depth, the length of the screened section, and the materials of construction will also be available.

Sample hoses, filters, meters and well depth measuring devices will be properly cleaned prior to collection of each sample using de-ionized/de-mineralized water.



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6.3.1.3 Measurement of Groundwater Levels

The static water level in each well will be measured and recorded on the field log sheet in accordance with this sampling plan. All depth-to-groundwater measurements will be recorded from the top of the PVC well casing. Water level measurements will be field recorded in feet below the top of the casing.

6.3.1.4 Calculate Water Volume in Wells

Before beginning any well purging or sampling, the field sampling team will determine the height of water column in the well by subtracting the distance to the top of the water column from the measured well depth, and calculating the volume of water in the well in gallons. All measurements and the calculated volume of each well will be recorded on the log sheet.

6.3.1.5 Purge the Well

To remove stagnant water in the well, three well-volumes of water, calculated as described in the previous paragraph, will be pumped from the well. If the well is purged dry before three well volumes of water have been removed, the volume removed will be considered adequate for purging purposes. From the log sheet, the volume of water that must be removed from the well will determine how long pumping will be required or how many bails of water need to be removed.

A review of all information pertaining to the well will be made to determine that the well has not collapsed or filled with sediment. Every effort will be made to repair the well or clean the well by further developing it. If the well cannot be repaired or cleaned, it will be re-drilled and sampled.

The actual volume of water removed from each well will be recorded on the log sheet. Water removed from each well will be discharged to the ground surface in the vicinity of the well.

6.3.1.6 Sample Collection

The field sampling team will collect a sample from the well once the water recovers to static conditions after three well volumes have been removed or the well is bailed dry. In the shallow monitoring wells, it may take several hours for a well to recharge enough to provide the needed sample volumes. In this case, the sampling team may purge several wells dry on one day and allow them to recharge overnight for sample collection on the next day. The maximum period between well development and sampling will not exceed 24 hours.

Samples will be collected using dedicated bailers or sampling pumps such as the "Well Wizard". The first liter of water removed from the well will be placed in a beaker at



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the well location for field analysis (temperature, pH, and specific conductance). Equipment cleaning will consist of rinsing with detergent wash solution followed by a distilled water rinse. New sample containers provided by the analytical laboratory will then be filled as required. All information will be recorded on the log sheet at the time of sampling. The filled sample containers will be labeled in the field. Samples will be be placed in a cooler filled with ice until delivery to the laboratory. Every effort will be made to deliver
the samples to the laboratory on the same day as collected, or transferred to an overnight carrier that will deliver the samples to the laboratory on the next business morning.

### 6.3.2 Procedure for Sampling Effluent Water

The effluent sampling frequency is established by the NPDES permit. Flow is sampled daily. pH is sampled weekly, and iron, total suspended solids (TSS), and manganese are sampled every two weeks, when there is flow. Testing for pH, iron and manganese will be performed in the field, the TSS sample will be submitted to the lab for each monitoring event.

The same precautions required in the groundwater sampling procedure will apply to all effluent water samples collected. The effluent water sample will be collected from the proposed polishing pond, at a point where it is allowed to discharge to the Piney Creek outfall. Sample containers will be filled from a cleaned beaker that is used to collect water directly from the pond. The attached log sheet is to be used to record all field activities associated with collection of the surface water sample.

Equipment cleaning, record keeping, field measurements, and sample shipping and custody will be as described in Section 6.3.1, "Procedure for Groundwater Sampling".

The effluent sampling event that coincides with the annual groundwater sampling event will be submitted for review. Flow rate, pH, and TSS data as measured during discharge will be incorporated into annual reports. Copies of all field log sheets, chain of custody, sampling and analysis results, and previous reports will be filed on site.

### 6.3.3 Sample Containers and Sample Analysis

6.3.3.1 Sample Containers

Sample containers for all groundwater and effluent water samples will be provided by the laboratory. All containers will be compatible with intended analysis and preservatives used, if any. A list of container types, preservative quantity and type, minimum container size, and holding times are summarized as follows:



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**SAMPLING AND PRESERVATION PROCEDURES FOR DETECTION MONITORING**

| Parameter | Recommended Container | Preservative | Maximum Holding Time | Minimum Volume Required |
|---|---|---|---|---|
| pH | Plastic or glass | Field Determined | None | 25 ml |
| Temperature | Plastic or glass | Field Determined | None | 100 ml |
| Total Mercury | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Iron | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Manganese | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Dissolved Solids | Plastic or glass | Cool, 4 deg. C | 2 days | 100 ml |
| Sulfate | Plastic or glass | Cool, 4 deg. C | 28 days | 100 ml |
| Total Lead | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Selenium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Alkalinity | Plastic or glass | HNO3 to pH<2 | 14 days | 50 ml |
| Total Magnesium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Barium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Calcium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Chloride | Plastic or glass | None Required | 28 days | 50 ml |
| Total Sodium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Zinc | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Arsenic | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Aluminum | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Cadmium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Total Chromium | Plastic or glass | HNO3 to pH<2 | 6 months | 100 ml |
| Specific Conductivity | Plastic or glass | HNO3 to pH<2 | 28 days | 25 ml |

6.3.3.2 Analysis of Groundwater and Effluent Water Samples

Groundwater and effluent samples from the coarse coal refuse disposal facility will be analyzed in the field or laboratory, as appropriate. When the facility is discharging to Perkins Run Stream, the effluent will be analyzed for the following parameters:

Flow - daily
pH – once weekly
Total Suspended Solids - once every two weeks, when flowing
Total Iron - once every two weeks, when flowing
Total Manganese - once every two weeks, when flowing

Groundwater will be analyzed four times per year, in the initial year, to establish background concentrations for the following parameters:

| | | |
|---|---|---|
| * Specific Conductivity | Barium | Gross Alpha |
| * pH | Calcium | Gross Beta |
| Total Dissolved Solids (TDS) | Chloride | |
| * Sulfate | Cadmium | |
| * Alkalinity | Chromium | |
| * Iron | Lead | |
| Magnesium | * Manganese | |
| Selenium | Sodium | |
| Aluminum | Mercury | |
| Arsenic | Zinc | |

Groundwater will be analyzed quarterly for the life of the permit for the above parameters marked with an asterisk, as well as Acidity, T.S.S., and Hardness.



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After the initial sampling year, samples collected to establish ground water quality will be obtained and analyzed at least annually for the following parameters:

| | |
|---|---|
| pH | Chloride |
| Iron | Cadmium |
| Magnesium | Chromium |
| Selenium | Lead |
| Barium | Manganese |
| Calcium | Sodium |
| Aluminum | Mercury |
| Arsenic | Zinc |

After the initial sampling year, samples collected to indicate ground water contamination (indicator parameters) will be obtained and analyzed at least semi-annually for the following parameters:

| | |
|---|---|
| Specific Conductivity | Sulfate |
| Total Dissolved Solids | Alkalinity |
| pH | |

6.3.3.3 Sample Labels

Waterproof sample labels will be provided by the laboratory and shall contain sample identification, type, date, internal laboratory identification (if any), and any special instructions.

### 6.3.4 Reporting

Results of all analyses performed on groundwater samples will be submitted to the Ohio EPA and ODNR, Division of Mineral Resources Management, appropriate District office. Analytical results will be presented in tabular form that will include the results, method detection limit, and any applicable limits of allowable concentration for a given parameter.

All ground water and statistical analysis/data analysis results generated in accordance with sections 4, 5, 6, 7, 8, and 9 of Attachment D, OEPA Policy GD0303.010 will be submitted to the Ohio EPA, Southeast District Office (SEDO), within 75 days after sampling the wells. All ground water data, with accompanying text, will be submitted to the Ohio EPA, SEDO, Division of Surface Water, and ODNR, Division of Mineral Resources Management, appropriate District office, within 75 days after sampling the wells.

The minimum frequency of sampling used to establish background and down-gradient (after initial year) ground water quality for parameters used to indicate ground water contamination will be consistent with the statistical procedure utilized pursuant to Attachment E, OEPA Policy GD0303.010. The minimum frequency of sampling will be as often as necessary to ensure, with reasonable confidence, that a contaminant release to the ground water from the facility will be detected.



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A determination will be made whether or not there is a significant increase over background values for indicator parameters (specific conductivity, total dissolved solids, sulfate, alkalinity) using an approved statistical/data evaluation method chosen from Attachment E, OEPA Policy GD0303.010. Determinations will be made semi-annually. The ground water quality of each indicator parameter at each down-gradient well will be compared to the background value of that indicator parameter according to approved evaluation procedures specified in Attachment E.

If at any monitoring well there has been a statistically significant increase (or decrease in the case of pH) from the background values according to the statistical method specified pursuant to Attachment E, for the indicator parameters listed in Section 6.3.3.2, the Director shall be notified not later than 15 days after receiving the statistical results which indicate a statistically significant change. This notification will also indicate which parameters have shown a statistically significant change from background levels.

Where appropriate, The Century mine may demonstrate that a source other than the regulated unit causes the contamination or that the statistically significant increase resulted from an error in sampling, analysis, statistical evaluation or natural variation in ground water quality. A report documenting this demonstration requires approval by Ohio EPA, SEDO, Division of Drinking and Groundwater through the Division of Surface Water. If a successful demonstration is made and documented, American Energy Corporation may continue detection monitoring as earlier specified.

### 6.3.5 Groundwater Quality Assessment

The proposed sampling plan will be initiated before the placement of any coal refuse. The data generated from this first sampling event, along with groundwater quality data presented in the hydrogeological investigation section of this document, will be considered to be representative of existing conditions and will represent a baseline evaluation of the parameters being tested. Most of the parameters being tested may be naturally occurring, or be present due to a pre-existing environmental condition. This baseline data will be tabulated and submitted.

Within 90 days of obtaining the final sample which completes the initial year of ground water monitoring, Century will specify a statistical procedure to be used in analyzing ground water quality data. The statistical method chosen will be conducted separately for each of the appropriate indicator parameters specified in Section 6.3.3.2. of this Report. The method chosen will be protective of human health and the environment and will comply with the standards outlined in OEPA Policy GW0303.010, Attachment E, Section 2. The method selected will be taken from those listed in Attachment E, Section 1 of Policy Gw0303.010.

## 6.4 Post-Closure Maintenance Plan

The coarse coal refuse disposal facility is being designed to accommodate coarse coal refuse disposal through the year 2010, and possibly longer. The Century mine proposes to terminate all monitoring of this facility after the final cap is constructed, and final bond is release by the Ohio Department of Natural Resources for Permit D-0425-2, the permit assigned to this project. Length of monitoring following closure will be determined at the time of cap construction. The monitoring wells will be maintained until deemed necessary by the Ohio EPA and the Division of Mineral Resources Management to evaluate the impact of the coarse coal refuse disposal facility on groundwater. The period between the placement of the final cap and termination of monitoring the facility is termed the Post-Closure Maintenance Period. Post-Closure Maintenance, and the work to be performed during this period is described in the following sections.

### 6.4.1 Visual Inspection

The Century mine will complete a visual inspection of the disposal facility on a semi-annual basis for two years after completion of the clay cap or until final bond release by ODNR for this permit. If there is evidence of undue subsidence or erosion of the cover, appropriate maintenance will be undertaken. The physical condition of the leachate collection system, ponds, and monitoring wells will also be documented. If leachate is observed exiting the site, or if undue accumulation is noted in the collection system, remedial activity will be initiated to correct the problem. Documentation of these inspections will be submitted to the Ohio EPA.

### 6.4.2 Groundwater Sampling

As described in Section 6.1, "Groundwater Monitoring Plan", the monitoring wells will be sampled four times per year for the life of the permit. Two complete groundwater sampling rounds will be performed following the placement of the final clay cap. Quarterly Monitoring Reports will be submitted to ODNR, Division of Mineral Resources Management, appropriate District office. The final two monitoring reports will be submitted to the Ohio EPA as described in the plan.

### 6.4.3 Effluent Sampling

Although the effluent from the facility should decrease significantly after completion of coal refuse disposal and the clay cap, some leachate may still be generated and storm water will continue to collect in the ponds. Effluent sampling will continue throughout the post-closure maintenance period (until final bond release). Effluent sampling will be performed as described in Section 6.3.3.2.



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### 6.4.4 Closure

After the post-closure maintenance period is completed, if no groundwater degradation as evidenced by the sampling and analysis has resulted, and no leachate migration is observed, then the disposal facility will be permanently closed. Closure will consist of pressure grouting all groundwater monitoring wells per OAC Rule 3745-09-10, and re-grading the facility to eliminate the ponds. A final closure report describing the closure of these activities will be submitted to the Ohio EPA.



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# 1

**TABLE 1**
**SUMMARY DATA**
**CG-01 SERIES GROUNDWATER MONITORING WELLS**
**CENTURY MINE COARSE COAL REFUSE DISPOSAL FACILITY**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**10 May 2001**

| Well | Well Depth (ft) | Ground Surface Elevation (ft) | Top of PVC Elevation (ft) | State plane Coordinates(1927) Northing | Easting | Effective Screened Interval Depth (ft) From | To | Elevation (ft) From | To | Effective Screen Length (ft) | Slotted Screen Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CG-01-1A | 50.00 | 973.63 | 974.92 | 694,527.72 | 2,414,808.02 | 36.0 | 50.0 | 938.92 | 924.92 | 14 | 10 |
| CG-01-2A | 25.03 | 939.41 | 940.33 | 694,817.65 | 2,414,981.54 | 10.0 | 24.0 | 930.33 | 916.33 | 14 | 10 |
| CG-01-3A | 285.95 | 1,161.21 | 1,163.04 | 694,963.93 | 2,413,390.24 | 256.0 | 281.0 | 907.04 | 882.04 | 25 | 10 |
| CG-01-3B | 90.30 | 1,161.31 | 1,163.22 | 694,960.31 | 2,413,398.70 | 73.0 | 88.0 | 1090.22 | 1075.22 | 15 | 10 |
| CG-01-3C | 27.20 | 1,160.66 | 1,162.35 | 694,958.80 | 2,413,381.85 | 11.0 | 25.0 | 1151.35 | 1137.35 | 14 | 10 |
| CG-01-4A | 259.00 | 1,152.95 | 1,154.06 | 696,720.93 | 2,412,001.29 | 234.0 | 259.0 | 920.06 | 895.06 | 25 | 10 |
| CG-01-4B | 58.60 | 1,152.30 | 1,153.58 | 696,716.79 | 2,412,008.57 | 42.0 | 57.0 | 1111.58 | 1096.58 | 15 | 10 |
| CG-01-4C | 25.80 | 1,151.96 | 1,153.26 | 696,713.01 | 2,412,015.57 | 12.0 | 24.0 | 1141.26 | 1129.26 | 12 | 10 |
| CG-01-5A | 267.00 | 1,158.98 | 1,161.07 | 695,518.10 | 2,412,309.91 | 255.0 | 270.0 | 906.07 | 891.07 | 15 | |
| CG-01-5B | 84.86 | 1,158.57 | 1,160.16 | 695,537.87 | 2,412,307.73 | 68.5 | 82.0 | 1091.66 | 1078.16 | 13.5 | 10 |
| CG-01-5C | 25.66 | 1,158.98 | 1,160.86 | 695,528.14 | 2,412,308.76 | 11.0 | 23.5 | 1149.86 | 1137.36 | 12.5 | 10 |
| CG-01-6B | 81.22 | 1,165.52 | 1,166.70 | 696,894.84 | 2,413,834.75 | 64.0 | 79.0 | 1102.70 | 1087.70 | 15 | 10 |
| CG-01-6C | 44.83 | 1,165.64 | 1,167.01 | 696,895.79 | 2,413,842.77 | 30.0 | 44.0 | 1137.01 | 1123.01 | 14 | 10 |

Notes:
1. Well depth measured from top of PVC riser.
2. Filter pack included in effective screened interval.

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**TABLE 2**
**DEVELOPMENT PARAMETER DATA**
**CG-01 SERIES GROUNDWATER MONITORING WELLS**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**26-Jun-01**

| Well No. | Date | Gallons Removed (1) | pH | Temperature (deg C) | Turbidity |
|---|---|---|---|---|---|
| CG-01-1A | 27-Mar-01 | 2 | 7.5 | 8 | cloudy |
| CG-01-2A | 27-Mar-01 | 8 | 7.9 | 7 | cloudy |
| CG-01-3A | 27-Mar-01 | 63.6 | 7.9 | 7 | cloudy |
| CG-01-3B | 27-Mar-01 | 1 | 7.5 | 8 | cloudy |
| CG-01-3C | 27-Mar-01 | 2 | 7.4 | 8 | cloudy |
| CG-01-4A | 27-Mar-01 | 67 | 9.9 | 10 | cloudy |
| CG-01-4B | 27-Mar-01 | 3 | 8.5 | 10 | cloudy |
| CG-01-4C | 27-Mar-01 | 7.5 | 7.2 | 8 | cloudy |
| CG-01-5A | 27-Mar-01 | 106 | 9.3 | 8 | cloudy |
| CG-01-5B | 27-Mar-01 | 2.5 | 7.6 | 7 | cloudy |
| CG-01-5C | 27-Mar-01 | 8 | 7.4 | 6 | cloudy |
| CG-01-6B | 27-Mar-01 | 2.1 | 8.3 | 11 | cloudy |
| CG-01-6C | 27-Mar-01 | 2.1 | 7.7 | 8 | cloudy |

Notes: 1. Gallons are cumulative totals

**TABLE 2A**
**DEVELOPMENT PARAMETER DATA**
**CG-01 SERIES GROUNDWATER MONITORING WELLS**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**22-Jul-01**

| Well No. | Date | Gallons Removed (1) | Ph | Temperature (deg C) | Turbidity |
|---|---|---|---|---|---|
| CG-01-1A | 21-Jun-01 | 1.5 | 7.2 | 13 | cloudy |
| CG-01-2A | 21-Jun-01 | 5.1 | 7.9 | 13 | cloudy |
| CG-01-3A | | | | | |
| CG-01-3B | 29-Jun-01 | 1.8 | 7 | 13 | cloudy |
| CG-01-3C | | | | | |
| CG-01-4A | 21-Jun-01 | 34 | 9.7 | 13 | cloudy |
| CG-01-4B | 14-Jun-01 | 59 | | 13 | cloudy |
| CG-01-4C | | | | | |
| CG-01-5A | 02-Jun-01 | 18 | 9.3 | 13 | cloudy |
| CG-01-5B | 21-Jun-01 | 2.4 | 7.6 | 13 | cloudy |
| CG-01-5C | | | | | |
| CG-01-6B | 14-Jun-01 | 2 | | 12 | cloudy |
| CG-01-6C | 14-Jun-01 | 8.3 | 7.3 | 13 | cloudy |

Notes:
1. Gallons are cumulative totals
2. No data for wells 3A, 3C, 4C, 5C

**TABLE 3**
**FIELD PERMEABILITY TESTS**
**CG-01 SERIES GROUNDWATER MONITORING WELLS**
**CENTURY MINE COARSE COAL REFUSE DISPOSAL FACILITY**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**18 MAY 2001**

| Well No. | Calculated Permeability (cm/sec) |
|---|---|
| CG-01-1A | 1.36E-07 |
| CG-01-2A | 3.54E-05 |
| CG-01-3A | 2.70E-09 |
| CG-01-3B | 7.18E-05 |
| CG-01-3C | 3.92E-05 |
| CG-01-4A | 7.74E-09 |
| CG-01-4B | 1.12E-07 |
| CG-01-4C | 1.06E-04 |
| CG-01-5A | 4.74E-09 |
| CG-01-5B | 4.82E-05 |
| CG-01-5C | 5.66E-05 |
| CG-01-6B | 7.74E-06 |
| CG-01-6C | 1.22E-06 |

Notes: 1. Bouwer & Rice method used to calculate hydraulic conductivity.

T3PERM.WK4

**TABLE 4**
**STATIC WATER LEVEL DATA**
**CG-01 SERIES GROUNDWATER MONITORING WELLS**
**COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**WAYNE TOWNSHIP, BELMONT COUNTY, OHIO**
**10 May 2001**

| | | Well Data | | | Static Water Level | |
|---|---|---|---|---|---|---|
| Well No. | Date | Collar Elevation (Feet MSL) | Depth (Feet ) | Bottom Elevation (Feet MSL) | Depth (Feet) | Elevation (Feet MSL) |
| CG-01-1A | 16 Apr 01 | 974.92 | 50.00 | 924.92 | 46.55 | 928.37 |
| CG-01-2A | 16 Apr 01 | 940.33 | 25.03 | 915.30 | 13.28 | 927.05 |
| CG-01-3A | 16 Apr 01 | 1163.04 | 285.95 | 877.09 | 209.68 | 953.36 |
| CG-01-3B | 16 Apr 01 | 1163.22 | 90.30 | 1072.92 | 85.04 | 1078.18 |
| CG-01-3C | 16 Apr 01 | 1162.35 | 27.20 | 1135.15 | 20.15 | 1142.20 |
| CG-01-4A | 16 Apr 01 | 1154.06 | 259.00 | 895.06 | 145.05 | 1009.01 |
| CG-01-4B | 16 Apr 01 | 1153.58 | 58.60 | 1094.98 | 56.82 | 1096.76 |
| CG-01-4C | 16 Apr 01 | 1153.26 | 25.80 | 1127.46 | 5.65 | 1147.61 |
| CG-01-5A | 16 Apr 01 | 1161.07 | 267.00 | 894.07 | 203.12 | 957.95 |
| CG-01-5B | 16 Apr 01 | 1160.16 | 84.86 | 1075.30 | 77.06 | 1083.10 |
| CG-01-5C | 16 Apr 01 | 1160.86 | 25.66 | 1135.20 | 7.24 | 1153.62 |
| CG-01-6B | 16 Apr 01 | 1166.70 | 81.22 | 1085.48 | 74.64 | 1092.06 |
| CG-01-6C | 16 Apr 01 | 1167.01 | 44.83 | 1122.18 | 30.91 | 1136.10 |

T4STATIC.WK4

# 2

**Diamond Drill Hole: CG-01-5A**

Driller: Randy McKay, McKay & Gould Drilling, Inc.

Coordinates: N 695,518.10 E 2,412,309.91 (1927 State Plane)
Elevation: 1158.98 Feet MSL
Start: 12 March 2001
Finish: 20 March 2001
Engineer: W. J. Siplivy

Location: Ridge west of refuse area #2
Township: Wayne
Section: 3
County: Belmont
State: Ohio

| Thickness | Depth | Description | Construction Use | Bottom Elevation | Acres | Volume (cubic yds.) |
|---|---|---|---|---|---|---|
| 22.00 | 22.00 | Non-coring, soil and weathered rock | General fill | 1136.98 | | |
| 1.70 | 23.70 | Claystone, olive-gray, Fe-stained | Clay liner | 1135.28 | | |
| 3.30 | 27.00 | Claystone, gray (1.7' lost) | Clay liner | 1131.98 | | |
| 1.30 | 28.30 | Limestone, Middle Washington, tan-light gray | Riprap or road base | 1130.68 | | |
| 1.00 | 29.30 | Shale, gray, calcareous | General fill | 1129.68 | | |
| 3.70 | 33.00 | Limestone, Middle Washington, tan-light gray | Riprap or road base | 1125.98 | | |
| 3.10 | 36.10 | Claystone, gray | Clay liner | 1122.88 | | |
| 0.50 | 36.60 | Claystone, red | Clay liner | 1122.38 | | |
| 1.10 | 37.70 | Claystone, greenish-gray | Clay liner | 1121.28 | | |
| 1.80 | 39.50 | Claystone, greenish-gray w/limestone nods. | General fill | 1119.48 | | |
| 1.00 | 40.50 | Shale, greenish-gray, sandy w/ls nods. | General fill | 1118.48 | | |
| 3.00 | 43.50 | Sandstone, Lower Marietta, l. gray, calcareous | Riprap or road base | 1115.48 | | |
| 2.40 | 45.90 | Shale, gray w/sandstone partings, x-bedded | General fill | 1113.08 | | |
| 4.60 | 50.50 | Shale, gray | General fill | 1108.48 | | |
| 0.10 | 50.60 | Limestone, tan-light gray | General fill | 1108.38 | | |
| 1.60 | 52.20 | Claystone, gray w/occasional limestone nods. | General fill | 1106.78 | | |
| 2.70 | 54.90 | Shale, gray w/sandstone partings, x-bedded | General fill | 1104.08 | | |
| 0.80 | 55.70 | Shale, gray, silty | General fill | 1103.28 | | |
| 0.60 | 56.30 | Claystone, gray | Clay liner | 1102.68 | | |
| 0.30 | 56.60 | Claystone, gray & red | Clay liner | 1102.38 | | |
| 1.40 | 58.00 | Claystone, gray | Clay liner | 1100.98 | | |
| 0.80 | 58.80 | Shale, gray, silty | Clay liner | 1100.18 | | |
| 4.00 | 62.80 | Claystone, gray w/occasional limestone nods. | General fill | 1096.18 | | |
| 5.90 | 68.70 | Shale, gray w/sandstone partings | General fill | 1090.28 | | |
| 0.90 | 69.60 | Shale, gray | General fill | 1089.38 | | |
| 5.90 | 75.50 | Claystone, gray | Clay liner | 1083.48 | | |
| 0.55 | 76.05 | Shale, black, carbonaceous w/pyrite | Dispose as refuse | 1082.93 | | |
| **3.70** | **79.75** | **Washington (No. 12) Coalbed** | None | 1079.23 | | |
| 12.55 | 92.30 | Claystone, gray (6.05' lost) | Clay liner | 1066.68 | | |
| 3.40 | 95.70 | Claystone, gray w/abundant limestone nods. | General fill | 1063.28 | | |
| 3.80 | 99.50 | Claystone, gray, silty | General fill | 1059.48 | | |
| 0.50 | 100.00 | Shale, gray | General fill | 1058.98 | | |
| 5.40 | 105.40 | Sandstone, Mannington, l. gray, calcareous | Riprap or road base | 1053.58 | | |
| 14.20 | 119.60 | Claystone, gray, silty | General fill | 1039.38 | | |
| 3.95 | 123.55 | Claystone, red | Clay liner | 1035.43 | | |
| 4.95 | 128.50 | Claystone, gray (2.45') | Clay liner | 1030.48 | | |
| 0.75 | 129.25 | Shale, black, carbonaceous | Dispose as refuse | 1029.73 | | |
| **0.25** | **129.50** | **Coal** | None | 1029.48 | | |
| 1.65 | 131.15 | Shale, dark gray | General fill | 1027.83 | | |
| **0.85** | **132.00** | **WAYNESBURG "A" COALBED, w/shale** | None | 1026.98 | | |
| 0.50 | 132.50 | Shale, black, carbonaceous | Dispose as refuse | 1026.48 | | |
| 7.20 | 139.70 | Shale, gray | General fill | 1019.28 | | |
| 5.20 | 144.90 | Claystone, gray w/limestone nodules | General fill | 1014.08 | | |
| 11.70 | 156.60 | Shale, gray w/occasional limestone nodules | General fill | 1002.38 | | |
| 4.90 | 161.50 | Claystone, gray w/limestone nodules | General fill | 997.48 | | |
| 2.75 | 164.25 | Shale, gray | General fill | 994.73 | | |
| 7.35 | 171.60 | Claystone, gray w/occasional limestone nods. | General fill | 987.38 | | |
| 0.45 | 172.05 | Sandstone, Waynesburg, light gray | Riprap or road base | 986.93 | | |
| 5.45 | 177.50 | Shale, gray w/abundant sandstone partings | General fill or road base | 981.48 | | |
| 1.60 | 179.10 | Shale, dark gray w/sandstone partings | General fill or road base | 979.88 | | |
| 1.45 | 180.55 | Shale, dark gray-black | Dispose as refuse | 978.43 | | |
| 0.10 | 180.65 | Shale, black, carbonaceous | Dispose as refuse | 978.33 | | |
| **3.62** | **184.27** | **WAYNESBURG (No. 11) COALBED** | None | 974.71 | | |
| 1.33 | 185.60 | Claystone, gray | Clay liner | 973.38 | | |
| 7.55 | 193.15 | Shale, gray | General fill | 965.83 | | |
| **0.10** | **193.25** | **Coal, broken** | None | 965.73 | | |
| 0.30 | 193.55 | Claystone, gray | | 965.43 | | |

**Diamond Drill Hole: CG-01-6A (Continued)**

| Thickness | Depth | Description | |
|---|---|---|---|
| 0.25 | 193.80 | Limestone, tan-light gray | 965.18 |
| 0.35 | 194.15 | Claystone, gray | 964.83 |
| 0.15 | 194.30 | Shale, gray w/carbonaceous streaks | 964.68 |
| 1.70 | 196.00 | Shale, gray, calcareous | 962.98 |
| 2.70 | 198.70 | Limestone, tan, very hard | 960.28 |
| 3.30 | 202.00 | Shale, gray, calcareous | 956.98 |
| 0.55 | 202.55 | Limestone, tan, very hard | 956.43 |
| 2.90 | 205.45 | Claystone, gray w/limestone nodules | 953.53 |
| 0.80 | 206.25 | Limestone, tan, very hard | 952.73 |
| 1.70 | 207.95 | Claystone, greenish-gray w/limestone nodules | 951.03 |
| 2.45 | 210.40 | Limestone, Waynesburg, tan, nodular | 948.58 |
| 6.60 | 217.00 | Claystone, greenish-gray | 941.98 |
| 1.65 | 218.65 | Limestone, tan-light gray | 940.33 |
| 1.00 | 219.65 | Claystone, greenish-gray | 939.33 |
| 0.15 | 219.80 | Shale, gray w/carbonaceous streaks | 939.18 |
| 0.25 | 220.05 | Claystone, greenish-gray w/limestone nodules | 938.93 |
| 0.85 | 220.90 | Shale, gray w/carbonaceous streaks (Uniontown No. 10 coal horizon) | 938.08 |
| 3.40 | 224.30 | Claystone, greenish-gray | 934.68 |
| 4.60 | 228.90 | Shale, greenish-gray w/sandstone streaks | 930.08 |
| 1.60 | 230.50 | Shale, greenish-gray | 928.48 |
| 0.70 | 231.20 | Shale, gray, calcareous | 927.78 |
| 1.25 | 232.45 | Shale, olive-gray | 926.53 |
| 0.90 | 233.35 | Limestone, tan-light gray | 925.63 |
| 2.85 | 236.20 | Shale, gray, calcareous | 922.78 |
| 1.15 | 237.35 | Shale, greenish-gray | 921.63 |
| 7.15 | 244.50 | Shale, gray | 914.48 |
| 0.65 | 245.15 | Shale, greenish-gray | 913.83 |
| 0.80 | 245.95 | Limestone, tan-light gray | 913.03 |
| 1.05 | 247.00 | Claystone, gray | 911.98 |
| 7.55 | 254.55 | Shale, gray, calcareous, Fe-stained upper 4' | 904.43 |
| 2.65 | 257.20 | Limestone, Arnoldsburg, tan-light gray | 901.78 |
| 1.70 | 258.90 | Claystone, greenish-gray | 900.08 |
| 2.50 | 261.40 | Shale, gray, calcareous | 897.58 |
| 1.60 | 263.00 | Claystone, greenish-gray w/occasional limestone nods. | 895.98 |
| 5.00 | 268.00 | Sandstone, Morningview, light gray, Fe-stained | 890.98 |
| 4.45 | 272.45 | Shale, gray | 886.53 |
| 2.40 | 274.85 | Shale, gray, calcareous | 884.13 |
| 2.60 | 277.45 | Limestone, Benwood, tan-light gray | 881.53 |
| 0.60 | 278.05 | Shale, gray | 880.93 |
| 2.25 | 280.30 | Limestone, Benwood, tan-light gray, shaly | 878.68 |
| 2.70 | 283.00 | Claystone, green | 875.98 |

End of Log

Respectfully submitted,

William J. Siplivy, P.E., C.P.G.

AMERICAN INSTITUTE OF PROFESSIONAL GEOLOGISTS
CERTIFICATE NUMBER
4599
AIPG
WILLIAM J. SIPLIVY
CERTIFIED PROFESSIONAL GEOLOGIST

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/26/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-01A | 0 | 8 | Br. damp clay |
| | 8 | 12 | Dr. gr. clay |
| | 12 | 13 | Br. clay |
| | 13 | 13½ | Coal 6" |
| | 13½ | 14 | Br. clay |
| | 14 | 16 | Gr. clay |
| | 16 | 16¼ | Limestone |
| | 16¼ | 17 | Br. shale |
| | 17 | 19 | Limestone |
| | 19 | 24 | Gr. clay shale |
| | 24 | 27 | Limestone w/shale bds. |
| | 27 | 36 | Gr. shale clay |
| | 36 | 38 | Limey shale |
| | 38 | ~~40~~ 50 | Br. gr. silty shale w/sandstone |
| | | WJS | bands |
| | | | |
| | | | |
| | | | |
| | | | |

| | |
|---|---|
| | AMERICAN ENERGY CORPORATION<br>CENTURY MINE |
| William J. Siplivy, PE., Inc.<br>50 Munroe Falls Avenue<br>Munroe Falls, Ohio 44262 | ***ROCK CORE LOG***<br>***CG-01-1A***<br>***COARSE COAL REFUSE FACILITY*** |
| Checked by: WJS Date: 12 April 2001 | **Project: Hydrogeologic Investigation** |

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/26/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-02A | 0 | 2 | Fill - road base |
| | 2 | 4 | Br. shale |
| | 4 | 14 | Br. sandstone & 2' gr. sandstone |
| | 14 | 17 | Br. gr. shale |
| | 17 | 24 | Limestone w/shale bands |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-2A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | **Project: Hydrogeologic Investigation**

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/22 & 23/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-3A | 0 | 4 | Br. clay |
| | 4 | 24 | Br. shale firm @ 6' w/clay bds. |
| | 24 | 32 | Gr. & red clay shale |
| | 32 | 39 | Limestone |
| | 39 | 48 | Gr. clay shale |
| | 48 | 67 | Gr. silty shale/1'limestone @ 63 |
| | 67 | 76 | Br. sandstone w/shale bds. |
| | 76 | 82½ | Med. gr. shale |
| | 82½ | 87 | Coal WASHINGTON (No. 12) |
| | 87 | 93 | Clay shale |
| | 93 | 140 | Gr. silty shale w/siltstone bds. |
| | 140 | 147 | Limestone |
| | 147 | 154 | Gr. silty shale |
| | 154 | 163 | Gr. sandstone |
| | 163 | 178 | Gr. silty shale w/limestone bds |
| | 178 | 188 | Dr. gr. silty shale |
| | 188 | 191½ | Coal WAYNESBURG (No. 11) |
| | 191½ | 199 | Dr. clay shale |
| | 199 | 207 | Limestone |
| | 207 | 223 | Gr. silty shale |
| | 223 | 233 | Gr. sandstone |
| | 233 | 239 | Red gr. shale |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-3A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001

**Project: Hydrogeologic Investigation**

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/22 & 23/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-3A | 239 | 253 | Gr. silty shale w/limestone bds |
| | 253 | 263 | Limestone w/shale bds. |
| | 263 | 276 | Gr. silty shale w/limestone bds. |
| | 276 | 280 | Dr. gr. shale |
| | 280 | 281 | Limestone |

AMERICAN ENERGY CORPORATION
CENTURY MINE

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Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-3A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | **Project: Hydrogeologic Investigation**

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/22/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-3B | 0 | 4 | Br. clay |
| | 4 | 24 | Br. shale firm @ 6' w/clay bds. |
| | 24 | 32 | Gr. & red clay shale |
| | 32 | 39 | Limestone |
| | 39 | 48 | Gr. clay shale |
| | 48 | 67 | Gr. silty shale w/1' limestone |
| | 67 | 76 | Br. sandstone w/shale bds. |
| | 76 | 82½ | Med. gr. shale |
| | 82½ | 86½ | Coal WASHINGTON (No. 12) |
| | 86½ | 88 | Clay shale |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-3B***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001

**Project: Hydrogeologic Investigation**

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/26/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| GC-01-3C | 0 | 4 | Br. clay |
| | 4 | 6 | Br. shale |
| | 6 | 7 | Br. sandstone |
| | 7 | 21 | Br. shale w/clay bands |
| | 21 | 25 | Gr. shale clay |

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50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-3C***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/27,28,29/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-4A | 0 | 1 | Topsoil |
| | 1 | 13 | Br. clay |
| | 13 | 20 | Br. gr. sandstone |
| | 20 | 26 | Gr. shale |
| | 26 | 27 | Limestone |
| | 27 | 30 | Gr. silty shale |
| | 30 | 40 | Clay shale |
| | 40 | 45 | Gr. silty shale w/limestone bds. |
| | 45 | 50 | Trace of coal - clay |
| | 50 | 52 | Dr. shale |
| | 52 | 56 | Coal WASHINGTON (No. 12) |
| | 56 | 61 | Clay |
| | 61 | 76 | Clay shale |
| | 76 | 79 | Limestone |
| | 79 | 87 | Gr. shale |
| | 87 | 95 | Gr. sandstone to siltstone |
| | 95 | 106 | Gr. red silty shale to dr. gr. |
| | 106 | 107 | 3" trace of coal @ 106' - clay |
| | 107 | 108 | Coal 12" WAYNESBURG "A" |
| | 108 | 118 | Gr. shale w/limestone bds. |
| | 118 | 140 | Gr. silty shale |
| | 140 | 163 | Gr. sandstone |

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***ROCK CORE LOG***
***CG-01-4A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/27,28,29/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-4A | 163 | 170 | Gr. sandstone |
| | 170 | 174 | Gr. sandstone |
| | 174 | 181 | Gr. shale 6" coal @ 180½' (Waynesburg No. 11) |
| | 181 | 182 | Clay |
| | 182 | 207 | Limestone w/shale bds. |
| | 207 | 233 | Gr. silty shale w/limestone bds. |
| | 233 | 242 | Limestone w/shale bds. |
| | 242 | 252 | Shale w/limestone bds. |
| | 252 | 256 | Gr. sandstone |
| | 256 | 259 | Gr. shale |

AMERICAN ENERGY CORPORATION
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50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-4A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/27/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-4B | 0 | 1 | Topsoil |
| | 1 | 13 | Br. clay |
| | 13 | 20 | Br. gr. sandstone |
| | 20 | 26 | Gr. shale/water @ 20' |
| | 26 | 27 | Limestone |
| | 27 | 30 | Gr. silty shale |
| | 30 | 40 | Clay shale |
| | 40 | 45 | Gr. silty shale w/limestone bds. |
| | 45 | 50 | Trace of coal - clay |
| | 50 | 52 | Dr. shale |
| | 52 | 56 | Coal WASHINGTON (No. 12) |
| | 56 | 57 | Clay |
| | | | |
| | | | |
| | | | |
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| | | | |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-4B***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/27 & 29/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-4C | 0 | 1 | Topsoil |
| | 1 | 13 | Br. clay |
| | 13 | 20 | Br. gr. sandstone |
| | 20 | 24 | Gr. shale |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-4C***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County Belmont Date 3/12,13,14,15,16,19,20/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-5A | 0 | 2 | Br. clay |
| | 2 | 7 | Br. sandstone w/mud seams |
| | 7 | 22 | Gr. br. shale w/mud seams |
| | 22 | 27 | Core - Retrieved 3'3" of 5' |
| | 27 | 42 | Core - Retrieved 14'5" of 15' |
| | | | |
| | 22 | 27 | Gr. clay shale/22-24' water |
| | 27 | 38 | Gr. dr. gr. & 1' red @ 36' of |
| | | | clay shale |
| | 38 | 40 | Siltstone w/limestone |
| | 40 | 42 | Gr. siltstone |
| | | | |
| | 42 | 58½ | Core - Retrieved 16'4" |
| | 58½ | 65 | Core - Retrieved 6'8" |
| | 65 | 86 | Core - Retrieved 13' |
| | | | |
| | 42 | 51 | Gr. silty shale w/sandstone bds. |
| | 51 | 52 | Clay shale |
| | 52 | 56 | Silty shale |
| | 56 | 57 | Clay shale |
| | 57 | 59 | Silty shale |
| | 59 | 66 | Clay shale w/silty bds. |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-5A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/12,13,14,15,16,19,20/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-5A | 66 | 69 | Silty shale |
| | 69 | 75 | Dr. silty shale w/clay bds. |
| | 75 | 79 | Coal WASHINGTON (No.12) |
| | 79 | 86 | Lost |
| | 86 | 99½ | Core |
| | | | |
| | 86 | 92 | Dr. gr. silty shale |
| | 92 | 96 | Gr. shale w/imbedded limestone |
| | 96 | 99½ | Gr. silty shale |
| | 99½ | 109 | Core |
| | 109 | 126 | Core |
| | 126 | 142 | Core |
| | 142 | 159½ | Core |
| | | | |
| | 99½ | 108 | Gr. siltstone |
| | 108 | 110 | Clay shale |
| | 110 | 121 | Gr. silty shale |
| | 121 | 126 | Red gr. clay shale - lost 2' |
| | 126 | 131 | Gr. & dr. gr. silty shale |
| | 131 | 132 | Coal 9" WAYNESBURG "A" |
| | 132 | 142 | Clay shale |
| | 142 | 159½ | Clay shale w/limestone bds. |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-5A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/12,13,14,15,16,19,20/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-5A | 159½ | 163 | Gr. silty shale |
| | 163 | 168¼ | Clay shale - lost 1' |
| | 168¼ | 171 | Clay shale |
| | 171 | 178 | Gr. silty shale |
| | 178 | 180½ | Dr. gr. silty shale |
| | 180½ | 184 | Coal 42" Waynesburg (No. 11) |
| | 184 | 185½ | Clay shale |
| | 185½ | 188 | Dr. gr. shale |
| | 188 | 189 | Dr. gr. shale drilled 6" |
| | 189 | 193½ | Dr. gr. shale w/trace of coal |
| | 193½ | 208½ | Limestone |
| | 208½ | 218½ | Limestone |
| | 218½ | 229¼ | Green gr. silty shale |
| | 229¼ | 247 | Core |
| | 247 | 263 | Core |
| | 263 | 283 | Core |
| | | | |
| | 229¼ | 232½ | Gr. silty shale |
| | 232½ | 236½ | Limestone |
| | 236½ | 245 | Gr. silty shale |
| | 245 | 246 | Limestone |
| | 246 | 247 | Clay shale |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
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***ROCK CORE LOG***
***CG-01-5A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/12,13,14,15,16,19,20/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-5A | 247 | 250 | Gr. silty shale |
| | 250 | 257 | Limestone |
| | 257 | 263 | Gr. silty shale |
| | 263 | 268 | Gr. sandy limestone |
| | 268 | 271 | Dr. gr. silty shale |
| | 271 | 280 | Limestone |
| | 280 | 283 | Gr. silty shale |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-5A***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/20/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-5B | 0 | 1 | Br. clay |
| | 1 | 7 | Br. sandstone |
| | 7 | 27 | Gr. br. shale clay |
| | 27 | 33 | Limestone |
| | 33 | 38 | Dr. gr. shale |
| | 38 | 40 | Gr. silty shale |
| | 40 | 44 | Gr. silty limestone |
| | 44 | 58 | Gr. silty shale |
| | 58 | 64 | Gr. silty shale w/limestone bds. |
| | 64 | 77½ | Br. gr. shale |
| | 77½ | 81 | Coal WASHINGTON (No. 12) |
| | 81 | 82 | Clay shale |
| | | | |
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AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-5B***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/20/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-5C | 0 | 3 | Br. clay |
| | 3 | 8 | Br. sandstone |
| | 8 | 12 | Br. clay |
| | 12 | 24 | Red & br. shale |
| | 24 | 25 | Gr. clay shale |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-5C***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/30/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-6B | 0 | 8 | Br. silty shale |
| | 8 | 19 | Br. shale w/clay bands |
| | 19 | 23 | Gr. clay shale |
| | 23 | 30 | Limestone w/shale bands |
| | 30 | 42 | Gr. shale |
| | 42 | 44 | Gr. sandstone |
| | 44 | 57 | Gr. silty shale w/clay bds. |
| | 57 | 64 | Gr. fine sandstone |
| | 64 | 72 | Gr. clay shale |
| | 72 | 74 | Dr. shale |
| | 74 | 78 | Coal WASHINGTON (No. 12) |
| | 78 | 79 | Clay |
| | | | |
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|---|---|
| | AMERICAN ENERGY CORPORATION<br>CENTURY MINE |
| William J. Siplivy, PE., Inc.<br>50 Munroe Falls Avenue<br>Munroe Falls, Ohio 44262 | ***ROCK CORE LOG***<br>***CG-01-6B***<br>***COARSE COAL REFUSE FACILITY*** |
| Checked by: WJS Date: 12 April 2001 | Project: Hydrogeologic Investigation |

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2906

For _____ Land Owner Century Mine

County _____ Date 3/30/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-6C | 0 | 8 | Br. silty shale |
| | 8 | 19 | Br. shale w/clay bands |
| | 19 | 23 | Gr. clay shale |
| | 23 | 30 | Limestone w/shale bands |
| | 30 | 42 | Gr. shale |
| | 42 | 44 | Gr. sandstone |

AMERICAN ENERGY CORPORATION
CENTURY MINE

William J. Siplivy, PE., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

***ROCK CORE LOG***
***CG-01-6C***
***COARSE COAL REFUSE FACILITY***

Checked by: WJS | Date: 12 April 2001 | Project: Hydrogeologic Investigation

# McKAY & GOULD DRILLING, INC.

267 Taggart Road
Darlington, PA 16115-9299
(724) 436-6823 OR 1-800-788-2908

For _____ Land Owner Century Mine

County _____ Date 3/29/01

Twp. _____ Driller RMc-19

| Hole No. | From | To | Type of Formation |
|---|---|---|---|
| #CG-01-6 | TEST HOLE | | |
| | 0 | 1 | Br. silty clay |
| | 1 | 6 | Gr. dr. shale/slate |
| | 6 | 7 | Br. clay |
| | 7 | 10 | Limestone |
| | 10 | 13 | Br. clay |
| | 13 | 19 | Red clay |
| | 19 | 21 | Br. shale |
| | 21 | 29 | Br. silty shale to gr. @ 26' |
| | 29 | 36 | Gr. clay shale |
| | 36 | 38 | Gr. silty shale |
| | 38 | 42 | Limey shale |
| | 42 | 49 | Gr. sandstone |
| | 49 | 53 | Gr. silty shale |
| | 53 | 58 | Dr. gr. silty shale |
| | 58 | 62 | Coal WASHINGTON (No. 12) |
| | 62 | 63 | Clay |
| | | | |
| | | | |

| | |
|---|---|
| | AMERICAN ENERGY CORPORATION<br>CENTURY MINE |
| William J. Siplivy, PE., Inc.<br>50 Munroe Falls Avenue<br>Munroe Falls, Ohio 44262 | ***ROCK CORE LOG***<br>***CG-01-6***<br>***COARSE COAL REFUSE FACILITY*** |
| Checked by: WJS Date: 12 April 2001 | Project: Hydrogeologic Investigation |

# 3

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-1A**

Collar Elevation (feet, msl): 974.92
Location: N 694,527.72 E 2,414,808.02
Date Started: 26 March 2001
Date Completed: 26 March 2001
Water Depth: 46.55 feet
Water Elevation: 928.37 feet, msl

Well Materials List

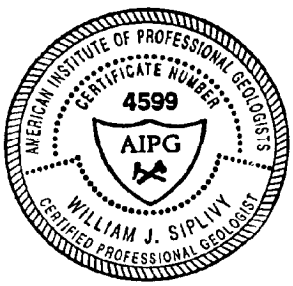
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 6 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

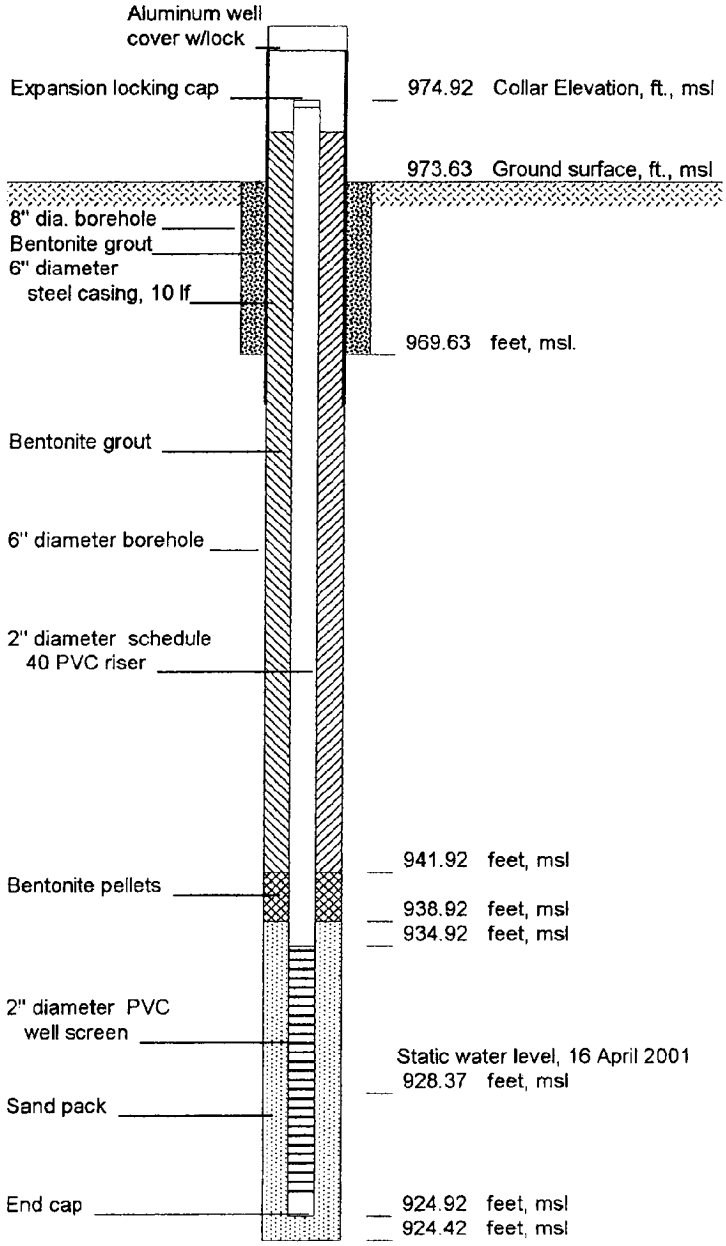
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-1A.WK4 WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-2A**

Collar Elevation (feet, msl): 940.33
Location: N 694,817.65 E 2,414,981.54
Date Started: 26 March 2001
Date Completed: 26 March 2001
Water Depth: 13.28 feet
Water Elevation: 927.05 feet, msl

Well Materials List

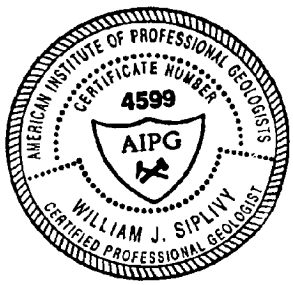
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 2 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

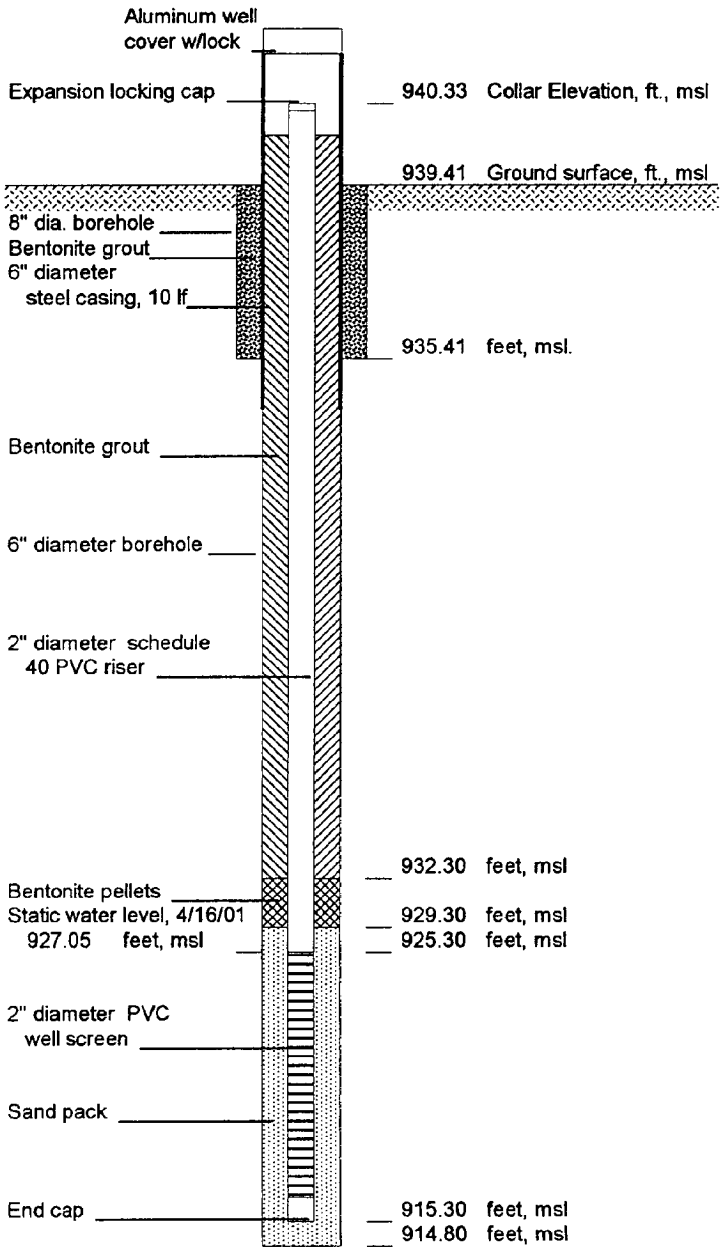
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-2A.WK4

WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-3A**

Collar Elevation (feet, msl): 1163.04
Location: N 694,963.93 E 2,413,390.24
Date Started: 22 March 2001
Date Completed: 23 March 2001
Water Depth: 209.68 feet
Water Elevation: 953.36 feet, msl

Well Materials List

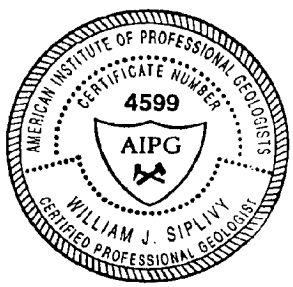
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 47 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 5 bags
11. Installation method: Gravity

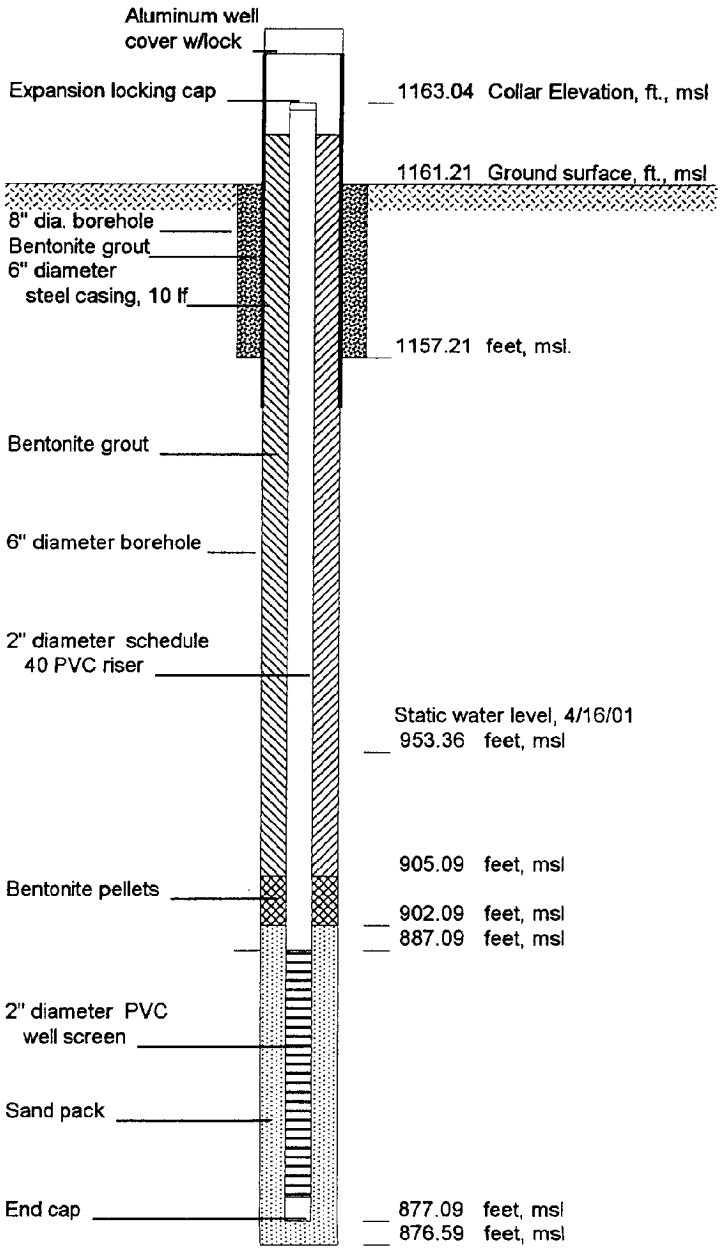
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-3A.WK4 WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-3B**

Collar Elevation (feet, msl): 1163.22
Location: N 694,960.31 E 2,413,398.70
Date Started: 23 March 2001
Date Completed: 23 March 2001
Water Depth: 85.04 feet
Water Elevation: 1078.18 feet, msl

Well Materials List

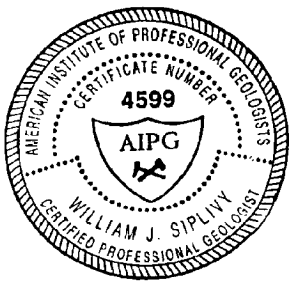
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 15 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

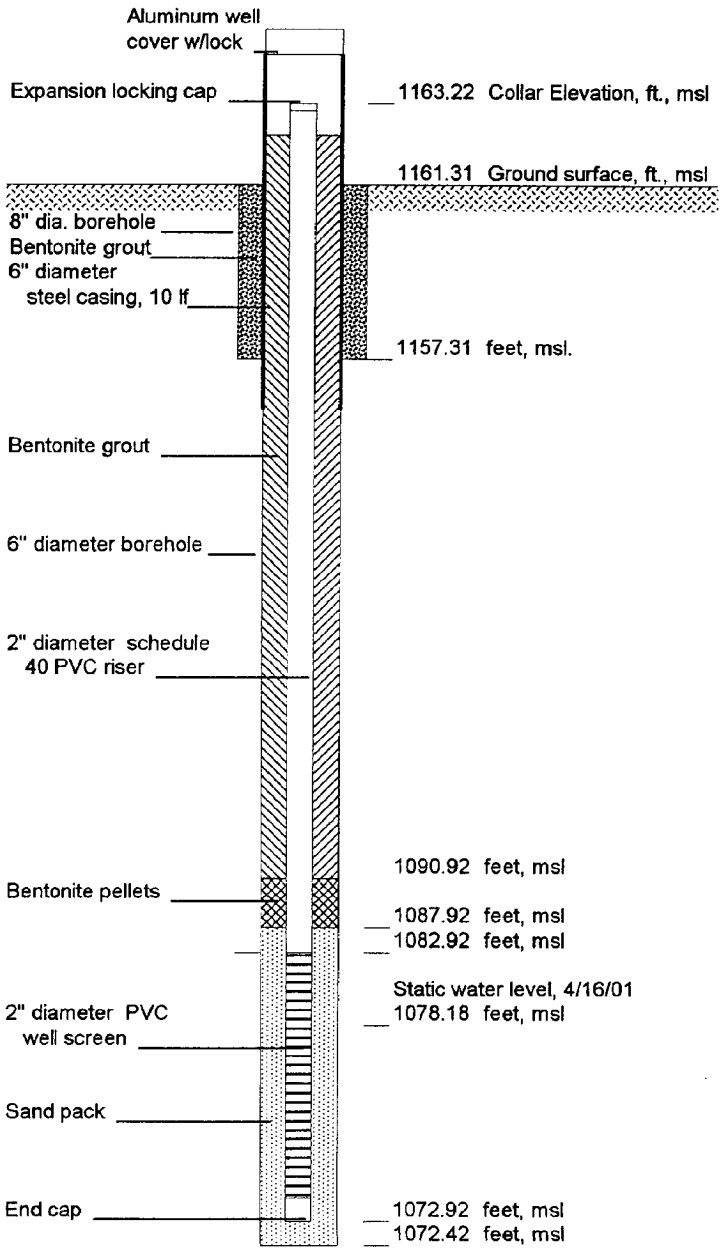
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-3B.WK4

WJS

AEC 11847

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-3C**

Collar Elevation (feet, msl): 1162.35
Location: N 694,958.80 E 2,413,381.85
Date Started: 26 March 2001
Date Completed: 26 March 2001
Water Depth: 20.15 feet
Water Elevation: 1142.2 feet, msl

Well Materials List

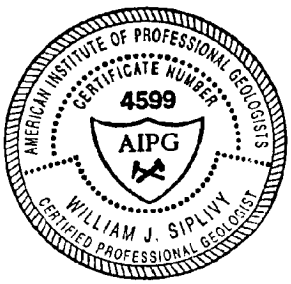
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 2 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

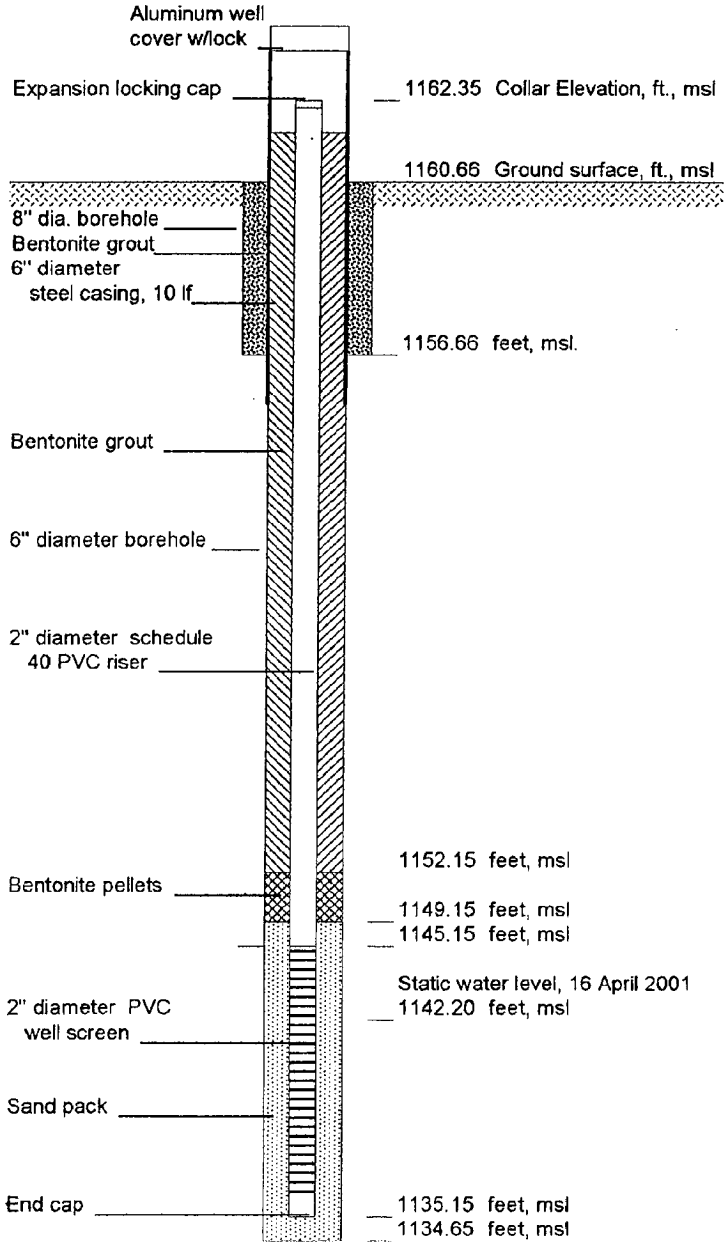
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-3C.WK4 WJS

AEC 11848

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-4A**

Collar Elevation (feet, msl): 1154.06
Location: N 696,720.93 E 2,412,001.29
Date Started: 27 March 2001
Date Completed: 29 March 2001
Water Depth: 145.05 feet
Water Elevation: 1009.01 feet, msl

Well Materials List

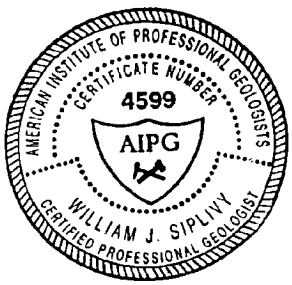
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 50 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

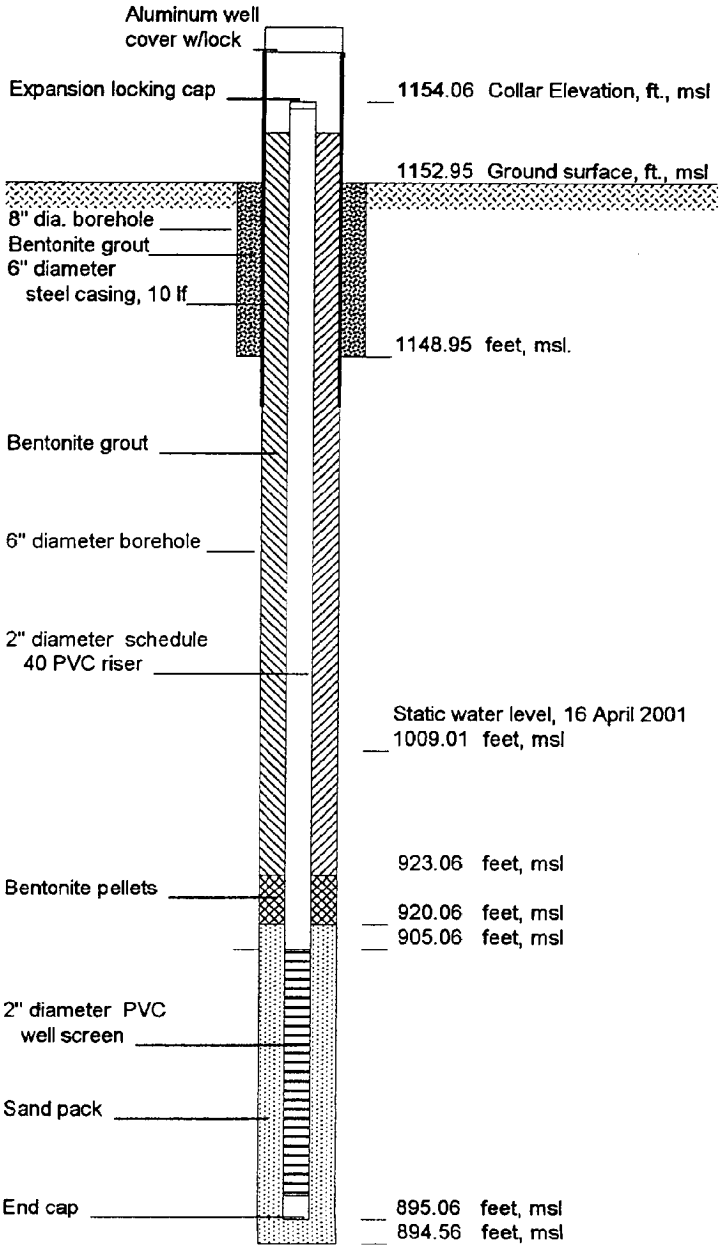
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-4A.WK4

WJS

AEC 11849

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-4B**

Collar Elevation (feet, msl): 1153.58
Location: N 696,716.79 E 2,412,008.57
Date Started: 27 March 2001
Date Completed: 27 March 2001
Water Depth: 56.82 feet
Water Elevation: 1096.76 feet, msl

Well Materials List

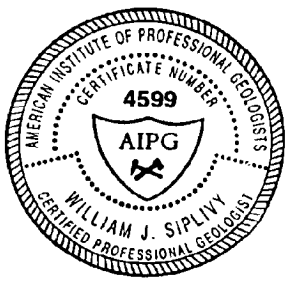
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 9 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

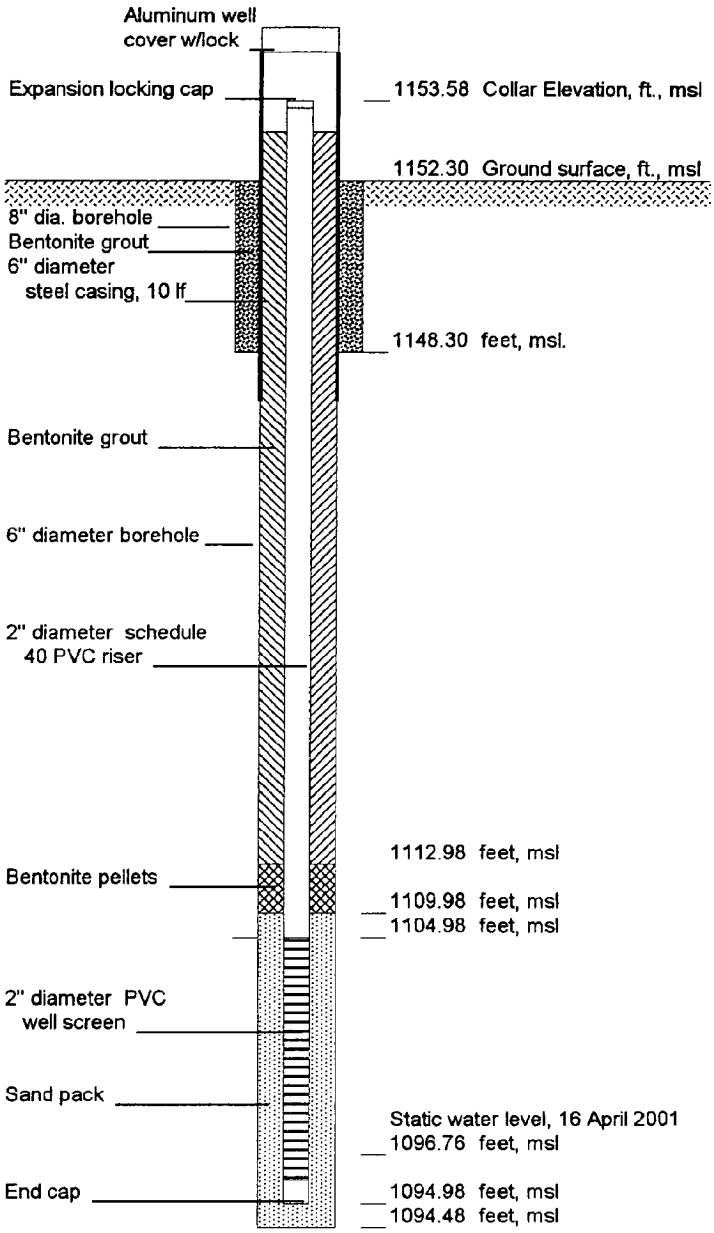
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-4B.WK4 WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-5A**

Collar Elevation (feet, msl): 1161.07
Location: N 695,518.10 E 2,412,309.91
Date Started: 12 March 2001
Date Completed: 20 March 2001
Water Depth: 203.12 feet
Water Elevation: 957.95 feet, msl

Well Materials List

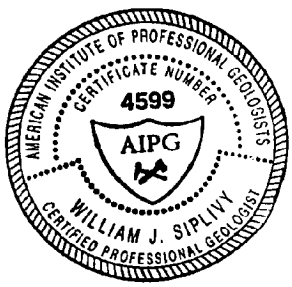
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 56 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 4 bags
11. Installation method: Gravity

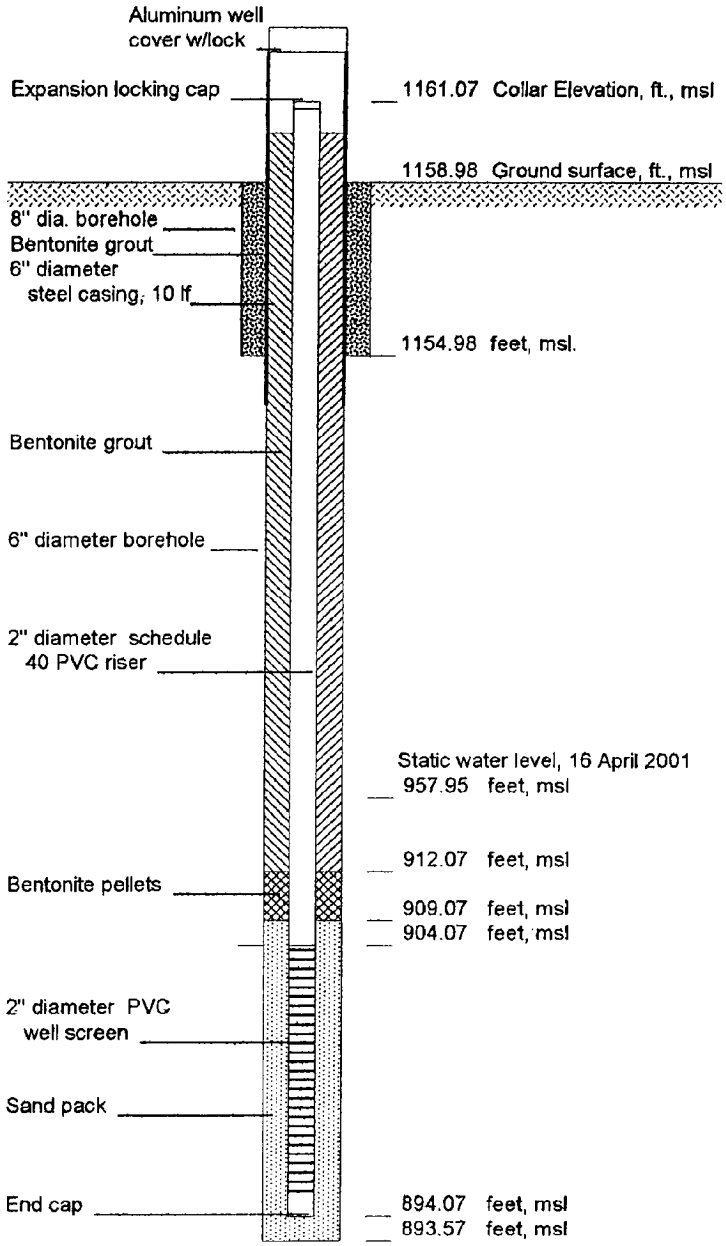
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy w/rain, high 30's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-5A.WK4

WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-5B**

Collar Elevation (feet, msl): 1160.16
Location: N 695,537.87 E 2,412,307.73
Date Started: 20 March 2001
Date Completed: 20 March 2001
Water Depth: 77.06 feet
Water Elevation: 1083.1 feet, msl

Well Materials List

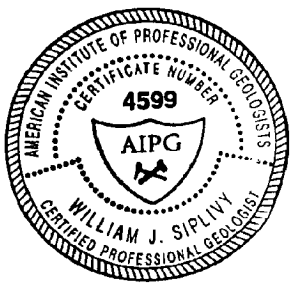
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 14 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

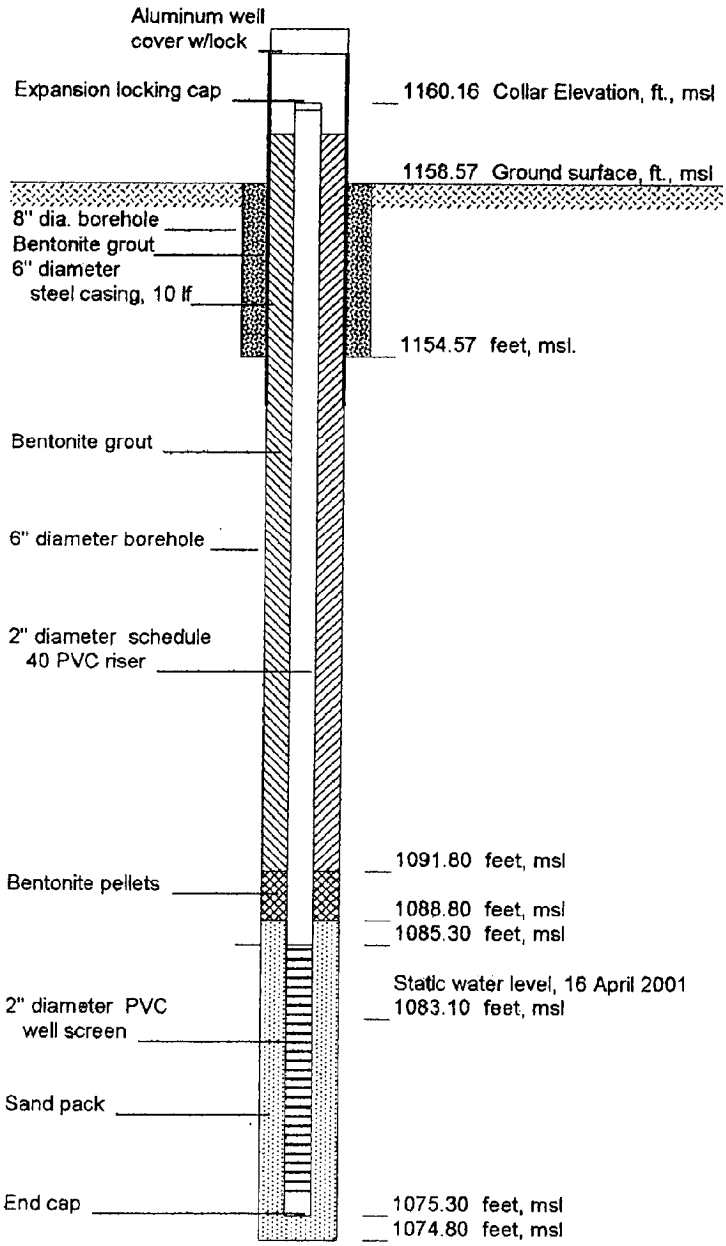
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-5B.WK4

WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 3, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-5C**

Collar Elevation (feet, msl): 1160.86
Location: N 695,528.14 E 2,412,308.76
Date Started: 20 March 2001
Date Completed: 20 March 2001
Water Depth: 7.24 feet
Water Elevation: 1153.62 feet, msl

Well Materials List

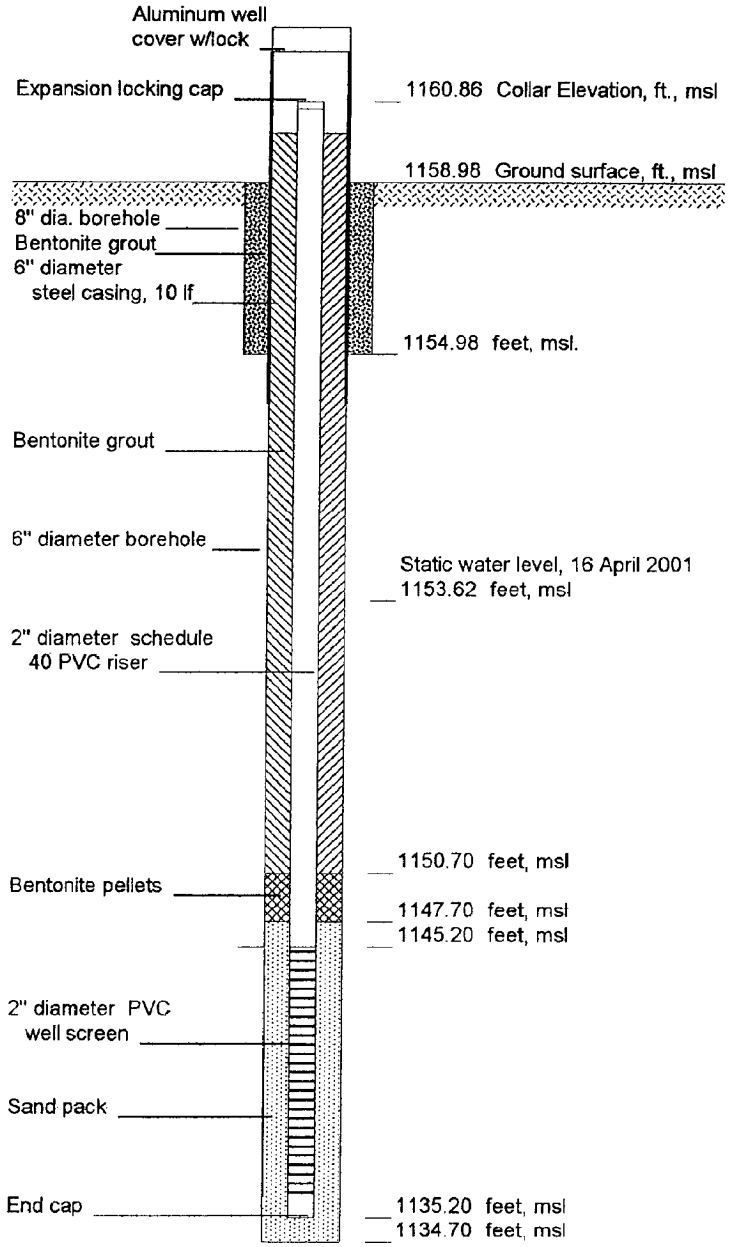
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 2 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 5 bags
11. Installation method: Gravity

Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Partly cloudy, high 40's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-5C.WK4

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# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 4, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-6B**

Collar Elevation (feet, msl): 1166.7
Location: N 696,894.84 E 2,413,834.75
Date Started: 30 March 2001
Date Completed: 30 March 2001
Water Depth: 74.64 feet
Water Elevation: 1092.06 feet, msl

Well Materials List

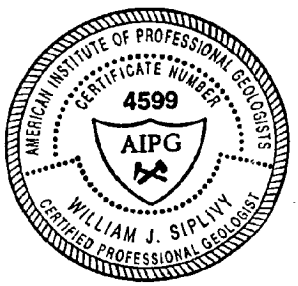
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 12 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

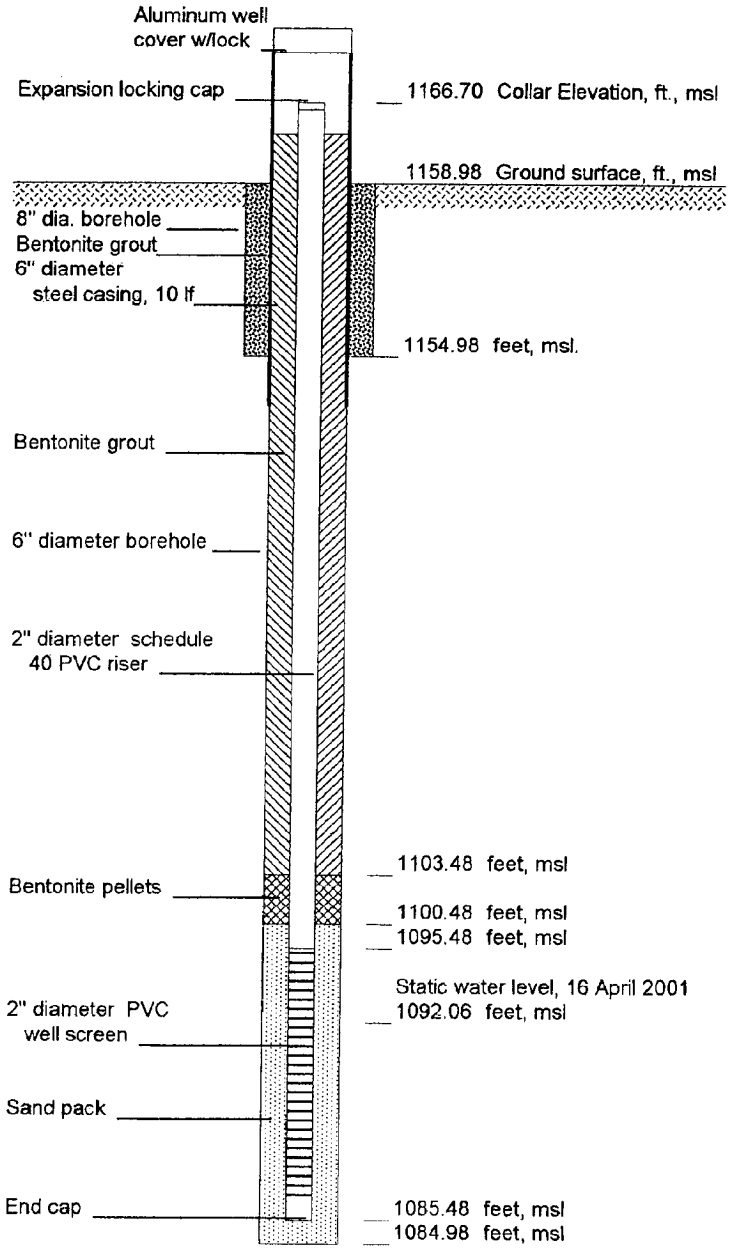
Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Sunny, mid 50's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-6B.WK4

WJS

# MONITOR WELL INSTALLATION LOG

**HYDROGEOLOGIC INVESTIGATION - COARSE COAL REFUSE DISPOSAL FACILITY**
**CENTURY MINE**
**SECTION 4, WAYNE TOWNSHIP, BELMONT CO., OHIO**

**Well No.: CG-01-6C**

Collar Elevation (feet, msl): 1167.01
Location: N 696,895.79 E 2,413,842.77
Date Started: 30 March 2001
Date Completed: 30 March 2001
Water Depth: 30.91 feet
Water Elevation: 1136.1 feet, msl

Well Materials List

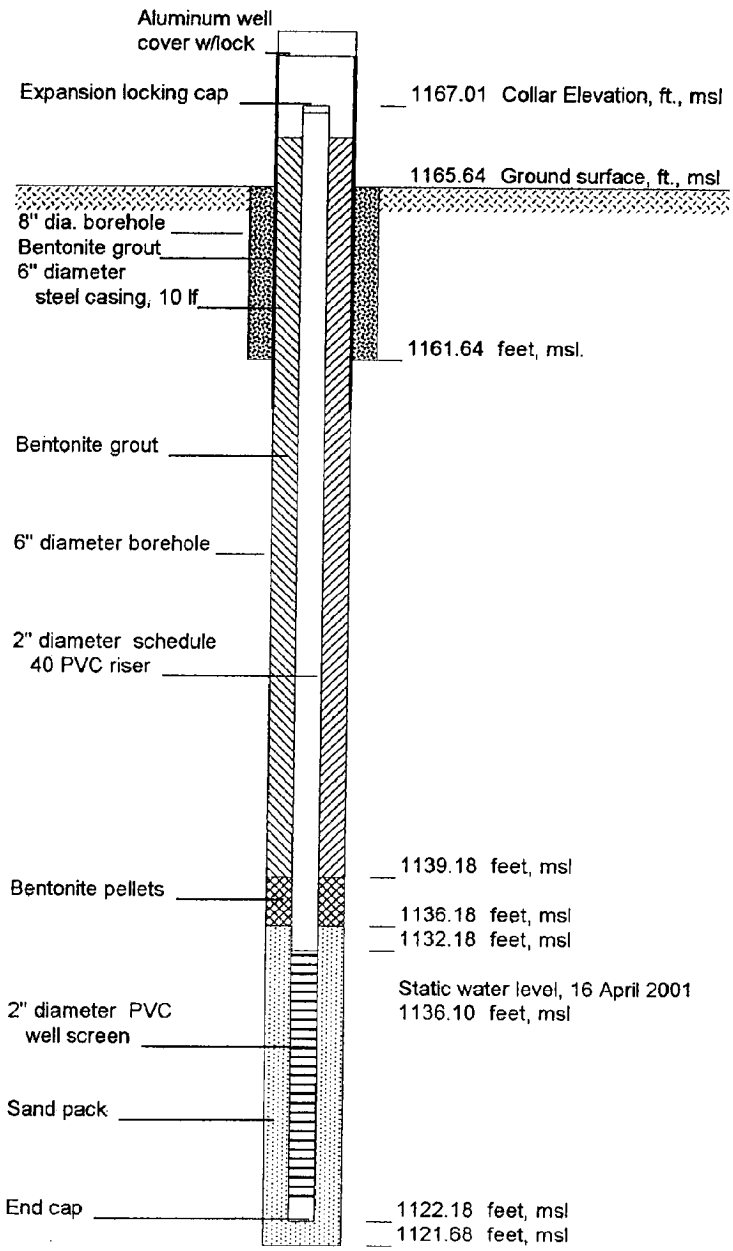
1. Well casing: 2" ID, Sch 40 PVC
2. Joint type: Flush thread
3. Grout type: Bentonite
4. Grout quantity: 6 bags
5. Well screen: 2" ID, 10 LF
6. Screen type: Machine cut Sch 40 PVC
7. Slot size: 0.010
8. Bentonite seal: Bentonite pellets, 1 bucket
9. Filter pack type: 430 silica stone
10. Filter pack quantity: 3 bags
11. Installation method: Gravity

Drilling

1. Contractor: McKay & Gould, Drilling, Inc.
2. Driller: Randy McKay
3. Method: Air rotary, 6 & 8" diameter
4. Weather: Sunny, mid 50's
5. Supervision: William J. Siplivy

Respectfully submitted,

William J. Siplivy
Certified Professional Geologist
No. 4599, AIPG




CG-01-6C.WK4

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AEC 11855

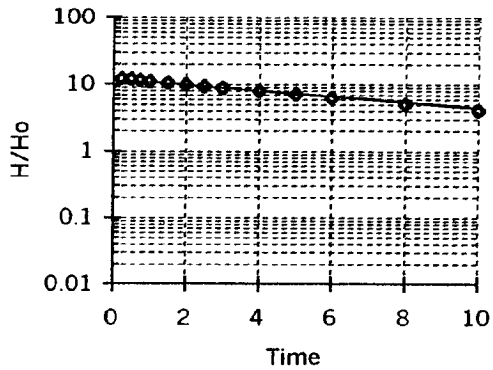
# 4

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Client Name: Century Mine
Analysis By: PP
Run Date: 04/17/2001

Project No.: 0121-3044.00
Identification: CG-01-02A

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 14 | feet |
| Saturated Column Length: | 12 | feet |
| Water Table Depth: | 13.28 | feet |
| Aquifer Thickness: | 20 | feet |
| Line Fit Starting No.: | 3 | Min 1 to |
| Line Fit Ending No.: | 15 | Max 19 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 3.54E-05 | cm./sec. |
| Error of Fit: | 0.019 | |

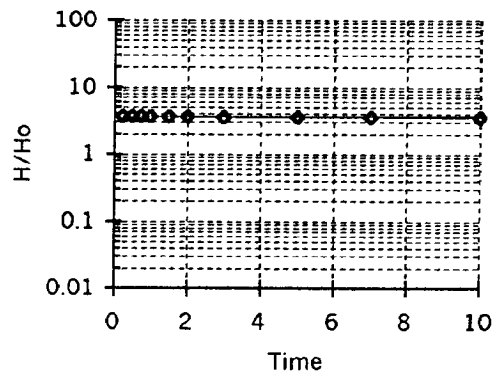



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 1.04 | 12.24 | | 2.505 | 2.457 |
| 2) | 0.50 | 1.35 | 11.93 | | 2.479 | 2.431 |
| 3) | 0.75 | 1.82 | 11.46 | | 2.439 | 2.406 |
| 4) | 1.00 | 2.23 | 11.05 | | 2.402 | 2.381 |
| 5) | 1.50 | 2.67 | 10.61 | | 2.362 | 2.331 |
| 6) | 2.00 | 3.30 | 9.98 | | 2.301 | 2.281 |
| 7) | 2.50 | 3.87 | 9.41 | | 2.242 | 2.230 |
| 8) | 3.00 | 4.45 | 8.83 | | 2.178 | 2.180 |
| 9) | 4.00 | 5.30 | 7.98 | | 2.077 | 2.080 |
| 10) | 5.00 | 6.15 | 7.13 | | 1.964 | 1.979 |
| 11) | 6.00 | 6.90 | 6.38 | | 1.853 | 1.879 |
| 12) | 8.00 | 8.20 | 5.08 | | 1.625 | 1.678 |
| 13) | 10.00 | 9.21 | 4.07 | | 1.404 | 1.477 |
| 14) | 15.00 | 10.70 | 2.58 | | 0.948 | 0.974 |
| 15) | 20.00 | 11.54 | 1.74 | | 0.554 | 0.472 |
| 16) | 25.00 | 12.05 | 1.23 | | 0.207 | -0.030 |
| 17) | 32.00 | 12.36 | 0.92 | | -0.083 | -0.734 |
| 18) | 45.00 | 12.67 | 0.61 | | -0.494 | -2.040 |
| 19) | 60.00 | 12.74 | 0.54 | | -0.616 | -3.547 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Project No.: 0121-3044.00
Client Name: American Energy
Identification: CG-01-3A
Analysis By: PP
Run Date:

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 25 | feet |
| Saturated Column Length: | 76 | feet |
| Water Table Depth: | 209.63 | feet |
| Aquifer Thickness: | 28 | feet |
| Line Fit Starting No.: | 3 | Min 1 to |
| Line Fit Ending No.: | 13 | Max 15 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 2.70E-09 | cm./sec. |
| Error of Fit: | 0.003 | |

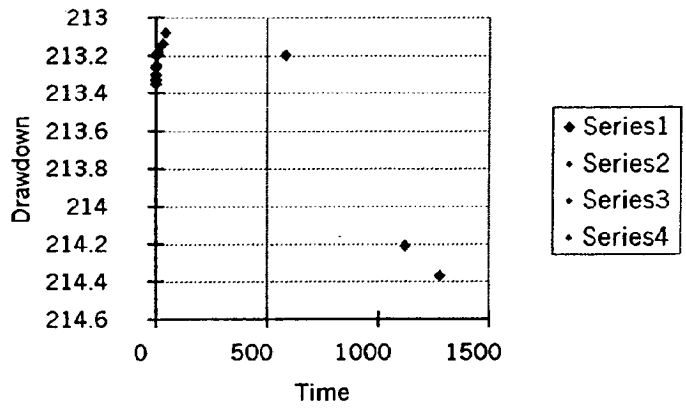



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 213.35 | 3.72 | | 1.314 | 1.274 |
| 2) | 0.50 | 213.33 | 3.70 | | 1.308 | 1.274 |
| 3) | 0.75 | 213.30 | 3.67 | | 1.300 | 1.274 |
| 4) | 1.00 | 213.26 | 3.63 | | 1.289 | 1.274 |
| 5) | 1.50 | 213.25 | 3.62 | | 1.286 | 1.274 |
| 6) | 2.00 | 213.25 | 3.62 | | 1.286 | 1.274 |
| 7) | 3.00 | 213.20 | 3.57 | | 1.273 | 1.274 |
| 8) | 5.00 | 213.19 | 3.56 | | 1.270 | 1.274 |
| 9) | 7.00 | 213.19 | 3.56 | | 1.270 | 1.274 |
| 10) | 10.00 | 213.18 | 3.55 | | 1.267 | 1.274 |
| 11) | 30.00 | 213.14 | 3.51 | | 1.256 | 1.274 |
| 12) | 42.00 | 213.08 | 3.45 | | 1.238 | 1.274 |
| 13) | 580.00 | 213.20 | 3.57 | | 1.273 | 1.269 |
| 14) | 1119.00 | 214.21 | 4.58 | | 1.522 | 1.264 |
| 15) | 1279.00 | 214.37 | 4.74 | | 1.556 | 1.263 |

# SLUG TEST DATA ENTRY FORM

Client Name: American Energy | Well Number: CG-01-02A | Test Type: Bail Test
Project No.: 0121-3044.00 | Topo. Elev.: 940 | Weather: Partly Cloiudy
Project Name: Proposed FIll Area | Analysis By: PP | Date Started: 04/16/2001

| BASIC TEST DATA | |
|---|---|
| Measurement Units (1-6): | 2 |
| Unconfined(1)/Confined(2): | 1 |
| Well Depth - TOC (feet): | 285.95 |
| Static W/L-Depth (ft.): | 209.63 |
| Riser Pipe Diameter (feet): | 0.17 |
| Initial Test Depth Value (ft.): | 213.36 |
| TOC Elevation (feet): | 1150 |
| Intake/Soil Col. Diam. (feet): | 0.5 |
| Depth to Top of Pack (feet): | 256 |
| Intake/Soil Col. Length (ft.): | 25 |
| Saturat. Col. Thickness (ft.): | 76 |
| Casing Soil Length (if appl.): | |
| Casing Stickup (feet): | 1.92 |
| Slug Volume (ft^3): | |
| Thickness of Aquifer (feet): | 28 |



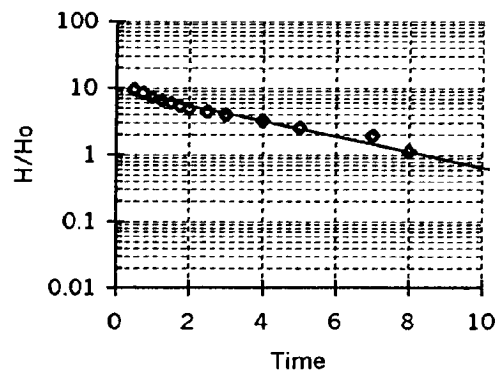

**AQUIFER RECOVERY DATA**

| Time (min) | Depth (ft.) | Time (min) | Depth (ft.) | Time (min) | Depth (ft.) | Time (min) | Depth (ft.) |
|---|---|---|---|---|---|---|---|
| 0.25 | 213.35 | | | | | | |
| 0.5 | 213.33 | | | | | | |
| 0.75 | 213.3 | | | | | | |
| 1 | 213.26 | | | | | | |
| 1.5 | 213.25 | | | | | | |
| 2 | 213.25 | | | | | | |
| 3 | 213.2 | | | | | | |
| 5 | 213.19 | | | | | | |
| 7 | 213.19 | | | | | | |
| 10 | 213.18 | | | | | | |
| 30 | 213.14 | | | | | | |
| 42 | 213.08 | | | | | | |
| 580 | 213.2 | | | | | | |
| 1119 | 214.21 | | | | | | |
| 1279 | 214.37 | | | | | | |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

| | | | |
|---|---|---|---|
| Project Name: | Proposed FIll Area | Project No.: | 0121-3044.00 |
| Client Name: | Century Mine | Identification: | CG-01-03B |
| Analysis By: | PP | | |
| Run Date: | 04/16/2001 | | |

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 15 | feet |
| Saturated Column Length: | 5.26 | feet |
| Water Table Depth: | 85.04 | feet |
| Aquifer Thickness: | 21 | feet |
| Line Fit Starting No.: | 7 | Min 1 to |
| Line Fit Ending No.: | 14 | Max 15 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 7.18E-05 | cm./sec. |
| Error of Fit: | 0.143 | |

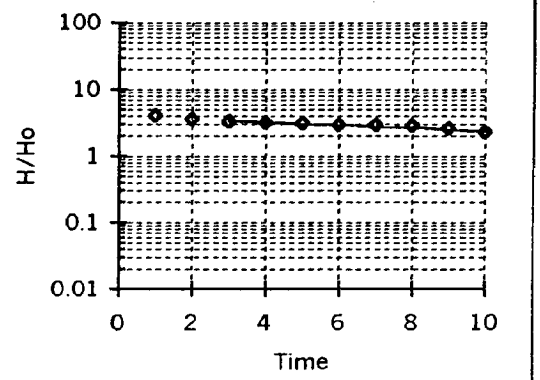



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.50 | 75.45 | 9.59 | | 2.261 | 2.079 |
| 2) | 0.75 | 76.50 | 8.54 | | 2.145 | 2.013 |
| 3) | 1.00 | 77.73 | 7.31 | | 1.989 | 1.946 |
| 4) | 1.25 | 78.50 | 6.54 | | 1.878 | 1.880 |
| 5) | 1.50 | 79.04 | 6.00 | | 1.792 | 1.814 |
| 6) | 1.75 | 79.70 | 5.34 | | 1.675 | 1.748 |
| 7) | 2.00 | 80.20 | 4.84 | | 1.577 | 1.681 |
| 8) | 2.50 | 80.65 | 4.39 | | 1.479 | 1.549 |
| 9) | 3.00 | 81.07 | 3.97 | | 1.379 | 1.416 |
| 10) | 4.00 | 81.81 | 3.23 | | 1.172 | 1.151 |
| 11) | 5.00 | 82.51 | 2.53 | | 0.928 | 0.886 |
| 12) | 7.00 | 83.10 | 1.94 | | 0.663 | 0.356 |
| 13) | 8.00 | 83.93 | 1.11 | | 0.104 | 0.091 |
| 14) | 12.00 | 84.72 | 0.32 | | -1.139 | -0.969 |
| 15) | 28.00 | 85.02 | 0.02 | | -3.912 | -5.209 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

| | | | |
|---|---|---|---|
| Project Name: | Proposed FIll Area | Project No.: | 0121-3044.00 |
| Client Name: | American Energy | Identification: | CG-01-03C |
| Analysis By: | PP | | |
| Run Date: | 04/16/2001 | | |

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 14 | feet |
| Saturated Column Length: | 7.05 | feet |
| Water Table Depth: | 20.15 | feet |
| Aquifer Thickness: | 19 | feet |
| Line Fit Starting No.: | 3 | Min 1 to |
| Line Fit Ending No.: | 17 | Max 17 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 3.92E-05 | cm./sec. |
| Error of Fit: | 0.092 | |

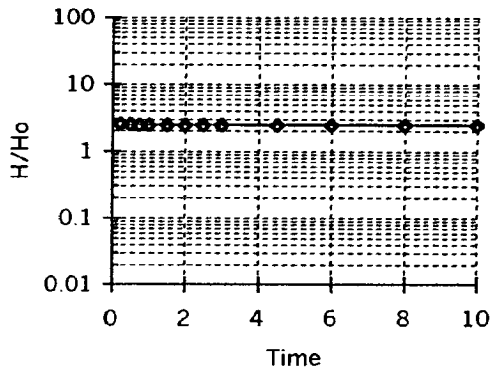



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.50 | 16.10 | 4.05 | | 1.399 | 1.284 |
| 2) | 1..0 | 16.55 | 3.60 | | 1.281 | #VALUE! |
| 3) | 1.25 | 16.80 | 3.35 | | 1.209 | 1.189 |
| 4) | 1.50 | 16.94 | 3.21 | | 1.166 | 1.158 |
| 5) | 2.00 | 17.03 | 3.12 | | 1.138 | 1.095 |
| 6) | 2.25 | 17.21 | 2.94 | | 1.078 | 1.063 |
| 7) | 2.75 | 17.21 | 2.94 | | 1.078 | 1.000 |
| 8) | 3.00 | 17.25 | 2.90 | | 1.065 | 0.969 |
| 9) | 3.50 | 17.55 | 2.60 | | 0.956 | 0.906 |
| 10) | 4.00 | 17.83 | 2.32 | | 0.842 | 0.843 |
| 11) | 4.50 | 18.09 | 2.06 | | 0.723 | 0.780 |
| 12) | 5.00 | 18.24 | 1.91 | | 0.647 | 0.717 |
| 13) | 6.00 | 18.53 | 1.62 | | 0.482 | 0.591 |
| 14) | 7.50 | 18.78 | 1.37 | | 0.315 | 0.403 |
| 15) | 9.00 | 19.05 | 1.10 | | 0.095 | 0.214 |
| 16) | 11.00 | 19.22 | 0.93 | | -0.073 | -0.038 |
| 17) | 15.00 | 19.46 | 0.69 | | -0.371 | -0.541 |
| 18) | 23.00 | 19.75 | 0.40 | | -0.916 | -1.548 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

| | | | |
|---|---|---|---|
| Project Name: | Proposed FIll Area | Project No.: | 0121-3044.00 |
| Client Name: | Century Mine | Identification: | CG-01-04A |
| Analysis By: | PP | | |
| Run Date: | 04/16/2001 | | |

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 25 | feet |
| Saturated Column Length: | 114 | feet |
| Water Table Depth: | 145.05 | feet |
| Aquifer Thickness: | 26 | feet |
| Line Fit Starting No.: | 1 | Min 1 to |
| Line Fit Ending No.: | 14 | Max 17 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 7.74E-09 | cm./sec. |
| Error of Fit: | 0.002 | |



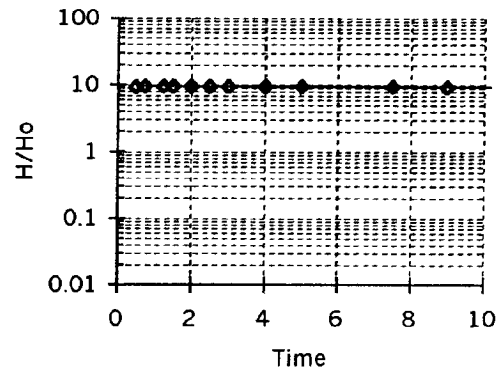

| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 147.60 | 2.55 | | 0.936 | 0.901 |
| 2) | 0.50 | 147.55 | 2.50 | | 0.916 | 0.901 |
| 3) | 0.75 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 4) | 1.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 5) | 1.50 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 6) | 2.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 7) | 2.50 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 8) | 3.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 9) | 4.50 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 10) | 6.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 11) | 8.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 12) | 10.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 13) | 15.00 | 147.50 | 2.45 | | 0.896 | 0.901 |
| 14) | 247.00 | 147.50 | 2.45 | | 0.896 | 0.895 |
| 15) | 492.00 | 147.47 | 2.42 | | 0.884 | 0.889 |
| 16) | 4567.00 | 147.78 | 2.73 | | 1.004 | 0.795 |
| 17) | 21620.00 | 147.50 | 2.45 | | 0.896 | 0.398 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Client Name: American Energy
Analysis By: PP
Run Date: 04/16/2001

Project No.: 0121-3044.00
Identification: CG-01-04B

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 15 | feet |
| Saturated Column Length: | 5.11 | feet |
| Water Table Depth: | 56.85 | feet |
| Aquifer Thickness: | 17 | feet |
| Line Fit Starting No.: | 4 | Min 1 to |
| Line Fit Ending No.: | 18 | Max 18 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 1.12E-07 | cm./sec. |
| Error of Fit: | 0.002 | |

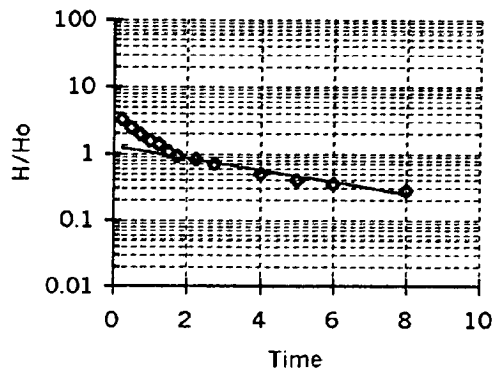



| Meas # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.50 | 47.30 | 9.55 | | 2.257 | 2.258 |
| 2) | 0.75 | 47.28 | 9.57 | | 2.259 | 2.258 |
| 3) | 1.25 | 47.25 | 9.60 | | 2.262 | 2.257 |
| 4) | 1.50 | 47.25 | 9.60 | | 2.262 | 2.257 |
| 5) | 2.00 | 47.24 | 9.61 | | 2.263 | 2.257 |
| 6) | 2.50 | 47.24 | 9.61 | | 2.263 | 2.257 |
| 7) | 3.00 | 47.24 | 9.61 | | 2.263 | 2.257 |
| 8) | 4.00 | 47.25 | 9.60 | | 2.262 | 2.256 |
| 9) | 5.00 | 47.25 | 9.60 | | 2.262 | 2.256 |
| 10) | 7.50 | 47.28 | 9.57 | | 2.259 | 2.255 |
| 11) | 9.00 | 47.31 | 9.54 | | 2.255 | 2.254 |
| 12) | 11.00 | 47.32 | 9.53 | | 2.254 | 2.253 |
| 13) | 13.00 | 47.33 | 9.52 | | 2.253 | 2.252 |
| 14) | 15.00 | 47.34 | 9.51 | | 2.252 | 2.252 |
| 15) | 20.00 | 47.38 | 9.47 | | 2.248 | 2.250 |
| 16) | 84.50 | 47.95 | 8.90 | | 2.186 | 2.223 |
| 17) | 250.00 | 48.40 | 8.45 | | 2.134 | 2.154 |
| 18) | 493.00 | 48.93 | 7.92 | | 2.069 | 2.053 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

| | | | |
|---|---|---|---|
| Project Name: | Proposed FIll Area | Project No.: | 0121-3044.00 |
| Client Name: | Century Mine | Identification: | CG-01-04C |
| Analysis By: | PP | | |
| Run Date: | 04/16/2001 | | |

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 12 | feet |
| Saturated Column Length: | 20.15 | feet |
| Water Table Depth: | 5.65 | feet |
| Aquifer Thickness: | 11 | feet |
| Line Fit Starting No.: | 6 | Min 1 to |
| Line Fit Ending No.: | 13 | Max 13 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 1.06E-04 | cm./sec. |
| Error of Fit: | 0.071 | |

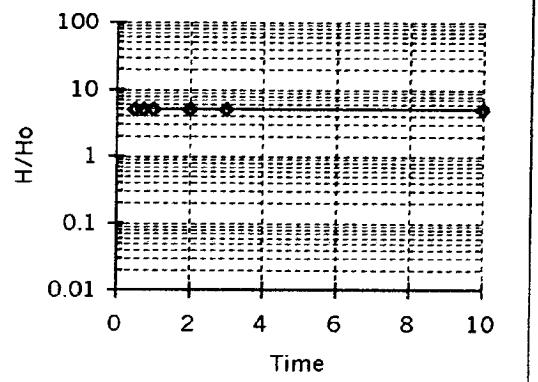



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 2.40 | 3.25 | | 1.179 | 0.210 |
| 2) | 0.50 | 3.20 | 2.45 | | 0.896 | 0.157 |
| 3) | 0.75 | 3.70 | 1.95 | | 0.668 | 0.104 |
| 4) | 1.00 | 4.08 | 1.57 | | 0.451 | 0.052 |
| 5) | 1.25 | 4.25 | 1.40 | | 0.336 | -0.001 |
| 6) | 1.50 | 4.58 | 1.07 | | 0.068 | -0.053 |
| 7) | 1.75 | 4.72 | 0.93 | | -0.073 | -0.106 |
| 8) | 2.25 | 4.82 | 0.83 | | -0.186 | -0.211 |
| 9) | 2.75 | 4.95 | 0.70 | | -0.357 | -0.317 |
| 10) | 4.00 | 5.15 | 0.50 | | -0.693 | -0.580 |
| 11) | 5.00 | 5.25 | 0.40 | | -0.916 | -0.790 |
| 12) | 6.00 | 5.30 | 0.35 | | -1.050 | -1.001 |
| 13) | 8.00 | 5.37 | 0.28 | | -1.273 | -1.422 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Project No.: 0121-3044.00
Client Name: Century Mine
Identification: CG-01-05A
Analysis By: PP
Run Date: 04/16/2001

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 15 | feet |
| Saturated Column Length: | 66.88 | feet |
| Water Table Depth: | 203.12 | feet |
| Aquifer Thickness: | 15 | feet |
| Line Fit Starting No.: | 3 | Min 1 to |
| Line Fit Ending No.: | 13 | Max 14 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 4.74E-09 | cm./sec. |
| Error of Fit: | 0.000 | |

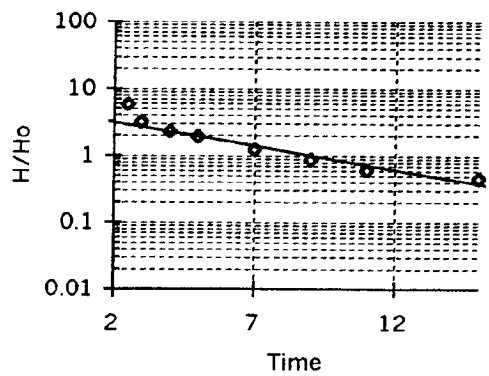



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.50 | 208.15 | 5.03 | | 1.615 | 1.602 |
| 2) | 0.75 | 208.10 | 4.98 | | 1.605 | 1.602 |
| 3) | 1.00 | 208.10 | 4.98 | | 1.605 | 1.602 |
| 4) | 2.00 | 208.10 | 4.98 | | 1.605 | 1.602 |
| 5) | 3.00 | 208.10 | 4.98 | | 1.605 | 1.602 |
| 6) | 10.00 | 208.08 | 4.96 | | 1.601 | 1.602 |
| 7) | 20.00 | 208.08 | 4.96 | | 1.601 | 1.601 |
| 8) | 48.00 | 208.07 | 4.95 | | 1.599 | 1.601 |
| 9) | 69.00 | 208.05 | 4.93 | | 1.595 | 1.601 |
| 10) | 128.00 | 208.05 | 4.93 | | 1.595 | 1.600 |
| 11) | 1144.00 | 208.04 | 4.92 | | 1.593 | 1.591 |
| 12) | 1321.00 | 208.02 | 4.90 | | 1.589 | 1.589 |
| 13) | 1591.00 | 208.00 | 4.88 | | 1.585 | 1.586 |
| 14) | 4558.00 | 208.35 | 5.23 | | 1.654 | 1.558 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Project No.: 0121-3044.00
Client Name: American Energy
Identification: CG-01-05B
Analysis By: PP
Run Date: 04/16/2001

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 13.5 | feet |
| Saturated Column Length: | 5 | feet |
| Water Table Depth: | 77.06 | feet |
| Aquifer Thickness: | 18 | feet |
| Line Fit Starting No.: | 6 | Min 1 to |
| Line Fit Ending No.: | 12 | Max 13 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 4.82E-05 | cm./sec. |
| Error of Fit: | 0.130 | |



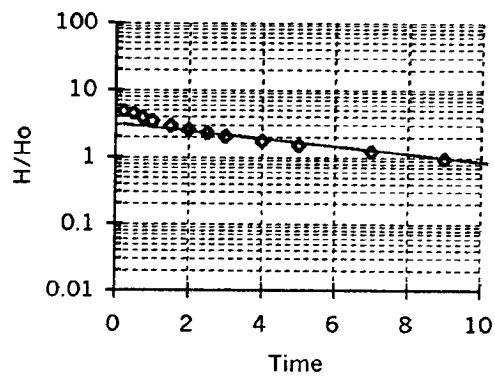

| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 63.10 | 13.96 | | 2.636 | 1.426 |
| 2) | 0.50 | 65.85 | 11.21 | | 2.417 | 1.385 |
| 3) | 0.75 | 66.55 | 10.51 | | 2.352 | 1.344 |
| 4) | 1.50 | 68.63 | 8.43 | | 2.132 | 1.222 |
| 5) | 2.50 | 71.20 | 5.86 | | 1.768 | 1.058 |
| 6) | 3.00 | 73.90 | 3.16 | | 1.151 | 0.977 |
| 7) | 4.00 | 74.75 | 2.31 | | 0.837 | 0.813 |
| 8) | 5.00 | 75.15 | 1.91 | | 0.647 | 0.650 |
| 9) | 7.00 | 75.83 | 1.23 | | 0.207 | 0.323 |
| 10) | 9.00 | 76.18 | 0.88 | | -0.128 | -0.004 |
| 11) | 11.00 | 76.45 | 0.61 | | -0.494 | -0.331 |
| 12) | 15.00 | 76.60 | 0.46 | | -0.777 | -0.985 |
| 13) | 74.00 | 76.95 | 0.11 | | -2.207 | -10.627 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Client Name: American Energy
Analysis By: PP
Run Date: 04/16/2001

Project No.: 0121-3044.00
Identification: CG-01-05C

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 12.5 | feet |
| Saturated Column Length: | 18.41 | feet |
| Water Table Depth: | 7.25 | feet |
| Aquifer Thickness: | 21 | feet |
| Line Fit Starting No.: | 5 | Min 1 to |
| Line Fit Ending No.: | 13 | Max 13 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 5.66E-05 | cm./sec. |
| Error of Fit: | 0.045 | |

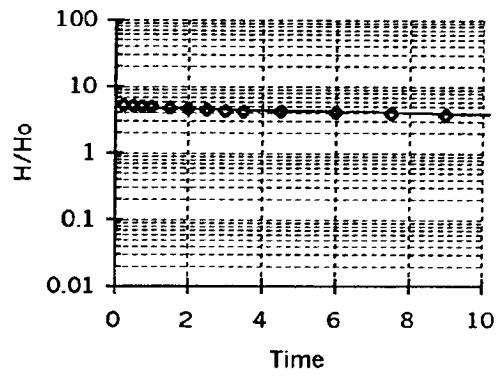



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 2.36 | 4.89 | | 1.587 | 1.120 |
| 2) | 0.50 | 2.79 | 4.46 | | 1.495 | 1.087 |
| 3) | 0.75 | 3.37 | 3.88 | | 1.356 | 1.055 |
| 4) | 1.00 | 3.78 | 3.47 | | 1.244 | 1.022 |
| 5) | 1.50 | 4.30 | 2.95 | | 1.082 | 0.957 |
| 6) | 2.00 | 4.70 | 2.55 | | 0.936 | 0.891 |
| 7) | 2.50 | 4.96 | 2.29 | | 0.829 | 0.826 |
| 8) | 3.00 | 5.20 | 2.05 | | 0.718 | 0.761 |
| 9) | 4.00 | 5.50 | 1.75 | | 0.560 | 0.631 |
| 10) | 5.00 | 5.75 | 1.50 | | 0.405 | 0.500 |
| 11) | 7.00 | 6.03 | 1.22 | | 0.199 | 0.239 |
| 12) | 9.00 | 6.29 | 0.96 | | -0.041 | -0.022 |
| 13) | 11.00 | 6.42 | 0.83 | | -0.186 | -0.283 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

| | | | |
|---|---|---|---|
| Project Name: | Proposed FIll Area | Project No.: | 0121-3044.00 |
| Client Name: | American Energy | Identification: | CG-01-06B |
| Analysis By: | PP | | |
| Run Date: | 04/16/2001 | | |

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 15 | feet |
| Saturated Column Length: | 13 | feet |
| Water Table Depth: | 74.64 | feet |
| Aquifer Thickness: | 6 | feet |
| Line Fit Starting No.: | 3 | Min 1 to |
| Line Fit Ending No.: | 18 | Max 20 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 7.74E-06 | cm./sec. |
| Error of Fit: | 0.032 | |

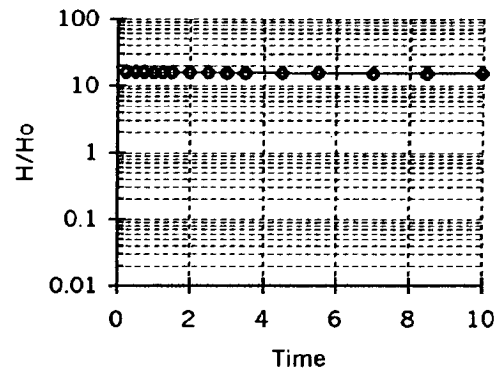



| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To LN(Yt) | Regression On LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 69.37 | 5.27 | | 1.662 | 1.551 |
| 2) | 0.50 | 69.49 | 5.15 | | 1.639 | 1.545 |
| 3) | 0.75 | 69.55 | 5.09 | | 1.627 | 1.540 |
| 4) | 1.00 | 69.68 | 4.96 | | 1.601 | 1.535 |
| 5) | 1.50 | 69.84 | 4.80 | | 1.569 | 1.525 |
| 6) | 2.00 | 69.97 | 4.67 | | 1.541 | 1.514 |
| 7) | 2.50 | 70.19 | 4.45 | | 1.493 | 1.504 |
| 8) | 3.00 | 70.31 | 4.33 | | 1.466 | 1.493 |
| 9) | 3.50 | 70.38 | 4.26 | | 1.449 | 1.483 |
| 10) | 4.50 | 70.43 | 4.21 | | 1.437 | 1.462 |
| 11) | 6.00 | 70.60 | 4.04 | | 1.396 | 1.431 |
| 12) | 7.50 | 70.71 | 3.93 | | 1.369 | 1.400 |
| 13) | 9.00 | 70.88 | 3.76 | | 1.324 | 1.369 |
| 14) | 11.00 | 70.95 | 3.69 | | 1.306 | 1.327 |
| 15) | 13.00 | 71.05 | 3.59 | | 1.278 | 1.286 |
| 16) | 15.00 | 71.28 | 3.36 | | 1.212 | 1.244 |
| 17) | 20.00 | 71.64 | 3.00 | | 1.099 | 1.140 |
| 18) | 30.00 | 71.87 | 2.77 | | 1.019 | 0.933 |
| 19) | 59.00 | 74.03 | 0.61 | | -0.494 | 0.330 |
| 20) | 445.00 | 74.90 | 0.26 | | -1.347 | -7.686 |

# Bouwer & Rice Method for Calculating Hydraulic Conductivity

Project Name: Proposed FIll Area
Project No.: 0121-3044.00
Client Name: American Energy
Identification: CG-01-06C
Analysis By: PP
Run Date:

| | | |
|---|---|---|
| Riser Pipe Diameter: | 0.17 | feet |
| Intake Diameter: | 0.5 | feet |
| Intake Length: | 14 | feet |
| Saturated Column Length: | 15 | feet |
| Water Table Depth: | 30.91 | feet |
| Aquifer Thickness: | 14 | feet |
| Line Fit Starting No.: | 3 | Min 1 to |
| Line Fit Ending No.: | 22 | Max 25 |
| Specify Output Units: | 7 | 1 to 9 |
| Hyd. Cond., K(h): | 1.22E-06 | cm./sec. |
| Error of Fit: | 0.015 | |




| Meas. # | Time minutes | Field Meas. feet | Drawdown/up feet | | Line Fit To: LN(Yt) | Regression On: LN(Yt) |
|---|---|---|---|---|---|---|
| 1) | 0.25 | 14.74 | 16.17 | | 2.783 | 2.756 |
| 2) | 0.50 | 14.75 | 16.16 | | 2.783 | 2.755 |
| 3) | 0.75 | 14.76 | 16.15 | | 2.782 | 2.755 |
| 4) | 1.00 | 14.79 | 16.12 | | 2.780 | 2.754 |
| 5) | 1.25 | 14.85 | 16.06 | | 2.776 | 2.753 |
| 6) | 1.50 | 14.88 | 16.03 | | 2.774 | 2.753 |
| 7) | 2.00 | 15.04 | 15.87 | | 2.764 | 2.751 |
| 8) | 2.50 | 15.07 | 15.84 | | 2.763 | 2.750 |
| 9) | 3.00 | 15.10 | 15.81 | | 2.761 | 2.748 |
| 10) | 3.50 | 15.15 | 15.76 | | 2.757 | 2.747 |
| 11) | 4.50 | 15.20 | 15.71 | | 2.754 | 2.744 |
| 12) | 5.50 | 15.30 | 15.61 | | 2.748 | 2.741 |
| 13) | 7.00 | 15.47 | 15.44 | | 2.737 | 2.736 |
| 14) | 8.50 | 15.57 | 15.34 | | 2.730 | 2.732 |
| 15) | 10.00 | 15.70 | 15.21 | | 2.722 | 2.727 |
| 16) | 12.50 | 15.85 | 15.06 | | 2.712 | 2.720 |
| 17) | 15.00 | 15.98 | 14.93 | | 2.703 | 2.712 |
| 18) | 20.00 | 16.44 | 14.47 | | 2.672 | 2.698 |
| 19) | 25.00 | 16.91 | 14.00 | | 2.639 | 2.683 |
| 20) | 35.00 | 17.50 | 13.41 | | 2.596 | 2.653 |
| 21) | 55.00 | 18.32 | 12.59 | | 2.533 | 2.594 |
| 22) | 157.00 | 20.58 | 10.33 | | 2.335 | 2.291 |
| 23) | 543.00 | 22.70 | 8.21 | | 2.105 | 1.145 |
| 24) | 1451.00 | 24.53 | 6.38 | | 1.853 | -1.549 |
| 25) | 1749.00 | 25.23 | 5.68 | | 1.737 | -2.434 |

Dodson-Stilson, Inc.

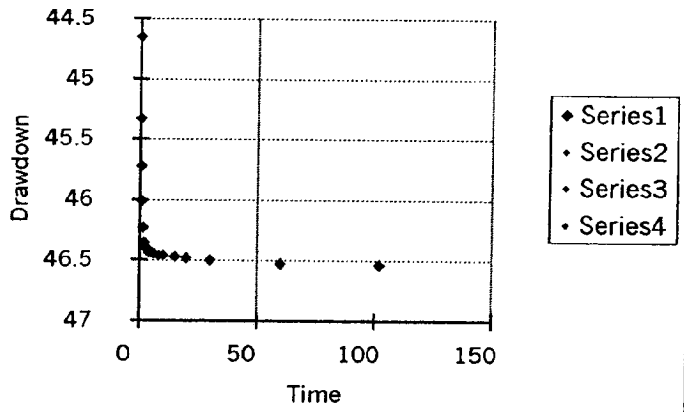
# SLUG TEST DATA ENTRY FORM

Client Name: Century Mine
Project No.: 0121-3044.00
Project Name: Proposed Fill Area

Well Number: MW 01-1A
Topo. Elev.: 973.63
Analysis By: PP

Test Type: Slug Test
Weather: Cloudy
Date Started: 04/17/2001

| BASIC TEST DATA | |
|---|---|
| Measurement Units (1-6): | 2 |
| Unconfined(1)/Confined(2): | 2 |
| Well Depth - TOC (feet): | 58 |
| Static W/L-Depth (ft.): | 46.55 |
| Riser Pipe Diameter (feet): | 0.17 |
| Initial Test Depth Value (ft.): | 44.24 |
| TOC Elevation (feet): | 940 |
| Intake/Soil Col. Diam. (feet): | 0.5 |
| Depth to Top of Pack (feet): | 36 |
| Intake/Soil Col. Length (ft.): | 14 |
| Saturat. Col. Thickness (ft.): | 11.45 |
| Casing Soil Length (if appl.): | |
| Casing Stickup (feet): | 2 |
| Slug Volume (ft^3): | |
| Thickness of Aquifer (feet): | 14 |




## AQUIFER RECOVERY DATA

| Time (min) | Depth (ft.) | Time (min) | Depth (ft.) | Time (min) | Depth (ft.) | Time (min) | Depth (ft.) |
|---|---|---|---|---|---|---|---|
| 0.25 | 44.65 | | | | | | |
| 0.5 | 45.33 | | | | | | |
| 0.75 | 45.72 | | | | | | |
| 1 | 46.01 | | | | | | |
| 1.5 | 46.23 | | | | | | |
| 2 | 46.35 | | | | | | |
| 2.5 | 46.4 | | | | | | |
| 3 | 46.4 | | | | | | |
| 4 | 46.44 | | | | | | |
| 5 | 46.44 | | | | | | |
| 6 | 46.45 | | | | | | |
| 8 | 46.46 | | | | | | |
| 10 | 46.46 | | | | | | |
| 15 | 46.47 | | | | | | |
| 20 | 46.48 | | | | | | |
| 30 | 46.5 | | | | | | |
| 60 | 46.53 | | | | | | |
| 102 | 46.54 | | | | | | |

# 5

**Westmoreland-Lowell association**

*Deep, strongly sloping to steep, well drained and moderately well drained soils formed in residuum of siltstone, sandstone, shale, and limestone bedrock; on uplands*

This association consists of strongly sloping soils on narrow ridgetops and moderately steep and steep soils on hillsides (fig. 3). The hillsides are commonly benched or have irregular slopes. The stream valleys are narrow. The maximum difference in local relief is about 400 feet.

This association makes up about 18 percent of the county. It is about 35 percent Westmoreland soils, 30 percent Lowell soils, and 35 percent soils of minor extent.

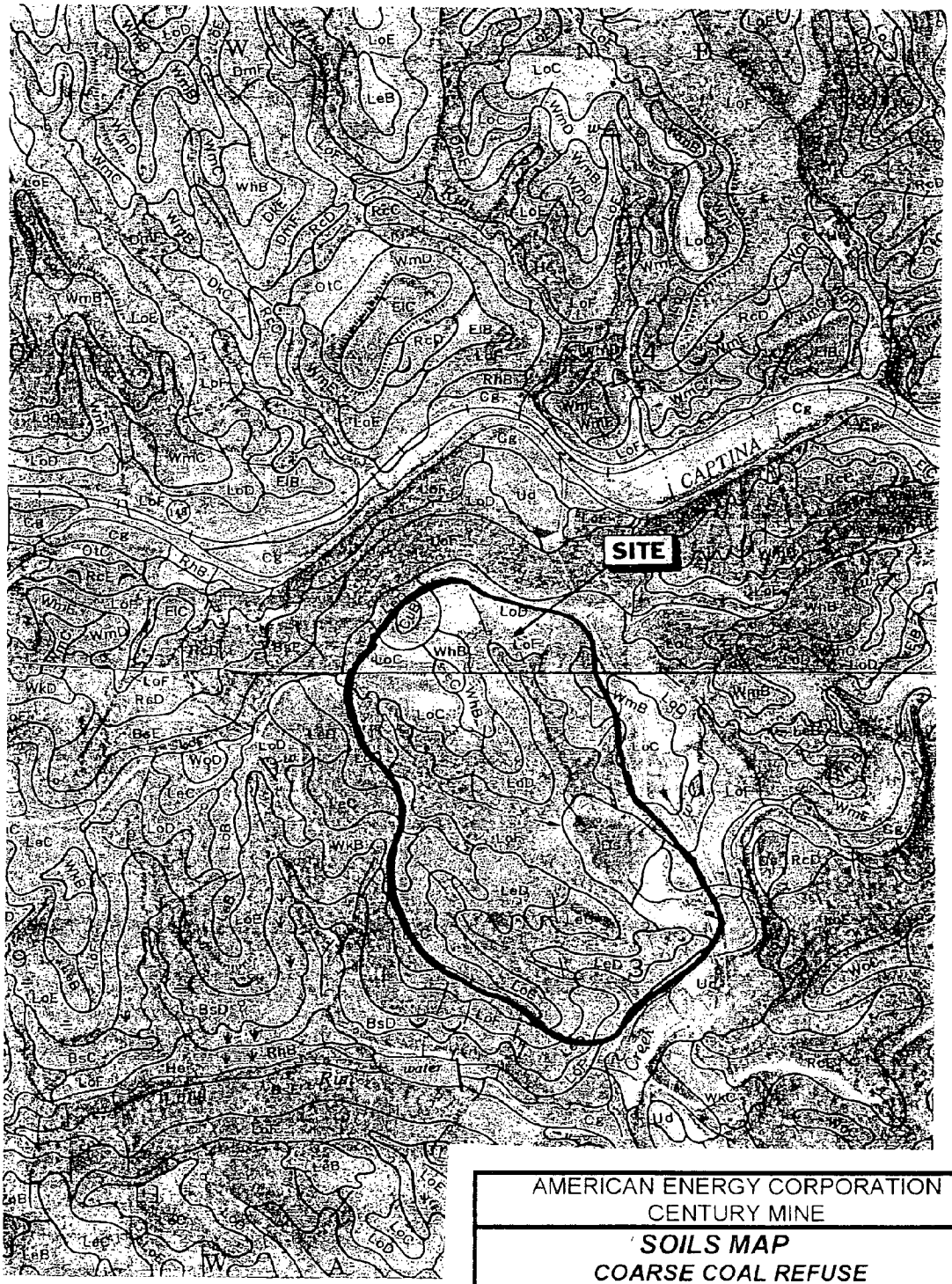
Westmoreland and Lowell soils are on ridgetops and hillsides. Westmoreland soils are deep, well drained, and moderately permeable. Lowell soils are deep, moderately well drained and well drained, and moderately slowly permeable. Both soils have a silt loam surface layer.

Of minor extent in this association are Brookside soils on colluvial foot slopes, Culleoka and Westmore soils on ridgetops, and Dekalb soils on hillsides. Also of minor extent are areas of very steep Westmoreland and Lowell soils on hillsides.

The soils of this association are used for cultivated crops, hay, pasture, and woodland and for openland and woodland wildlife habitat. In the strongly sloping and moderately steep soils, the potential is high for hay and pasture and high to medium for cultivated crops. In the steep soils, the potential is low for cultivated crops. The potential for building site development and sanitary facilities is higher in the strongly sloping soils than in the steeper soils.

The erosion hazard, moderately steep and steep slopes, and susceptibility to hillside slippage are the main limitations. The strongly sloping and moderately steep soils are suited to cropping systems that include meadow crops. Contour stripcropping and grassed waterways are commonly used to reduce erosion. Reseeding by the trash mulch or no-till method or with cover crops or companion crops reduces the erosion hazard. The soils have a moderate to high lime requirement. Cover should be maintained on the site as much as possible during construction. Trails in recreation areas should be protected against erosion and laid out on the contour if possible.

| |
|---|
| AMERICAN ENERGY CORPORATION<br>CENTURY MINE |
| ***SOIL DESCRIPTION***<br>***COARSE COAL REFUSE***<br>***DISPOSAL FACILITY*** |
| Wayne Township, Sections 3 and 4<br>Belmont County, Ohio |
| SCS Belmont County Soil Survey |
| Date: 24 March 2001 |




AMERICAN ENERGY CORPORATION
CENTURY MINE

***SOILS MAP***
***COARSE COAL REFUSE***
***DISPOSAL FACILITY***

Wayne Township, Sections 3 and 4
Belmont County, Ohio

Source: SCS Belmont County Soil Survey

Date: 3-24-01 Scale: 1" = 1667'

PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

| Soil name and map symbol | Depth | Clay <2mm | Moist bulk density | Permeability | Available water capacity | Soil reaction | Shrink-swell potential | Erosion factors K | Erosion factors T | Organic matter |
|---|---|---|---|---|---|---|---|---|---|---|
| | In | Pct | g/cm3 | In/hr | In/in | pH | | | | Pct |
| WmB, WmC, WmD, WmE, WmF-------- Westmoreland | 0-8 | 15-27 | 1.20-1.40 | 0.6-2.0 | 0.16-0.20 | 4.5-7.3 | Low---------- | 0.37 | 3 | 1-4 |
| | 8-50 | 18-35 | 1.20-1.50 | 0.6-2.0 | 0.12-0.18 | 4.5-6.0 | Low---------- | 0.28 | | |
| | 50-52 | --- | --- | --- | --- | --- | ---------- | ---- | | |
| WoC*, WoD*: Westmoreland---- | 0-8 | 15-27 | 1.20-1.40 | 0.6-2.0 | 0.16-0.20 | 4.5-6.0 | Low---------- | 0.37 | 3 | 1-4 |
| | 8-50 | 18-35 | 1.20-1.50 | 0.6-2.0 | 0.12-0.18 | 4.5-6.0 | Low---------- | 0.28 | | |
| | 50-52 | --- | --- | --- | --- | --- | ---------- | ---- | | |
| LeB, LeC, LeD, LeE, LeF-------- Lowell | 0-7 | 18-27 | 1.30-1.50 | 0.6-2.0 | 0.18-0.23 | 4.5-6.5 | Low---------- | 0.37 | 3 | 1-4 |
| | 7-18 | 27-33 | 1.30-1.60 | 0.2-2.0 | 0.16-0.20 | 4.5-6.5 | Moderate------ | 0.32 | | |
| | 18-42 | 40-55 | 1.50-1.70 | 0.2-0.6 | 0.09-0.13 | 4.5-7.8 | Moderate------ | 0.28 | | |
| | 42-50 | 27-35 | 1.45-1.65 | 0.2-2.0 | 0.05-0.14 | 5.6-7.8 | Moderate------ | 0.28 | | |
| | 50-52 | --- | --- | --- | --- | --- | ---------- | ---- | | |
| LoB*, LoC*, LoD*, LoE*, LoF*, LpF*: Lowell---------- | 0-7 | 18-27 | 1.30-1.50 | 0.6-2.0 | 0.18-0.23 | 4.5-6.5 | Low---------- | 0.37 | 3 | 1-4 |
| | 7-18 | 27-33 | 1.30-1.60 | 0.2-2.0 | 0.16-0.20 | 4.5-6.5 | Moderate------ | 0.32 | | |
| | 18-42 | 40-55 | 1.50-1.70 | 0.2-0.6 | 0.09-0.13 | 4.5-7.8 | Moderate------ | 0.28 | | |
| | 42-50 | 27-35 | 1.45-1.65 | 0.2-2.0 | 0.05-0.14 | 5.6-7.8 | Moderate------ | 0.28 | | |
| | 50-52 | --- | --- | --- | --- | --- | ---------- | ---- | | |
| Westmoreland--- | 0-8 | 15-27 | 1.20-1.40 | 0.6-2.0 | 0.16-0.20 | 4.5-6.0 | Low---------- | 0.37 | 3 | 1-4 |
| | 8-28 | 18-35 | 1.20-1.50 | 0.6-2.0 | 0.12-0.18 | 4.5-6.0 | Low---------- | 0.28 | | |
| | 28-50 | 18-35 | 1.20-1.50 | 0.6-2.0 | 0.06-0.10 | 4.5-5.5 | Low---------- | 0.17 | | |
| | 50-52 | --- | --- | --- | --- | --- | ---------- | ---- | | |

SOIL AND WATER FEATURES--Continued

| Soil name and map symbol | Hydrologic group | Flooding: Frequency | Flooding: Duration | Flooding: Months | High water table: Depth | High water table: Kind | High water table: Months | Bedrock: Depth | Bedrock: Hardness | Potential frost action | Risk of corrosion: Uncoated steel | Risk of corrosion: Concrete |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Ft | | | In | | | | |
| LeB, LeC, LeD----- Lowell | C | None--------- | --- | --- | 2.5-5.0 | Perched | Jan-Mar | >40 | Hard | Moderate | High------ | Moderate. |
| LeE, LeF---------- Lowell | C | None--------- | --- | --- | >6.0 | --- | --- | >40 | Hard | Moderate | High------ | Moderate. |
| LoB*, LoC*, LoD*: Lowell---------- | C | None--------- | --- | --- | 2.5-5.0 | Perched | Jan-Mar | >40 | Hard | Moderate | High------ | Moderate. |
| Westmoreland----- | B | None--------- | --- | --- | 3.0-6.0 | Apparent | Mar-May | >40 | Hard | Moderate | Low-------- | High. |
| LoE*, LoF*, LpF*: Lowell---------- | C | None--------- | --- | --- | >6.0 | --- | --- | >40 | Hard | Moderate | High------ | Moderate. |
| Westmoreland----- | B | None--------- | --- | --- | 3.0-6.0 | Apparent | Mar-May | >40 | Hard | Moderate | Low-------- | High. |

AMERICAN ENERGY CORPORATION
CENTURY MINE

***SOIL PHYSICAL & CHEMICAL PROPERTIES***
***COARSE COAL REFUSE***
***DISPOSAL FACILITY***

Wayne Township, Sections 3 and 4
Belmont County, Ohio

SCS Belmont County Soil Survey

Date: 24 March 2001

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LeB, LeC, LeD, LeE, LeF---------- Lowell | 0-7 | Silt loam------- | CL, ML, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 85-100 | 70-90 | 22-40 | 4-12 |
| | 7-18 | Silty clay loam | CL | A-6, A-7 | 0-2 | 95-100 | 95-100 | 90-100 | 80-95 | 34-42 | 15-22 |
| | 18-42 | Silty clay, clay | CH, CL | A-7, A-6 | 0-5 | 95-100 | 90-100 | 80-100 | 75-95 | 35-65 | 14-45 |
| | 42-50 | Gravelly silty clay loam, shaly silty clay. | GC, CL | A-6, A-7 | 5-20 | 65-90 | 55-80 | 50-80 | 45-75 | 30-45 | 15-30 |
| | 50-52 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| LoB#, LoC#, LoD#, LoE#, LoF#, LpF#: Lowell---------- | 0-7 | Silt loam------- | CL, ML, CL-ML | A-4, A-6 | 0 | 100 | 95-100 | 85-100 | 70-90 | 22-40 | 4-12 |
| | 7-18 | Silty clay loam | CL | A-6, A-7 | 0-2 | 95-100 | 95-100 | 90-100 | 80-95 | 34-42 | 15-22 |
| | 18-42 | Silty clay, clay | CH, CL | A-7, A-6 | 0-5 | 95-100 | 90-100 | 80-100 | 75-95 | 35-65 | 14-45 |
| | 42-50 | Gravelly silty clay loam, shaly silty clay. | GC, CL | A-6, A-7 | 5-20 | 65-90 | 55-80 | 50-80 | 45-75 | 30-45 | 15-30 |
| | 50-52 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WhB, WhC---------- Wellston | 0-8 | Silt loam------- | ML | A-4 | 0 | 95-100 | 90-100 | 85-100 | 70-95 | 25-35 | 3-10 |
| | 8-29 | Silt loam, silty clay loam. | CL, CL-ML | A-6, A-4 | 0-5 | 75-100 | 70-100 | 60-95 | 60-90 | 25-40 | 5-20 |
| | 29-59 | Very gravelly silt loam, loam, gravelly silt loam. | CL-ML, CL, SC, SM-SC | A-4, A-6 | 0-10 | 65-90 | 65-90 | 60-90 | 40-65 | 20-35 | 5-15 |
| | 59-67 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | 67-69 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WkB, WkC, WkD------ Westmore | 0-8 | Silt loam------- | ML, CL-ML, CL | A-4 | 0 | 100 | 90-100 | 80-100 | 70-95 | 22-35 | 4-10 |
| | 8-25 | Silty clay loam, silt loam. | CL, ML | A-6, A-7 | 0-5 | 95-100 | 90-100 | 85-100 | 80-90 | 30-50 | 11-20 |
| | 25-50 | Clay, silty clay, shaly silty clay loam. | CH, CL | A-7, A-6 | 0-15 | 80-100 | 65-95 | 60-90 | 55-90 | 38-70 | 17-40 |
| | 50-61 | Weathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WmB, WmC, WmD, WmE, WmF---------- Westmoreland | 0-8 | Silt loam------- | ML, CL | A-4, A-6 | 0 | 85-100 | 80-100 | 75-95 | 60-95 | --- | --- |
| | 8-50 | Clay loam, channery clay loam, silt loam. | CL, ML, GM, GC | A-4, A-6, A-7, A-2 | 0-15 | 65-100 | 55-95 | 50-90 | 45-85 | 22-45 | 2-20 |
| | 50-52 | Unweathered bedrock. | --- | --- | --- | --- | --- | --- | --- | --- | --- |

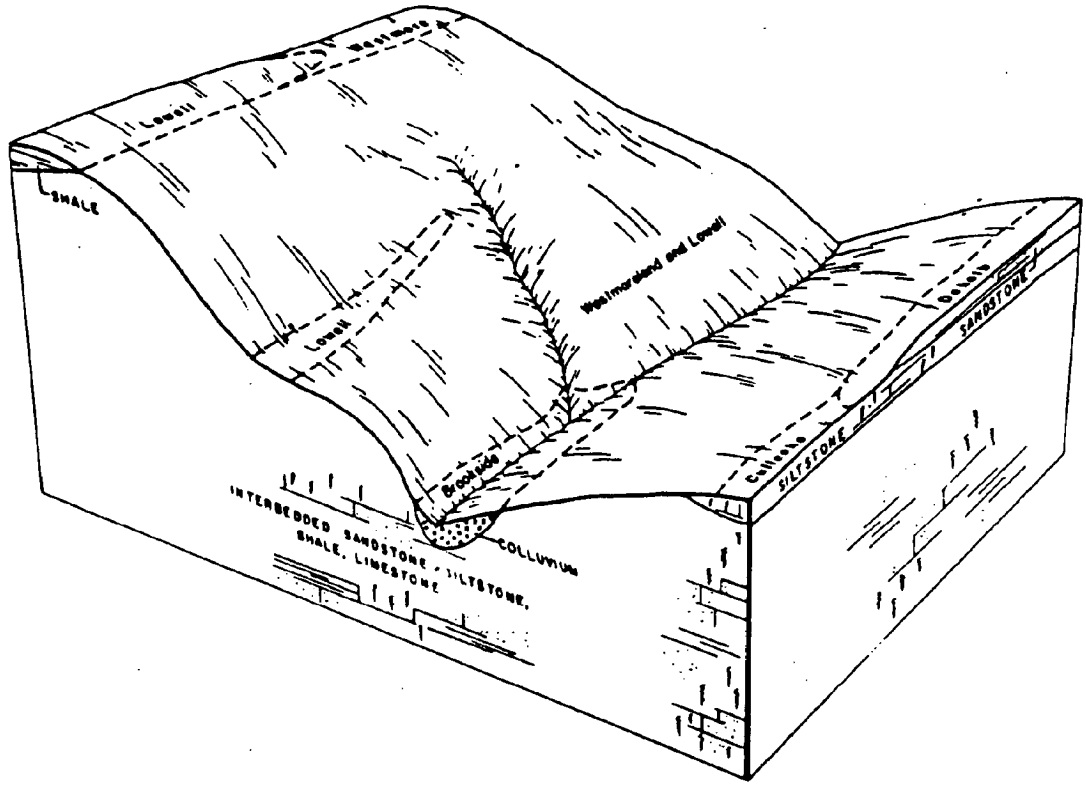
AMERICAN ENERGY CORPORATION
CENTURY MINE

***SOIL ENGINEERING PROPERTIES***
***COARSE COAL REFUSE***
***DISPOSAL FACILITY***

Wayne Township, Sections 3 and 4
Belmont County, Ohio

SCS Belmont County Soil Survey

Date: 24 March 2001




Typical pattern of soils in the Westmoreland-Lowell association.

| |
|---|
| AMERICAN ENERGY CORPORATION<br>CENTURY MINE |
| ***TYPICAL PATTERN OF SOILS***<br>***COARSE COAL REFUSE***<br>***DISPOSAL FACILITY*** |
| Wayne Township, Sections 3 and 4<br>Belmont County, Ohio |
| SCS Belmont County Soil Survey |
| Date: 24 March 2001 |

# 6

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-07-414 | 01-07-415 | 01-07-416 | 01-07-417 | 01-07-418 | 01-07-419 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .69 GPM | .23 GPM | 1.6 GPM | .72 GPM | 1.7 GPM | .35 GPM |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.86 | 8.06 | 7.58 | 7.57 | 7.98 | 6.60 |
| 11 | Total Acidity (mg/l CaCO3) | 6.80 | 7.80 | 6.20 | 16.20 | 10.20 | 55.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | 149.00 | 254.00 | 106.40 | 261.40 | 290.80 | 191.60 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 772.00 | 633.00 | 245.00 | 585.00 | 951.00 | 1470.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.24 | 0.06 | 0.13 | 0.04 | 0.03 | 8.20 |
| 16 | Total Sulfates (mg/l) | 235.00 | 57.00 | <10.00 | 29.00 | 201.00 | 548.00 |
| 17 | Total Iron (mg/l) | 0.15 | 0.21 | 0.20 | 0.08 | 0.11 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 17 | 58 | 53 | 34 | 26 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 396.00 | 320.00 | 116.00 | 300.00 | 400.00 | 800.00 |
| 20 | Nitrates | | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | 01-07-498 | 01-07-499 | 01-07-500 | 01-07-501 | 01-07-502 | 01-07-503 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | .19 GPM | .22 GPM | .29 GPM | .38 GPM | .19 GPM | .34 GPM |
| 8 | Date Above Measurements Made | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | 3.20 | 7.98 | 7.54 | 7.98 | 8.23 | 8.09 |
| 11 | Total Acidity (mg/l CaCO3) | 112.00 | 5.80 | 7.40 | 4.20 | 3.40 | 6.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 0.00 | 220.80 | 112.00 | 123.00 | 224.00 | 207.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1559.00 | 1215.00 | 279.00 | 292.00 | 527.00 | 667.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 10.60 | 0.07 | <0.02 | <0.02 | <0.02 | <0.02 |
| 16 | Total Sulfates (mg/l) | 660.00 | 51.00 | 17.00 | 18.00 | 42.00 | 94.00 |
| 17 | Total Iron (mg/l) | 12.40 | 0.10 | 0.24 | <0.04 | 0.05 | 0.04 |
| 18 | Total Suspended Solids (mg/l) | 22 | 10 | 11 | 4 | 3 | 3 |
| 19 | Total Hardness (mg/l as CaCO3) | 660.00 | 228.00 | 124.00 | 136.00 | 276.00 | 320.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-13 | CMDS-1 | CMW-2 | CMW-2 | CMW-2 | CMD-1 |
| 2 | Identification Number | 01-07-504 | 01-07-413 | 00-03268 | 01-07-373 | -- | 01-07-371 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | H | I | L | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1060 | 1080 | 1190 | 1190 | 1190 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | 21' | 21' | 21' | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | 12' | 16' | DRY | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | .13 GPM | 1.8 GPM | -- | -- | -- | 28.6 CFS |
| 8 | Date Above Measurements Made | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | 10-19-01 | 7-6-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | B | C | C | C | -- |
| 10 | pH (Standard Units) | 8.25 | 8.26 | 6.70 | 7.33 | | 8.33 |
| 11 | Total Acidity (mg/l CaCO3) | 2.20 | 5.00 | 7.10 | 5.00 | | 0.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 227.00 | 212.60 | 22.0 | 57.80 | | 132.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 653.00 | 459.00 | 160.00 | 137.00 | | 426.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | | --- |
| 15 | Total Manganese (mg/l) | 0.02 | 0.10 | <0.02 | <0.02 | | <0.02 |
| 16 | Total Sulfates (mg/l) | 106.00 | 20.00 | 42.00 | <10.00 | | 48.00 |
| 17 | Total Iron (mg/l) | 0.41 | 0.10 | 0.23 | 0.42 | | 0.09 |
| 18 | Total Suspended Solids (mg/l) | 4 | 60 | <1 | 9 | | 7 |
| 19 | Total Hardness (mg/l as CaCO3) | 324.00 | 228.00 | 60.00 | 64.00 | | 188.00 |
| 20 | Nitrates | --- | --- | 0.09 | --- | | --- |
| 21 | Date Sampled for Analysis | 7-11-01 | 7-7-01 | 3-19-99 | 7-6-01 | | 7-6-01 |
| 22 | Date Last Precipitation Event Occurred | 7-8-01 | 7-5-01 | 3-14-99 | 7-5-01 | 10-16-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMD-2 | CMD2-A | CMD-3 | CMD-4 | CMD-5 | CMD-6 |
| 2 | Identification Number | 01-07-400 | 01-07-401 | 01-07-402 | 01-07-403 | 01-07-404 | 01-07-505 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 890 | 930 | 1020 | 950 | 935 | 925 |
| 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) | 5.25 CFS | .69 CFS | .007 CFS | .03 CFS | .01 CFS | .01 CFS |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 8.34 | 7.95 | 8.17 | 8.20 | 8.33 | 7.93 |
| 1 | Total Acidity (mg/l CaCO3) | 0.00 | 3.20 | 3.20 | 4.00 | 0.00 | 4.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 51.20 | 105.80 | 131.20 | 172.20 | 194.60 | 102.00 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 384.00 | 278.00 | 379.00 | 463.00 | 650.00 | 847.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.07 | 0.08 | 0.08 | 0.03 | 0.04 | 0.07 |
| 16 | Total Sulfates (mg/l) | 54.00 | 21.00 | 46.00 | 54.00 | 117.00 | 283.00 |
| 17 | Total Iron (mg/l) | 0.20 | 0.34 | 0.17 | 0.15 | 0.05 | 0.10 |
| 18 | Total Suspended Solids (mg/l) | 3 | 4 | 3 | 2 | 6 | 3 |
| 19 | Total Hardness (mg/l as CaCO3) | 160.00 | 124.00 | 180.00 | 224.00 | 260.00 | 326.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 | 7-7-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF RECLAMATION

ATTACHMENT 14A
(HYDROLOGIC MEASUREMENTS AND ANALYSES)

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMD-7 | CMD-8 | CMD-9 | CMU-I | CMU-2 | CMU-2A |
| 2 | Identification Number | 01-07-405 | 01-07-406 | 01-07-506 | 01-07-372 | 01-07-407 | 01-07-408 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 918 | 900 | 878 | 855 | 959 | 938 |
| 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) | .01 CFS | .008 CFS | .01 CFS | 25.8 CFS | .64 CFS | 1.93 CFS |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-11-01 | 7-6-01 | 7-7-01 | 7-7-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 8.12 | 8.08 | 8.20 | 8.28 | 7.81 | 7.91 |
| 11 | Total Acidity (mg/l CaCO3) | 6.40 | 5.60 | 2.80 | 5.60 | 4.80 | 4.00 |
| 12 | Total Alkalinity (mg/l CaCO3) | 191.00 | 105.40 | 186.80 | 129.80 | 114.00 | 86.60 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 798.00 | 1208.00 | 430.00 | 449.00 | 309.00 | 266.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.06 | 0.07 | <0.02 | <0.02 | 0.10 | 0.07 |
| 16 | Total Sulfates (mg/l) | 197.00 | 537.00 | 25.00 | 54.00 | 23.00 | 19.00 |
| 17 | Total Iron (mg/l) | 0.59 | 0.61 | 0.20 | 0.04 | 0.08 | 0.04 |
| 18 | Total Suspended Solids (mg/l) | 3 | 8 | 49 | 2 | 2 | <2 |
| 19 | Total Hardness (mg/l as CaCO3) | 310.00 | 600.00 | 236.00 | 188.00 | 140.00 | 112.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-11-01 | 7-6-01 | 7-7-01 | 7-7-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-8-01 | 7-5-01 | 7-5-01 | 7-5-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMU-3 | CMU-5 | CMU-6 | CMU-6A | CMU-6B | CMU-6C |
| 2 | Identification Number | 01-07-409 | 01-07-410 | 01-07-494 | 01-07-495 | 01-07-496 | 01-07-497 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | I | I | I | I | I | I |
| 4 | Surface Elevation for Sampling Station (msl) | 1060 | 1098 | 1100 | 1098 | 1127 | 1130 |
| 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) | .004 CFS | .0007 CFS | .004 CFS | .001 CFS | .38 CFS | .001 CFS |
| 8 | Date Above Measurements Made | 7-7-01 | 7-7-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | -- | -- | -- | -- | -- | -- |
| 10 | pH (Standard Units) | 7.99 | 7.53 | 7.99 | 7.09 | 7.97 | 7.72 |
| 11 | Total Acidity (mg/l CaCO3) | 4.60 | 8.00 | 5.00 | 11.20 | 8.20 | 6.80 |
| 12 | Total Alkalinity (mg/l CaCO3) | 121.80 | 116.80 | 140.80 | 91.60 | 174.40 | 114.80 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 356.00 | 284.00 | 346.00 | 258.00 | 395.00 | 291.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.05 | 0.04 | <0.02 | <0.02 | 0.02 | 0.02 |
| 16 | Total Sulfates (mg/l) | 37.00 | 15.00 | 22.00 | 27.00 | 20.00 | 21.00 |
| 17 | Total Iron (mg/l) | 0.17 | 0.10 | 0.27 | 0.10 | 0.10 | 0.07 |
| 18 | Total Suspended Solids (mg/l) | 2 | 72 | 4 | 2 | 4 | 6 |
| 19 | Total Hardness (mg/l as CaCO3) | 164.00 | 132.00 | 152.00 | 116.00 | 180.00 | 124.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 7-7-01 | 7-7-01 | 7-11-01 | 7-11-01 | 7-11-01 | 7-11-01 |
| 22 | Date Last Precipitation Event Occurred | 7-5-01 | 7-5-01 | 7-8-01 | 7-8-01 | 7-8-01 | 7-8-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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.
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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-4 | CMS-5 | CMS-6 |
| 2 | Identification Number | 01-10-705 | | 01-10-709 | | 01-10-713 | 01-10-696 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1095 | 1096 |
| 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) | .02 GPM | DRY | .09 GPM | DRY | .75 GPM | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | B |
| 10 | pH (Standard Units) | 7.37 | | 7.80 | | 7.14 | 7.33 |
| 11 | Total Acidity (mg/l CaCO3) | 10.80 | | 13.60 | | 14.00 | 40.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 18.60 | | 207.80 | | 273.80 | 356.20 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 1259 | | 450.00 | | 945.00 | 1320.00 |
| 14 | Total Dissolved Solids (mg/l) | --- | | --- | | --- | --- |
| 15 | Total Manganese (mg/l) | 2.66 | | 0.02 | | <0.02 | 0.09 |
| 16 | Total Sulfates (mg/l) | 526.00 | | 17.00 | | 188.00 | 261.00 |
| 17 | Total Iron (mg/l) | 0.65 | | 0.11 | | <0.04 | 0.44 |
| 18 | Total Suspended Solids (mg/l) | 60 | | 92 | | 3 | 9 |
| 19 | Total Hardness (mg/l as CaCO3) | 640.00 | | 220.00 | | 400.00 | 440.00 |
| 20 | Nitrates | --- | | --- | | --- | --- |
| 21 | Date Sampled for Analysis | 10-19-01 | | 10-19-01 | | 10-19-01 | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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NOTE: For each sample provide data for either item 13 or 14.

**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-7 | CMS-8 | CMS-9 | CMS-10 | CMS-11 | CMS-12 |
| 2 | Identification Number | | 01-10-697 | | | | 01-10-722 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | L | L | L | L | L | L |
| 4 | Surface Elevation for Sampling Station (msl) | 1070 | 1130 | 1130 | 1132 | 1080 | 1080 |
| 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) | DRY | .05 GPM | DRY | DRY | DRY | .05 GPM |
| 8 | Date Above Measurements Made | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 | 10-19-01 |
| 9 | Aquifer/Zone Identification For Well/Spring | B | C | C | C | B | B |
| 10 | pH (Standard Units) | | 7.53 | | | | 8.12 |
| 11 | Total Acidity (mg/l CaCO3) | | 8.40 | | | | 13.40 |
| 12 | Total Alkalinity (mg/l CaCO3) | | 57.20 | | | | 240.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | | 1176 | | | | 756 |
| 14 | Total Dissolved Solids (mg/l) | | --- | | | | --- |
| 15 | Total Manganese (mg/l) | | 2.16 | | | | <0.02 |
| 16 | Total Sulfates (mg/l) | | 529.0 | | | | 122.00 |
| 17 | Total Iron (mg/l) | | 0.05 | | | | 0.33 |
| 18 | Total Suspended Solids (mg/l) | | <2.0 | | | | 4 |
| 19 | Total Hardness (mg/l as CaCO3) | | 560 | | | | 370.00 |
| 20 | Nitrates | | --- | | | | --- |
| 21 | Date Sampled for Analysis | | 10-19-01 | | | | 10-19-01 |
| 22 | Date Last Precipitation Event Occurred | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 | 10-16-01 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-1 | CMS-2 | CMS-3 | CMS-5 | CMS-6 | CMS-8 |
| 2 | Identification Number | 02-02-833 | 02-02-846 | 02-02-837 | 02-02-838 | 02-02-852 | 02-02-841 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 995 | 1095 | 1095 | 1095 | 1096 | 1130 |
| 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) | 1.1 GPM | 9.1 GPM | 1.9 GPM | 3 GPM | .37 GPM | .63 GPM |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | A | B | B | B | B | C |
| 10 | pH (Standard Units) | 7.84 | 7.97 | 7.59 | 8.26 | 6.77 | 7.87 |
| 11 | Total Acidity (mg/l CaCO3) | 6.20 | 1.80 | 4.60 | 1.20 | 64.00 | 5.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 116.00 | 108.20 | 97.20 | 312.80 | 201.80 | 176.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 837 | 341 | 278 | 1042 | 1592 | 453 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | 0.51 | 0.02 | 0.08 | <0.02 | 0.95 | <0.02 |
| 16 | Total Sulfates (mg/l) | 297.0 | 43.00 | 29.00 | 220.0 | 692.0 | 38.0 |
| 17 | Total Iron (mg/l) | 0.17 | 0.19 | 0.54 | <0.04 | 0.59 | 0.05 |
| 18 | Total Suspended Solids (mg/l) | 2 | <2 | 53 | 4 | 42 | 6 |
| 19 | Total Hardness (mg/l as CaCO3) | 388.00 | 148.00 | 124.00 | 470.00 | 860.00 | 208.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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**OHIO DEPARTMENT OF NATURAL RESOURCES**
**DIVISION OF RECLAMATION**

**ATTACHMENT 14A**
**(HYDROLOGIC MEASUREMENTS AND ANALYSES)**

APPLICANT AMERICAN ENERGY CORPORATION (REFUSE FACILITY)

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | Identification No. of Sampling Station from Hydrology Map | CMS-9 | CMS-10 | CMS-12 | CMW-2 | CMDS-1 | CMD-1 |
| 2 | Identification Number | 02-02-857 | 02-02-842 | 02-02-849 | 02-02-831 | 02-02-836 | 02-02-828 |
| 3 | High (H)/Low (L) Intermediate (I) Designation (if applicable) | H | H | H | H | H | H |
| 4 | Surface Elevation for Sampling Station (msl) | 1130 | 1132 | 1080 | 1190 | 1080 | 850 |
| 5 | Depth of Well Below Land Surface (feet) | -- | -- | -- | 21' | -- | -- |
| 6 | Static Water Level of Well Below Land Surface (feet) | -- | -- | -- | 16.5' | -- | -- |
| 7 | Flow for Spring and Stream (gpm or cfs) | 1.9 GPM | 3.9 GPM | 1.8 GPM | --- | 6 GPM | 74 CFS |
| 8 | Date Above Measurements Made | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 9 | Aquifer/Zone Identification For Well/Spring | C | C | B | C | B | --- |
| 10 | pH (Standard Units) | 7.31 | 7.71 | 8.18 | 8.93 | 7.72 | 8.13 |
| 11 | Total Acidity (mg/l CaCO3) | 18.60 | 2.60 | 3.20 | 0.00 | 7.80 | 2.20 |
| 12 | Total Alkalinity (mg/l CaCO3) | 101.00 | 71.00 | 147.60 | 277.80 | 219.00 | 116.40 |
| 13 | Specific Conductivity (umhos/cm at 25° C) | 895 | 207 | 485 | 715 | 507 | 421 |
| 14 | Total Dissolved Solids (mg/l) | --- | --- | --- | --- | --- | --- |
| 15 | Total Manganese (mg/l) | <0.02 | <0.02 | 0.04 | <0.02 | <0.02 | 0.02 |
| 16 | Total Sulfates (mg/l) | 350.0 | 21.00 | 82.00 | 25.0 | 24.0 | 55.0 |
| 17 | Total Iron (mg/l) | 0.06 | 0.05 | 1.20 | 1.43 | <0.04 | 0.06 |
| 18 | Total Suspended Solids (mg/l) | <2 | 5 | 34 | 4 | <2 | <2 |
| 19 | Total Hardness (mg/l as CaCO3) | 428.00 | 84.00 | 220.00 | <10.00 | 240.00 | 172.00 |
| 20 | Nitrates | --- | --- | --- | --- | --- | --- |
| 21 | Date Sampled for Analysis | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |
| 22 | Date Last Precipitation Event Occurred | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 | 02-27-02 |

Laboratory Name INDUSTRIAL LAB ANALYSIS, INC.
Address 2240 WILLIAMSBURG DRIVE City GLEN DALE
State WEST VIRGINIA Zip 26038

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# 7

# Ohio Department of Natural Resources

BOB TAFT, GOVERNOR SAMUEL W. SPECK, DIRECTOR

Date: June 27, 2001

## ANALYSIS OF EXISTING GROUND WATER FILE DATA

Prepared By: Bill Haiker, Hydrogeologist

Operator: American Energy Corporation

County: Belmont

Township: Wayne and Washington

Section(s): 3, 4 and 33, 34

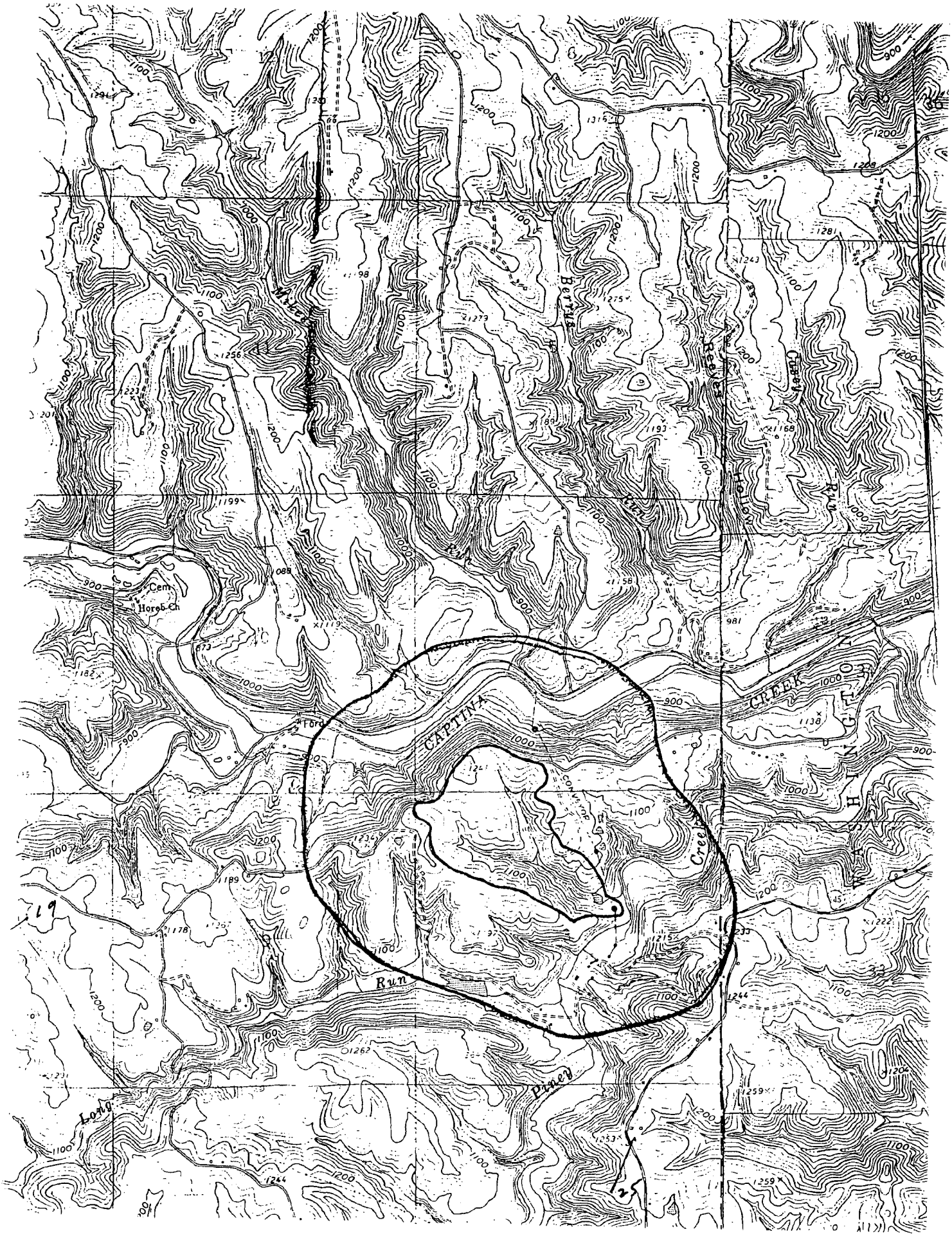
Number of water well logs within 2,000 foot radius of site (copies attached) 2: Field located: 0

General description of local hydrology:

Ground water is obtained from interbedded shale, sandstone and limestone bedrock. Well depths are generally less than 150 feet with yields of less than two gallons per minute.

Areas of Particular concern:

Proposed coal refuse disposal facility.




AEC 11890
AEC 11890

Date: 6/27/2001 Time : 01:00:14 PM

# WELL LOG AND DRILLING REPORT

State of Ohio
DEPARTMENT OF NATURAL RESOURCES
Division of Water
Fountain Square
Columbus, Ohio 43224

NO CARBON PAPER NECESSARY - SELF-TRANSCRIBING

602687

COUNTY BELMONT TOWNSHIP WAYNE SECTION OF TOWNSHIP

OWNER KEN ROBERTS ADDRESS 40561 WILLIAMSON RD

LOCATION OF PROPERTY TWP RD 74 OFF CO RD 92 BEALLSVILLE, OHIO 43716

## CONSTRUCTION DETAILS

Casing diameter 8" Length of casing 71'

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 5/13/88

## BAILING OR PUMPING TEST
(specify one by circling)

Test rate 1 gpm Duration of test 8 hrs

Drawdown ft Date 5/13/88

Static level (depth to water) 27' ft

Quality (clear, cloudy, taste, odor) CLEAR

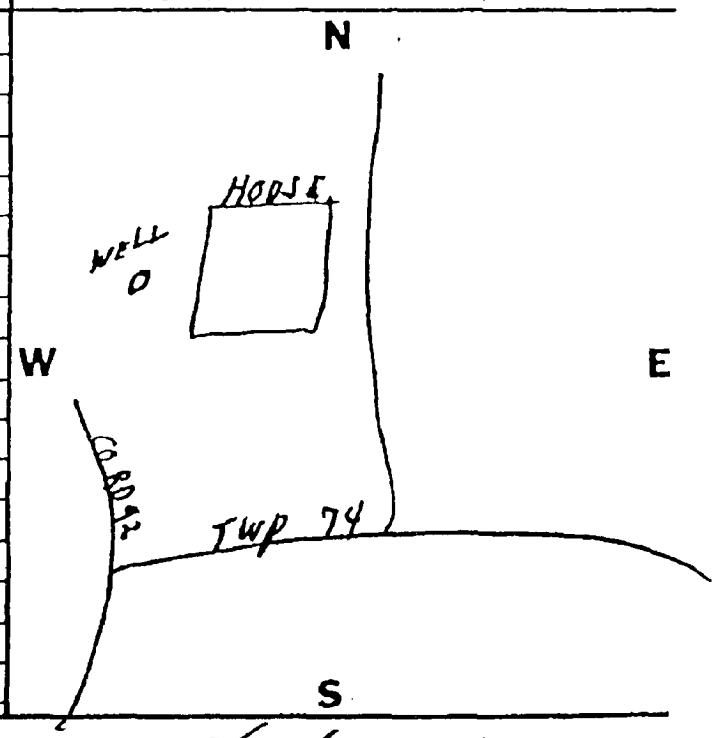
Pump installed by OWNER

## WELL LOG*

| Formations: sandstone, shale, limestone, gravel, clay | From | To |
|---|---|---|
| TOP | 0 ft | 3 ft |
| SANDSTONE | 3 | 35 |
| SHALE | 35 | 40 |
| LIME | 40 | 60 |
| SHALE | 60 | 69 |
| LIME | 69 | 70 TD |
| | | |
| | | |
| WATER | | |
| 34 - 45 | | |

## SKETCH SHOWING LOCATION

Locate in reference to numbered state highways, street intersections, county roads, etc.




DRILLING FIRM VESS DRILLING DATE 5/13/88

ADDRESS BOX 63 WARNER, OHIO SIGNED George L. Vess

*If additional space is needed to complete well log, use next consecutive numbered form.

ORIGINAL COPY - ODNR, DIVISION OF WATER, FOUNTAIN SQ., COLS., OHIO 43224

Title: 602687

AEC 11891

Date: 6/27/2001 Time : 01:04:08 PM

# 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. 413061

County BELMONT Township ~~BROWN~~ Wayne Section of Township 26

Owner GEORGE FINCH Address BARNESVILLE, OHIO

Location of property ON ST RT 148

## CONSTRUCTION DETAILS

Casing diameter 8 Length of casing 17

Type of screen Length of screen

Type of pump

Capacity of pump

Depth of pump setting

Date of completion 10-9-70

## BAILING OR PUMPING TEST
(Specify one by circling)

Test Rate 1 G.P.M. Duration of test hrs.

Drawdown ft. Date

Static level-depth to water 13 ft.

Quality (clear, cloudy, taste, odor)

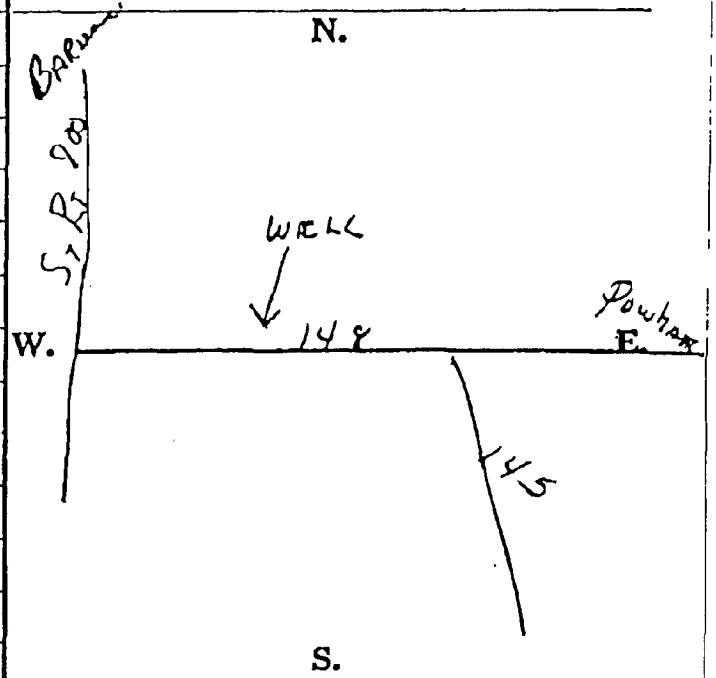
Pump installed by

## WELL LOG*

| Formations Sandstone, shale, limestone, gravel and clay | From | To |
|---|---|---|
| SOIL | 0 Feet | 11 Ft. |
| GRAVEL | 11 | 12 |
| SANDSTONE | 12 | 16 |
| LIMESTONE | 16 | 51 |
| GRAY SHALE | 51 | 75 |
| WATER 51 | | |

## SKETCH SHOWING LOCATION

Locate in reference to numbered State Highways, St. Intersections, County roads, etc.




Drilling Firm BILLMAN DRILLING Date 10-9-70

Address WOODSFIELD Signed H. H. Billman

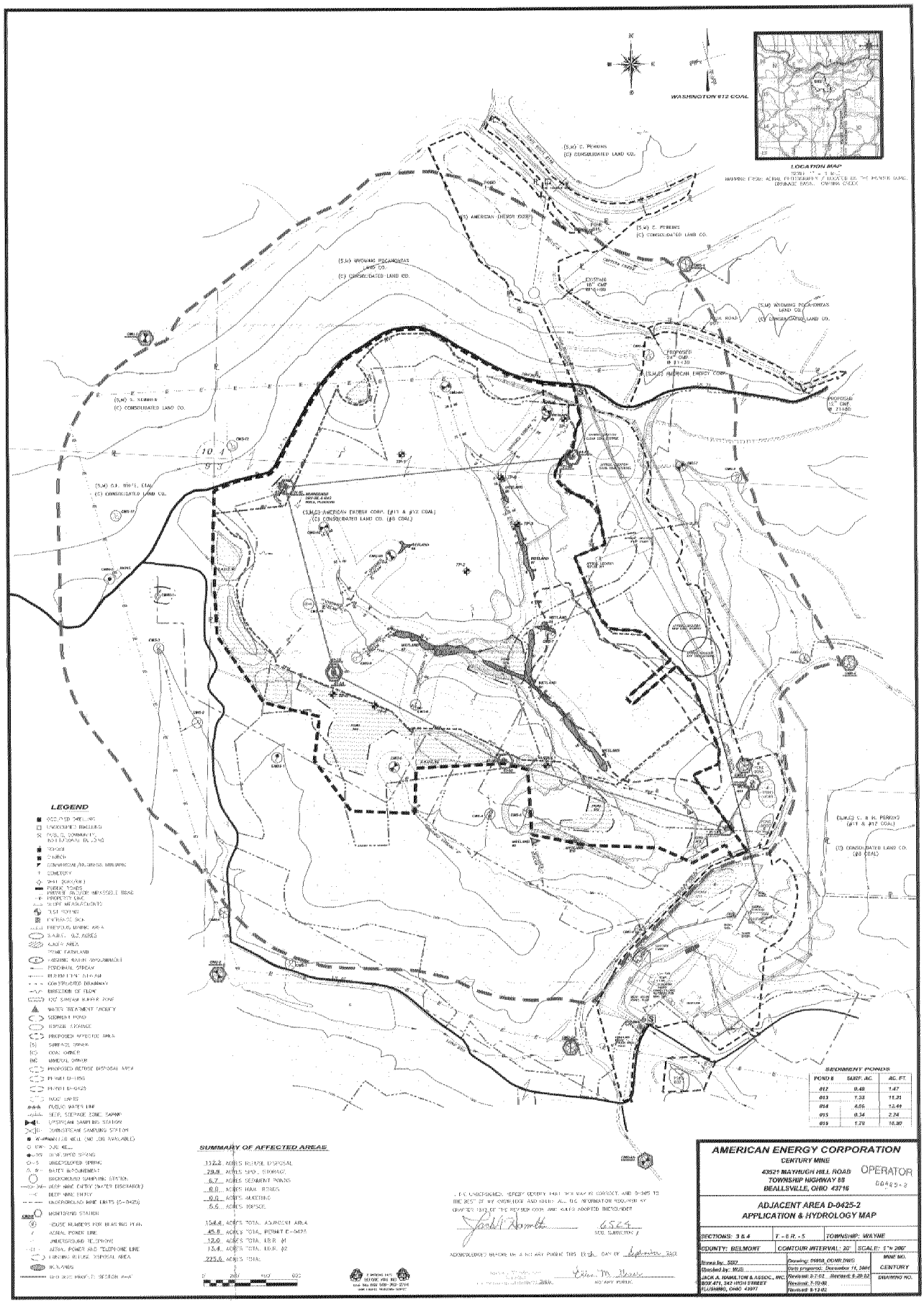
*If additional space is needed to complete well log, use next consecutive numbered form.

Title: 413061

AEC 11892

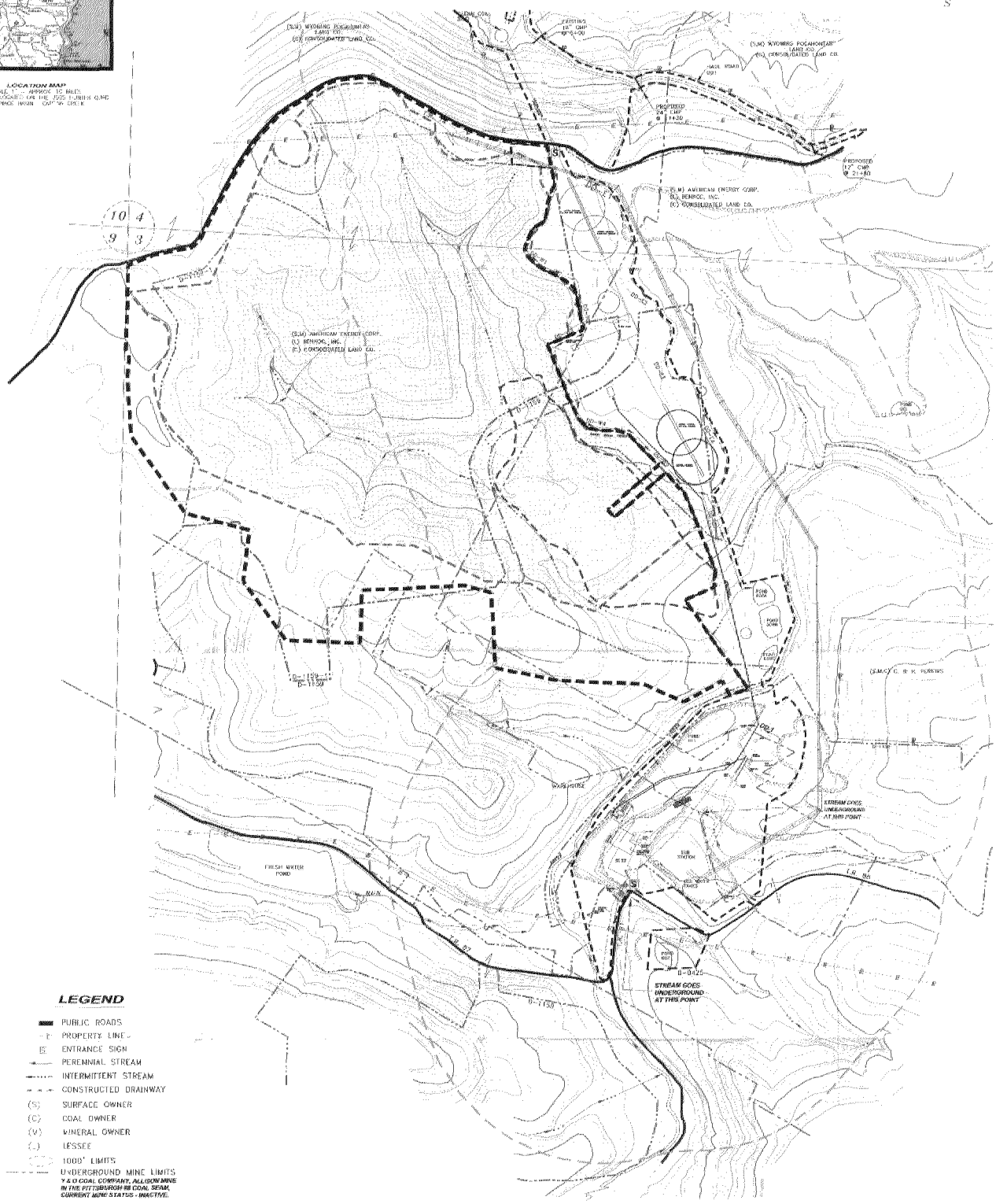
# 8

AEC 11893


WASHINGTON #12 COAL
LOCATION MAP
(S,M) C. PERKINS
(C) CONSOLIDATED LAND CO.
(S) AMERICAN ENERGY CORP.
(S,M) WYOMING POCAHONTAS LAND CO.
(C) CONSOLIDATED LAND CO.
(S,M) S. SCHMIER
(C) CONSOLIDATED LAND CO.
(S,M) O.J. WHITE, ETAL
(C) CONSOLIDATED LAND CO.
(S,M,C) AMERICAN ENERGY CORP. (#11 & #12 COAL)
(C) CONSOLIDATED LAND CO. (#8 COAL)
(S,M,C) C. & H. PERKINS
(#11 & #12 COAL)
(C) CONSOLIDATED LAND CO.
(#8 COAL)
LEGEND
SUMMARY OF AFFECTED AREAS
112.2 ACRES REFUSE DISPOSAL
79.4 ACRES SPOIL STORAGE
6.7 ACRES SEDIMENT PONDS
0.0 ACRES HAUL ROADS
0.0 ACRES ADMIN
5.6 ACRES TOPSOIL
154.4 ACRES TOTAL ADJACENT AREA
45.0 ACRES TOTAL PERMIT D-0425
13.0 ACRES TOTAL I.B.R. #1
13.4 ACRES TOTAL I.B.R. #2
225.6 ACRES TOTAL
SEDIMENT PONDS
POND # | SURF. AC. | AC. FT.
012 | 0.48 | 1.47
013 | 1.33 | 11.31
014 | 4.06 | 12.49
015 | 0.34 | 2.24
019 | 1.79 | 16.80
AMERICAN ENERGY CORPORATION
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716
OPERATOR
ADJACENT AREA D-0425-2
APPLICATION & HYDROLOGY MAP
SECTIONS: 3 & 4
T. - 6 R. - 5
TOWNSHIP: WAYNE
COUNTY: BELMONT
CONTOUR INTERVAL: 20'
SCALE: 1"= 200'
MINE NO.
CENTURY
DRAWING NO.
JACK A. HAMILTON & ASSOC., INC.
BOX 471, 342 HIGH STREET
FLUSHING, OHIO 43977

AEC 11894

LOCATION MAP
SCALE: 1" = APPROX. 10 MILES
SITE LOCATED ON THE 2005 FLUSHING QUAD
STARTING FROM CAPTAIN CREEK




## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- (S) SURFACE OWNER
- (C) COAL OWNER
- (V) MINERAL OWNER
- (L) LESSEE
- 1000' LIMITS
- UNDERGROUND MINE LIMITS
  *Y & O COAL COMPANY, ALLISON MINE IN THE PITTSBURGH #8 COAL SEAM, CURRENT MINE STATUS - INACTIVE.*
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- SURFACE PERMIT D-1159
- AREA AFFECTED BY D-1159
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 3, 1978, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159, THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

2 WORKING DAYS BEFORE YOU DIG
CALL TOLL FREE 800-362-7764
OHIO UTILITIES PROTECTION SERVICE

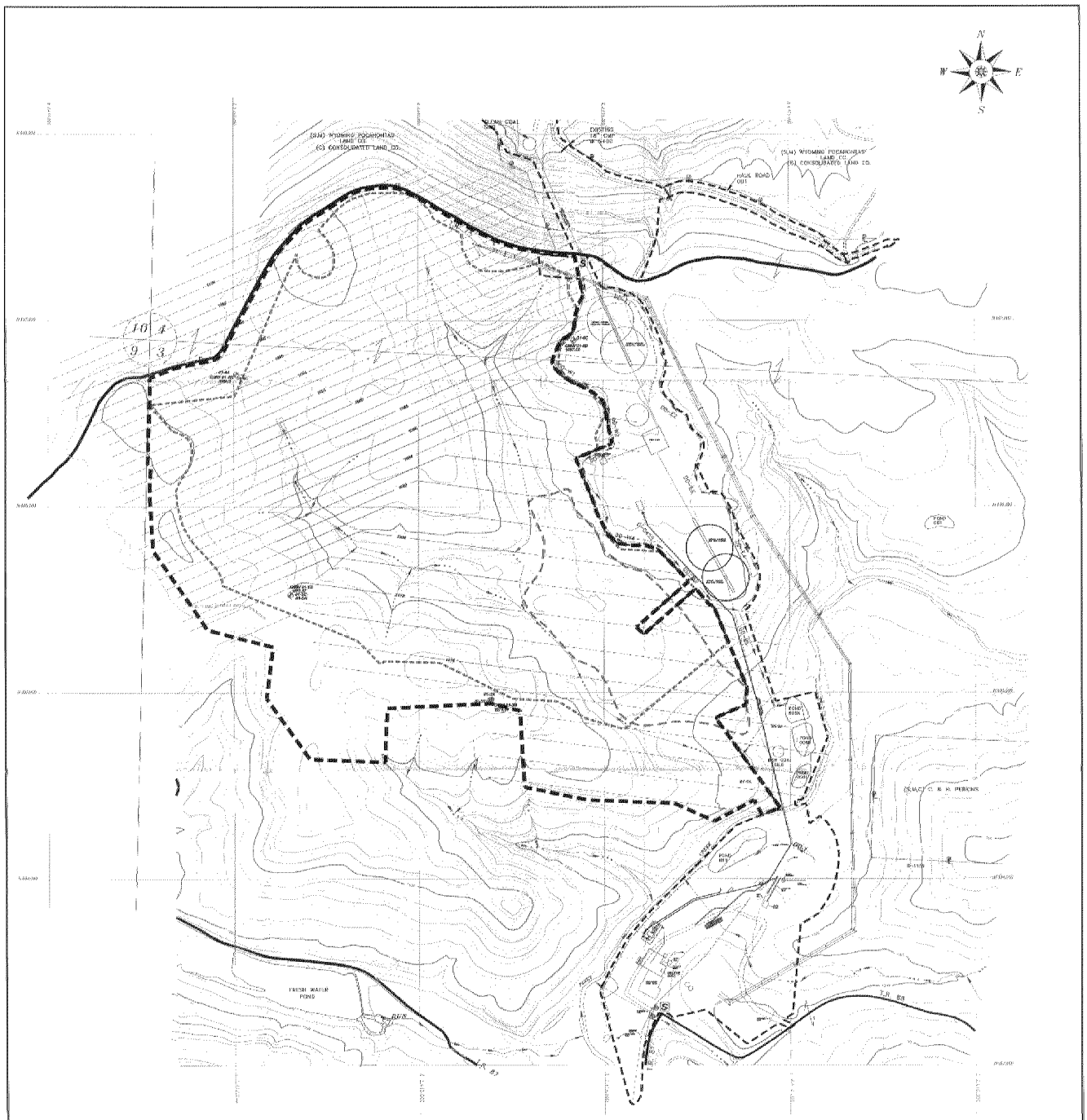
0' 200' 400' 600'

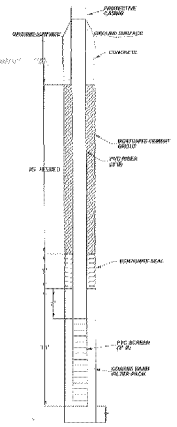
STATE OF OHIO
PHILLIP
BRUNO
E-54915
REGISTERED PROFESSIONAL ENGINEER

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 119
AVONMORE, PA 15618

**LOCATION MAP WITH EXISTING CONDITIONS**
**PROPOSED COARSE COAL REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Drawn by: SSB | Drawing: 7MBPTL.DWG | MINE NO. CENTURY |
| Designed by: PJB | Date prepared: April 15, 1991 | |
| JACK A. HANNA/VIM & ASSOC., INC. BOX 471, 342 HIGH STREET FLUSHING, OHIO 43977 | Revised: 7-30-92 | PLATE NO. 1 |




TYPICAL WELL CONSTRUCTION

## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- STRUCTURE CONTOURS CONTOUR INTERVAL = 1'
- ESTIMATED STRUCTURE CONTOURS

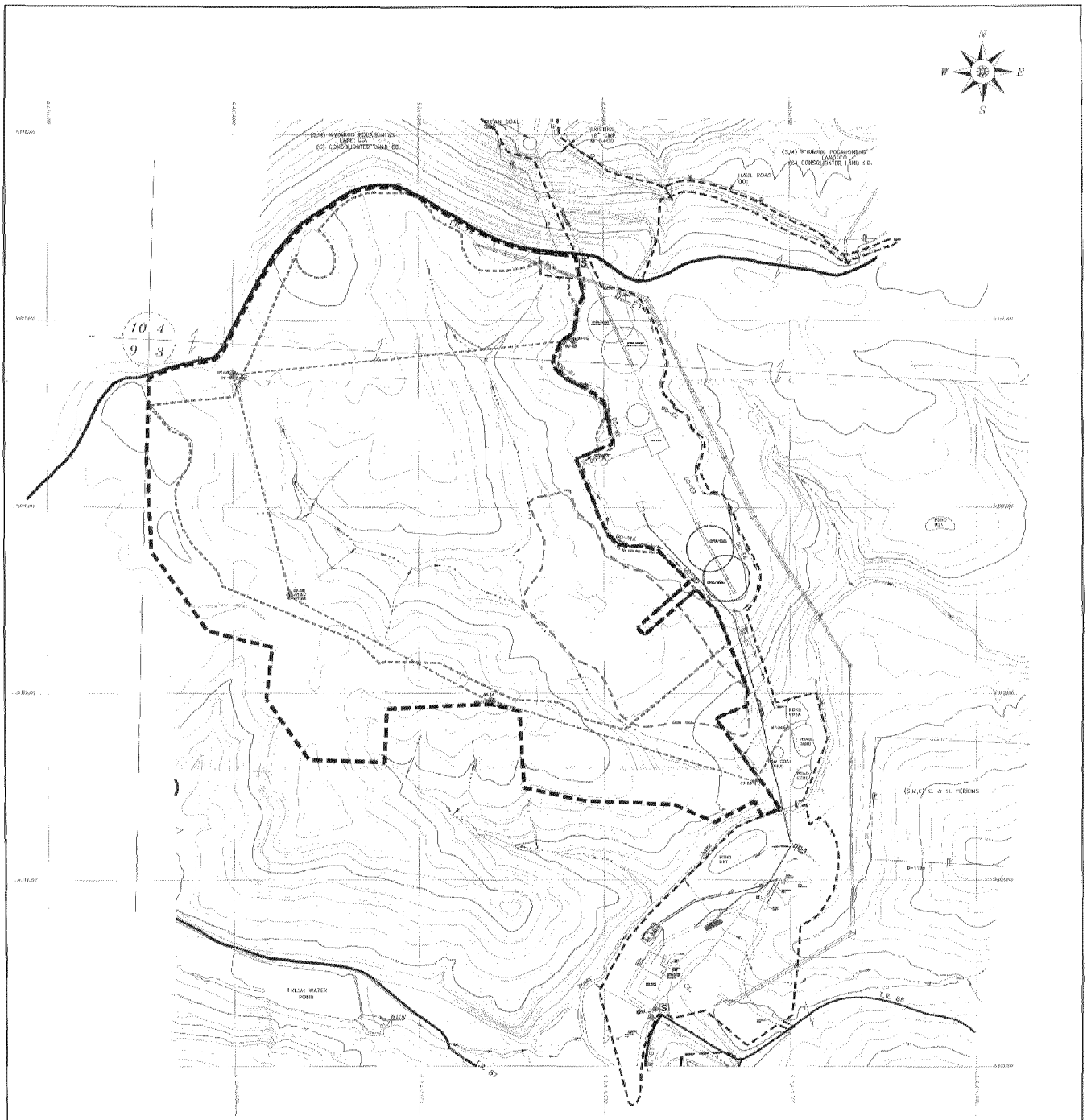
NOTES:

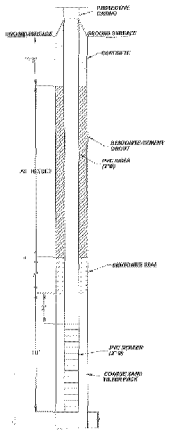
1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1139. THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
42521 Maybugh Hill Road
TOWNSHIP HIGHWAY 82
BRALLSVILLE, OHIO 43110

**STRUCTURE CONTOUR MAP**
**WASHINGTON (#12) COAL BED**
**COAL REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 N. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Designer: SGU<br>Checked by: MJB | Drawing: 8-0407 (8.DWG)<br>Date prepared: May 31, 2001 | MINE NO.<br>CENTURY |
| JACK A. HAME FOR & ASSOC., INC.<br>BOX 479, 345 HIGH STREET<br>PLAINING, OHIO 43917 | Revisions: 7-19-07 | PLATE NO.<br>4 |




TYPICAL WELL CONSTRUCTION

## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- CROSS SECTION A – A'

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159, THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYNUGH HILL ROAD
TOWNSHIP HIGHWAY 98
BEALLSVILLE, OHIO 43716

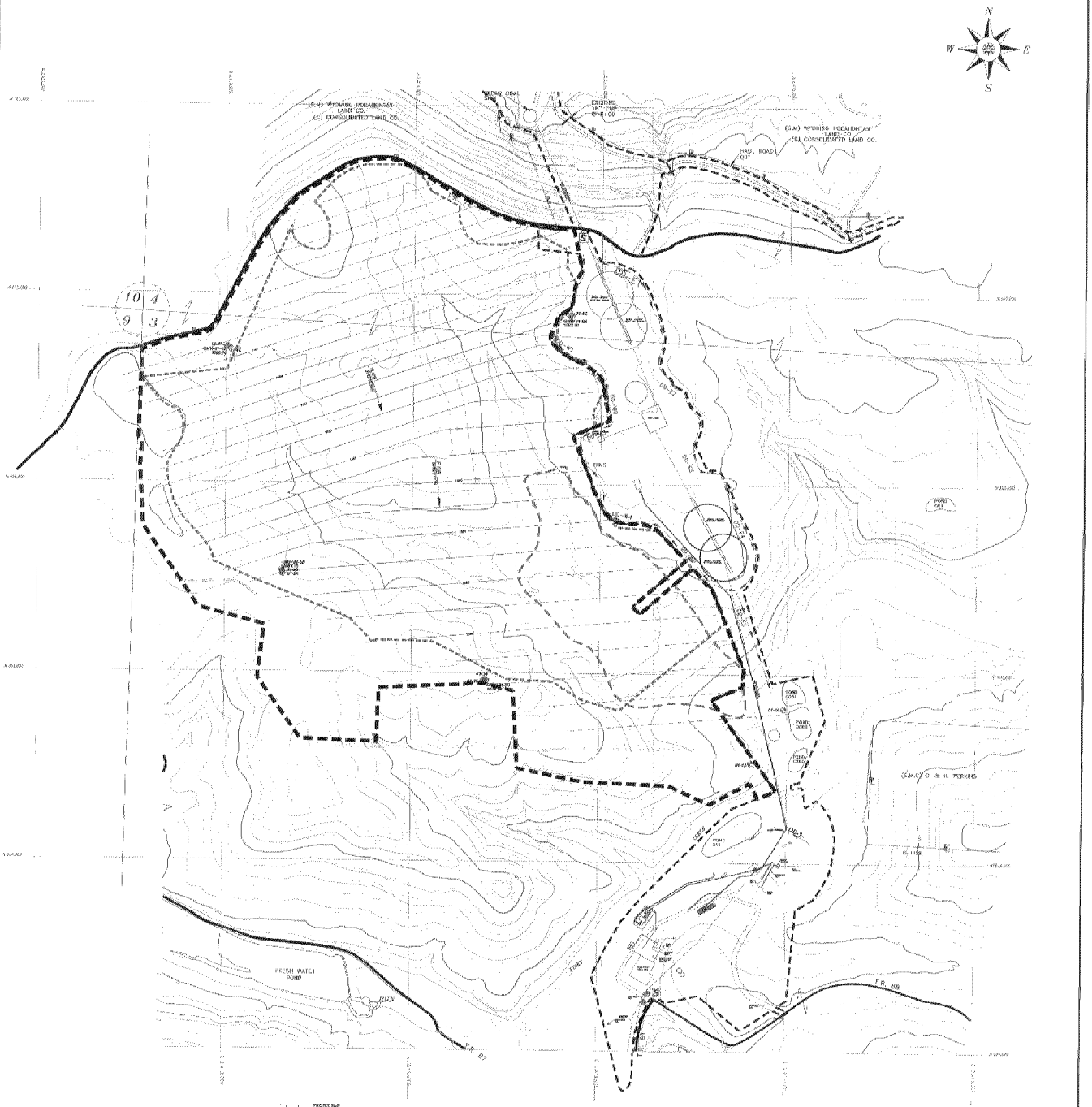
**GROUNDWATER MONITORING**
**LOCATION MAP**
**COAL REFUSE DISPOSAL FACILITY**

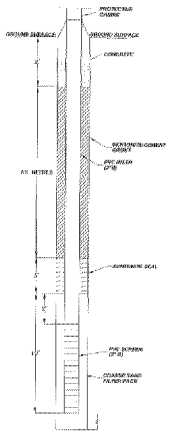
| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Drawn by: BSU | Drawing: D7GMPT5.DWG | MINE NO. |
| Checked by: MJS | Date prepared: May 9, 1991 | CENTURY |
| JACK A. PARRILLO & ASSOC., INC. BOX 475, 343 HIGH STREET FLUSHING, OHIO 43977 | Revised: 7-18-93 | PLATE NO. 5 |

STATE OF OHIO WILLIAM M. SPLATT E-11196 REGISTERED PROFESSIONAL ENGINEER

18 "July 2002

AEC 11897




TYPICAL WELL CONSTRUCTION

## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- POTENTIOMETRIC WATER SURFACE CONTOUR INTERVAL = 1'
- ESTIMATED POTENTIOMETRIC SURFACE

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D 1-58, THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 86
BEALLSVILLE, OHIO 43716

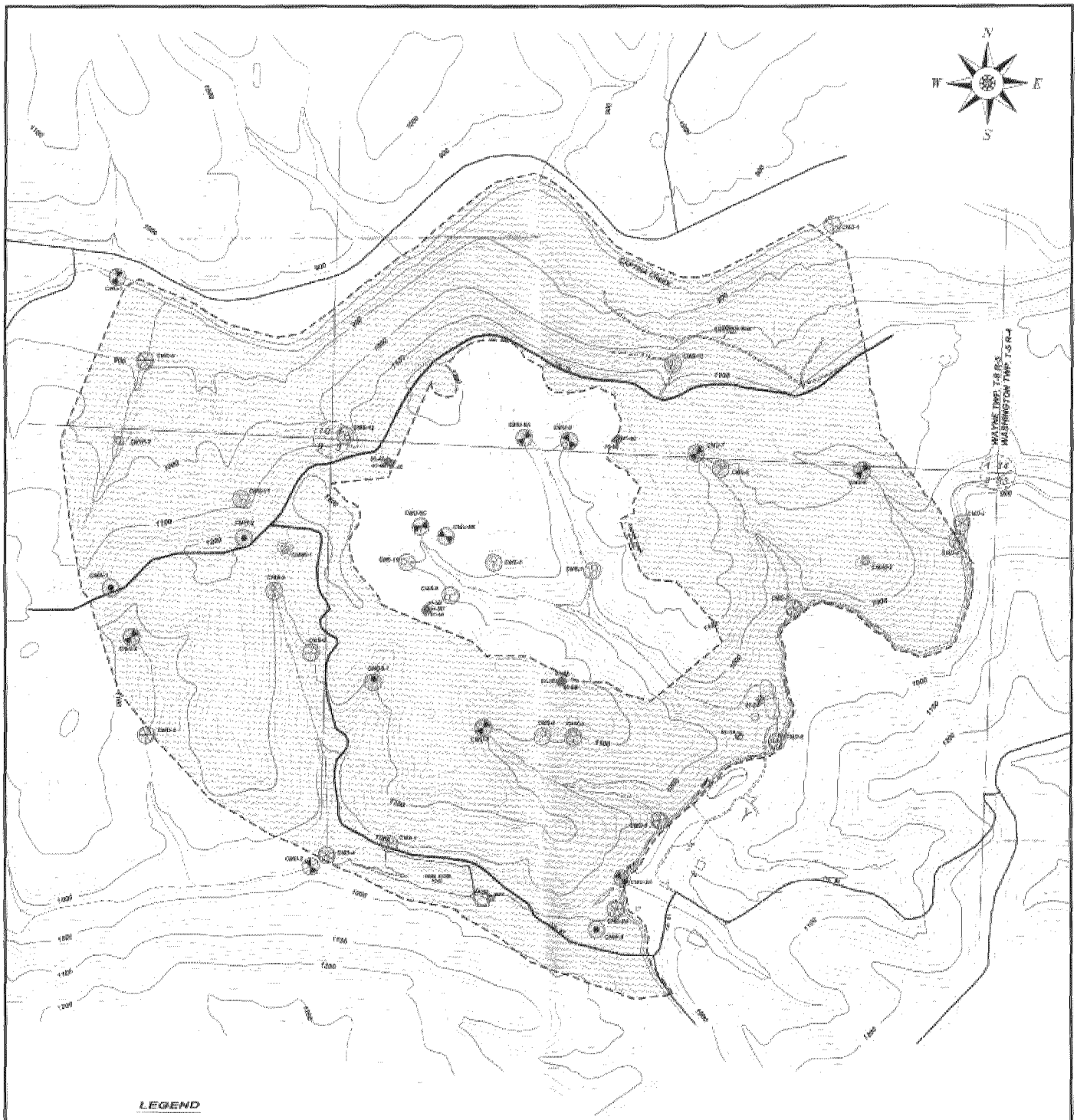
**FIRST ZONE OF SATURATION**
**COAL REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T.-6 R.-5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |

Drawn by: JSM
Checked by: HGS
Drawing: 0.5GBFT1.DWG
Date prepared: May 30, 2007
New Field: 7-17-07
JACK A. HAMILTON & ASSOC., INC.
RD# 471, 540 HIGH STREET
PLUSHUNG, OHIO 43977

MINE NO. CENTURY
PLATE NO. 6

AEC 11898




**LEGEND**

- PROPOSED REFUSE DISPOSAL AREA
- 2000' ISOLATION ZONE
- BORE HOLE
- U– UPSTREAM SAMPLING STATION
- D– DOWNSTREAM SAMPLING STATION
- WL– DRILLED WELL (LOG AVAILABLE)
- W– DRILLED WELL (NO LOG AVAILABLE)
- DW– DUG WELL
- DS– DEVELOPED SPRING
- S– UNDEVELOPED SPRING
- WI– WATER IMPOUNDMENT
- BACKGROUND SAMPLING STATION
- EXISTING WATER IMPOUNDMENT

NOTE:
SITE IS LOCATED ON THE HUNTER
U.S.G.S. 7 1/2 MINUTE QUADRANGLE.

0 500' 1000' 1500'

STATE OF OHIO
WILLIAM J. SPLIVY
E-51015
REGISTERED PROFESSIONAL ENGINEER

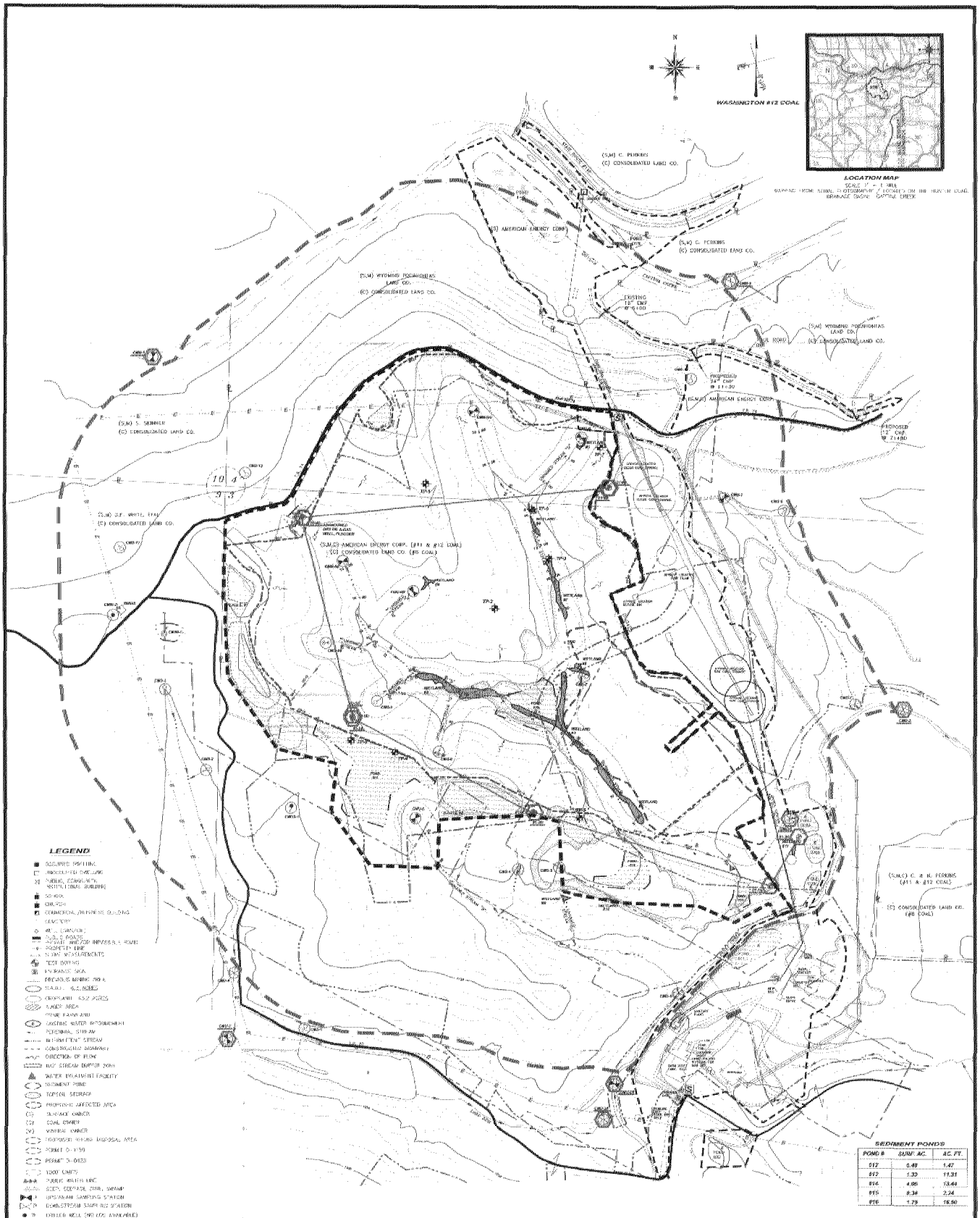
10 July 2002

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 119
AVONMORE, PA 15618

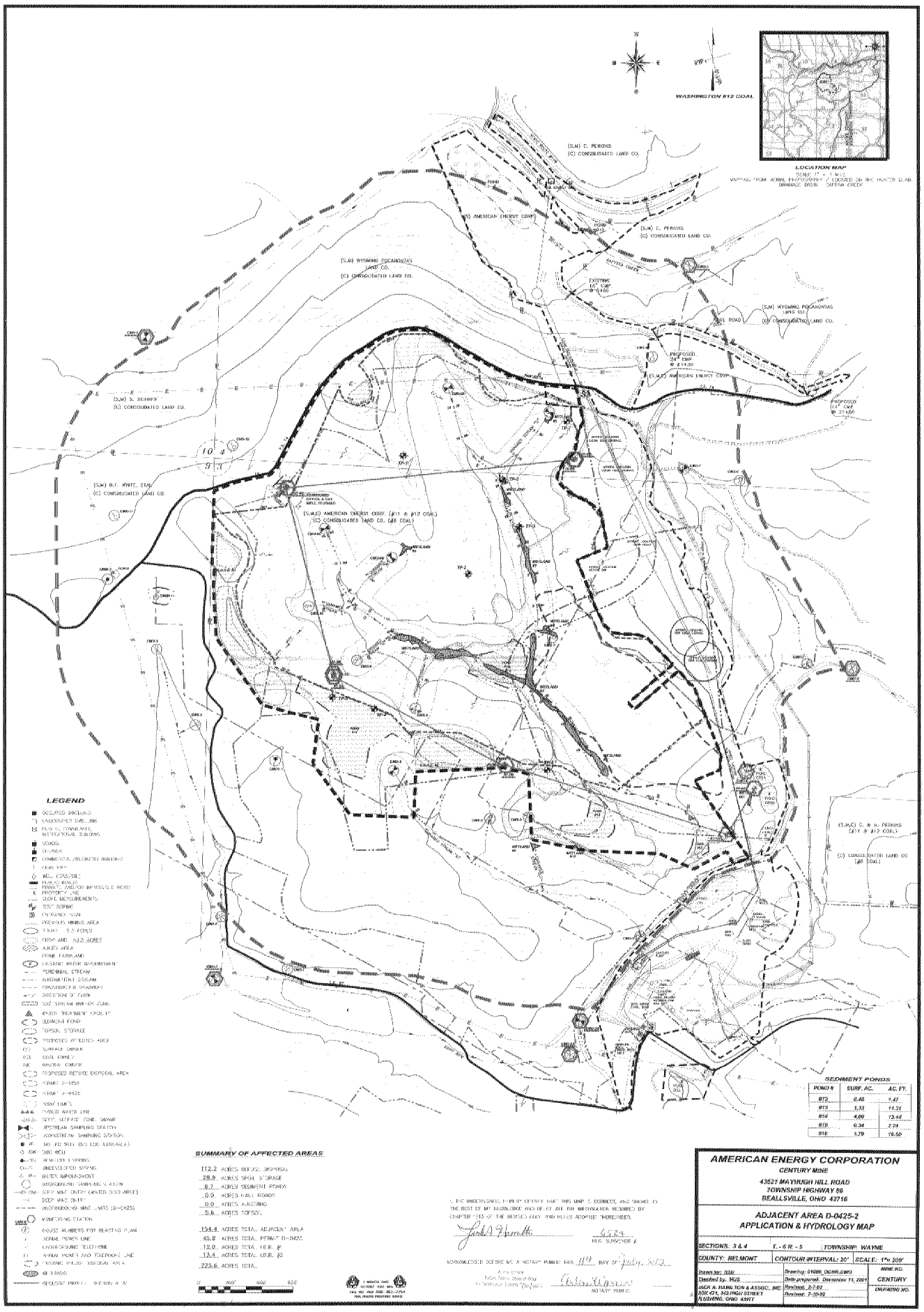
**2000' HYDROLOGIC ISOLATION ZONE**
**CENTURY MINE**
**COAL REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3, 4, 9 & 10<br>SECTIONS: 33 & 34 | T. - 6 R. - 5<br>T. - 5 R. - 4 | TOWNSHIP: WAYNE<br>TOWNSHIP: WASHINGTON |
| COUNTY: BELMONT | CONTOUR INTERVAL: 20' | SCALE: 1" = 500' |
| Drawn by: SSU<br>Checked by: WJS<br>JACK A. HAMILTON & ASSOC., Inc.<br>BOX 471, 242 HIGH STREET<br>FLUSHING, OHIO 43977 | Drawing: 01058F10.DWG<br>Date prepared: July 17, 2001<br>Revised: 7-10-02 | MINE NO.<br>CENTURY<br>PLATE NO.<br>9 |

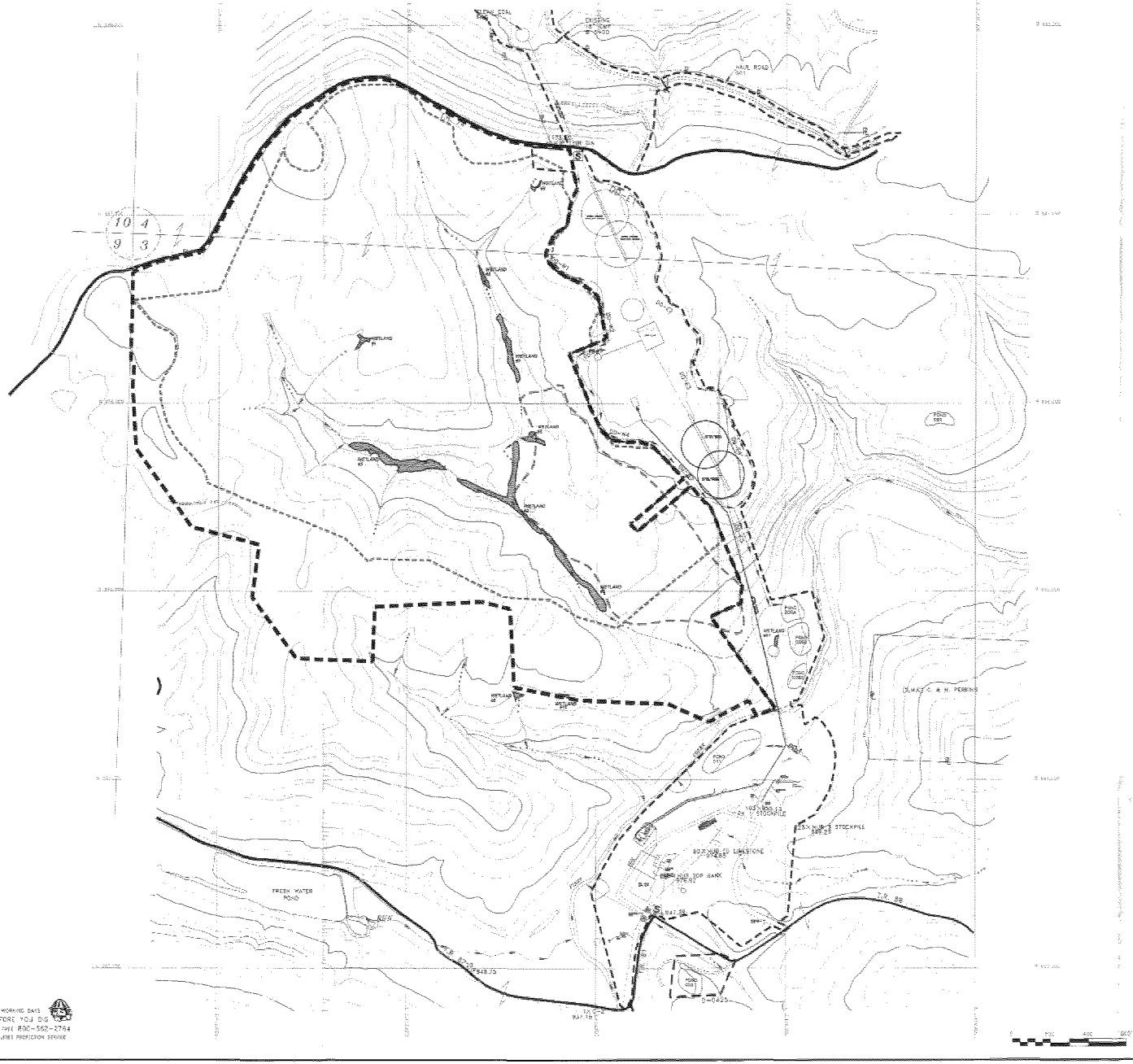

AEC 11899


WASHINGTON #12 COAL
LOCATION MAP
(S,M) C. PERKINS
(C) CONSOLIDATED LAND CO.
(S) AMERICAN ENERGY CORP.
(S,M) WYOMING POCAHONTAS LAND CO.
(C) CONSOLIDATED LAND CO.
EXISTING 18" CMP
PROPOSED 24" CMP
(S,M,C) AMERICAN ENERGY CORP.
PROPOSED 12" CMP
(S,M) S. SKINNER
(C) CONSOLIDATED LAND CO.
(S,M) G.F. WHITE, ETAL
(C) CONSOLIDATED LAND CO.
(S,M,C) AMERICAN ENERGY CORP. (#11 & #12 COAL)
(C) CONSOLIDATED LAND CO. (#8 COAL)
(S,M,C) C. & H. PERKINS (#11 & #12 COAL)
(C) CONSOLIDATED LAND CO. (#8 COAL)
LEGEND
SEDIMENT PONDS
POND # | SURF. AC. | AC. FT.
012 | 0.49 | 1.47
012 | 1.33 | 11.31
014 | 4.05 | 13.44
015 | 8.34 | 2.24
016 | 1.79 | 16.50
SUMMARY OF AFFECTED AREAS
112.2 ACRES REFUSE DISPOSAL
28.9 ACRES SPOIL STORAGE
8.7 ACRES SEDIMENT PONDS
0.0 ACRES HAUL ROADS
0.0 ACRES AUGERING
5.6 ACRES TOPSOIL
154.4 ACRES TOTAL ADJACENT AREA
45.8 ACRES TOTAL PERMIT D-0425
12.0 ACRES TOTAL LB.R. #1
13.4 ACRES TOTAL LB.R. #2
225.6 ACRES TOTAL
0 200 400 600
I, THE UNDERSIGNED, HEREBY CERTIFY THAT THIS MAP IS CORRECT, AND SHOWS IN THE BEST OF MY KNOWLEDGE AND BELIEF ALL THE INFORMATION REQUIRED BY CHAPTER 1513 OF THE REVISED CODE AND RULES ADOPTED THEREUNDER.
6524
REG. SURVEYOR #
ACKNOWLEDGED BEFORE ME A NOTARY PUBLIC THIS 14th DAY OF July, 2002
NOTARY PUBLIC
AMERICAN ENERGY CORPORATION
CENTURY MINE
43621 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716
ADJACENT AREA D-0425-2
APPLICATION & HYDROLOGY MAP
SECTIONS: 3 & 4
T. - 8 R. - 5
TOWNSHIP: WAYNE
COUNTY: BELMONT
CONTOUR INTERVAL: 20'
SCALE: 1"= 200'
Drawn by: SSW
Checked by: WJS
JACK A. HAMILTON & ASSOC., INC.
BOX 471, 342 HIGH STREET
FLUSHING, OHIO 43977
Drawing: 01008_OCNR.DWG
Date prepared: December 11, 2001
Revised: 2-7-02
Revised: 2-10-02
MINE NO.
CENTURY
DRAWING NO.

ASC 11500


WASHINGTON #12 COAL
LOCATION MAP
(S,M) C. PERKINS
(C) CONSOLIDATED LAND CO.
(S,M) WYOMING POCAHONTAS LAND CO.
(C) CONSOLIDATED LAND CO.
(S,M) S. SCHIRER
(C) CONSOLIDATED LAND CO.
(S,M) D.T. WHITE, ETAL
(C) CONSOLIDATED LAND CO.
(S,M,C) AMERICAN ENERGY CORP. (#11 & #12 COAL)
(C) CONSOLIDATED LAND CO. (#8 COAL)
(S,M,C) C. & H. PERKINS
(#11 & #12 COAL)
(C) CONSOLIDATED LAND CO
(#8 COAL)
LEGEND
SUMMARY OF AFFECTED AREAS
112.2 ACRES REFUSE DISPOSAL
28.8 ACRES SPOIL STORAGE
8.7 ACRES SEDIMENT PONDS
0.0 ACRES HAUL ROADS
0.0 ACRES AUGERING
5.6 ACRES TOPSOIL
154.4 ACRES TOTAL ADJACENT AREA
45.8 ACRES TOTAL PERMIT D-0425
12.0 ACRES TOTAL I.B.R. #1
13.4 ACRES TOTAL I.B.R. #2
225.6 ACRES TOTAL
SEDIMENT PONDS
POND # | SURF. AC. | AC. FT.
#12 | 0.48 | 1.47
#13 | 1.33 | 11.31
#14 | 4.00 | 13.44
#15 | 0.34 | 2.24
#16 | 1.79 | 16.50
AMERICAN ENERGY CORPORATION
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 98
BEALLSVILLE, OHIO 43716
ADJACENT AREA D-0425-2
APPLICATION & HYDROLOGY MAP
SECTIONS: 3 & 4
T. - 6 R. - 5
TOWNSHIP: WAYNE
COUNTY: BELMONT
CONTOUR INTERVAL: 20'
SCALE: 1"= 200'
MINE NO.
CENTURY
DRAWING NO.

AEC 11901




## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- WETLANDS

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1189. LIMESTONE CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.
3. ELEVATIONS ARE BASED ON THE ELEVATION OF T & O MONUMENT C-2, POINT NUMBER 1

2 WORKING DAYS BEFORE YOU DIG
CALL TOLL FREE 800-362-2764
OHIO UTILITIES PROTECTION SERVICE

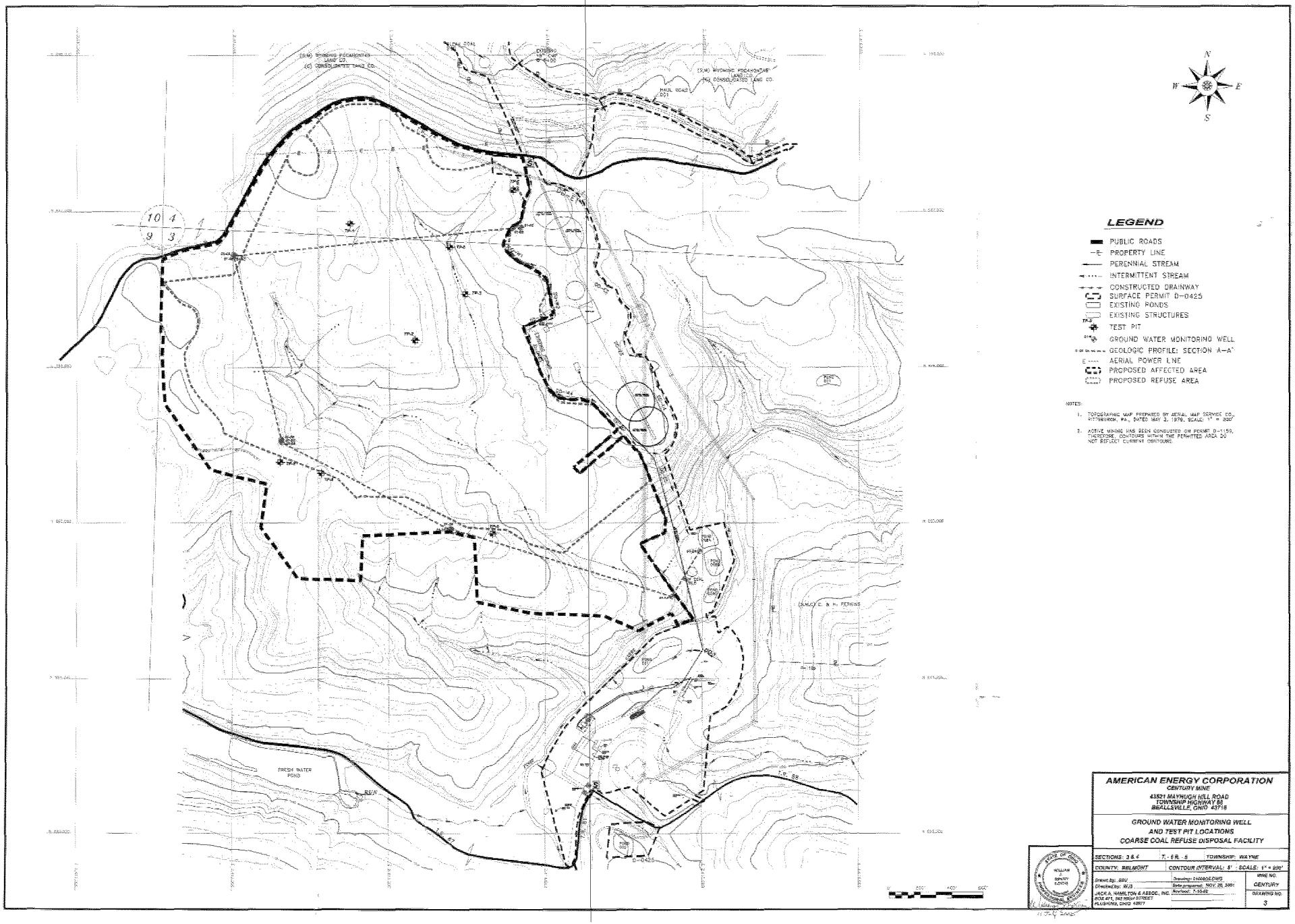
STATE OF OHIO
HELLAR
STEVEN T. HELLAR
7-19-02
REGISTERED
PROFESSIONAL ENGINEER

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 89
BEALLSVILLE, OHIO 43716

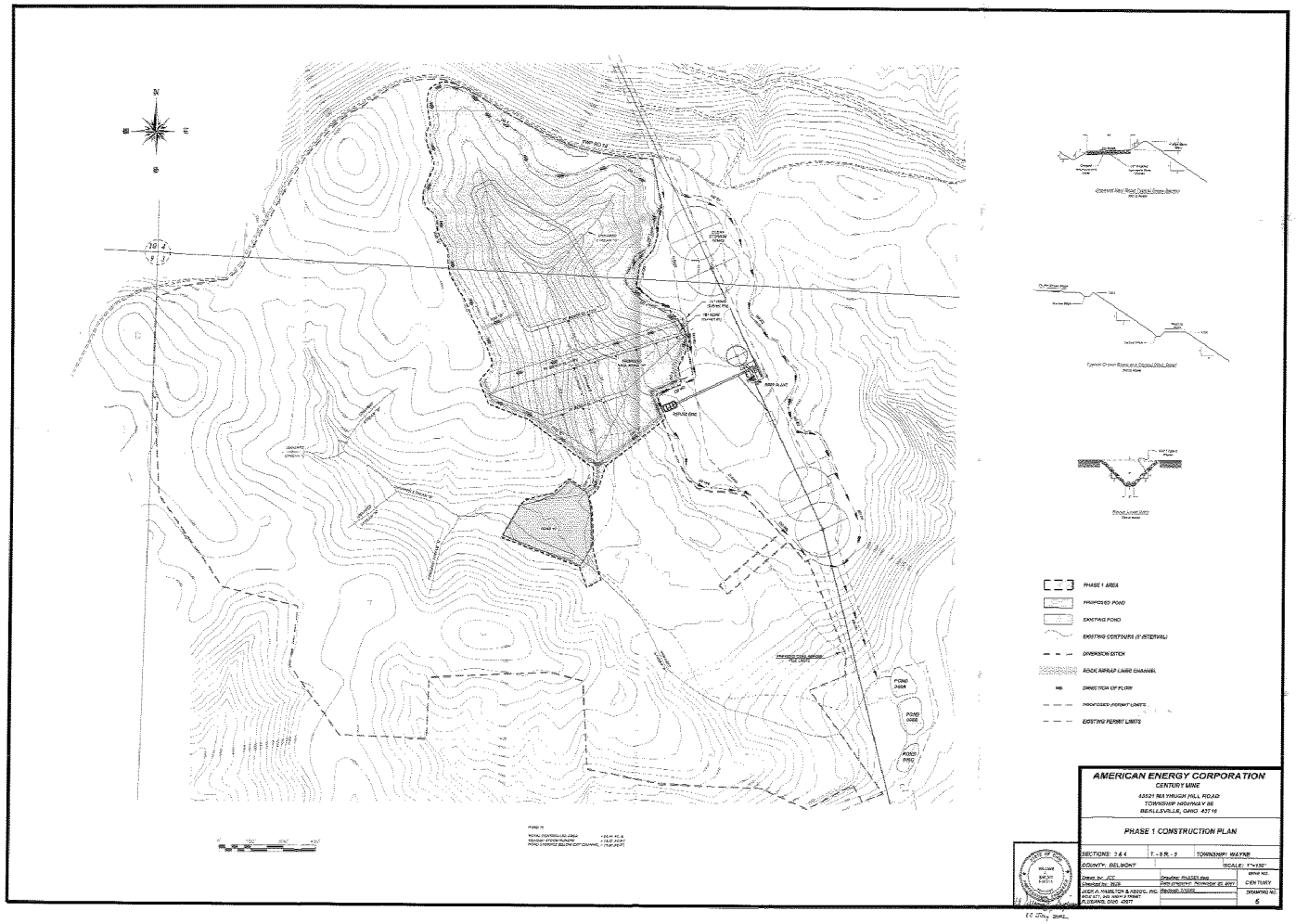
LOCATION MAP WITH EXISTING CONDITIONS
PROPOSED COARSE COAL
REFUSE DISPOSAL FACILITY

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Drawn by: SBU | Drawing: 010503.DWG | MINE NO. |
| Checked by: WJS | Date prepared: NOV. 28, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. | Revised: 7-19-02 | DRAWING NO. |
| SUITE 411, 342 HIGH STREET | | |
| PLUSHING, OHIO 43977 | | 2 |

2 WORK DAYS



N
S
E
W
LEGEND
PUBLIC ROADS
PROPERTY LINE
PERENNIAL STREAM
INTERMITTENT STREAM
CONSTRUCTED DRAINWAY
SURFACE PERMIT D-0425
EXISTING PONDS
EXISTING STRUCTURES
TEST PIT
GROUND WATER MONITORING WELL
GEOLOGIC PROFILE: SECTION A-A'
AERIAL POWER LINE
PROPOSED AFFECTED AREA
PROPOSED REFUSE AREA
NOTES:
1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979. SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159, THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.
FRESH WATER POND
D-0425
AMERICAN ENERGY CORPORATION
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716
GROUND WATER MONITORING WELL
AND TEST PIT LOCATIONS
COARSE COAL REFUSE DISPOSAL FACILITY
SECTIONS: 3 & 4
7 - 6 R - 5
TOWNSHIP: WAYNE
COUNTY: BELMONT
CONTOUR INTERVAL: 5'
SCALE: 1" = 200'
Drawn by: BBU
Checked by: WJS
Drawing: 0100BDE.DWG
Date prepared: NOV. 26, 2001
Revised: 7-10-02
JACK A. HAMILTON & ASSOC., INC.
BOX 471, 242 HIGH STREET
FLUSHING, OHIO 43977
MINE NO.
CENTURY
DRAWING NO.
3



PHASE 1 AREA
PROPOSED POND
EXISTING POND
EXISTING CONTOURS (1' INTERVAL)
DIVERSION DITCH
ROCK RIPRAP LINER CHANNEL
DIRECTION OF FLOW
PROPOSED PERMIT LIMITS
EXISTING PERMIT LIMITS
AMERICAN ENERGY CORPORATION
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 86
BEALLSVILLE, OHIO 43716
PHASE 1 CONSTRUCTION PLAN
SECTIONS: 3 & 4
T - 5 R - 5
TOWNSHIP: WAYNE
COUNTY: BELMONT
SCALE: 1"=150'
Drawn by: JCC
Checked by: BGB
Drawing: PHASE1.dwg
Date drawn: Thursday 01 2017
JACK A. HAMILTON & ASSOC. INC.
Revised: 10/2018
DRAWING NO.
CENTURY
DRAWING NO.
5

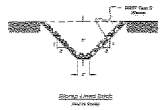

AEC 11904

POND 10

TOTAL WATERSHED AREA = 99.84 AC ±
100-yr/24-hr STORM RUNOFF = 15.47 AC-FT
POND STORAGE BELOW OUT CHANNEL = 16.16 AC-FT

Unpaved Haul Road Typical Cross Section

Typical Cross Slope and Central Ditch Detail



Riprap Lined Ditch

PHASE 1 AREA

PHASE 2 AREA

PROPOSED POND

EXISTING POND

EXISTING CONTOURS (5' INTERVAL)

DIVERSION DITCH

ROCK RIPRAP LINED CHANNEL

DIRECTION OF FLOW

PROPOSED PERMIT LIMITS

EXISTING PERMIT LIMITS

**AMERICAN ENERGY CORPORATION**

CENTURY MINE

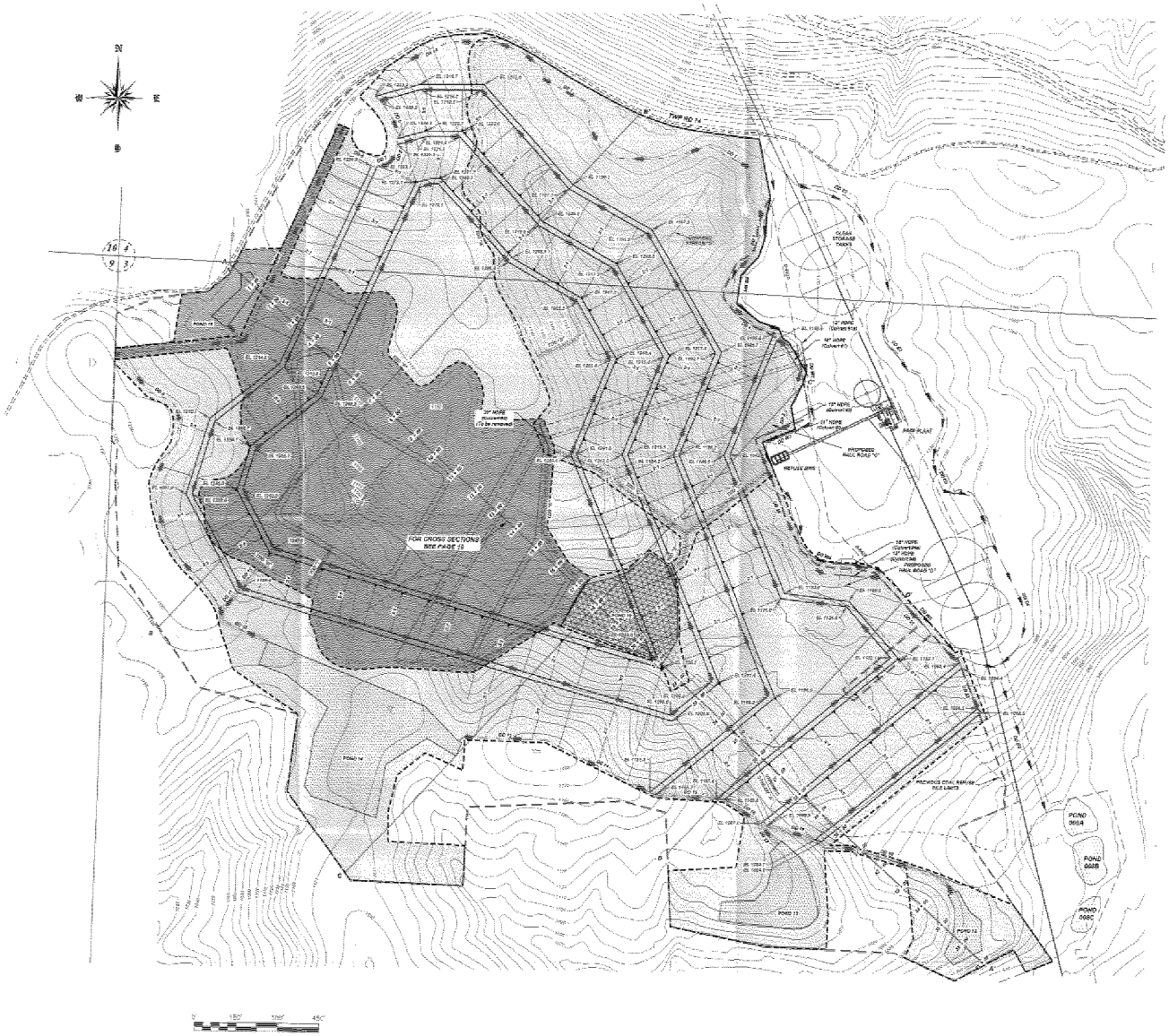
42527 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 66
BEALLSVILLE, OHIO 43716

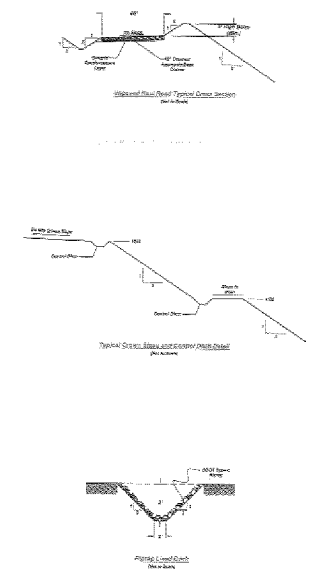
**PHASE 2 CONSTRUCTION PLAN**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 8 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=150' |
| Drawn by: JCC | Drawing: PHASE2.dwg | MINE NO. |
| Checked by: WJS | Date prepared: November 20, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. | Revised: 5/16/02 | DRAWING NO. |
| 1024 8TH, 3RD HIGH STREET | | 7 |
| PLUSHING, OHIO 43977 | | |

STATE OF OHIO
WILLIAM J. SPLITY
E-51015
PROFESSIONAL ENGINEER

10 May 2002




PHASE 1 AREA

PHASE 2 AREA

PHASE 3 AREA

PROPOSED POND

EXISTING POND

EXISTING CONTOURS (5' INTERVAL)

DIVERSION DITCH

ROCK RIPRAP LINED CHANNEL

DIRECTION OF FLOW

PROPOSED PERMIT LIMITS

EXISTING PERMIT LIMITS

**AMERICAN ENERGY CORPORATION**

CENTURY MINE

43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

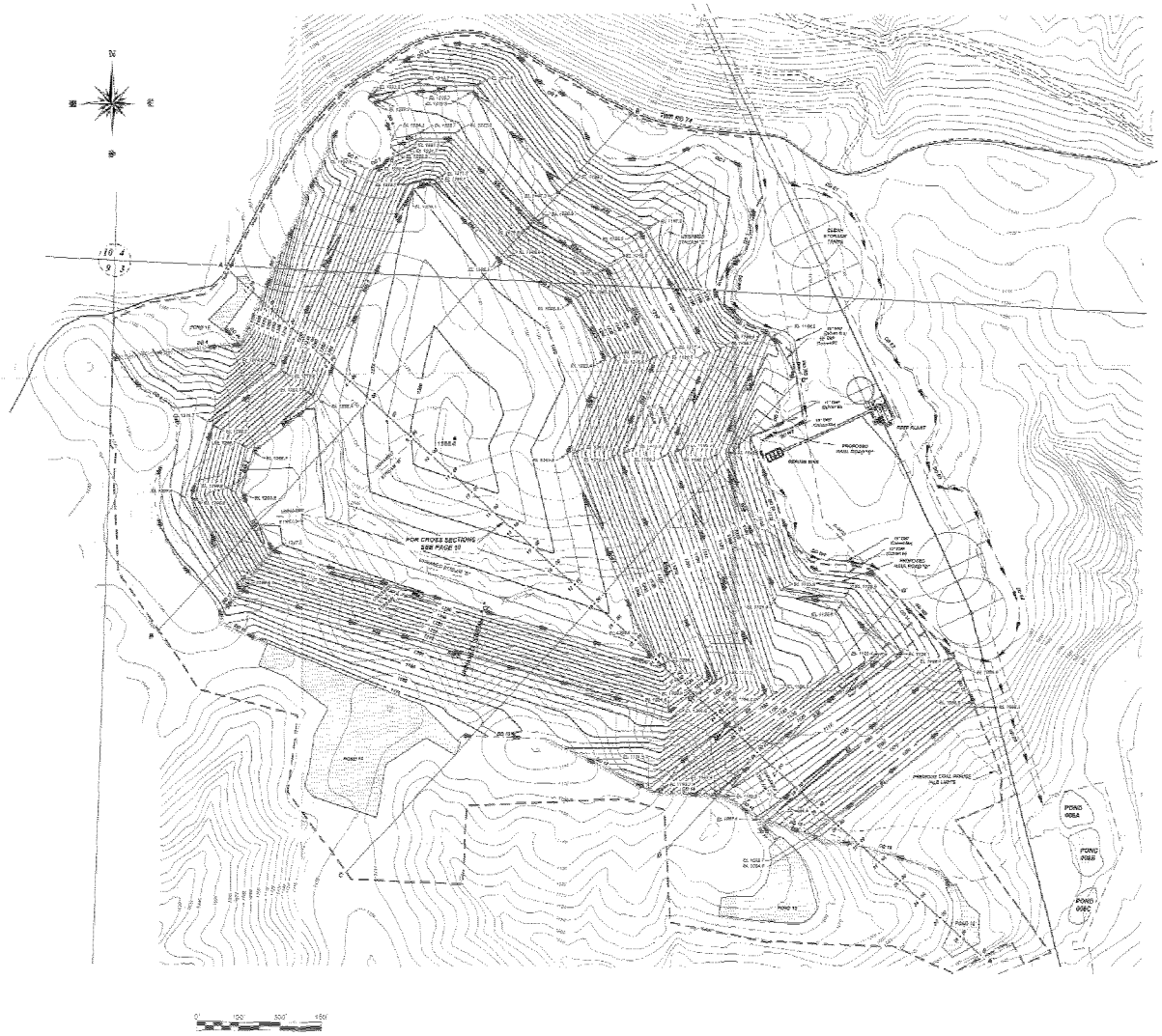
**PHASE 3 CONSTRUCTION PLAN**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=150' |
| Drawn by: JCC | Drawing: PHASE3.dwg | MINE NO. |
| Checked by: WJS | Date prepared: November 26, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 242 HIGH STREET FLUSHING, OHIO 43977 | Revised: 7/15/02 | DRAWING NO. 8 |

STATE OF OHIO
WILLIAM J. BRADY
E-45015
PROFESSIONAL ENGINEER

18 July 2002

AEC 11906



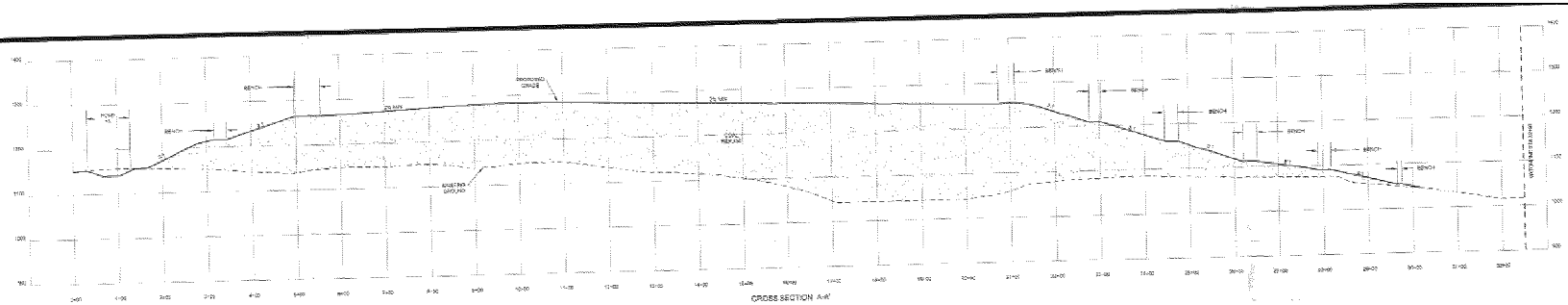

PROPOSED POND
EXISTING POND
EXISTING CONTOURS (5' INTERVAL)
PROPOSED CONTOURS (5' INTERVAL)
PROPOSED DIVERSION DITCH
ROCK RIPRAP LINED CHANNEL
DIRECTION OF FLOW
PROPOSED PERMIT LIMITS
EXISTING PERMIT LIMITS
PROPOSED BENCH

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 86
BEALLSVILLE, OHIO 43716

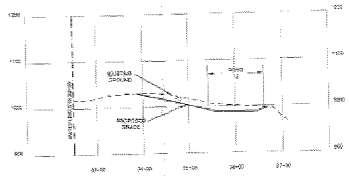
**FINAL CLOSURE PLAN**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=150' |
| DESIGNED BY: JCC | Original FINAL CLOSE Date | SIZE NO. |
| Checked BY: JCC | Date Revised: September 24, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 345 HIGH STREET FLUSHING, OHIO 43977 | Revised: 7/1/03 | DRAWING NO. 9 |

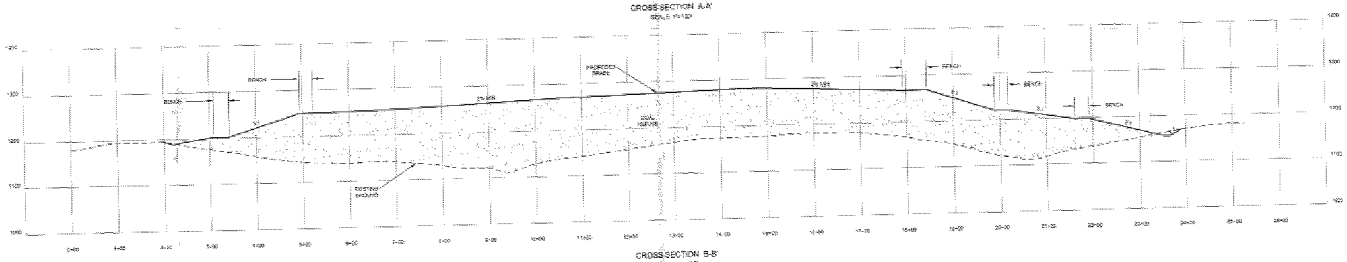
STATE OF OHIO
WILLIAM F. SPLITT
E-5413



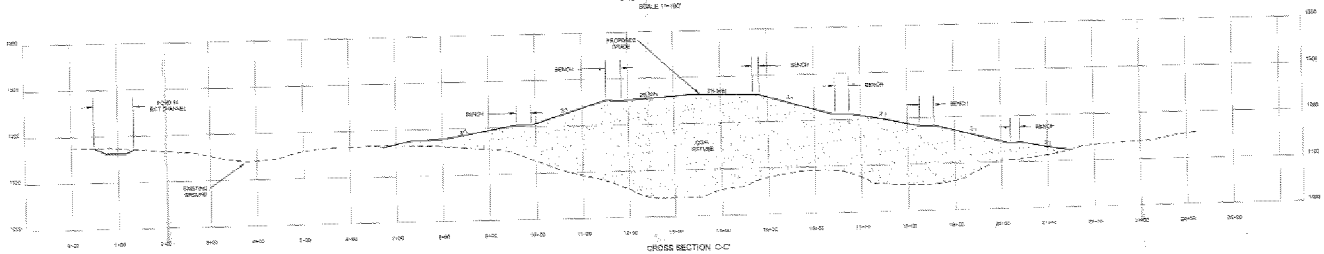

CROSS SECTION A-A'
SCALE 1"=100'



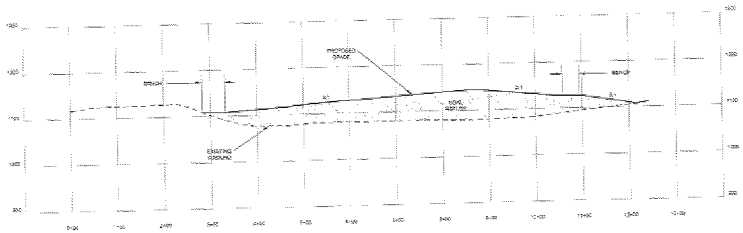

CROSS SECTION A-A'
SCALE 1"=100'




CROSS SECTION B-B'
SCALE 1"=100'




CROSS SECTION C-C'
SCALE 1"=100'




CROSS SECTION D-D'
SCALE 1"=100'

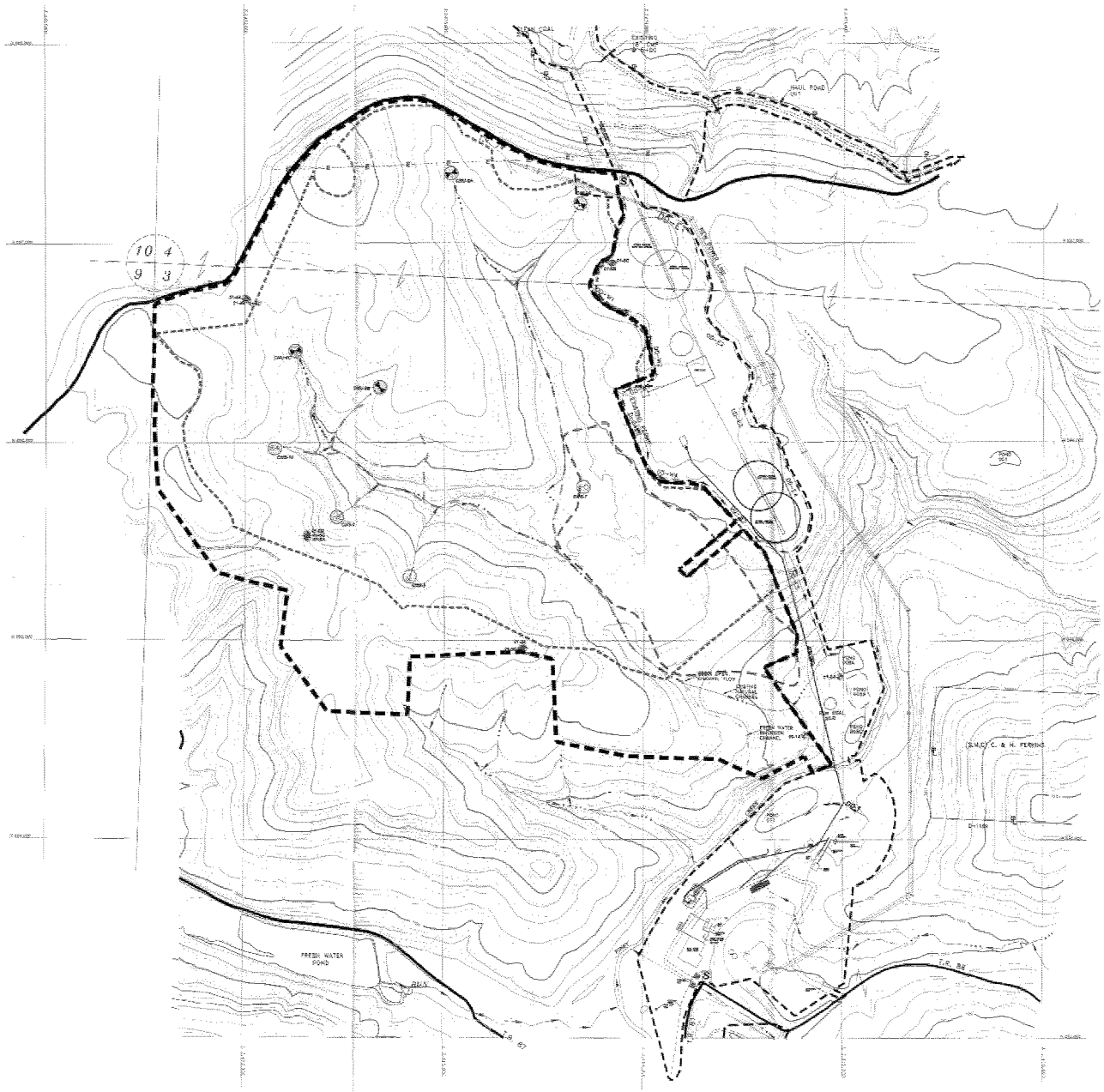
**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

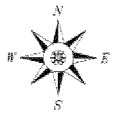
FINAL CLOSURE CROSS-SECTIONS

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=100' |
| Drawn by: JCC | Drawing: XSECTION.dwg | MINE NO. CENTURY |
| Checked by: JCC | Date prepared: November 20, 2001 | |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 342 HIGH STREET FLUSHING, OHIO 43977 | Revised: 7/10/02 | DRAWING NO. 10 |

WILLIAM J. SPLINT 5-6-2002

AEC 11908



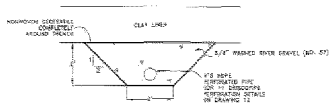




## LEGEND

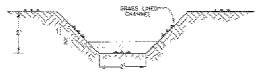
- PUBLIC ROADS
- PROPERTY LINE
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- EXISTING STRUCTURES
- FOUNDATION DRAIN
- GROUND WATER MONITORING WELL
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- SEEP, SEEPAGE ZONE, SWAMP
- U- UPSTREAM SAMPLING STATION
- D- DOWNSTREAM SAMPLING STATION
- W- DRILLED WELL (NO LOG AVAILABLE)
- DW- DUG WELL
- DS- DEVELOPED SPRING
- S- UNDEVELOPED SPRING
- WI- WATER IMPOUNDMENT
- BACKGROUND SAMPLING STATION

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979. SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1158. THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.




FOUNDATION DRAIN SECTION
NOT TO SCALE




TYPICAL SECTION
FRESH WATER DIVERSION CHANNEL
NOT TO SCALE

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

**GROUNDWATER COLLECTION SYSTEM**
**COARSE COAL REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T.-8R.-3 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |

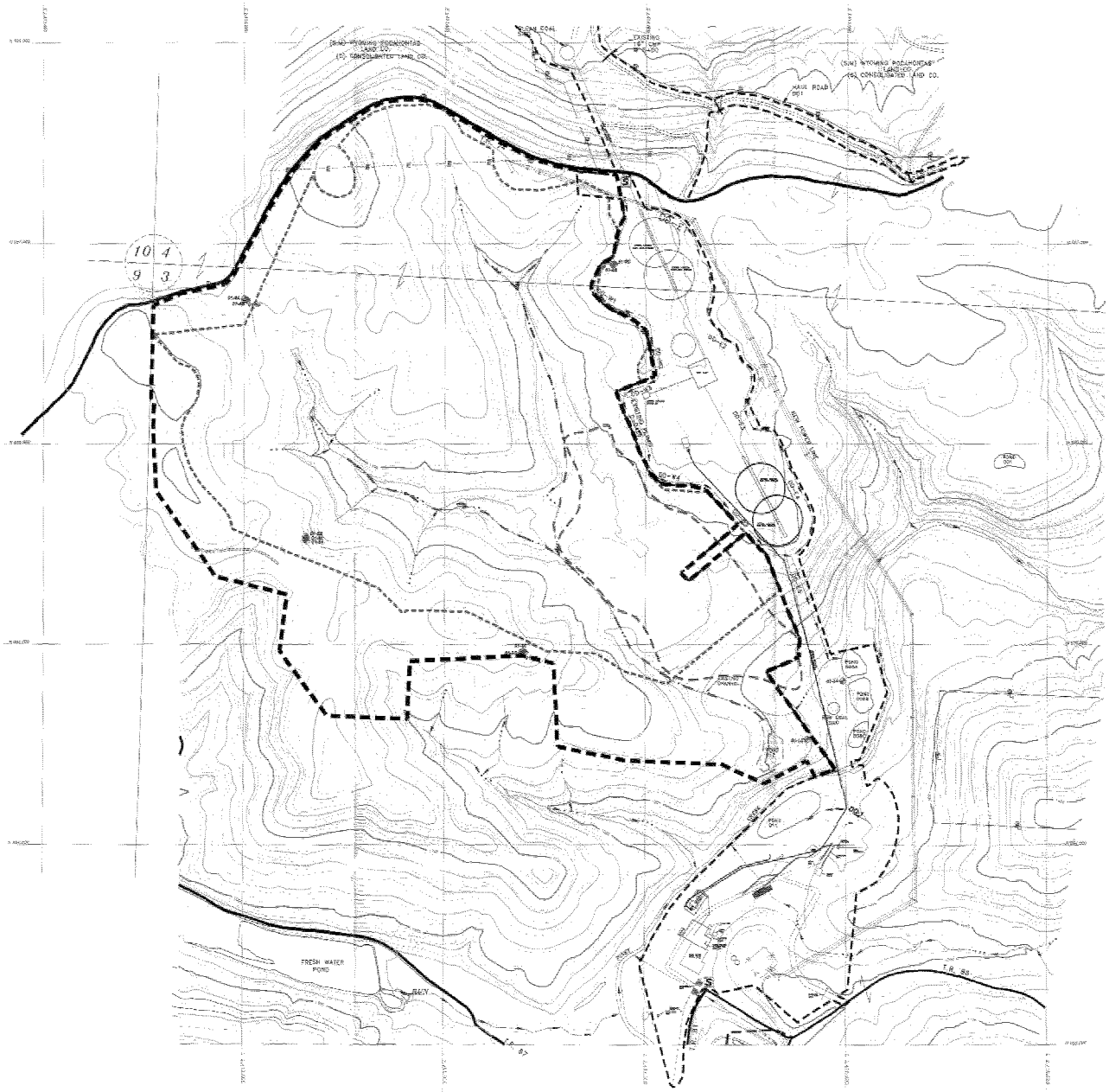
Drawn by: BSU
Checked by: BWS
JACK A. HANSTON & ASSOC., INC.
BOX 477, 342 HIGH STREET
PLAINSVILLE, OHIO 43077

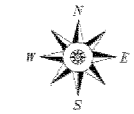
Drawing: 07C0802.DWG
File Drawing: NOV. 28, 2001
Revised: 7-10-02

BINE NO. CENTURY
DRAWING NO. 11

STATE OF OHIO WILLIAM A. SHELBY 5-2-2006 REGISTERED PROFESSIONAL ENGINEER

ARC 00119



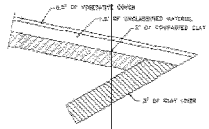




## LEGEND

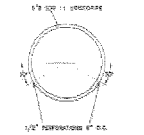
- PUBLIC ROADS
- PROPERTY LINE
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- EXISTING STRUCTURES
- LEACHATE COLLECTION SYSTEM
- GROUND WATER MONITORING WELLS
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0426
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA

NOTES:

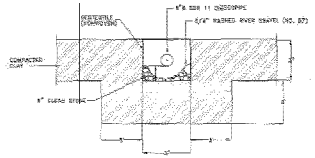
1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1129, THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.




FINAL COVER AND LINER DETAIL




LEACHATE COLLECTION PIPE PERFORATIONS




LEACHATE COLLECTION TRENCH

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 68
BEALLSVILLE, OHIO 43716

**LEACHATE COLLECTION SYSTEM**

**COARSE COAL REFUSE DISPOSAL FACILITY**

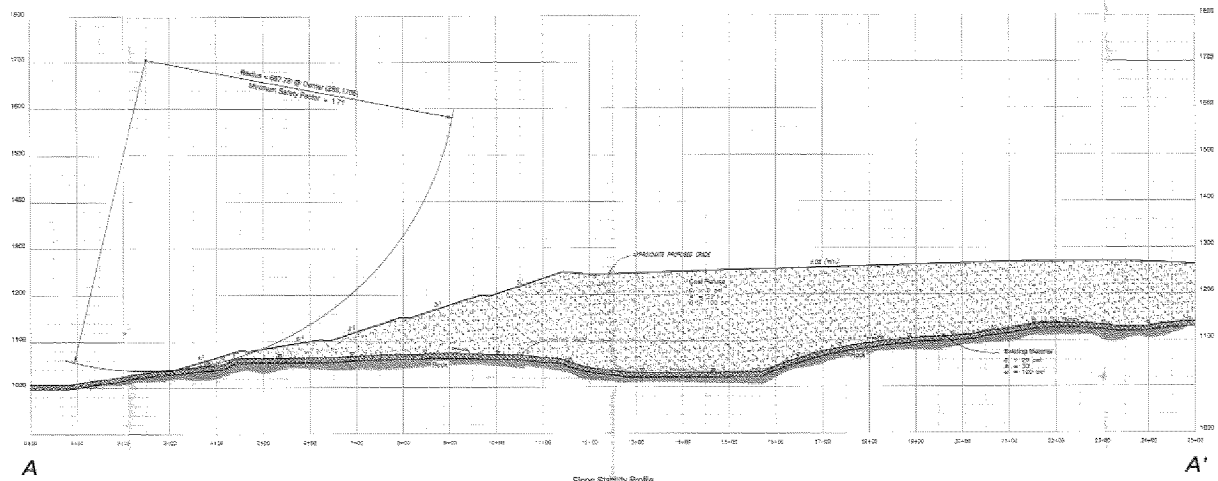
| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |

Drawn by: BGU — Drawing: 97-0924.DWG
Checked by: BGS — Date prepared: NOV. 26, 2001
JACK A. HAMILTON & ASSOC., INC. — Revised: 7-15-02
BOX 471, 340 HIGH STREET
FLUSHING, OHIO 43977

MINE NO. CENTURY
DRAWING NO. 12

STATE OF OHIO — WILLIAM BRUCE SPURGEON — REGISTERED PROFESSIONAL ENGINEER

JAN 11 2010

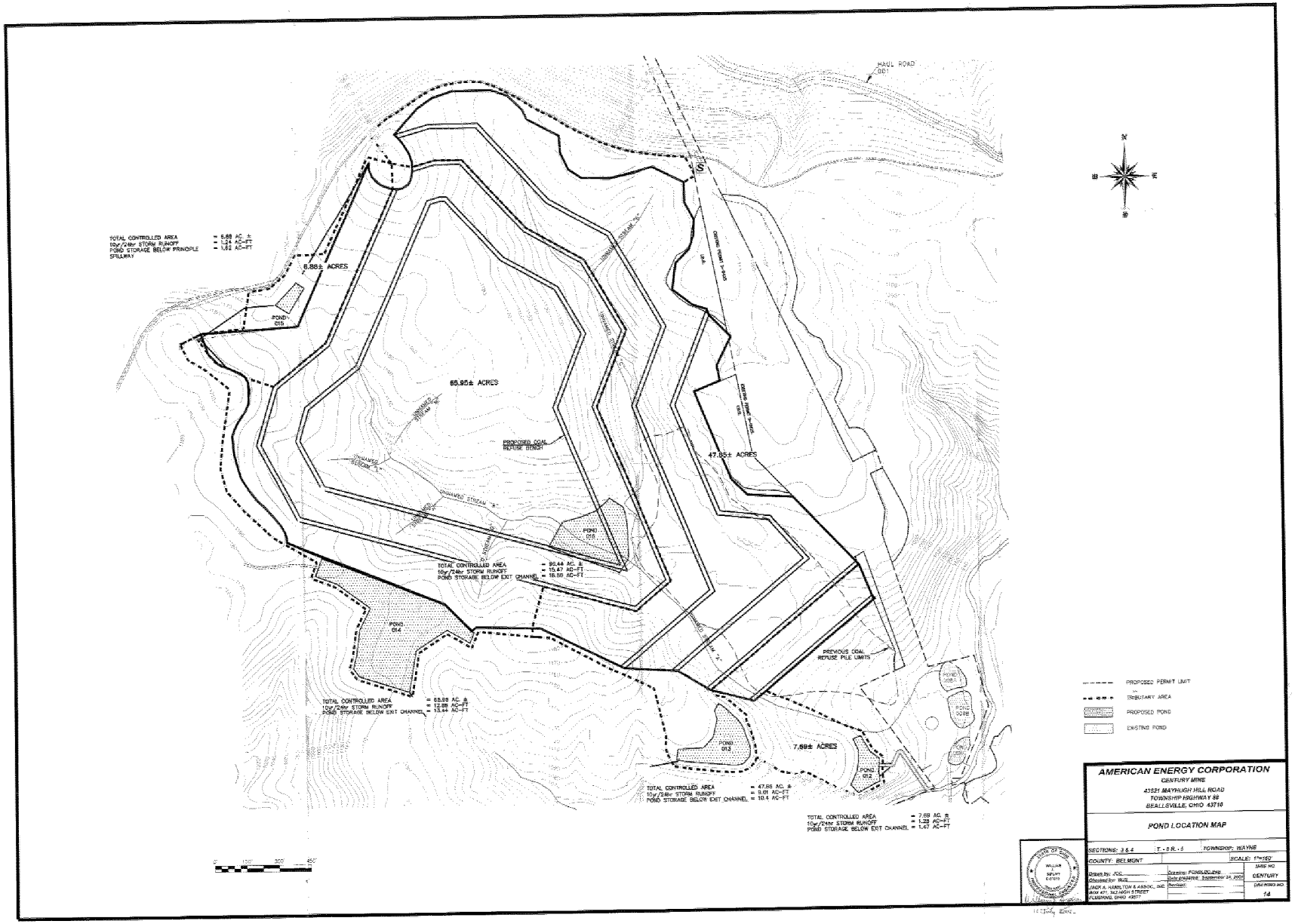



Slope Stability Profile
Scale: 1" = 100'

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 68
BEALLSVILLE, OHIO 43716

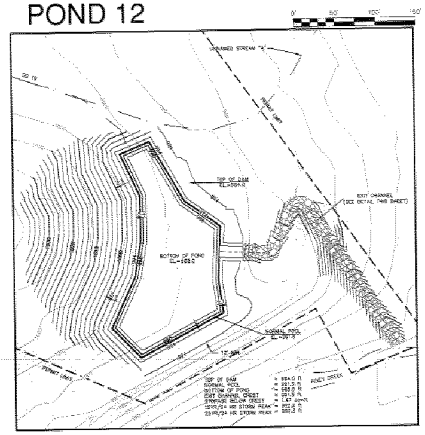
STABILITY ANALYSIS

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 8 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=100' |
| Drawn by: JCC | Drawing: XSECTION.dwg | MINE NO |
| Checked by: WJE | DWG prepared: September 24, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 342 HIGH STREET FLUSHING, OHIO 43977 | Revised: | DRAWING NO. 13 |

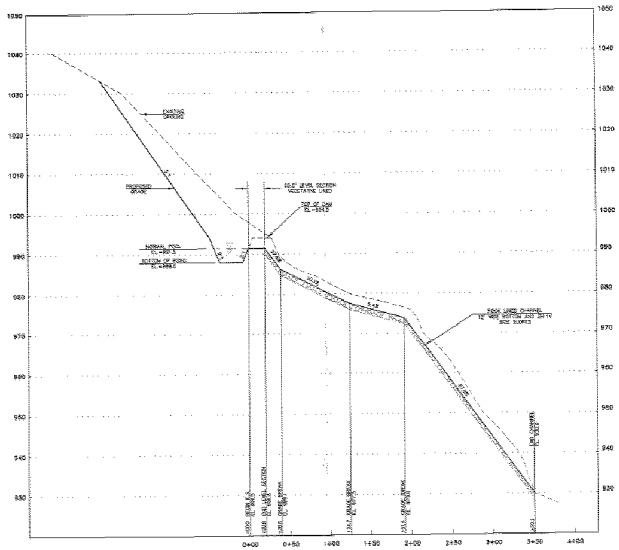

HAUL ROAD (GB1)
TOTAL CONTROLLED AREA = 6.88 AC. ±
10yr/24hr STORM RUNOFF = 1.24 AC-FT
POND STORAGE BELOW PRINCIPLE SPILLWAY = 1.62 AC-FT
6.88± ACRES
POND 015
65.90± ACRES
PROPOSED COAL REFUSE BENCH
UNNAMED STREAM "A"
UNNAMED STREAM "B"
UNNAMED STREAM "C"
UNNAMED STREAM "D"
UNNAMED STREAM "E"
POND 016
TOTAL CONTROLLED AREA = 90.44 AC. ±
10yr/24hr STORM RUNOFF = 15.47 AC-FT
POND STORAGE BELOW EXIT CHANNEL = 16.59 AC-FT
POND 014
TOTAL CONTROLLED AREA = 63.98 AC. ±
10yr/24hr STORM RUNOFF = 12.88 AC-FT
POND STORAGE BELOW EXIT CHANNEL = 13.44 AC-FT
CENTRAL POWER 345KV
47.85± ACRES
PREVIOUS COAL REFUSE PILE LIMITS
POND 013
TOTAL CONTROLLED AREA = 47.86 AC. ±
10yr/24hr STORM RUNOFF = 9.01 AC-FT
POND STORAGE BELOW EXIT CHANNEL = 10.4 AC-FT
7.69± ACRES
POND 012
TOTAL CONTROLLED AREA = 7.69 AC. ±
10yr/24hr STORM RUNOFF = 1.28 AC-FT
POND STORAGE BELOW EXIT CHANNEL = 1.47 AC-FT
POND 018
POND 019
POND 020
N
W
E
S
PROPOSED PERMIT LIMIT
TRIBUTARY AREA
PROPOSED POND
EXISTING POND
0' 150' 300' 450'
AMERICAN ENERGY CORPORATION
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716
POND LOCATION MAP
SECTIONS: 3 & 4
T. - 8 R. - 5
TOWNSHIP: WAYNE
COUNTY: BELMONT
SCALE: 1"=750'
DRAWN BY: JCC
Checked by: MJC
Date prepared: September 24, 2003
JACK A. HAMILTON & ASSOC., INC.
800W 4TH, MAYHUGH STREET
PLEASANT, OHIO 43577
MINE NO.
CENTURY
DRAWING NO.
14
WILLIAM J. DEPUY
E-24966
STATE OF OHIO
14 July 2004

ABT 11922

## POND 12

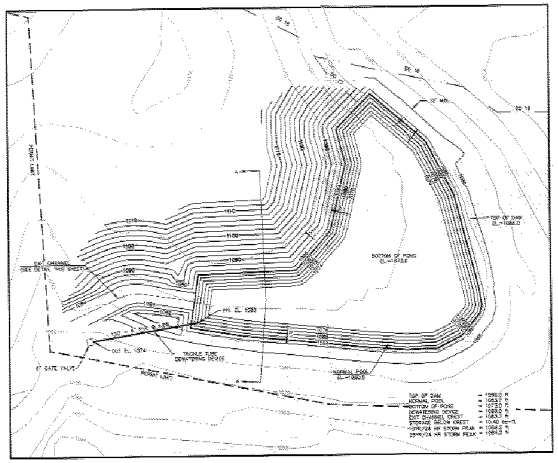


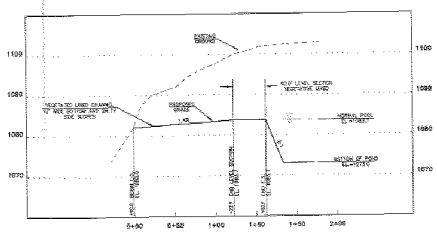

SCALE: 1" = 50'
CONTOUR INTERVAL = 2'




Exit Channel Profile
Scale: 1" = 50' Horizontal
1" = 10' Vertical

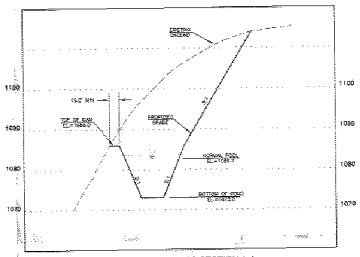
## POND 13




Exit Channel Profile
Scale: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | Elev/Grdx | Discharge | Min. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|---|
| EXIT CHANNEL | 1.4% | 11.8 cfs | 1.7 ft | 3.7 fps | Vegetated Lined | |




EXCAVATION CROSS SECTION A-A
Scale: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | Elev/Grdx | Discharge | Min. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|---|
| EXIT CHANNEL | 1.4% | 11.8 cfs | 1.7 ft | 3.7 fps | Vegetated Lined | |
| | 1.4% | 11.8 cfs | 0.3 ft | 4.5 fps | Rock Lined | |
| | 5.4% | 11.8 cfs | 0.3 ft | 4.5 fps | Rock Lined | |
| | 11.0% | 11.8 cfs | 0.3 ft | 4.5 fps | Rock Lined | |

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYNUGM MILL ROAD
TOWNSHIP HIGHWAY 55
BEALLSVILLE, OHIO 43716

**POND 12 & 13 PLAN AND PROFILE**

SECTIONS: 2 & 4 | T. - 4 R. - 5 | TOWNSHIP: WAYNE
COUNTY: BELMONT | SCALE: AS SHOWN

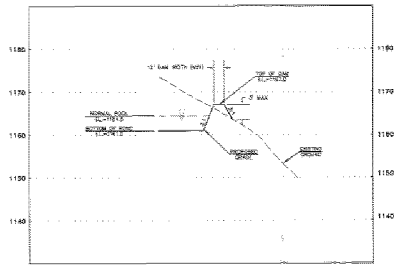
Drawn By: JCC | Drawing: PondTables
Checked By: RLB | Date prepared: September 24, 2002
JACK A. HOBBS, PDP & ASSOC., INC. | Revised: 7/10/02
ACH ATL 342 MAIN STREET
FLUSHING, OHIO 43977

BOND NO.
CENTURY
DRAWING NO.
15

STATE OF OHIO
RICHARD L. BUTLER
E-2147
REGISTERED
PROFESSIONAL ENGINEER

ACE 11573

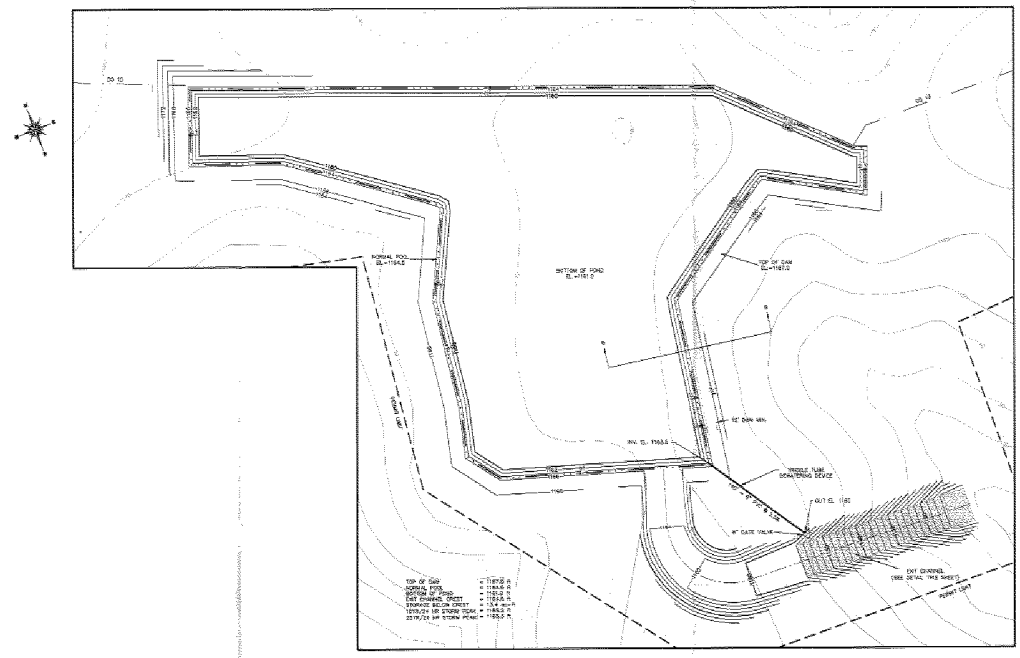
# POND 14



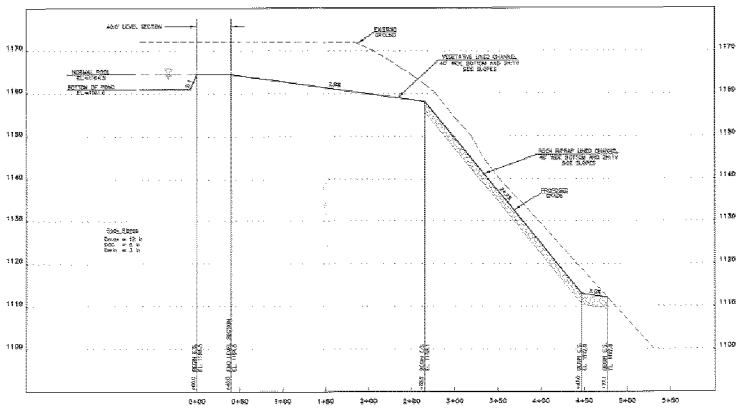

DAM CROSS SECTION B-B

Scale: 1" = 10' Horizontal
1" = 10' Vertical

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EXIT CHANNEL | 2.5% | 66.00 cfs | 0.5 ft | 3.0 fps | Vegetative Channel |
| | 2.5% | 66.00 cfs | 0.5 ft | 3.0 fps | TYPE C RIPRAP |
| | 2.5% | 66.00 cfs | 0.7 ft | 3.0 fps | TYPE C RIPRAP |




SCALE: 1" = 50'
CONTOUR INTERVAL = 2'




Exit Channel Profile

Scale: 1" = 50' Horizontal
1" = 10' Vertical

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43281 MAYNEIGH HILL ROAD
TOWNSHIP HIGHWAY 68
BEALLSVILLE, OHIO 43716

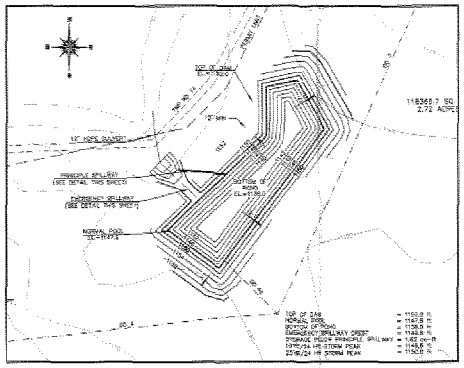
POND 14 PLAN AND PROFILE

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: AS SHOWN |
| Drawn by: JCC | Drawings Plotted Date | MINE NO. |
| Designed by: WCR | Date prepared: November 25, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. | Revised: 1/13/03 | DRAWING NO. |
| 808 4TH. SAYNEIGH STREET | | |
| FLUSHING, OHIO 43977 | | 15 |

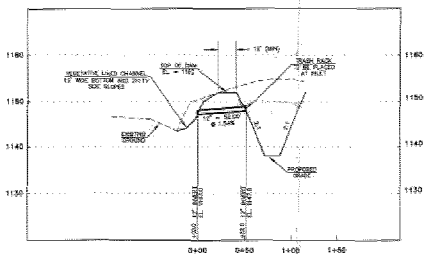
WILLIAM C. SCHUTT
SURVEY
S-8703

ABC 11314

# POND 15

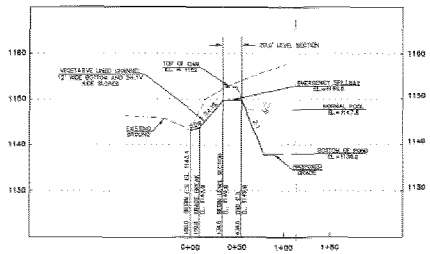



SCALE: 1" = 50'
CONTOUR INTERVAL = 2'




Principle Spillway Profile

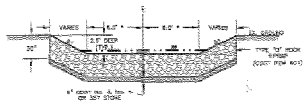
Scale: 1" = 50' Horizontal
1" = 10' Vertical




Emergency Spillway Profile

Scale: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EMERGENCY SPILLWAY | 2.4 % | 9.8 cfs | 0.7 ft | 2.2 fps | Vegetative Channel |
| | 0.50 | 19.8 cfs | 0.9 ft | 1.7 fps | Vegetative Channel |




TYPICAL EXIT CHANNEL SECTION

NOT TO SCALE
NO SCALE

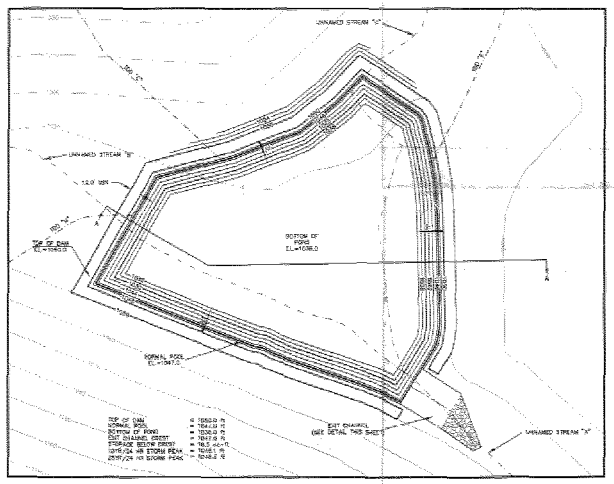
TYPICAL EXIT CHANNEL SECTION

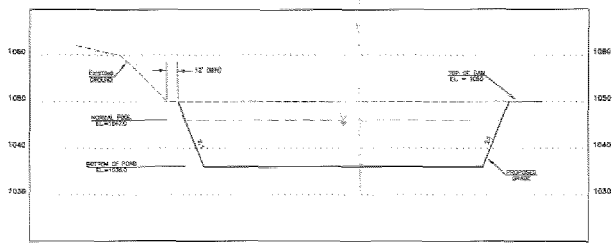
VEGETATIVE LINED
NO SCALE

* POND 14 & 16 DIMENSION = 90'

** SEE NOMINAL POND CHARTS FOR
25YR, 24HR FLOW DEPTHS

# POND 16

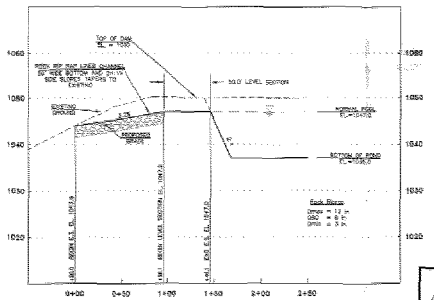



EXCAVATION CROSS SECTION A-A

Scale: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EXIT CHANNEL | 1.2% | 132 cfs | 1.6 ft | 5.6 fps | Rock Riprap |
| | | | | | |




Exit Channel Profile

Scale: 1" = 50' Horizontal
1" = 10' Vertical

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHIGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

POND 15 & 16 PLAN AND PROFILE

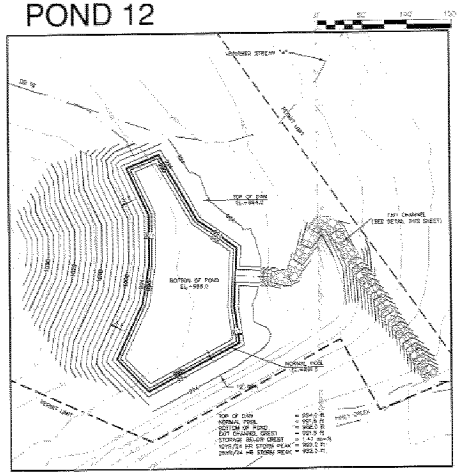
| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: AS SHOWN |
| Drawn by: JCC | Drawing: Pond1.dwg | MINE NO. |
| Checked by: WJS | Date prepared: September 24, 2001 | CENTURY |
| JACK A. HAMILTON & ASSOC. INC. | Revised: 11-1-02 | DRAWING NO. |
| BOX 471, 540 NORTH STREET | | 17 |
| POLAND, OHIO 44514 | | |

STATE OF OHIO
WILLIAM
SPURGEON
SCHOTT
No. 6200
REGISTERED
PROFESSIONAL ENGINEER

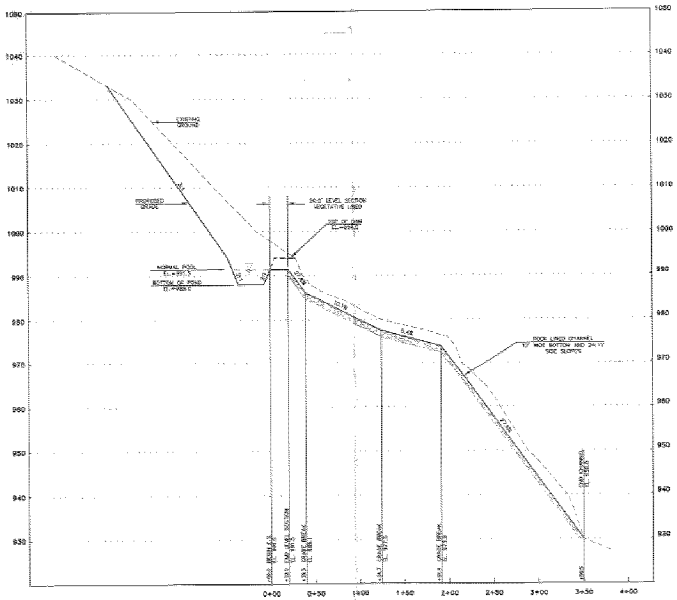
11 July 2002

ARC 11915

# POND 12

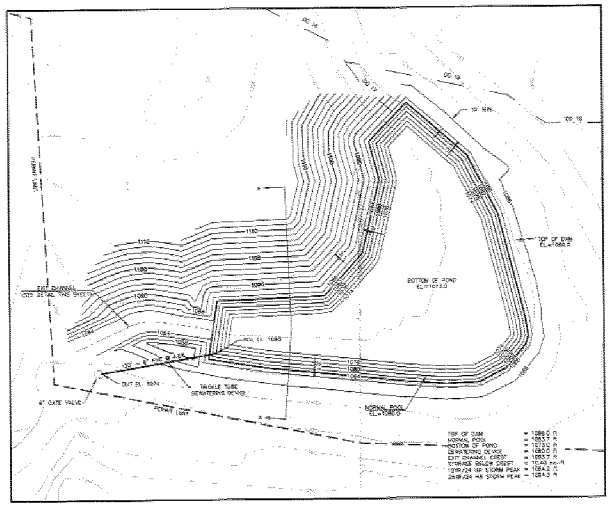


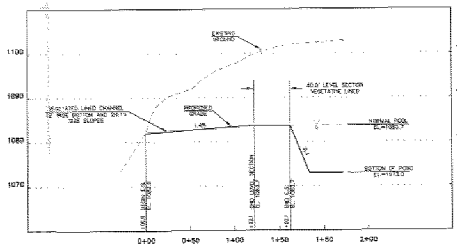

SCALE: 1" = 50'
CONTOUR INTERVAL = 2'




Exit Channel Profile
Scale: 1" = 50' Horizontal
1" = 10' Vertical

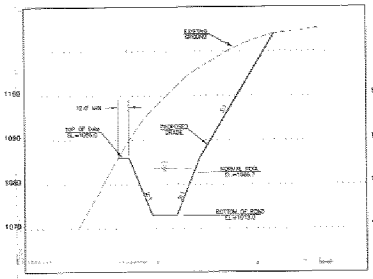
# POND 13




Exit Channel Profile
Scale: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Min. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EXIT CHANNEL | 1.0% | 10.0 cfs | 0.4 ft | 5.5 fps | Reinforced Channel |




EXCAVATION CROSS SECTION A-A
Scale: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EXIT CHANNEL | 0.7% | 10.0 cfs | 0.5 ft | 3.3 fps | Rock Riprap |
| | 10.1% | 10.0 cfs | 0.3 ft | 4.0 fps | Rock Riprap |
| | 4.0% | 10.0 cfs | 0.3 ft | 4.3 fps | Rock Riprap |
| | 7.0% | 10.0 cfs | 0.3 ft | 5.2 fps | Rock Riprap |

STATE OF OHIO
WILLIAM
BRALICH
E-49914
REGISTERED
PROFESSIONAL ENGINEER

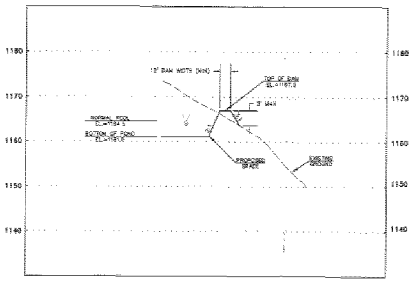
**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43821 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 82
BEALLSVILLE, OHIO 43716

POND 12 & 13 PLAN AND PROFILE

SECTIONS: 3 & 4 T. - 6 R. - 5 TOWNSHIP: WAYNE
COUNTY: BELMONT SCALE: AS SHOWN
MINE NO. CENTURY
Drawn by: JCC Drawing: POND1.dwg
Checked by: WB Date prepared: September 24, 2001
JACK A. HAMILTON & ASSOC., INC. Revised: 7/10/2002
BOX 171, 242 HIGH STREET
FLUSHING, OHIO 43977
DRAWING NO. 13

ABC 11916

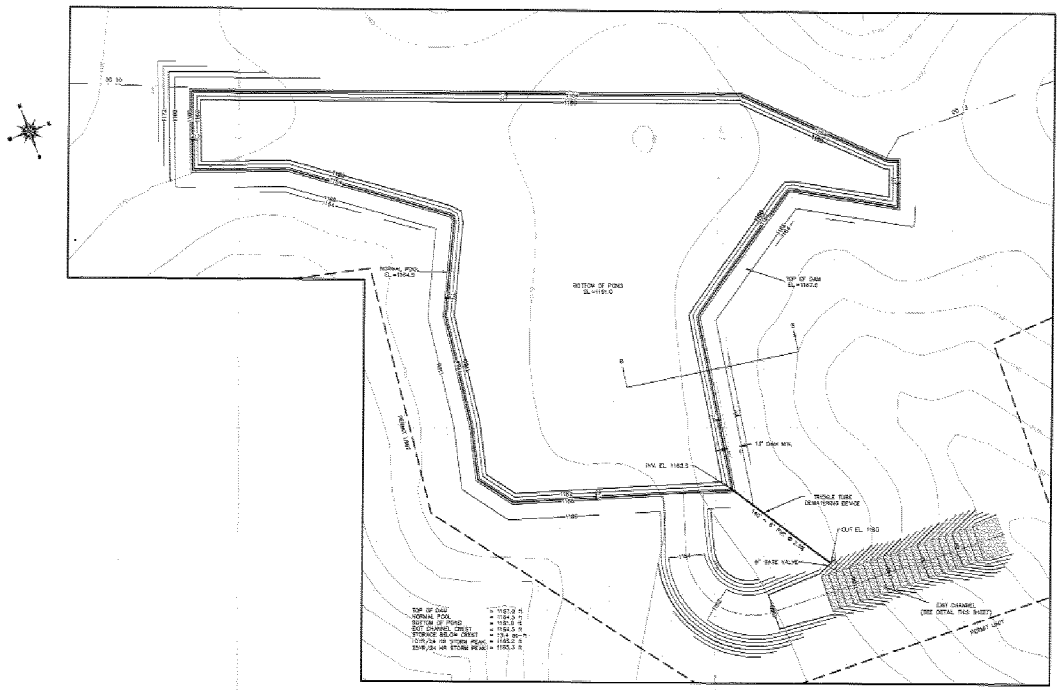
# POND 14



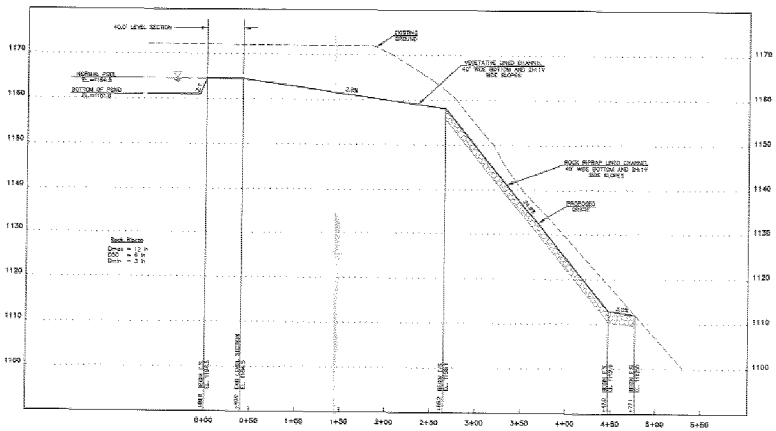

DAM CROSS SECTION B-B

Scales: 1" = 50' Horizontal
1" = 10' Vertical

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EXIT CHANNEL | 2.0% | 60.80 cfs | 0.9 ft. | 3.1 fps | Vegetative Channel |
| | 2.0% | 60.80 cfs | 0.6 ft. | 5.8 fps | Type D Stone Riprap |
| | 2.0% | 60.80 cfs | 0.3 ft. | 5.8 fps | Type D Stone Riprap |




SCALE: 1" = 50'
CONTOUR INTERVAL = 2'




Exit Channel Profile

Scales: 1" = 50' Horizontal
1" = 10' Vertical

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43621 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 60
BEALLSVILLE, OHIO 43716

POND 14 PLAN AND PROFILE

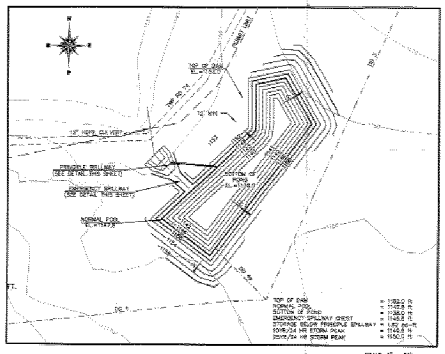
SECTIONS: 3 & 4 T. - 8 R. - 5 TOWNSHIP: WAYNE
COUNTY: BELMONT SCALE: AS SHOWN
Drawn by: JDS Drawing: Pond14.dwg MINE NO.
Checked by: DLR Date Created: November 30, 2007 CENTURY
SHOLA HAMILTON & ASSOC., INC. Revised: 7/3/08
BOX 475, 342 HIGH STREET DRAWING NO.
PLAINWELL, OHIO 45877 16

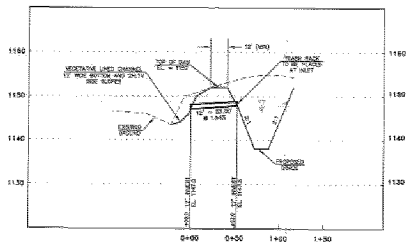
STATE OF OHIO WILLIAM D. HENRY E-49374 Registered Professional Engineer

10 Years Bonds

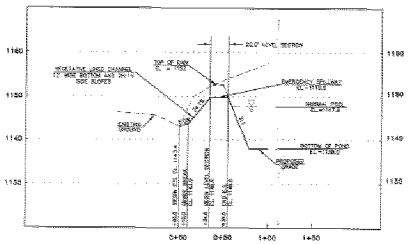
AEC 11947

# POND 15



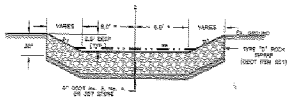


Principle Spillway Profile

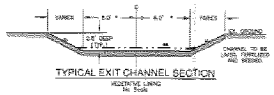


Emergency Spillway Profile

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EMERGENCY SPILLWAY | 2.4 % | 9.5 cfs | 0.5 ft | 3.3 fps | VEGETATIVE CHANNEL |
| | 3.0 % | 9.5 cfs | 0.5 ft | 3.5 fps | VEGETATIVE CHANNEL |



TYPICAL EXIT CHANNEL SECTION

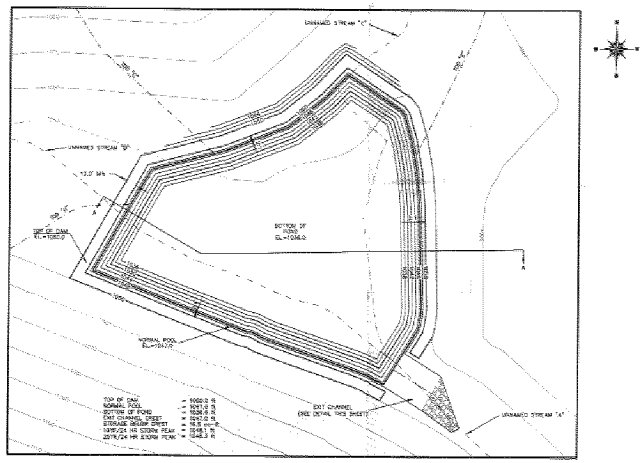


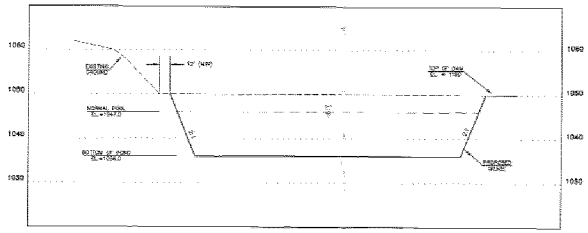
TYPICAL EXIT CHANNEL SECTION

* POND 14 & 16 DIVERSION = 20'

** SEE INDIVIDUAL POND DRAWS FOR 25YR 24HR FLOW DEPTHS

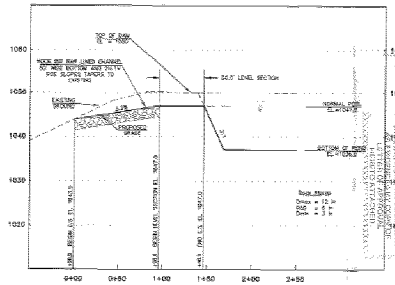
# POND 16





EXCAVATION CROSS SECTION A-A

| Channel | Slope | 25yr/24hr Discharge | Max. Flow Depth | Max. Velocity | Channel Lining |
|---|---|---|---|---|---|
| EXIT CHANNEL | 1.0% | 104 cfs | 1.0 ft | 5.6 fps | ROCK RIPRAP |



Exit Channel Profile

**AMERICAN ENERGY CORPORATION**

CENTURY MINE

43521 MAYNUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

POND 15 & 16 PLAN AND PLOT

SECTION3: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE

COUNTY: BELMONT | SCALE: AS SHOWN

Drawn by: JCC | Drawing: Pond3.dwg | SHEET NO.

Checked by: RVS | Date prepared: September 24, 2001 | CENTURY

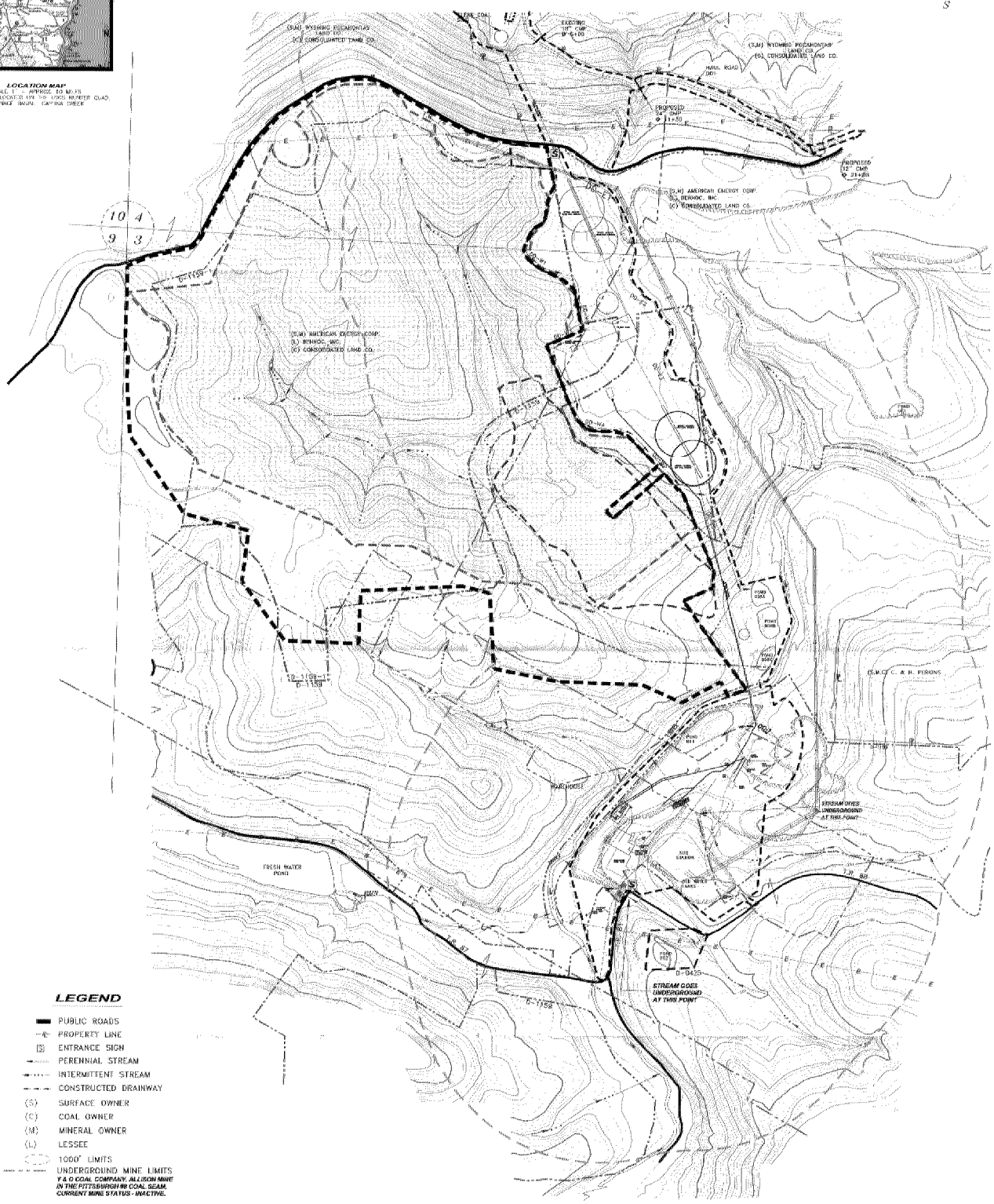
JACK A. HAMILTON & ASSOC., INC. | Revised: | DRAWING NO.

BOX 471, 342 HIGH STREET
PLAINSING, OHIO 43077 | 17

16 July 2002

ABC 11318

**LOCATION MAP**
SCALE: 1" = APPROX. 10 MILES
PERMIT SITE LOCATED ON THE LOGO MONITOR QUAD.
DRAINAGE BASIN: CAPTINA CREEK




## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- (S) SURFACE OWNER
- (C) COAL OWNER
- (M) MINERAL OWNER
- (L) LESSEE
- 1000' LIMITS
- UNDERGROUND MINE LIMITS
  **Y & O COAL COMPANY, ALLISON MINE IN THE PITTSBURGH #8 COAL SEAM. CURRENT MINE STATUS - INACTIVE.**
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- SURFACE PERMIT D-1159
- AREA AFFECTED BY D-1159
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1975, SCALE: 1" = 200'.
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159. THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

2 WORKING DAYS BEFORE YOU DIG
CALL TOLL FREE 800-362-2764
OHIO UTILITIES PROTECTION SERVICE

0' 200' 400' 600'

STATE OF OHIO
WILLIAM H. DEPUY II
STATE OF OHIO
REGISTERED
No. 4697
PROFESSIONAL ENGINEER

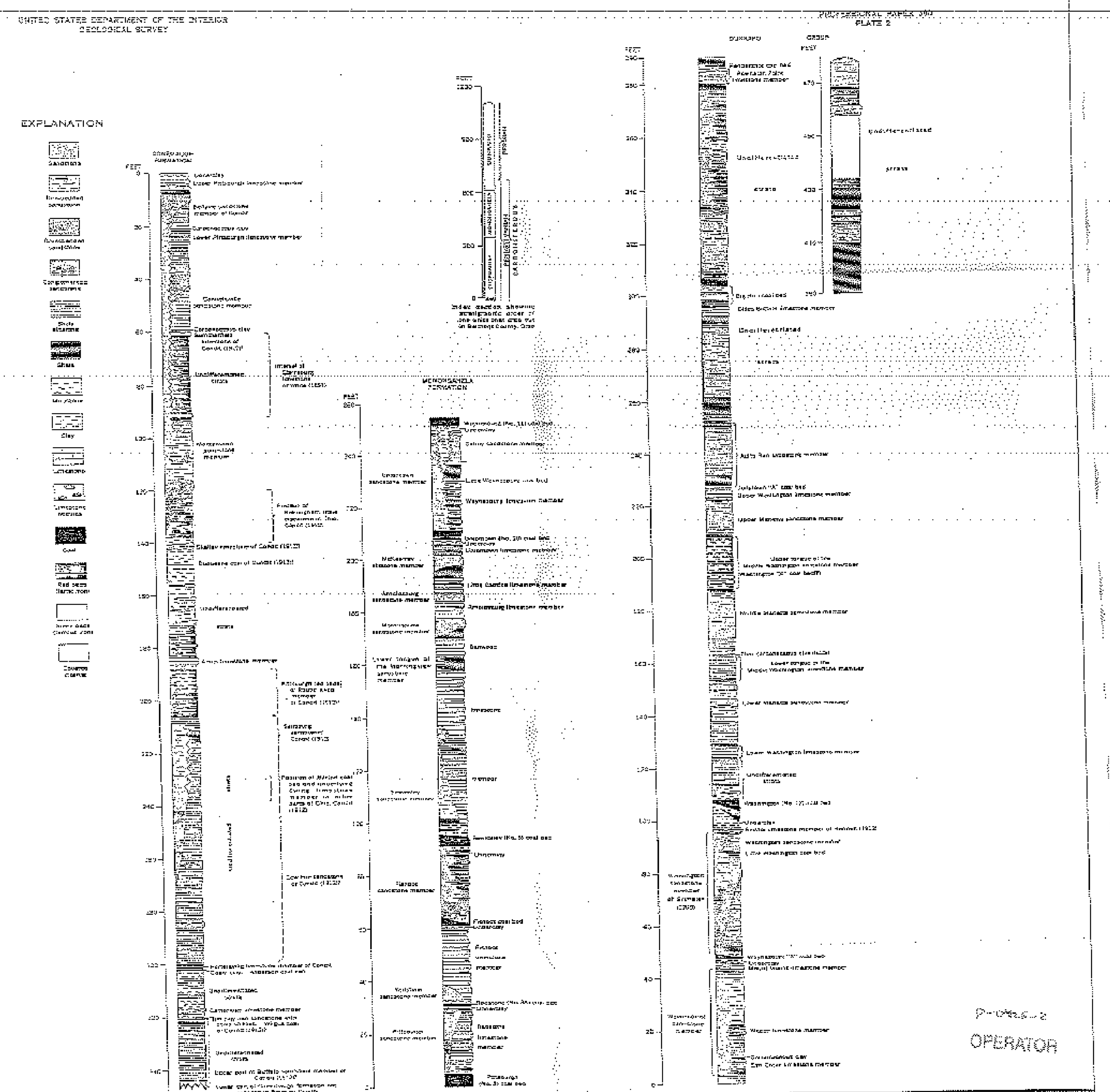
**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 110
AVONMORE, PA. 15618

00425u4

OPERATOR

**LOCATION MAP WITH EXISTING CONDITIONS**
**PROPOSED COARSE COAL**
**REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Drawn by: SBH<br>Checked by: MJG | Drawing: 8100MPT1.DWG<br>Date prepared: April 13, 2001<br>Revised: 7-12-02 | NAME NO.<br>CENTURY |
| JACK A. HAHN, FUH & ASSOC., INC.<br>BOX 471, 343 HIGH STREET<br>FLUSHING, OHIO 43977 | | PLATE NO.<br>1 |




GENERALIZED SECTIONS OF ROCKS THAT CROP OUT IN BELMONT COUNTY, OHIO

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 119
AVONMORE, PA 15616

**GENERALIZED STRATIGRAPHIC COLUMN**
**BELMONT COUNTY, OHIO**

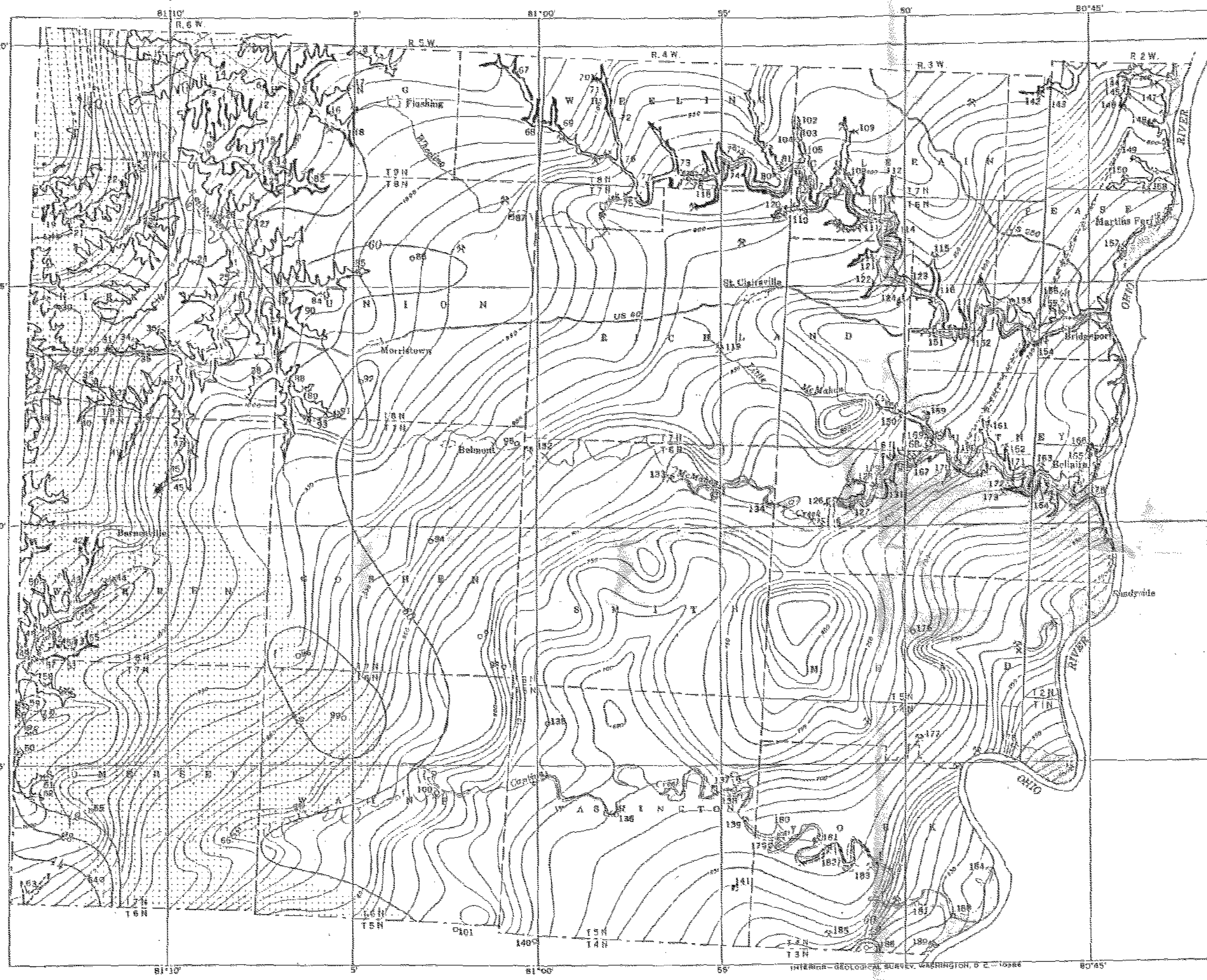
| | | |
|---|---|---|
| Drawn by: USGS PROF. PAPER 380 | Drawing: N/A | MINE NO. |
| Checked by: N/A | Date prepared: 5-23-01 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 342 HIGH STREET FLUSHING, OHIO 43977 | Revised: N/A<br>Vertical Scale: 1" = 20' | PLATE NO. 2 |

STATE OF OHIO
WILLIAM A. SPLAIN
REGISTERED

AEC 11920

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PROFESSIONAL PAPER 380
PLATE 4




EXPLANATION

Alluvium

Coal outcrop
*Dashed where approximately located*

Area underlain by the Pittsburgh sandstone member
*Over much of this area, sandstone and siltstone are the roof rock overlying the Pittsburgh coal bed*

—60—
Coal thickness line, in inches
*These lines are projected across areas where the coal has been removed by erosion*

Strip mine

LOCATION OF MEASURED COAL SECTIONS

×184
Outcrop

○176
Core hole

178
Active mine

177
Abandoned mine

181
Inside large mine

Anticline

Syncline

—— 900 ——
Structure contours
*Drawn on base of Pittsburgh coal bed. Contour interval 10 feet. Dashed where inferred. Datum is mean sea level*

Measured sections 1-189 shown on plate 5

MAP OF THE PITTSBURGH (NO. 8) COAL BED SHOWING DISTRIBUTION AND THE STRUCTURE AND THICKNESS OF THE LOWER BENCH OF THE BED IN BELMONT COUNTY, OHIO

SCALE 1:125 000

2 1 0 2 4 6 MILES

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 119
AVONMORE, PA 15618

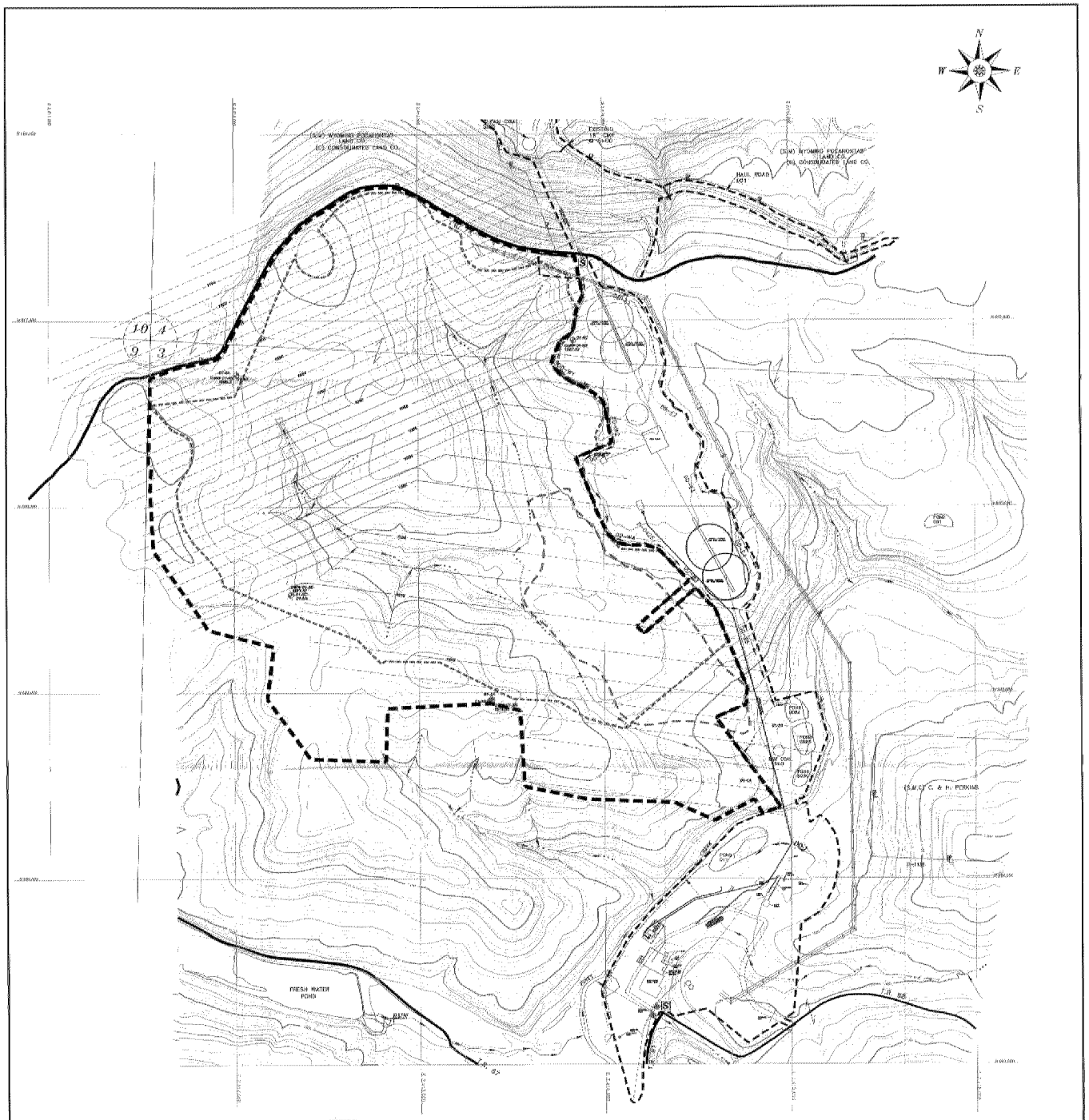
**STRUCTURE CONTOUR MAP**
**PITTSBURGH No. 8 COAL BED**
**BELMONT COUNTY, OHIO**

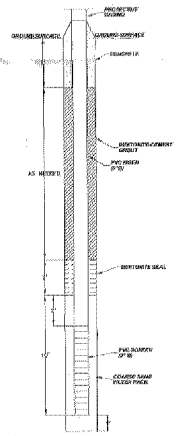
| | | |
|---|---|---|
| Drawn by: USGS PROF. PAPER 380 | Drawing: N/A | MINE NO. |
| Checked by: N/A | Date prepared: 6-20-01 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 342 HIGH STREET FLUSHING, OHIO 43977 | Revised: N/A<br>Scale: 1 : 125000 | PLATE NO.<br>3 |

SEAL

OPERATOR

AEC 11921




TYPICAL WELL CONSTRUCTION

## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- STRUCTURE CONTOURS CONTOUR INTERVAL = 1'
- ESTIMATED STRUCTURE CONTOURS

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1978, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159, THEREFORE, CONTOURS WITHIN THE PERMITED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**

CENTURY MINE
43521 Mayhugh Hill Road
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

00425-2

OPERATOR

**STRUCTURE CONTOUR MAP**
**WASHINGTON (#12) COAL BED**
**COAL REFUSE DISPOSAL FACILITY**

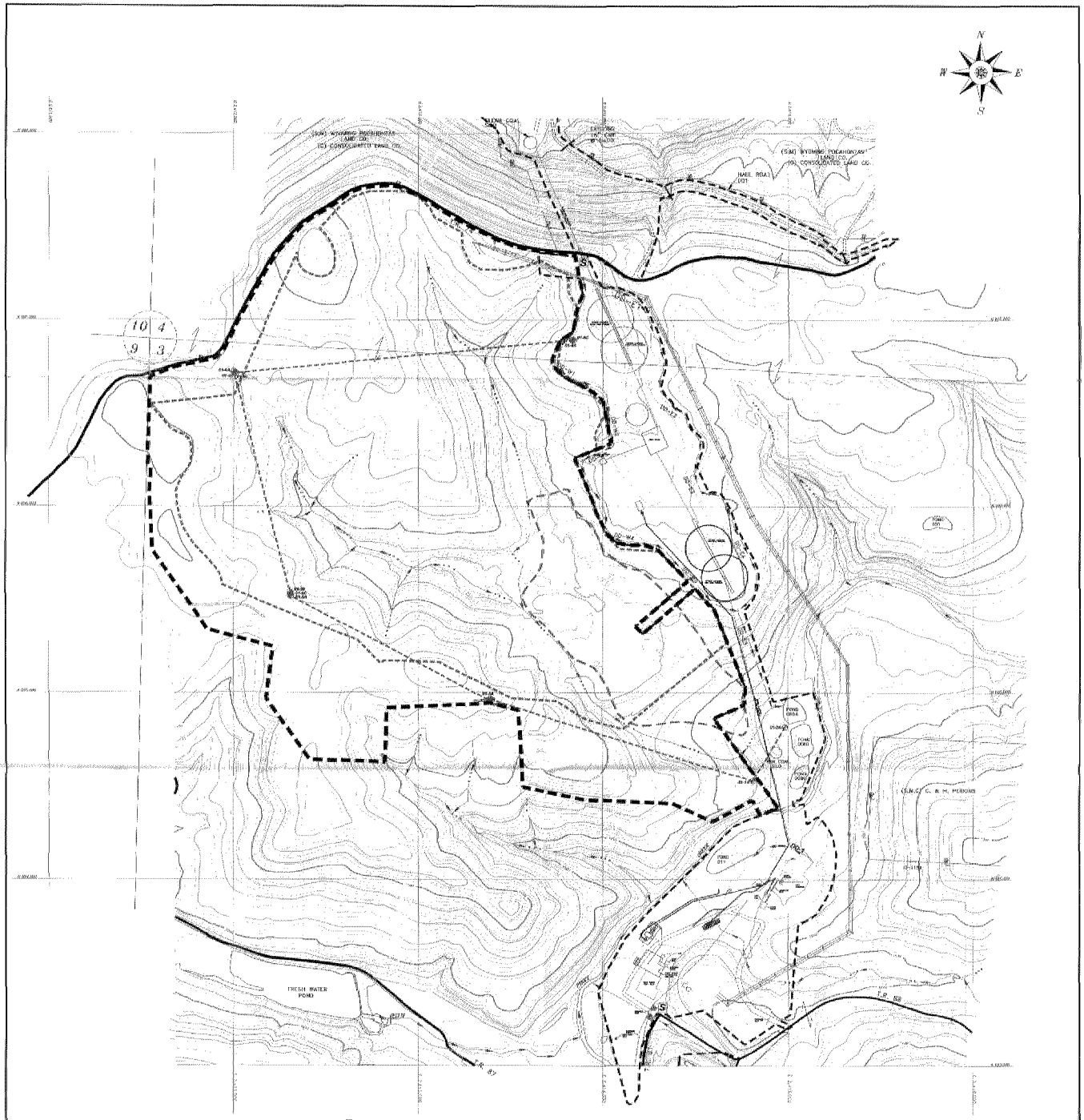
| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Drawn by: SSM | Drawing: 91MMP24.DWG | MINE NO. CENTURY |
| Checked by: MJS | Date prepared: May 25, 2001 | |
| MAGI & HAMP, FUNK & ASSOC., INC. BOX 471, 242 HIGH STREET PLOSBURG, OHIO 43967 | Revised: 7-10-03 | PLATE NO. 4 |

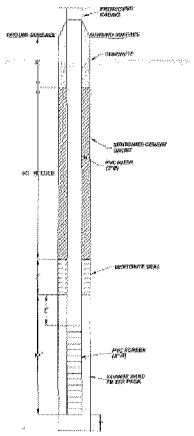
STATE OF OHIO MICHAEL J. SPRANG 6818 REGISTERED PROFESSIONAL ENGINEER

11 Mile Creek Valley

18 Mile Creek

AEC 11922




## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- PERENNIAL STREAM
- INTERMITTENT STREAM
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- CROSS SECTION A – A'

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159. THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

00425 ø 8

**GROUNDWATER MONITORING**
**LOCATION MAP**
**COAL REFUSE DISPOSAL FACILITY**

OPERATOR

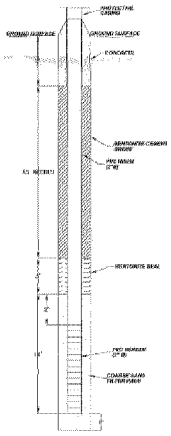
| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |

Drawn by: SBN — Drawing: WTOPOPTS.DWG
Standard Sz: 11x15 — Date prepared: May 2, 2001
JACK A. HAMILTON & ASSOC., INC. — Revised: 7-19-02
BOX 471, MI-HON STREET
PLAINING, OHIO 43077

MINE NO. CENTURY
PLATE NO. 5

STATE OF OHIO — WILLIAM A. MILLER — 5-04818 — REGISTERED PROFESSIONAL ENGINEER

10 Page Seal




TYPICAL WELL CONSTRUCTION

## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- POTENTIOMETRIC WATER SURFACE CONTOUR INTERVAL = 1'
- ESTIMATED POTENTIOMETRIC SURFACE

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 2, 1979, SCALE: 1" = 300'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1108, THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 BAYHAGH HILL ROAD
TOWNSHIP HIGHWAY 82
BEALLSVILLE, OHIO 43716

**FIRST ZONE OF SATURATION**
**COAL REFUSE DISPOSAL FACILITY**

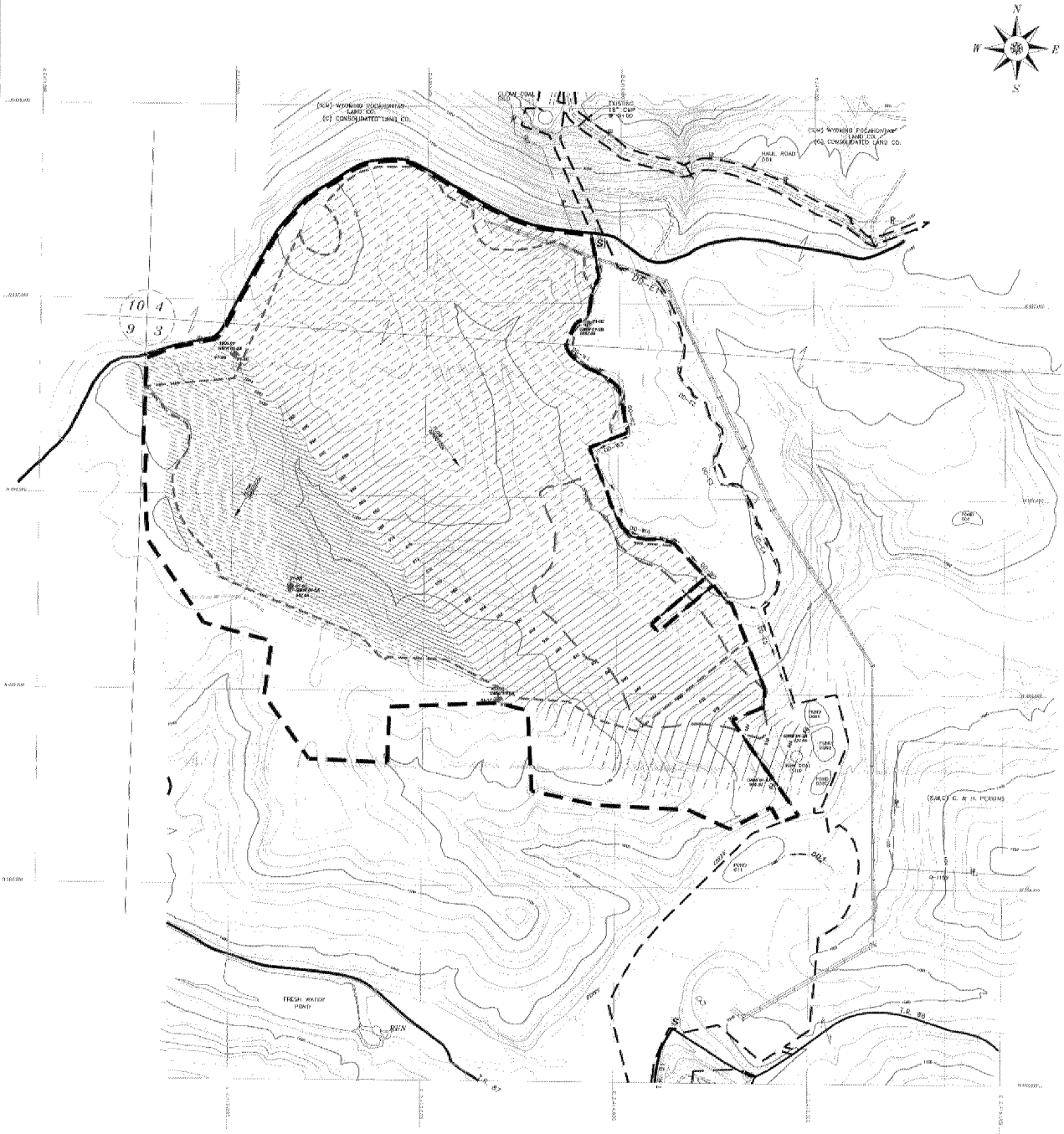
OPERATOR

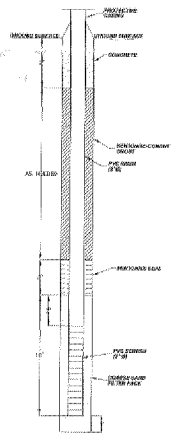
| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 300' |
| Drawn by: BSU | Drawing: C1880P2B.DWG | MINE NO. CENTURY |
| Checked by: WJB | Date prepared: May 30, 2001 | |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 342 HIGH STREET FLUSHING, OHIO 43977 | Revised: 7-10-02 | PLATE NO. 6 |

STATE OF OHIO WILLIAM J. BRADY 8015 REGISTERED PROFESSIONAL ENGINEER

18 Sept 2002

ARC 18924




**TYPICAL WELL CONSTRUCTION**

## LEGEND

- PUBLIC ROADS
- PROPERTY LINE
- ENTRANCE SIGN
- CONSTRUCTED DRAINWAY
- AERIAL POWER LINE
- PROPOSED AFFECTED AREA
- PROPOSED REFUSE AREA
- SURFACE PERMIT D-0425
- EXISTING PONDS
- EXISTING REFUSE DISPOSAL AREA
- POTENTIOMETRIC WATER SURFACE CONTOUR INTERVAL = 1'
- ESTIMATED POTENTIOMETRIC SURFACE

NOTES:

1. TOPOGRAPHIC MAP PREPARED BY AERIAL MAP SERVICE CO., PITTSBURGH, PA., DATED MAY 3, 1979, SCALE: 1" = 200'
2. ACTIVE MINING HAS BEEN CONDUCTED ON PERMIT D-1159. THEREFORE, CONTOURS WITHIN THE PERMITTED AREA DO NOT REFLECT CURRENT CONTOURS.

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
42521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 56
BEALLSVILLE, OHIO 43716

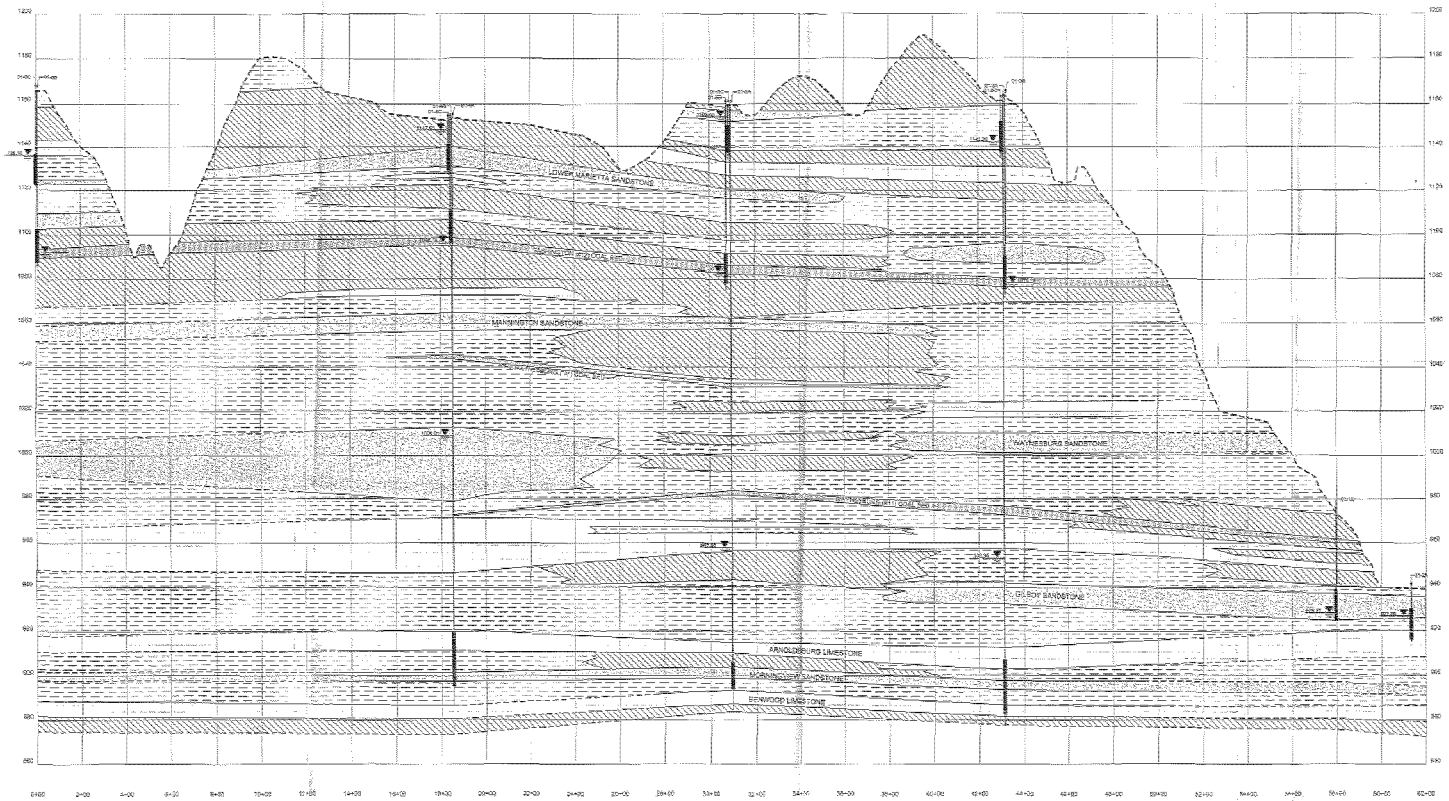
**CONTINUOUS ZONE OF SATURATION**
**COAL REFUSE DISPOSAL FACILITY**

OPERATOR

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | CONTOUR INTERVAL: 5' | SCALE: 1" = 200' |
| Drawn by: RSW | Drawing: R:\SURFT1.DWG | MINE NO. |
| Checked by: YMS | Date prepared: May 21, 2003 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 342 HIGH STREET FAIRFIELD, OHIO 43077 | Revised: 7-30-03 | PLATE NO. 7 |

STATE OF OHIO WILLIAM R. SPRUNT III SURVEYOR E-21313

AEC 11925




SECTION A - A'

GEOLOGIC UNIT

SHALE, SANDY SHALE

CLAY, CLAYSTONE

SANDSTONE

LIMESTONE

COAL

WELLS

BORE HOLE #

1078.18 WATER LEVEL

EFFECTIVE SCREENED INTERVAL

OPERATOR

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 119
AVONMORE, PA 15613

HYDROGEOLOGIC INVESTIGATION CROSS-SECTION A-A'
COARSE COAL
REFUSE DISPOSAL FACILITY

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 6 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | HORIZ. SCALE: 1" = 200' | VERT. SCALE: 1" = 20' |

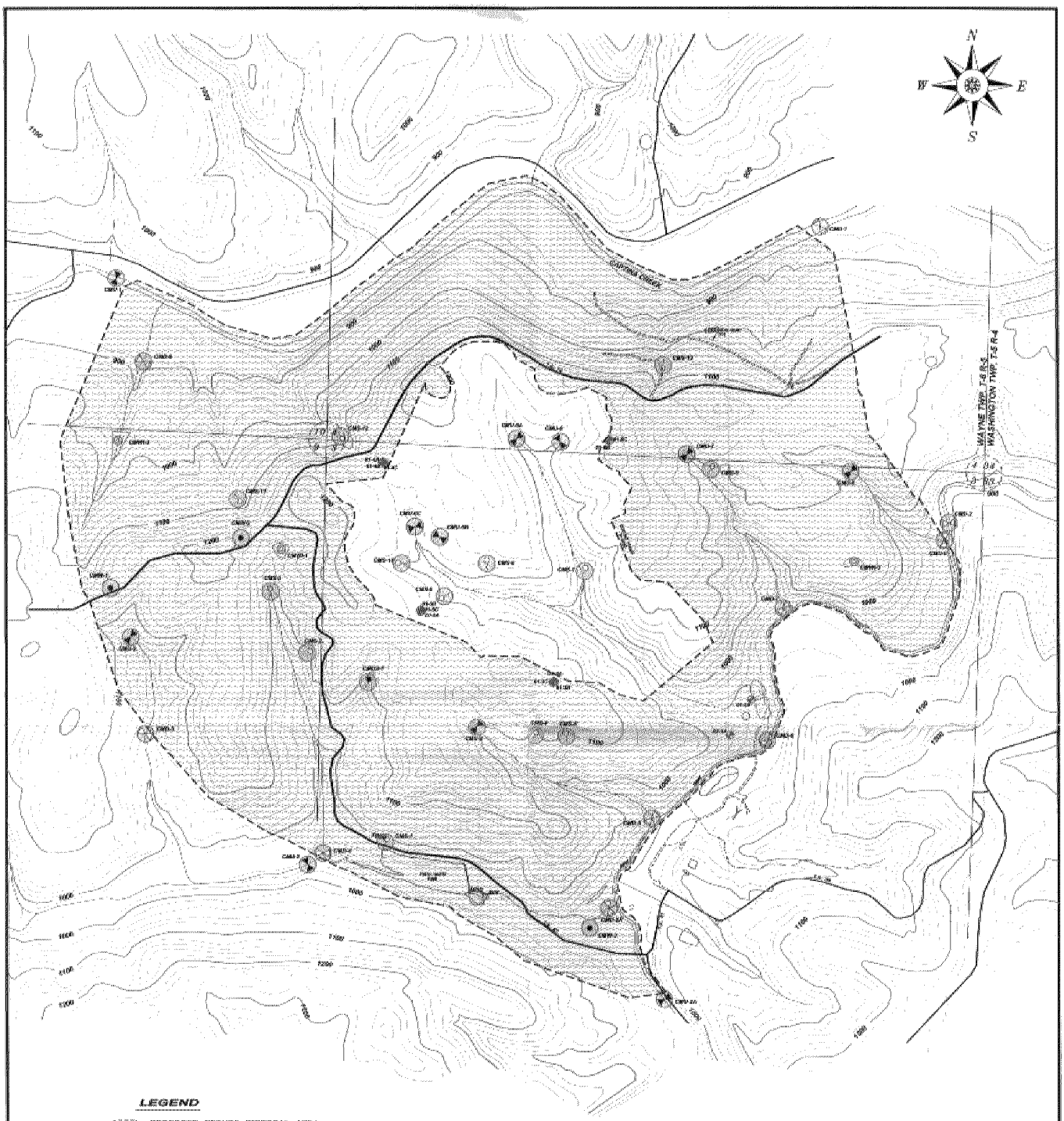
Drawn by: SSU
Checked by: WJS
JACK A. HAMILTON & ASSOC., INC.
BOX 471, SCOTCH STREET
FLEMING, OHIO 43077

Drawing: 6VCOBTS.DWG
Date Prepared: Mar. 20, 2001
Revised:

MINE NO. CENTURY

PLATE NO. 5

18 Sept. 2002




**LEGEND**

- PROPOSED REFUSE DISPOSAL AREA
- 2000' ISOLATION ZONE
- BORE HOLE
- U– UPSTREAM SAMPLING STATION
- D– DOWNSTREAM SAMPLING STATION
- WL– DRILLED WELL (LOG AVAILABLE)
- W– DRILLED WELL (NO LOG AVAILABLE)
- DW– DUG WELL
- DS– DEVELOPED SPRING
- S– UNDEVELOPED SPRING
- WI– WATER IMPOUNDMENT
- BACKGROUND SAMPLING STATION
- EXISTING WATER IMPOUNDMENT

NOTE:
SITE IS LOCATED ON THE HUNTER
U.S.G.S. 7 1/2 MINUTE QUADRANGLE.

0' 500' 1000' 1500'

0042558

OPERATOR

STATE OF OHIO
WILLIAM J. SPLINT
E-61015
PROFESSIONAL ENGINEER

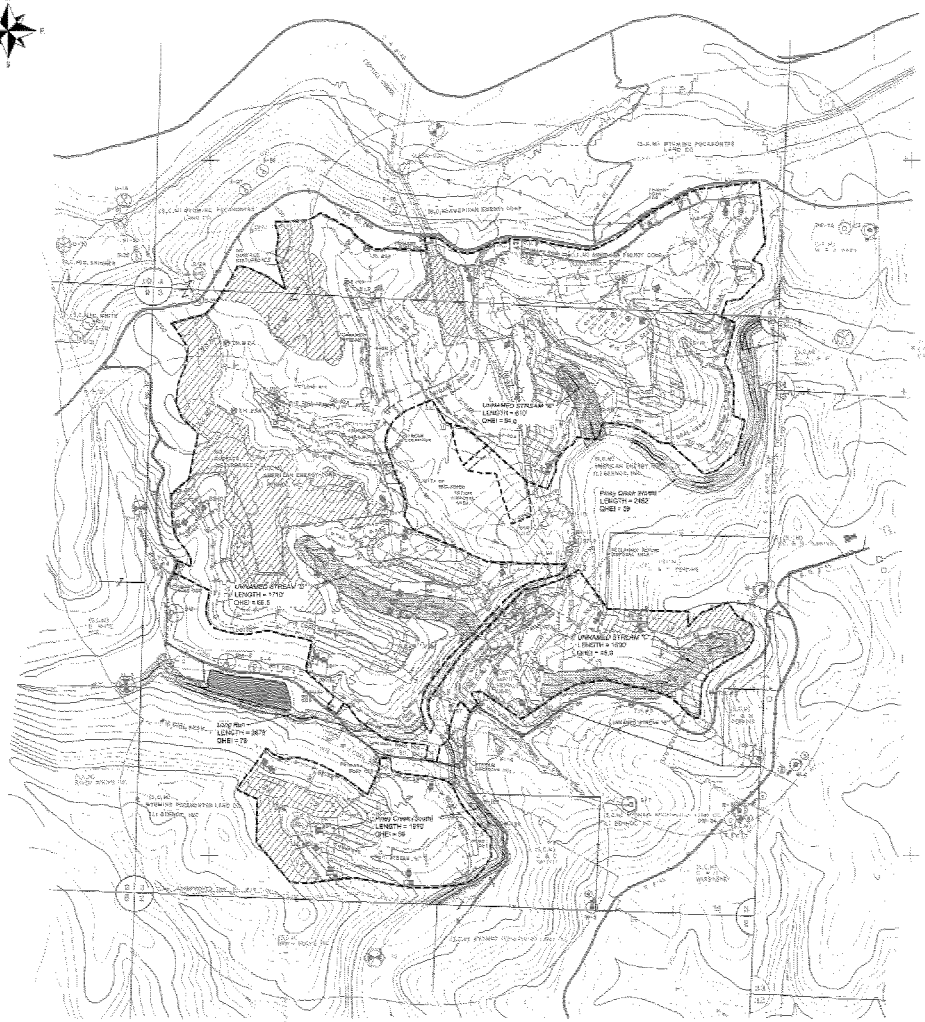
William J. Splint
18 Sept. 2002

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
R.D. 1, BOX 119
AVONMORE, PA 15618

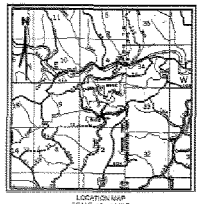
**2000' HYDROLOGIC ISOLATION ZONE**
**CENTURY MINE**
**COAL REFUSE DISPOSAL FACILITY**

| | | |
|---|---|---|
| SECTIONS: 3, 4, 9 & 10<br>SECTIONS: 33 & 34 | T. - 6 R. - 5<br>T. - 5 R. - 4 | TOWNSHIP: WAYNE<br>TOWNSHIP: WASHINGTON |
| COUNTY: BELMONT | CONTOUR INTERVAL: 20' | SCALE: 1" = 500' |
| Drawn by: SSD<br>Checked by: WJS | Drawing: 0100APTS.DWG<br>Date prepared: July 17, 2001 | MINE NO.<br>CENTURY |
| JACK A. HAMILTON & ASSOC., INC.<br>BOX 471, 242 HIGH STREET<br>FLUSHING, OHIO 43977 | Revised: 7-19-02<br>Revised: 8-19-02 | PLATE NO.<br>9 |

AEC 11927




NOTE: MAPPING SHOWN HEREON IS BASED ON THE YEAR TWO ANNUAL MAP PERMIT 0-1159



LOCATION MAP
SCALE: 1" = 1 MILE
PERMIT SITE IS LOCATED ON THE HUNTER QUAD
DRAINAGE BASIN: CHIPPINA CREEK

**LEGEND**

- 300' Conservation Easement
- Stream Reach to be Mitigated
- Pond to be Breached and Mitigated
- Watercourse to be Affected
- Forest Limits (CDNR D-1159)

Conservation Easement

| | |
|---|---|
| Unnamed Stream "D" Length = | 1690' |
| Unnamed Stream "C" Length = | 1710' |
| Unnamed Stream "B" Length = | 610' |
| Total = | 4010' |

Channel Improvement / Reconstruction

| | |
|---|---|
| Long Run Length = | 2679' |
| Piney Creek (North) Length = | 2452' |
| Piney Creek (South) Length = | 1970' |
| Total = | 7101' |

OPERATOR

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

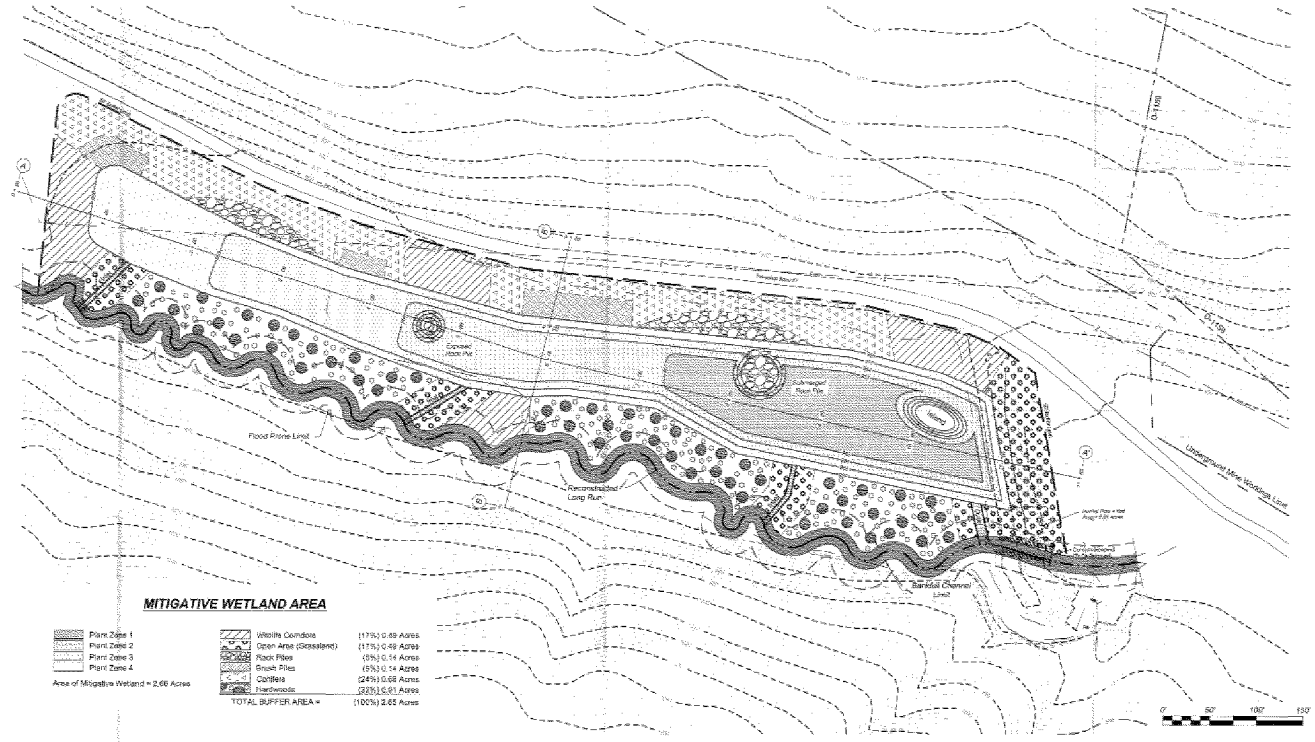
*WETLANDS MITIGATION PLAN*
*COARSE COAL REFUSE DISPOSAL PROJECT*

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=400' |
| Drawn by: JCK<br>Designed by: W.R. | Drawing: MITIGATION PLAN<br>Date Initiated: January 7, 2002<br>Revised: | NAME NO<br>CENTURY |
| JACK A. HAMILTON & ASSOC., INC.<br>BOX 471, 543 HIGH STREET<br>PUSHING, OHIO 43576 | | DRAWING NO.<br>16 |

STATE OF OHIO
WILLIAM R. BRLEY
6-4-02

16 Sept 2002

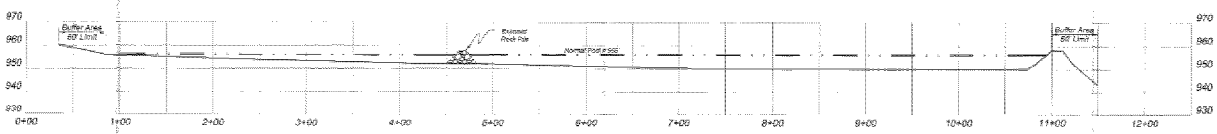
ARC 11628




*Note: Stream to be reconstructed based on dimensions of upstream reaches.

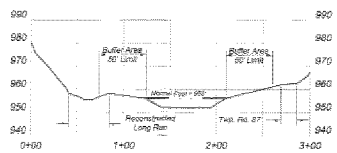
## MITIGATIVE WETLAND AREA

| | | |
|---|---|---|
| Plant Zone 1 | Wildlife Corridors | (17%) 0.69 Acres |
| Plant Zone 2 | Open Area (Grassland) | (17%) 0.49 Acres |
| Plant Zone 3 | Rock Piles | (5%) 0.14 Acres |
| Plant Zone 4 | Brush Piles | (5%) 0.14 Acres |
| Area of Mitigative Wetland = 2.66 Acres | Conifers | (24%) 0.68 Acres |
| | Hardwoods | (32%) 0.91 Acres |
| | TOTAL BUFFER AREA = | (100%) 2.85 Acres |




**Wetland Mitigation Area Section A - A'**

Horiz. Scale: 1" = 50'
Vert. Scale: 1" = 30'




**Wetland Mitigation Area Section B - B'**

Horiz. Scale: 1" = 50'
Vert. Scale: 1" = 20'

OPERATOR

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

*PROPOSED WETLANDS CONSTRUCTION*
*COARSE COAL REFUSE DISPOSAL PROJECT*

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 9 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=50' |
| Drawn by: JCC | Drawing: mitigate.dwg | MRP NO |
| Checked by: JMR | Date prepared: JANUARY 7, 2002 | CENTURY |
| SACILA, HAMILTON & ASSOC., INC. | Revised: 9/02 | DRAWING NO |
| 301 HIGH ST. SUITE 7 BELLAIRE, OHIO 43906 | | 28 |

WILLIAM J. SACILA 54863

19 August 2002

ABC 11925

# APPLICATION
# SECTION 401 WATER QUALITY CERTIFICATION

## CENTURY MINE
## COARSE COAL REFUSE DISPOSAL FACILITY
## SECTIONS 3 & 4, WAYNE TOWNSHIP
## BELMONT COUNTY, OHIO

**Prepared For:**

**THE OHIO ENVIRONMENTAL PROTECTION AGENCY**
**DIVISION OF SURFACE WATER**
**P. O. BOX 1049**
**COLUMBUS, OHIO 43216-1049**

By:

William J. Siplivy, P.E., Inc.
50 Munroe Falls Avenue
Munroe Falls, Ohio 44262

January, 2002

# APPLICATION FOR OHIO EPA
# SECTION 401 WATER QUALITY CERTIFICATION

## Effective October 1, 1996
## Revised August, 1998

This application must be completed whenever a proposed activity requires an individual Clean Water Act Section 401 Water Quality Certification (Section 401 certification) from Ohio EPA. A Section 401 certification from the State is required to obtain a federal Clean Water Act Section 404 permit from the U.S. Army Corps Engineers, or any other federal permits or licenses for projects that will result in a discharge of dredged or fill material to any waters of the State. To determine whether you need to submit this application to Ohio EPA, contact the U.S. Army Corps of Engineers District Office with jurisdiction over your project, or other federal agencies reviewing your application for a federal permit to discharge dredged or fill material to waters of the State, or an Ohio EPA Section 401 Coordinator at (614) 644-2001.

The Ohio EPA Section 401 Water Quality Certification Program is authorized by Section 401 of the Clean Water Act (33 U.S.C. 1251) and the Ohio Revised Code Section 6111.03(P). Ohio Administrative Code (OAC) Chapter 3745-32 outlines the application process and criteria for decision by the Director of Ohio EPA. In order for Ohio EPA to issue a Section 401 certification, the project must comply with Ohio's Water Quality Standards (OAC 3745-1) and not potentially result in an adverse long-term or short-term impact on water quality. Included in the Water Quality Standards is the Antidegradation Rule (OAC Rule 3745-1-05), effective October 1, 1996, revised October, 1997 and May, 1998. The Rule includes additional application requirements and public participation procedures. **Because there is a lowering of water quality associated with every project being reviewed for Section 401 certification, every Section 401 certification applicant must provide the information required in Part 10 (pages 3 and 4) of this application.** In addition, applications for projects that will result in discharges of dredged or fill material to wetlands must include a wetland delineation report approved by the Corps of Engineers, a wetland assessment with a proposed assignment of wetland category (ies), official documentation on evaluation of the wetland for threatened or endangered species, and appropriate avoidance, minimization, and mitigation as prescribed in OAC 3745-1-50 to 3745-1-54. Ohio EPA will evaluate the applicant's proposed wetland category assignment and make the final assignment.

Information provided with the application will be used to evaluate the project for certification and is a matter of public record. If the Director determines that the application lacks information necessary to determine whether the applicant has demonstrated the criteria set forth in OAC Rule 3745-32-05(A) and OAC Chapter 3745-1, Ohio EPA will inform the applicant in writing of the additional information that must be submitted. The application will not be accepted until the application is considered complete by the Section 401 Coordinator. An Ohio EPA Section 401 Coordinator will inform you in writing when your application is determined to be complete.

Please submit the following to "Section 401 Supervisor, Ohio EPA/DSW, P.O. Box 1049, Columbus, Ohio 43216-1049:

- Four (4) sets of the completed application form, including the location of the project (preferably on a USGS quadrangle) and 8-1/2 x 11" scaled plan drawings and sections.
- One (1) set of original scaled plan drawings and cross-sections (or good reproducible copies).

**(See Application Primer for detailed instructions)**

1. The federal permitting agency has determined this project: (check appropriate box and fill in blanks)

   a. X requires an individual 404 permit/401 certification- Public Notice # (if known)_____

   b. ____ requires a Section 401 certification to be authorized by Nationwide Permit #_____

   c. ____ requires a modified 404 permit/401 certification for original Public Notice #_____

   d. ____ requires a federal permit under _____ jurisdiction identified by #_____

   e. ____ requires a modified federal permit under _____ jurisdiction identified by #_____



AEC 11931

2. Application number (to be assigned by Ohio EPA):

3. Name and address of applicant:
American Energy Corporation
43521 Mayhugh Hill Road
Township Highway 88
Beallsville, Ohio 43716

Telephone number during business hours:
(_____)_____(Residence)
740 926-9152
(_____)_____(Office)

3a. Signature of Applicant: President Date: 1/21/02

4. Name, address and title of authorized agent:

N/A

Telephone number during business hours:
(_____)_____(Residence)
(_____)_____(Office)

4a. Statement of Authorization: I hereby designate and authorize the above-named agent to act in my behalf in the processing of this permit application, and to furnish, upon request, supplemental information in support of the application.

N/A

Signature of Applicant: Date:

5. Location on land where activity exists or is proposed. Indicate coordinates of a fixed reference point at the impact site (if known) and the coordinate system and datum used.

Address:

Sections 3 and 4, T-6, R-5, USGS Quad: Hunter, Ohio

Street, Road, Route, and Coordinates, or other descriptive location

See attached map, drawing 19.

| Captina Creek | Belmont | Wayne | | Ohio | 43716 |
|---|---|---|---|---|---|
| Watershed | County | Township | City | State | Zip Code |

6. Is any portion of the activity for which authorization is sought complete? ____ Yes _X_ No
If answer is "yes," give reasons, month and year activity was completed. Indicate the existing work on the drawings.

7. List all approvals or certifications and denials received from other federal, interstate, state or local agencies for any structures, construction, discharge or other activities described in this application.

| Issuing Agency | Type of Approval | Identification No. | Date of Application | Date of Approval | Date of Denial |
|---|---|---|---|---|---|
| Ohio EPA | NPDES | OIL-00091 * ED | | Oct 1983 | |
| ODNR | Adjacent Area Application | D0425-2 | Dec. 13, 2001 | Pending | |
| Ohio EPA | Permit to Install Pending (Ponds) | | Dec. 20, 2001 | Pending | |

8. **DESCRIPTION OF THE ACTIVITY (fill in information in the following four blocks - 8a, 8b, 8c & 9)**

8a. Activity: Describe the Overall Activity:

The proposed project is the expansion of an existing valley-fill coarse coal refuse disposal facility. The expanded facility will be an up-stream extension of the existing refuse disposal area, all of which are located on mine owned property. The new site will be lined with three feet of clay. Upon completion, the site will be capped with two feet of clay and up to two additional feet of earthen material. Collection systems will be installed to: (1) divert groundwater, and (2) collect leachate for treatment, if necessary.

8b. Purpose: Describe the purpose, need and intended use of the activity:

The purpose is to provide a disposal area for coarse coal refuse generated by the mine's coal cleaning (preparation) plant. The disposal area is needed to sustain mining operations at American Energy Corporation's Century Mine. The proposed site has an estimated disposal life of 7 to 9 years.

8c. Discharge of dredged or fill material: Describe type, quantity of dredged material (in cubic yards), and quantity of fill material (in cubic yards). **(OAC 3745-1-05(B)(2)(a))**

The refuse (fill) material consists of carbonaceous shale, claystone, limestone, and coarse coal reject. The volume of coarse coal refuse produced annually is estimated to range from 1.5 to 1.8 million cubic yards.

9. Waterbody and location of waterbody or upland where activity exists or is proposed, or location in relation to a stream, lake, wetland, wellhead or water intake (if known). Indicate the distance to, and the name of any receiving stream, if appropriate.

Coarse coal refuse will be placed in an unnamed ravine in the Piney Creek drainage basin. The new disposal facility will be located approximately 1,100 feet up-stream of Piney Creek

**10. To address the requirements of the Antidegradation Rule, your application must include a report evaluating the:**

- ☐ Preferred Design (your project) and Mitigative Techniques
- ☐ Minimal Degradation Alternative(s) (scaled-down version(s) of your project) and Mitigative Techniques
- ☐ Non-Degradation Alternative(s) (project resulting in avoidance of all waters of the state)

At a minimum, item a) below must be completed for the Preferred Design, the Minimal Degradation Alternative(s), and the Non-Degradation Alternative(s), followed by completion of item b) for each alternative, and so on, until all items have been discussed for each alternative (see Primer for specific instructions). (Application and review requirements appear at **OAC 3745-1-05(B)(2), OAC 3745-1-05(C)(6), OAC 3745-1-05(C)(1) and OAC 3745-1-54).**

10a) Provide a detailed description of any construction work, fill or other structures to occur or to be placed in or near the surface water. Identify all substances to be discharged, including the cubic yardage of dredged or fill material to be discharged to the surface water. **(OAC 3745-1-05(B)(2)(b))**

10b) Describe the magnitude of the proposed lowering of water quality. Include the anticipated impact of the proposed lowering of water quality on aquatic life and wildlife, including threatened and endangered species (include written comments from Ohio Department of Natural Resources and U.S. Fish and Wildlife Service), important commercial or recreational sport fish species, other individual species, and the overall aquatic community structure and function. Include a Corps of Engineers approved wetland delineation. (OAC 3745-1-05(C)(6)(a, b) and OAC 3745-1-54)



AEC 11933

10c) Include a discussion of the technical feasibility, cost effectiveness, and availability. In addition, the reliability of each alternative shall be addressed (including potential recurring operational and maintenance difficulties that could lead to increased surface water degradation.) **(OAC 3745-1-05(C)(6)(h, j-k) and OAC 3745-1-54)**

10d) For regional sewage collection and treatment facilities, include a discussion of the technical feasibility, cost effectiveness and availability, and long-range plans outlined in state or local water quality management planning documents and applicable facility planning documents. **(OAC 3745-1-05(C)(6)(i))**

10e) To the extent that information is available, list and describe any government and/or privately sponsored conservation projects that exist or may have been formed to specifically target improvement of water quality or enhancement of recreational opportunities on the affected water resource. **(OAC 3745-1-05(B)(2)(g))**

10f) Provide an outline of the costs of water pollution controls associated with the proposed activity. This may include the cost of best management practices to be used during construction and operation of the project. **(OAC 3745-01-05(C)(6)(g))**

10g) Describe any impacts on human health and the overall quality and value of the water resource. **(OAC 3745-1-05(C)(6)(c) and OAC 3745-1-54)**

10h) Describe and provide an estimate of the important social and economic benefits to be realized through this project. Include the number and types of jobs created and tax revenues generated and a brief discussion on the condition of the local economy. **(OAC 3745-1-5(B)(2)(e), and OAC 3745-1-05(C)(6)(i))**

10i) Describe and provide an estimate of the important social and economic benefits that may be lost as a result of this project. Include the effect on commercial and recreational use of the water resource, including effects of lower water quality on recreation, tourism, aesthetics, or other use and enjoyment by humans. **(OAC 3745-1-05(B)(2)(e,f), and OAC 3745-1-05(C)(6)(e))**

10j) Describe environmental benefits, including water quality, lost and gained as a result of this project. Include the effects on the aquatic life, wildlife, threatened or endangered species. **(OAC 3745-1-05 (B)(2)(e,f), OAC 3745-1-05 (C)(6)(b) and OAC 3745-1-54)**

10k) Describe mitigation techniques proposed (except for the Non-Degradation Alternative):

☐ Describe proposed Wetland Mitigation (see OAC 3745-1-54 and Primer)

☐ Describe proposed Stream, Lake, Pond Mitigation (see Primer)

11. Application is hereby made for a Section 401 Water Quality Certification. I certify that I am familiar with the information contained in this application and, to the best of my knowledge and belief, such information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities or I am acting as the duly authorized agent of the applicant.

| Signature of Applicant | Date | Signature of Agent |
|---|---|---|
| President | 1/21/92 | |

*The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in Block 3 has been filled out and signed.*

**Do not send a certification processing fee with this application. The appropriate fee will be assessed when a certification is issued.**

401\401appl.898



AEC 11934

# Antidegradation Alternative Analysis

## American Energy Corporation
## Century Mine
## Wayne Township, Belmont County, Ohio

10A. ***Provide a description of any construction work, fill or other structures to occur or be placed in or near the streambed. Identify all substances to be discharged, including the cubic yardage of dredged or fill material to be discharged to the surface water. (OAC 3745-1-05 (B)(2)(b)).***

***PREFERRED ALTERNATIVE***

**Description of Construction Work, Fill or other Structures:**

The project entails construction of a coarse coal refuse disposal facility as a valley fill within an unnamed tributary to Piney Creek. The valley-fill structure construction will begin on the 1050' elevation terrace of the former Allison Mine coal refuse structure.

The site will be developed in three phases. Phases 1 and 2 are intermediate stages that will fill the east and west forks of the tributary to elevations of 1210 feet. Phase 3 will cover both these phases as well as the remaining valley trunk to outslopes of the Allison refuse pile. The ultimate height of the structure will be 320 feet, when measured from the Allison refuse pile toe, at elevation 970 feet to the projected 1288.6 feet maximum crest elevation. The thickness of fill under the maximum crest elevation will be approximately 134 feet. The maximum fill thickness will be 200 feet, occurring where phase 3 overlaps the toe sections of phases 1 and 2.

The coarse coal refuse disposal capacity is 14.3 million cubic yards. The projected landfill area is 112.2 surface acres. The required permit area is 154.4 acres with the inclusion of environmental controls. The estimated project life is 7 to 9 years.

All precipitation runoff from unaffected portions of the water shed will be diverted around the disposal facility. Any precipitation falling within or passing through the coal waste disposal facility will be directed to ponds and treated, if necessary. The ponds will discharge to Piney Creek.

Initial construction includes installing all necessary erosion and sediment controls, excavating sedimentation ponds, clearing and grubbing vegetation, stripping and stockpiling topsoil, construction of groundwater underdrains, constructing diversion ditches, constructing haul roads, placement of a three-foot thick clay liner, and construction of a leachate collector system.

Upon completion of the project, the coal refuse will be capped with two-feet of clay, another two-feet of earthen material, then seeded. The site will be reclaimed in accordance with all applicable rules and regulations of the State of Ohio and the United States Government.

**Substances Discharged:**

Only fill materials are to be placed below the ordinary highwater mark (OHWM) in the tributary. These materials are composed of unclassified earthen sub-grade used as a foundation and the clay liner.



AEC 11935

**Cubic Yardage Discharged:**

Total linear impact and cubic yardage of fill material to be place below the OHWM for The Preferred Alternative is 7161 lineal feet and 23,870 cubic yards.

***MINIMAL DEGRADATION ALTERNATIVE***

**Description of Construction Work, Fill or other Structures:**

The Minimal Degradation Alternative is to backfill coarse coal refuse in the surface mine pits permitted for this site under ODNR Permit D-1159. This method is acceptable to ODNR specific to meeting permitting requirements. This technique is commonly applied throughout the coal fields.

This method would keep valley bottoms untouched. The trade-off is volume. This alternative offers 1.8 million cubic yards of capacity compared to 14.3 million cubic yards in the preferred alternative. The site life under this alternative is approximately one year. A long-term solution is not provided by the Minimal Degradation Alternative.

The disposal area would be reclaimed with a clay cap; soil cover and revegetated to meet ODNR, DMR reclamation requirements, as specified in the Preferred Alternative. .

**Substances Discharged:**

There will be no fill materials placed below the ordinary highwater mark (OHWM) in the tributary.

**Cubic Yardage Discharged:**

There is no linear impact or cubic yardage of fill material to be place below the OHWM for the Minimal Degradation Alternative.

***NON-DEGRADATION ALTERNATIVE***

**Description of Construction Work, Fill or other Structures:**

This Alternative entails the shipment of coarse coal waste to an off-site solid waste disposal facility. To dispose of 1.8 million cubic yards of coarse coal refuse annually it will require 98,000 truck loads at 25 tons a load. The closest facility permitted large enough to handle this volume is the Harrison County Solid Waste Disposal Facility. This facility is approximately 55 miles north of the wash plant, west of Cadiz, Ohio on State Route 250. No additional construction would be required as a result of this alternative.

**Substances Discharged:**

No fill or dredge materials will be discharged to the unnamed tributary and its forks.

**Cubic Yardage Discharged:**

The Minimal Degradation Alternative has no linear impact and cubic yardage of fill material to be place below the OHWM.



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**10B.** ***Described the magnitude of the proposed lowering of water quality. Include the anticipated impact of the proposed lowering of water quality on aquatic life and wildlife, including threatened and endangered species, important commercial or recreational sport fish species, other individual species, and the overall aquatic community structure and function. Include a Corps of Engineers approved wetland delineation. (OAC 3745-1-05 (C)(6)(a, b)) and OAC 3745-1-54)***

***PREFERRED ALTERNATIVE***

**Magnitude of Proposed Lowering of Water Quality:**

Changes to Aquatic Life and Wildlife Habitat: Approximately 7161 linear feet of intermittent stream, 2002 linear feet of ephemeral stream and 1.774 acres of wetlands will be impacted as a result of this project. This impact will result in the removal of 100% of the aquatic life habitat within these segments and the 100% removal of any potential wildlife habitat associated with their riparian corridor.

Change in Chemical Water Quality: The proposed Preferred Alternative will impact surface water quality in the receiving streams during the early stages of construction. Sediment loads to the drainage system will be increased. The quantity of sediments reaching surface waters will be minimized by directing all runoff through sedimentation ponds.

Changes in Flow Regime: The Preferred Alternative is expected to reduce base flows and peak flows in the downstream section of the unnamed tributary to Piney Creek due to the retention characteristics of the proposed sediment and quality control ponds. Runoff from the project or disturbed areas presently contributing to stream flow will be directed to sediment ponds. However, the tributary, which has intermittent flow during summer months have no downstream users. The tributary discharges into Piney Creek, a tributary of Captina Creek. Since the affected area drained by the unnamed tributary represents a small percentage of the Captina Creek drainage basin, there should not be any recognizable difference in quantity flow in Captina Creek. It is predicted that the proposed operation will not result in any significant adverse impacts on surface water quantity in the area.

Prior to commencing with the construction operation discharge within the impacted stream segments will be diverted around the construction site. The areas adjacent to and the stream channels will be graded with fill placed within the impacted segments in preparation for construction. The stream will no longer function as a stream and the pre-construction flow regime will not be reestablished within the disturbed segments.

The Ohio Department of Natural Resources has no record of rare, threatened, endangered or protected species in the project area (See Wetlands Delineation Report, Section 3.5).

Attached is a Wetlands Verification Report issued by the Corps of Engineers.

***MINIMAL DEGRADATION ALTERNATIVE***

**Magnitude of Proposed Lowering of Water Quality:**

Changes to Aquatic Life and Wildlife Habitat: The Minimal Degradation Alternative will have no impact on the aquatic life habitat within the project area.

Change in Chemical Water Quality: The proposed Minimal Degradation Alternative will impact surface water quality in the receiving streams during construction and operation of the facility. Sediment loads to the drainage system will be increased. The quantity of sediments reaching surface waters will be minimized by directing all runoff through sedimentation ponds.

Changes in flow Regime: The Minimal Degradation Alternative is expected to reduce base flows and peak flows to a lesser degree than the preferred alternative in the downstream section of the unnamed tributary to Piney Creek due to the retention characteristics of the proposed sediment and quality control ponds. Runoff from the project or disturbed areas presently contributing to stream flow will be directed to sediment ponds. However, the tributary, which has intermittent flow during summer months have no downstream users. The tributary discharges into Piney Creek, a tributary of Captina Creek. Since the affected area drained by the unnamed tributary represents a small percentage of the Captina Creek drainage basin, there should not be any recognizable difference in quantity flow in Captina Creek. It is predicted that the proposed operation will not result in any significant adverse impacts on surface water quantity in the area.

The Ohio Department of Natural Resources has no record of rare, threatened, endangered or protected species in the project area (See Wetlands Delineation Report, Section 3.5).

***NON-DEGRADATION ALTERNATIVE***

**Magnitude of Proposed Lowering of Water Quality:**

Changes to Aquatic Life and Wildlife Habitat: There would be no lowering of water quality by using the Non-Degradation Alternative.

Change in Chemical Water Quality: There are no changes in water quality anticipated as a result of the Non-Degradation Alternative.

Changes in flow Regime: There are no changes in flow regime anticipated as a result of the Non-Degradation Alternative.

***10C. Include a discussion of the technical feasibility, cost effectiveness, and availability. In addition, the reliability of each alternative shall be addressed (including potential recurring operational and maintenance difficulties that could lead to increased surface water degradation. (OAC 3745-1-05 (C)(6)(h, j-k) and OAC 3745-1-54).***

***PREFERRED ALTERNATIVE***

**Technical Feasibility:**

The proposed project is designed for disposal of coarse coal refuse in an environmentally acceptable manner. The site will be constructed to comply with the rules and regulations of the State of Ohio, Ohio EPA Policies 2.05 and 4.16, and U.S. Mining Safety and Health Administration 30 CFR 77.215 and 77.216. Valley fills are a common and excepted way of disposing of large volumes of coal waste materials and have been technically proven though out the coal bearing regions.

Permanent control measures and facilities include diversion ditches, benching side slopes and establishing vegetative cover over final fill surfaces. Permanent diversion ditches will be constructed to divert runoff from the working area. The east side is protected by the diversion system along the plant road. Control ditches and structural benches will contain runoff from the project area thereby preventing flows from freely discharging over side slopes. Waterways susceptible to erosion will be protected by vegetation or riprap. The final fill surface will be clay capped, covered with soil, seeded and mulched. A permanent stand of grass will be established to mitigate erosion and sedimentation and serve as a wildlife habitat.



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**Cost Effectiveness:**

The site disposal capacity is 14.3 million cubic yards. The site life is approximately 7 to 9 years, depending plant and mine operating variables. Total cost over the project life is approximately $14 million, which averages approximately $0.98 a cubic yard or $0.726 per ton. The incremental clean coal cost is $0.391 per ton.

**Availability:**

The topography of the site and most of Belmont County is composed of ridges and valleys. The coarse coal waste disposal area proposed will utilize a narrow, forking valley in an unnamed tributary of Piney Creek. The proposed disposal site is located on Company owned land, adjacent to the west of the preparation plant.

**Reliability:**

The construction of the disposal site will be under the guidance of the site engineer. A quality contol and quality assurance program will be implemented to monitor the construction of the facility. Completed constructed will be certified by the site engineer.

Groundwater and surface water will be protected through the use of diversion ditches, a clay liner, sedimentation ponds, and temporary erosion and control measures such as hay bales, silt fence and seeding. All control facilities will be maintained for their designed operation to insure adequate performance.

**Operation and Maintenance Difficulties:**

Routine maintenance will include reseeding, replacing riprap and drains, removal of debris from the site, observations and record keeping. A surveillance of the area will be made immediately following any unusual events such as heavy rains, heavy frost, and abnormal structural behavior. The most important maintenance tasks at these times are the prompt backfilling of erosional scarps and slumps, and the repair and improvement of drainage systems and riprap.

***MINIMAL DEGRADATION ALTERNATIVE***

**Technical Feasibility:**

The minimal degradation alternative is an excepted method for the disposal of coarse coal waste. Normally this technique is used in conjunction with a surface mining operation. The technical restrictions of this method would be the ability of the excavation to keep up with the rate of demand.

**Cost Effectiveness:**

The disposal capacity is 1.8 million cubic yards. The site life is approximately 1 year. Total cost for the project is approximately $750,000. The unit refuse disposal cost is approximately $0.42 a cubic yard or $0.311 per ton. The incremental clean coal cost is $0.167 per ton. This is the least costly Alternative, however, it does not provide any long-term solutions for disposal of coal refuse from the Century mine.

**Availability:**

This alternative provides 1.8 million cubic yards of disposal on Company owned property.



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**Reliability:**

This alternative has a high degree of reliability for its one-year life.

**Operation and Maintenance Difficulties:**

The site would be operated and maintained in the same manner as described in the Preferred Alternative.

***NON-DEGRADATION ALTERNATIVE***

**Technical Feasibility:**

Shipment off-site, in this region, involves disposal in another valley. Nothing is really solved by this alternative since the same environmental concerns must be addressed again. Transportation is another factor. To dispose of 1.8 million cubic yards of coarse coal refuse annually will require 98,000 truck loads. The impact to local highways will be significant. There will be much more road traffic, accelerated wear and tear, and greater road hazard to other drivers.

**Cost Effectiveness:**

Trucking coal refuse to the Harrison County Solid Waste Disposal Facility would cost an estimated $6.25 per ton. The estimated landfill fee is $5.00 per ton. Total cost is $11.25 per ton of refuse. This Alternative will increase the cost of clean coal by $6.06 per ton, making the mining operation uneconomic. This Alternative is 14 times greater in cost than the Preferred Alternative.

**Availability:**

Off-site shipments would be made to the Harrison County Solid Waste Disposal Facility, located west of Cadiz, Ohio on Route 250, approximately 55 miles away. There is no additional construction required under this alternative.

**Reliability:**

Shipments off-site, particularly 55 miles away has its greatest uncertainty during the winter months. Icy roads would limit steady shipment schedules and create added risk to others using the roads.

**Operation and Maintenance Difficulties:**

Not applicable to this alternative.

***10D. For regional sewage collection and treatment facilities, include a discussion of the technical feasibility, cost effectiveness and availability, and long-range plans outlined in state of local water quality management planning documents and applicable facility planning documents. (OAC 3745-1-05 (C)(6)(l)).***

Not applicable.



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***10E. To the extent that information is available, list and describe any government and/or privately sponsored conservation projects that may have been specifically targeted to improve water quality or enhance recreational opportunities on the affected water resource. (OAC 3745-1-05 (B)(2)(g)).***

***PREFERRED ALTERNATIVE***

There are no government and/or privately sponsored conservation projects specifically targeted to improve water quality or enhance recreational opportunities on the affected water resource. The property on which the disposal facility is to be sited and the affected water resource are Company owned. Access is restricted to company personnel and/or professionals upon invitation.

***MINIMAL DEGRADATION ALTERNATIVE***

There are no government and/or privately sponsored conservation projects specifically targeted to improve water quality or enhance recreational opportunities on the affected water resource. The property on which the disposal facility is sited and affected water resource are Company owned. Access is restricted to company personnel and/or professionals upon invitation.

***NON-DEGRADATION ALTERNATIVE***

There are no known government and/or privately sponsored conservation projects specifically targeted to improve water quality or enhance recreational opportunities on the affected water resource.

***10F. Provide an outline of the costs of water pollution controls associated with the proposed activity. This may include the cost of best management practices to be used during construction and operation of the project. (OAC 3745-1-05 (C)(6)(g)).***

***PREFERRED ALTERNATIVE***

The cost of water pollution controls associated with the project area as follows:

Ponds: $526,212.
Annual maintenance and operating cost is estimated at $62,125.

***MINIMAL DEGRADATION ALTERNATIVE***

The cost of water pollution controls associated with the project area as follows:

Ponds: $225,000.
Annual maintenance and operating cost is estimated at $28,900.

***NON-DEGRADATION ALTERNATIVE***

There are no water pollution controls associated with the non-degradation alternative.



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***10G. Describe any impacts on human health and the overall quality and value of the water resource. (OAC 3745-1-05 (C)(6)(c) and OAC 3745-1-54).***

***PREFERRED ALTERNATIVE***

**Impact to Human Health:**
**Impacts to Overall Quality of the Water Resource:**

There are no substances expected to be discharged in quantities that could impact human health or the environment. Effluent limits will be met for discharge.

***MINIMAL DEGRADATION ALTERNATIVE***

**Impact to Human Health:**
**Impacts to Overall Quality of the Water Resource:**

There are no substances expected to be discharged in quantities that could impact human health or the environment. Effluent limits will be met for discharge.

***NON-DEGRADATION ALTERNATIVE***

**Impact to Human Health:**
**Impacts to Overall Quality of the Water Resource:**

Does not apply

***10H. Describe and provide an estimate of the important social and economic benefits to be realized through this project. Include the number and type of jobs created and tax revenues generated and a brief discussion on the condition of the local economy. (OAC 3745-1-05 (B)(2)(e)) and (OAC 3745-1-05 (C)(6)(l)).***

**General Employment Information**

Number and Types of Jobs Created: The American Energy Corporation Century mine will employ 333 people full-time when the mine becomes fully operational in 2003. Among those to be employed include coal miners and administrative staff. The mine has a projected life of 30 years.

State and Local Tax Revenues Generated: The annual payroll will be $17.5 million. Annual tax revenues to be paid to the federal, state and local municipalities is $7.3 million.

Brief Description of the Local Economy: The local economy is depressed due to recent closings in the steel and coal mining industries. Unemployment is higher than the national average, but under 10 percent. Studies have shown that for each created mining job, an additional ten (10) supporting jobs are created in the local economy.

***PREFERRED ALTERNATIVE***

No additional jobs would be created or lost as a result of the Preferred Alternative. The Century mine has or is projected to have the staff, personnel and equipment on site, necessary to implement the proposed project.

***MINIMAL DEGRADATION ALTERNATIVE***

No additional jobs would be created or lost as a result of the Minimal Degradation Alternative. The Century mine has or is projected to have the staff, personnel and equipment on site, necessary to implement the proposed project.

***NON-DEGRADATION ALTERNATIVE***

**Number and Type of Job Created:**

An additional 45 trucks and 135 drivers would be required to implement the Non-degradation Alternative, based on each truck and driver making two (2) round trips per day.

**State and Local Tax Generated:**

The estimated annual state and local tax generated by 135 truck drivers earning $40,000 each, is $216,000.

***10l. Describe and provide an estimate of the important social and economic benefits that may be lost as a result of this project. Include the effect on commercial and recreational use of the water resource, including effects of lower water quality on recreation, tourism, aesthetics or other use and enjoyment by humans. (OAC 3745-1-05 (B)(2)(e, f)) and (OAC 3745-1-05 (C)(6)(e)).***

***PREFERRED ALTERNATIVE***

**Effects on Social and Economic Benefits Lost:**

There are no social and economic benefits lost as a result of the construction of the Preferred Alternative. The impacted stream segments are located on property owned and controlled by American Energy Corporation.

**Effects on Commercial and Recreational Use of Water:**

There are no commercial and recreational uses lost as a result of the construction of the Preferred Alternative. The impacted stream segments are located on property owned and controlled by American Energy Corporation.

**Effects on Recreation, Tourism, Aesthetics or Other Human use and Enjoyment:**

There will be no effects on recreation, tourism, aesthetics or other human use and enjoyment as a result of the construction of the Preferred Alternative. The impacted stream segments are located on property owned and controlled by American Energy Corporation.

***MINIMAL DEGRADATION ALTERNATIVE***

**Effects on Social and Economic Benefits Lost:**

There are no social and economic benefits lost as a result of the construction of the Minimal Degradation Alternative. The impacted stream segments are located on property owned and controlled by American Energy Corporation.



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**Effects on Commercial and Recreational Use of Water:**

There are no social and economic benefits lost as a result of the construction of the Minimal Degradation Alternative. The impacted stream segments are located on property owned and controlled by American Energy Corporation.

**Effects on Recreation, Tourism, Aesthetics or Other Human use and Enjoyment:**

There will be no effects on recreation, tourism, aesthetics or other human use and enjoyment as a result of the construction of the Minimal Degradation Alternative. The impacted stream segments are located on property owned and controlled by American Energy Corporation.

***NON-DEGRADATION ALTERNATIVE***

**Effects on Social and Economic Benefits Lost:**

There are no social and economic benefits lost as a result of the implementation of the Non-degradation Alternative.

**Effects on Commercial and Recreational Use of Water:**

There are no effects on commercial and recreational use of the water resource as a result of the implementation of the Non-degradation Alternative.

**Effects on Recreation, Tourism, Aesthetics or Other Human use and Enjoyment:**

There will be no effects on recreation, tourism, aesthetics or other human use and enjoyment as a result of the implementation of the Non-degradation Alternative.

***10J. Describe environmental benefits, including water quality, lost and gained as a result of this project. Include the effects on the aquatic life, wildlife, threatened or endangered species. (OAC) 3745-1-05 (B)(2)(e, f), (OAC 3745-1-05 (C)(6)(b) and (OAC 3745-1-54).***

***PREFERRED ALTERNATIVE***

**Effects on Aquatic Life:**

Aquatic life benefits will be lost within the impacted stream segments as a result of the construction of the Preferred Alternative.

**Effects on Wildlife:**

Wildlife benefits will temporarily be lost with the removal of the forested upland and riparian corridor for the short term but upon completion of the project the area will gain a grassland/prairie habitat. Specific seed plantings are being planned in cooperation with the Ohio Department of Natural Resources. The grass plantings will provide long-term wildlife habitat. Wildlife benefits gained as a result of the Preferred Alternative are the pond constructed within the lower reaches of the watershed.

**Effects on Threatened or Endangered Species:**

There are no benefits lost or gained as a result of the construction of the Preferred Alternative for threatened or endangered species.



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***MINIMAL DEGRADATION ALTERNATIVE***

**Effects on Aquatic Life:**

Aquatic life benefits will not be lost as a result of the construction of the Minimal Degradation Alternative.

**Effects on Wildlife:**

Wildlife benefits will temporarily be lost with the removal of the forested upland and riparian corridor as a result of the construction of the Minimal Degradation Alternative. To minimize this loss, an ODNR approved corridor for the movement of wildlife will be left within the area. Wildlife benefits gained as a result of the Minimal Degradation Alternative are the pond constructed within the lower reaches of the watershed. In addition, upon completion of the project the area will gain a grassland/prairie habitat. Specific seed plantings are being planned in cooperation with the Ohio Department of Natural Resources. The grass plantings will provide long-term wildlife benefits.

**Effects on Threatened or Endangered Species:**

There are no benefits lost or gained as a result of the construction of the Minimal Degradation Alternative for threatened or endangered species.

***NON-DEGRADATION ALTERNATIVE***

**Effects on Aquatic Life:**

There are no aquatic life benefits lost as a result of the non-degradation alternative.

**Effects on Wildlife:**
Wildlife benefits gained as a result of the Non-degradation Alternative are nominal, if any. The majority of the area is impacted as a result of agriculture, thus the wildlife habitat is limited.

**Effects on Threatened or Endangered Species:**

There are no benefits lost or gained as a result of the construction of the non-degradation Alternative for threatened or endangered species.

***10K. Describe mitigation techniques proposed (except for the non- degradation alternative):***

***Mitigative Techniques for Each Alternative***

**Preferred Alternative**

Water quality impacts will be mitigated through proper execution of construction, operations maintenance water monitoring and reclamation.

Diversion ditches will be installed to direct runoff from the coarse coal refuse area. Runoff entering the refuse pile and leachate, if any, collected by the underdrain system may be high in iron and low in pH. This drainage will be directed to the sediment pond for treatment, if necessary. If the water meets the NPDES effluent limitations, it will be released to the receiving stream, Piney Creek.

Long-term impacts will be mitigated through the implementation of the reclamation plan.

The proposed facility incorporates the following preventative measures. First, a groundwater



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underdrain system will be installed to collect and convey down gradient all seepage beneath the structure. Second, an impervious clay liner will be installed to separate the groundwater underdrain system from the coal refuse. The liner will be three feet thick minimum and compacted to permeability of E-07 or less. Along the valley bottom, the liner will be graded to slope down the valley at existing grades to allow for leachate collection. Third the leachate collection drain will be installed on top of the liner's surface to convey leachate, if any to the toe of the structure where it will drain to a clay lined ponds for possible treatment. Fourth the coal refuse will be compacted to reduce oxidation of the acid producing constituents, mainly pyritic sulphur, and seepage through the refuse material. Fifth, an impervious clay cap will be installed to prevent surface water from migrating into and through the refuse full, thereby elimination or reducing the chance for leachate generation.The surface will be graded to promote immediate drainage. Water will not pond or accumulate on the reclaimed surface.

The impact to wildlife during operations will be minimized as much as possible by limiting the amount of disturbed acreage. The construction of sediment ponds and creation of temporary brush piles throughout the fill process will provide temporary habitat for wildlife and aquatic life. Piney Creek, downstream of the project, will continue to provide a natural habitat for wildlife while the site is operational. Tree lines along the undisturbed sections of the permit area will provide travel lanes and cover for wildlife. Upon final reclamation the seeded areas will provide a good mixture of open areas for food and the natural undisturbed woods and brush lands for cover to promote the successful return of wildlife to the area.

**Minimal Degradation Alternative**

Water quality impacts will be mitigated through proper execution of construction, operations maintenance water monitoring and reclamation.

Diversion ditches will be installed to direct runoff from the coarse coal refuse area. Runoff entering the refuse pile and leachate, if any, may be high in iron and low in pH. This drainage will be directed to sediment ponds for treatment, if necessary. If the water meets the NPDES effluent limitations, it will be released to the receiving stream, Piney Creek.

Long-term impacts will be mitigated through the implementation of the reclamation plan.

The proposed facility incorporates the following preventative measures. First, an impervious clay liner will be installed in the refuse pits. The liner will be three feet thick minimum and compacted to permeability of E-07 or less. Second, leachate, if any, will be collected in channels that drain into sediment ponds for treatment, if required. Third, the coal refuse will be compacted to reduce oxidation of the acid producing constituents, mainly pyritic sulphur, and seepage through the refuse material. Fourth, an impervious clay cap will be installed to prevent surface water from migrating into and through the refuse full, thereby elimination or reducing the chance for leachate generation.The surface will be graded to promote immediate drainage. Water will not pond or accumulate on the reclaimed surface.

The impact to wildlife during operations will be minimized as much as possible by limiting the amount of disturbed acreage. The construction of sediment ponds and creation of temporary brush piles throughout the fill process will provide temporary habitat for wildlife and aquatic life. Piney Creek, downstream of the project, will continue to provide a natural habitat for wildlife while the site is operational. Tree lines along the undisturbed sections of the permit area will provide travel lanes and cover for wildlife. Upon final reclamation the seeded areas will provide a good mixture of open areas for food and the natural undisturbed woods and brush lands for cover to promote the successful return of wildlife to the area.



AEC 11946

# CENTURY MINE
# SURFACE FACILITIES

# MITIGATION PLAN

**MITIGATION PLAN**
**AMERICAN ENERGY CORPORATION**
**CENTURY MINE**

## INTRODUCTION:

The surface construction activities planned for this site will result in unavoidable impacts to stream beds and wetlands. The extent of impacts on individual water bodies were set forth in the previous permitting applications for the captioned project.

It is proposed to mitigate both the wetland and stream impacts on property of the mining company at this site and in a manner described subsequently in this document. The mitigation sites are located within the Piney Creek watershed. These mitigation procedures are being proposed because there is no other space available at the site to construct mitigative waterways.

## STREAM MITIGATION:

*NOTE:*

> Field construction should be supervised by an individual knowledgeable in the design procedure and in field construction methods. Design values shown on the drawings may need to be adjusted in the field to meet constraints of construction equipment, available materials, time and topography. The design dimensions given on the drawings provide a starting point for determining the geometry of the stream, but they do not represent an end point. Field adjustments in the design must be anticipated.

Stream disturbances occur on the site because of the development of the refuse disposal area necessary to service the site. Streams will be mitigated at a ratio of 1:1. The objective of the mitigation will be to improve on ~~7100~~ 7161 l.f. of streams which were disturbed by the previously mentioned activities. WJS

The streams are old and well established. They have remained relatively undisturbed for many years. The proposed improvement will consist of enhancement of the riparian zones and berms of Piney Creek and Long Run. The enhancement will be composed of planting accepted species in the already established areas.

***Stream Riparian Zones and Berms***:

*NOTE*:

> A plant specialist should be consulted to assure establishment of vegetation in stream, wetland, and impoundment areas. The establishment of these areas is critical to the acceptability of the mitigation effort by the regulatory agencies.



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A riparian zone will be established between the edge of water and the top the bank where practicable. A berm will be established from the top of the bank for a distance of 2 ½ times the bottom width of the stream or 100 feet, whichever is greater. Bare or sparsely vegetated areas in these zones will be planted with a mixture of trees and shrubs selected from the table below. Trees and shrubs will be interspersed on an 8 foot by 8 foot grid (each plant or plant group will occupy 64 square feet). Plant zones shown in the table are defined as follows:

**Plant Zone #1** is below the level of the normal waterline to the upper limit of the saturated area kept moist by capillary water movement. This zone includes the greatest potential for periodic inundation and the least moisture stress.

**Plant Zone #2** is from the upper limit of zone #1 to 2-3 feet from the top of the bank. This area may be subject to rapid drying and greater moisture stress.

**Plant Zone #3** is an area from 2-3 feet below the top of the bank to a minimum of 30 feet into the flood plain.

| Plant Zone | Common Name | Species | Note |
|---|---|---|---|
| 1 | White Willow | Salix Alba | a |
| 1 | Black Willow | Salix Nigra | a |
| 1 | Sandbar Willow | Salix Interior | a |
| 1 | Carolina Willow | Salix Caroliniana | a |
| 1 | Peach Leaved Willow | Salix Amygadaloides | a |
| 1,2,3 | Flowering Dogwood | Cornus Florida | |
| 1,2,3 | Green Ash | Fraxinus Pennsylvanica | |
| 1,2,3 | Sycamore | Plantanus Occidentalis | a |
| 1,2,3 | Bald Cypress | Taxodium Distichum | |
| 1,2 | River Birch | Betula Nigra | |
| 1,2,3 | Eastern Cottonwood | Populus Deltoides | a |
| 1,2,3 | Swamp Cottonwood | Populus Heterophylla | a |

Shrubs provide a viable understory for restored areas. Additionally, they provide browse and cover for wildlife and help prevent erosion. Shrub species will be randomly interspersed among tree species. They will be chosen from the following list and planted in groups of three.

| Plant Zone | Common Name | Species | Note |
|---|---|---|---|
| 1 | Bankers Willow | Salix Cottettii | a |
| 1 | Purple-osier Willow | Salix Purpurea | a |
| 1 | Buttonbush | Cephalanthis Occidetalis | a |
| 1,2,3 | Silky Dogwood | Cornus Amomum | |
| 1,2,3 | Red-Osier Dogwood | Cornus Stolonifera | a |

a. Indicates species suitable for use as dormant wood cuttings, stakes or posts if desired. All species of willow and cottonwood do not require hormone treatment



AEC 11949

Grasses and legumes will be planted over the entire riparian and berm sections. The following seed mixture will be sown at the rate of 35 lbs. per acre. The percentage of each seed is shown below:

| | |
|---|---|
| Perennial Rye Grass | 15% |
| Foxtail Millet | 15% |
| Red Top | 10% |
| Birdsfoot Trefoil | 10% |
| Appalow Lespedeza | 50% |

Areas planted with riparian or berm vegetation will not be cut or mowed in order to encourage the development of volunteer vegetation. Species of trees, shrubs, grasses, and legumes which appear naturally will be allowed to remain in order to enhance the wildlife environment along the stream. for rooting.

## WETLAND MITIGATION:

Wetland disturbances occur as previously described. The Ohio EPA has directed that the disturbed wetlands be mitigated at the ratio of 1 ½ : 1.

The mitigative wetland will be developed in the area of the existing abandoned fresh water pond. This location is shown on the enclosed mapping. Hydrology and vegetation is already established in the area. It is assumed that hydric soils exist or are in the process of developing since this area has been in its current condition for many years.

The water is approximately 6 feet deep at the deepest point. The dam will be lowered and the spillway will be systematically lowered over time until water depths are within the limits recognized as acceptable wetland conditions. The wetland surface area will then be adjusted to provide the required mitigative area (2.66 acres). Wetland planting will then be placed in the newly developed area.

The mitigation area is shown on the mapping and detail drawings included with this document. A section of the Belmont County Highway Map showing the general location of the site is also included. The planned topography, hydrology, soils, and vegetation are all addressed in this section. Planting areas and vegetation lists are included as are monitoring plans and schedules. Corrective measures are also included should the mitigative area not perform as expected.

The new wetland area will be established on land owned by the mining company which has agreed to incorporate deed restrictions which will preserve the mitigative wetland in perpetuity. The following conditions will be incorporated into any deed or other instrument of conveyance which may be written in the future.

"The mitigative wetland and deep water habitat area containing approximately 2.66 acres which exists on the property is a mitigative installation mandated by the Ohio Environmental Protection Agency (1-800-426-6515) and the U.S. Army Corps of Engineers, Pittsburgh District (412-395-7157). The grantee agrees that this area will be preserved in perpetuity; that no disturbances of the mitigative areas of any kind will ever be undertaken without first contacting the regulatory authorities and procuring the proper permits. The grantee further agrees that this condition will be incorporated into any deed or other instrument of conveyance should the property ever be sold or otherwise conveyed or transferred in the future."

The plan is based upon contours and elevations which are present at the site when this document was prepared (winter,2002). It is possible that elevations, contours, and locations may vary slightly from those assumed when mitigation is undertaken. However, basin morphology should remain constant regardless of topographic features.

***Wetland Topography:***

The site will be graded to provide a wetland area as shown on the enclosures with this document and as described in this commentary. A buffer area with more gentle slopes than other surrounding land will be established at the perimeter of the mitigative wetland area. The purpose of the buffer will be to slow runoff into the wetland and reduce siltation of the wetland basin. This buffer will be planted as described subsequently in the drawings included as part of this attachment. This planting will further enhance the buffering characteristics.

***Wetland Hydrology:***

The hydrology for the mitigative wetland area will be provided by Long Run. This stream is natural and undisturbed in the areas immediately upstream and downstream of the proposed mitigative wetland. It is also well established in these areas and in the area of the proposed mitigation. It has serviced the fresh water pond for many years. During the period when the water levels in the wetland are being adjusted, the stream bed will also be manipulated so that adequate water is fed into the wetland area while still maintaining flow in the stream. The existing conditions, proposed mitigative areas, and cross-sections are shown on the plans included with this attachment.

It is anticipated that beaver may be present on the site at some time after the completion of mitigation. If this occurs, additional wetland area may be created or the ratio of wetland planting areas may be altered. Beaver control is not part of the mitigation plan. Should they occupy the site at any time after completion of the work, they will be allowed to remain.

***Wetland Soils:***

It is presumed that wetland soils are either present or are in the process of developing in the proposed wetland area. The area has been present for many years and the shallower ranges have already shown aggressive development of wetland vegetation. This condition should continue to progress after completion of this mitigative work.

***Wetland Vegetation:***

A planting design has been established for the mitigative area. This plan should provide for a diverse species grouping which will naturally colonize on a time table fitting to the required establishment period. It will also provide browse and cover for a variety of wildlife which can be expected to occupy the site after mitigation is completed. No effort will be made to control natural colonization except to control invasive species as described subsequently in this attachment.

Plant zones have been established for the wetland which will accommodate placement of plants in the best hydrologic conditions conducive to growth of that particular species. All plant stock will be procured from reputable plant suppliers in the area. This should assure that stock is acclimated to the area.

Four plant zones have been established for the wetland area. Zone #1 is deep, permanent water; Zone #2 is permanent intermediate depth water. Zone #3 is shallow water which extends into the area adjacent but above the waterline. Zone #4 is water depths ranging from shallow to intermediate and includes areas in the shallower ranges which may be periodically dry. The island area is included in Plant Zones #3 & #4. Plants selected for each of the various zones are listed in the Plant List on Page -M-7- of this document.

Any of the following conifers may be used in riparian areas where called for in the drawings included with this Mitigation Plan:

| | |
|---|---|
| Austrian Pine (Pinus Nigra Arnold) | Scotch Pine (Pinus Sylvestris) |
| Eastern Pine (Pinus Strobus L.) | Jack Pine (Pinus Banksiana Lamb) |
| Red Pine (Pinus Resinosa Ait) | Pitch Pine (Pinus Rigida Mill) |

Hardwoods may be planted in the buffer areas outside the flood plains of the stream reaches developed. These species may be chosen from the list for stream riparian zones on Page -M-2-.

These conifers and hardwood species can be planted as seedlings; however establishment of viable root systems with plants of this size is difficult and time consuming. They require close observation and maintenance. Survival required by the regulatory agencies and outlined subsequently in this document is more assured if containerized plants between 4' and 6' in height are used.



AEC 11952

The berm and riparian zone around the wetland will be seeded with Red Top Grass and Meadow Fescue. Islands will be seeded with the same mixture. The mixture will, in both cases, be 50/50 at a rate of 35 lbs/acre. Clusters of shrubs will be established on banks and islands. Shrubs will be planted on 8 foot centers in clusters of three. Shrub species will include Alder, Wax Myrtle, Black Willow, and Elderberry. These shrubs are frequently found growing together and can tolerate the same or similar conditions. Black Willow will be used to stabilize the channels leading into and away from the mitigative wetland areas.



AEC 11953

## Wetland Plant List

| Plant | Zones | Stock |
|---|---|---|
| Water Smartweed (Polygonium Amphibium) | 1 | Seedling, 8 foot centers |
| Slender Pondweed (Potamogeton Pectinatis) | 1 | Rhizome, 8 foot centers |
| Common Cattail (Typha Latifolia) | 2 | Rhizome, 8 foot centers |
| Spatterdock (Nuphar Luteum) | 2 | Bare root, 8 foot centers |
| Soft Stem Bullrush (Scirpus Tabernaemontii) | 2, 4 | Rhizome, 8 foot centers |
| Arrowhead (Sagittaria Latifolia) | 2, 3, 4 | Tuber, 8 foot centers |
| Smart Weed (Polygonum Hydropiperoides | 2, 3, 4 | Plug, 8 foot centers |
| Soft Rush (Juncus Effusis) | 3, 4 | Rhizome, 8 foot centers |
| Long Hair Sedge (Carex Comosa) | 3 | Seed, ½ lb/acre |
| Red Top Grass (Agrostis Alba) | 3 | Seed, 5 lbs/acre |
| Pennsylvania Smartweed (Polygonum Pennsylvanicum) | 3 | Plugs, 8 foot centers |

## MONITORING PLAN:

A monitoring program will be implemented following establishment of the mitigative areas. The monitoring program will document hydrology, vegetation, and soils where applicable in accordance with the U.S. Army Corps of Engineers three parameter approach. The General Wetland Mitigation Monitoring Requirements prescribed by the Ohio Environmental Protection Agency will be followed. A copy of the official description of this program is included for reference on Page -M-10- of this attachment. The stream and impoundment monitoring programs will document the Q.H.E.I. score for the stream, the hydrology, and the vegetation for the impoundments. Monitoring will identify problems and potential problems and develop remedies as required.

In addition to the reporting procedure required by the general wetland monitoring document mentioned in the previous paragraph, reports will be submitted to the Pittsburgh District of the U.S. Army Corps of Engineers, 1000 Liberty Avenue, Pittsburgh, PA 15222-4186. The report will be based upon monitoring completed during the growing season. These reports will be submitted annually for a period of five years following completion of reclamation. They will be submitted on or before August 31 for the year of review. Reports will be based upon wetland sampling points described in the Ohio E.P.A. policy previously referenced; upon single sampling points for each deep water habitat; and upon two sampling points for each stream. These points will be identified in the field so that the same points can be used for each periodic observation. The reports will also include photographs which will be taken from the same point of view for each report. These viewpoints will also be identified in the field so that they can be used on a continuing basis.

Survival rates expected for all mitigative vegetation during the five year establishment period are:

| | |
|---|---|
| Year 1 | 50% |
| Year 2 | 60% |
| Year 3 | 70% |
| Year 4 | 80% |
| Year 5 | 90% |

Water sampling will be incorporated into the wetland monitoring plan. This will also be done in accordance with the Ohio E.P.A. guidelines previously referenced. Stream water sampling will also be carried out in accordance with Ohio Department of Natural Resources requirements.

Observation and photo view point identification markers will be established so that conformance with the requirements of the guidelines can be assured. These markers will consist of steel fence posts driven into the ground. Both sets of points will be identified and numbered so that continuity between observation and reporting periods will be assured.

Wetland, stream, and impoundment development will also be monitored by the Division of Mines and Reclamation personnel as part of the reclamation monitoring which this organization normally carries on.



AEC 11955

## MITIGATION CONTINGENCY PLAN:

Should it become evident that the *Mitigation Plan* has failed, steps will be taken to remedy the failure. In the event that vegetation is deemed inadequate, replanting of the significant bare spots will be undertaken. Any replanting will occur during the same growing period that the deficiencies are found except that if it becomes necessary to replant trees and shrubs, replanting will be done during the following growing season (replanting of areas created by the removal of invasive species will be covered subsequently.)

Should the integrity of the channels deteriorate to the point that significant erosion is taking place, the erosion will be repaired. Rock riprap may be incorporated. If this is required, then rock will be adequately sized in accordance with current practice. Should it become apparent that the original design is inadequate, then new specifications will be developed and implemented.

If invasive species such as Reed Canary Grass, Purple Loosestrife, or Giant Reed develop in the mitigative area, corrective measures will be taken. These measures will include either spraying or physical removal or both depending upon the extent of the contamination and the season of discovery.

If spraying is the chosen method, then applicators certified by the State of Ohio Department of Agriculture, Division of Plant Industry will be retained to apply herbicides. This will assure that herbicide will not affect nearby acceptable growth. If physical removal is deemed appropriate, then care will be taken to minimize distribution of seed into surrounding areas. If possible, removal will be undertaken during the dormant period . This will help assure that distribution of the seed into adjacent areas will be minimized. This removal may have to occur during several growing seasons until seed distribution from previous seasons is eliminated from the growing cycle. Bare spots left by the corrective action will be replanted following the appropriate time period (this period depends upon the type of herbicide used.)



AEC 11956

## Ohio Environmental Protection Agency
## General Wetland Mitigation Monitoring Requirements

Annual water quality, hydrology, and vegetation surveys shall be conducted. A report containing these data shall be submitted to Ohio E.P.A. for each of five consecutive years following completion of mitigation construction. The first annual report is due to Ohio E.P.A. by December 31 of the year following completion of mitigation construction. All subsequent reports shall be submitted by December 31 of each of the five monitoring years. The reports shall contain, at a minimum, the following information:

**Water Chemistry Monitoring**: A grab sample shall be collected in May of each monitoring year in each wetland mitigation area. The samples shall be analyzed for ammonia, nitrates, nitrite, carbon, total sulfates, total iron, total manganese, specific conductivity, pH, turbidity, total suspended solids heavy metals and biochemical oxygen demand.

**Hydrology Monitoring**: Water level data shall be collected in May and late August of each monitoring year. Ground water levels shall be measured in the absence of inundated conditions.

**Vegetation Monitoring**: The location and name of each plant community type within the mitigation area and buffer area shall be marked on a scaled drawing or scaled aerial photograph (base map) and named.

A representative observation point shall be selected in each plant community type in each distinct wetland mitigation area. This shall be a point which best represents the characteristics of the entire plant community. The observation points shall be marked on the base map.

The dominant plant species shall be visually determined in each vegetation layer of each community type, and the specific names of these species shall be included in the report. Dominant species are those species which have the greatest relative basal area (woody overstory), greatest height (woody overstory), greatest percentage of aerial coverage (herbaceous understory), and/or greatest number of stems (woody vines).

Each sample point shall be photo documented from the same position and angle during July of each monitoring year.

The applicant shall arrange an on-site mitigation meeting with Ohio E.P.A. on the third year after wetland mitigation construction. The purpose of this inspection is to determine if the mitigation project has been constructed in accordance with the agreement between the applicant an Ohio E.P.A.. If necessary, Ohio E.P.A. may make recommendations to improve the wetland. The applicant is responsible for undertaking any reasonable modification identified by Ohio E.P.A..

The applicant is responsible for ensuring the wetland is not filled, drained, or otherwise converted to upland. If the property is sold, the deed shall ensure that the wetland will not be filled, drained, or otherwise converted to upland.

**Ephemeral Stream Mitigation**

The proposed refuse disposal will affect 2,002 lineal feet of ephemeral streams. These are to be mitigated at a ratio of 2:1. American Energy Corporation proposes to mitigate this via Conservation Easement, as shown on attached Drawing No. 19. The proposed total length of streams is no less than 4,004 lineal feet at a width of 200 feet.

**ATTACHMENT #1**

**CORRESPONDENCE FROM THE DIVISION OF WILDLIFE AND THE DIVISION OF NATURAL AREAS AND PRESERVES.**

# Ohio Department of Natural Resources

BOB TAFT, GOVERNOR

SAMUEL W. SPECK, DIRECTOR
**Division of Wildlife**
*Michael J. Budzik, Chief*
1840 Belcher Drive
Columbus, OH 43224-1300
*Phone: (614) 265-6300*

January 3, 2002

Donald Brafford
Jack A. Hamilton & Associates, Inc.
Box 471, 342 High Street
Flushing, OH 43977

Subject: Information request
Century Mine Surface facilities
Belmont County, Ohio

Dear Mr. Bradford:

This letter is in response to your information request on the above referenced project in Belmont County. The aquatic habitat of the area highlighted on the map appears to be limited to two intermittent streams. Based on the information you provided, ODNR, Division of Wildlife (DOW) does not have records of any "significant aquatic life" nor threatened or endangered wildlife species in close proximity of this site.

If additional information or clarification is needed please feel free to contact my staff person Bob Fletcher @ 614-265-6308.

Sincerely,

Randy Sanders
Assistant Administrator
Fish Management & Research

DNR 0001

## DATA REQUEST

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF NATURAL AREAS AND PRESERVES
HERITAGE DATA SERVICES
1889 FOUNTAIN SQUARE COURT, BUILDING F-1
COLUMBUS, OHIO 43224
PHONE: 614-265-6453; FAX: 614-267-3096

**INSTRUCTIONS:**
Please fill out both sides of this data request form, sign it and return it to the address or fax number listed above along with: **(1)** a letter formally requesting data and describing your project, and **(2)** a map detailing the boundaries of your study area. A photocopy from the pertinent portion of a USGS 7.5 minute topographic map is preferred but other maps are acceptable. Our turnaround time is two weeks, although we can often respond more quickly.

**FEES:**
Fees are determined by the amount of time it takes to complete your project. The charge is $25.00 per ½ hour with a ½ hour minimum. We can perform a data search manually or by computer. The Heritage Data Services staff will determine the most cost-efficient method of doing your search. A cost estimate can be provided upon request. Unless otherwise specified, an invoice will accompany the data services response.

**********

This request is being submitted by: ☒ fax ☐ mail ☐ both

Date: JAN 7, 2001

Your Agency/Organization: JACK A HAMILTON & ASSOC.'S, INC.

Your Name/Title: DON BRAFFORD

Address: 342 HIGH ST, BOX 471

City/State/Zip: FLUSHING, OHIO 43977

Phone/Fax: 740-968-4947

Project Name/Number: CENTURY MINE SURFACE FACILITIES

Project is located on the following USGS 7.5 minute topographic map(s): HUNTER QUADRANGLE

If there is a program or contracting agency requiring this information, please give the name and phone number of a contact person:

OH EPA & ODNR

DNR 5293
REV 9/97

The Natural Heritage Data Base contains records for the categories of species and features listed below. Check the appropriate boxes to indicate your selection.

PLANTS:
- ☐ Federal Status Only
- ☐ State Legal Status Only
- ☐ Rare (non-legal status)
- ☒ All of the above

ANIMALS:
- ☐ Federal Status Only
- ☐ State Legal Status Only
- ☐ Rare (non-legal status)
- ☒ All of the above

PLANT COMMUNITIES:
- ☒ All
- ☐ Wetlands Only
- ☐ Other_____

OTHER FEATURES:
- ☐ Geologic Features
- ☐ Breeding/Non-breeding Animal Concentrations
- ☐ Champion Trees
- ☐ State Nature Preserves and Natural Areas
- ☐ State Wild, Scenic and Recreational Rivers
- ☐ State Parks, Forests, Wildlife Areas
- ☒ All of the above
- ☐ Other_____

Besides name, location and status, specify any additional information you need:

The area you want searched:
- ☒ study area as outlined on the map
- ☐ study area plus ½ mile radius
- ☐ study area plus 1 mile radius
- ☐ other_____

How will the information be used:

TO OBTAIN NECESSARY PERMITTING

The information supplied above is complete and accurate. Any material supplied by the Natural Heritage Data Base will not be published without prior written permission and without crediting the Division of Natural Areas and Preserves as the source of the material.

Your Signature Don Byfal

**ATTACHMENT # 2**

**PLANT PROTECTION**

## PLANT PROTECTION:

Planting which is completed to meet requirements of this *Mitigation Plan* should be protected against damages which may be caused by deer, beaver, or other varmints which can damage plants. This damage could have a devastating impact on survival rates which are required under this permitting.

Several methods of protection against these potential damages are available. One is a wireless deer fence. Another is a plastic sleeve which can be placed around the plant. Information on these two products is attached. Other alternatives are the use of coyote urine or other commercial products available for this application. These products and applications all require periodic maintenance or re-application

Jack A. Hamilton & Associates, Inc. is not a plant specialist or horticulturist. An expert in these matters should be contacted prior to and during the establishment of mitigative growing areas. The attached information is provided as a courtesy to our clients.

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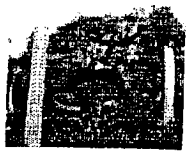

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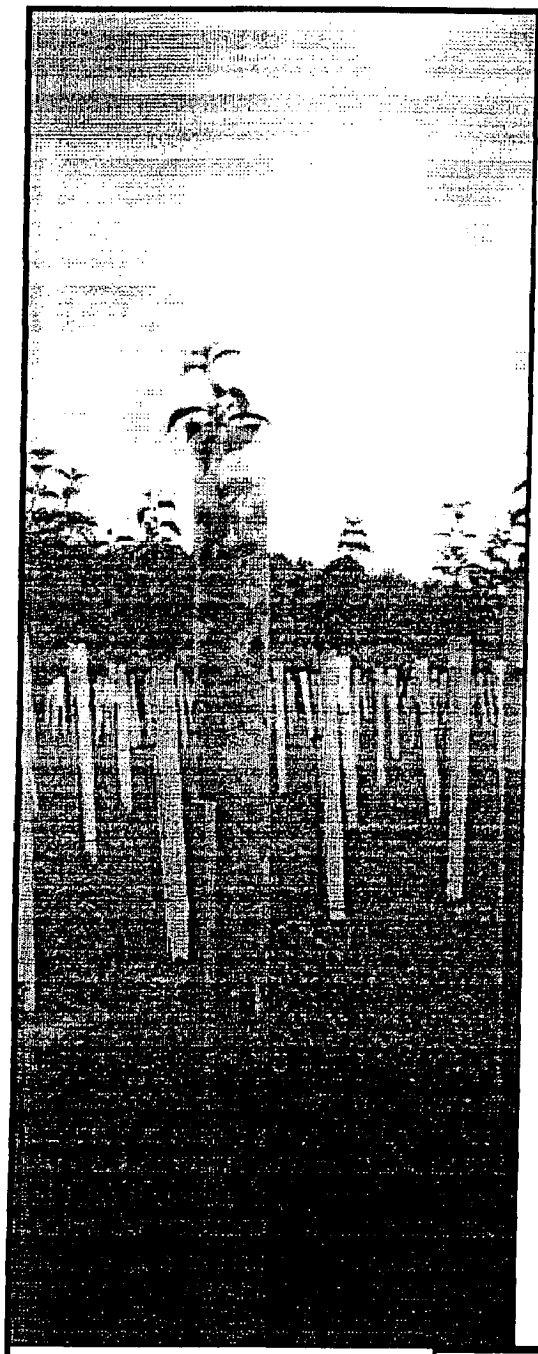

Testing CLEAR 60 inch Miracle Tube. This Crab Apple was planted 28 months ago; the miracle tube was put on May '98 and the photo taken July '98. The plant grew over 20 inches during this period. We have had a wet spring. The photograph was taken after a three week dry period with temperatures up to 98 degrees.

Previous Gallery Next

January, 1999

# New Wireless Fence Promises An End to Deer Encroachment

By LORI SMITHBERGER
Staff Writer

While deer population is at an all time high, a new product promises a method of peaceful co-existence, at least where your garden and lawn are concerned.

The Wireless Deer Fence is a new patented product that guarantees deer will avoid your yard and garden. The new product has been field tested for the last year and a half with nearly 100 percent effectiveness.

"After three and a half years of research and development, I am now ready to present the Wireless Deer Fence," said veterinarian and fence creator Keith Betzen. "The Wireless Deer Fence has been field tested for over two and a half years, and it has proven amazingly effective. It is sold with a complete satisfaction guarantee."

The operation of the deer fence, which functions using scented oils and two AA batteries, is rooted in deer psychology, initially relying on the animal's curious nature and then on its ability to learn and fear, explained Betzen. "The Wireless Deer Fence consists of field units which are positioned in yards and gardens such that when deer are attracted by the perfumed oil to touch the units, the fence delivers a harmless shock which frightens the deer from the area and instantly trains them never to return."

This system is a very productive method of eliminating deer problems because it not only installs fear in the deer who is initially shocked, but because deer are heard animals, this single shock to one animal will frighten other nearby deer from the area, Betzen said.

This does not mean that the units are causing the animal any great harm. While the Wireless Deer Fence will deliver an uncomfortable shock, the amount of energy involved is too low to initiate any problems other than momentary discomfort. The product s a very low amperage, a short cur- t path and a very short discharge ation, producing an effect similar at of static electricity from carpet. standard electric fences, the Deer Fence takes approxi- l minutes to recharge, so chance for repeated shocks, fe for both target animals and accidental victims.

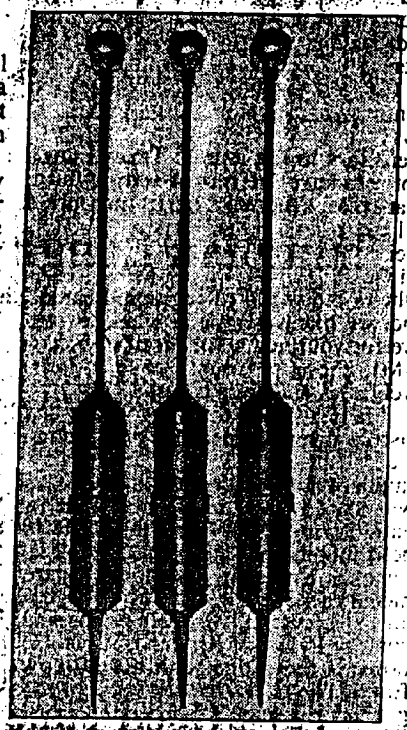

Photo provided

**The Wireless Deer Fence, a new product that promises deer will quickly learn to avoid your lawn and garden, utilizes essential oils and mild electric shock as a means of control. The new wonder product currently has two U.S. patents and three patents pending, and guarantees satisfaction.**

The Wireless Deer Fence is a non-toxic, environmentally safe product that can aid in the conservation of people's property. The device operates safely, efficiently and silently on two AA batteries. It is weather-proof and low maintenance, requiring new batteries once every two years and oil replenishment once a month, explained Betzen.

The deer fence has been tested only on relatively small plots of land and is recommended for areas not exceeding 3/4 of an acre.

For information on this new solution to the area's excessive deer population, call Betzen Manufacturing at (800) 927-5356

AEC 11967

WIRELESS DEER FENCE

You are here > Home > FAQs

# FAQs

The Wireless Deer Fence

Question: How large of an area can I protect with the Wireless Deer Fence?

Answer: The Wireless Deer Fence has only been tested on relatively small areas and so recommended for areas of about 3/4 of an acre or less.

Question: How far apart can I put the Wireless Deer Fence units?

Answer: If the units are positioned too far apart, the chances are increased that the deer between them. Depending on how many things that you grow that deer like, the Wirele: should be placed between 10 and 30 feet apart.

Question: The instructions are vague about how many Wireless Deer Fence units that I

Answer: It is difficult to be exact about how many are needed because there are so man variables include; how many deer are in your area, how many plants do you grow that d are located, the existence of other barriers to limit entry paths into the area, the size of t want to protect and how quickly do you want to train all the local deer. Example 1: In n that is overloaded with deer, where I have many things that deer like, that is way out in almost no existing barriers to deer entry, and that is about 3/4 of an acre in size I have b (6 packages) and have had 100% successful protection from deer. Example 2: In the yai testimonial in this website, there are 21 units ( 7 packages) in an area that is slightly mo acre and where there are about 80 types of hostas and many other things that deer like. no deer damage for almost 2 years.

Question:. I am worried about my dog being hurt by these devices.

Answer: The Wireless Deer Fence delivers a harmless shock and will not harm your do not to touch the devices. The scent used in the Wireless Deer Fence is designed to attra attract dogs. If your dog touches one of the devices it will quickly learn to leave them al

Question:. How do I maintain the units in my yard?

Answer: About once a month you should replenish the scented oil in the device. At this make sure that the device is clean of any spiders, in sects or debris that may be on the d you should test the units by shorting across the electrodes and observing for a small ele sure that the units do not become overgrown with vegetation. It may be a good idea to r occasionally to better protect vulnerable plants as they emerge.

Question: The felt in my units has become discolored, what is the problem?

Answer: The discoloration that you see with time is expected and it will not affect the p Wireless Deer Fence.

Question: How many units do I need?

Answer: The number required depends on what you grow, the size of your yard and the numb area.

| | | |
|---|---|---|
| Small yard | 3-6 units | 1-2 packages |
| Medium yard | 9-12 units | 3-4 packages |
| Large yard | 15-18 units | 5-6 packages |

Question: How safe is the the Wireless Deer Fence?

Answer: The Wireless Deer Fence delivers a harmless but uncomfortable shock. The amount by the Wireless Deer Fence is far too low to cause any damage or problems other than a mom Each unit has a brightly colored cap as a warning not to touch. Children should be warned abo small children should be closely supervised around the devices. The Wireless Deer Fence can from an area when children or pets are present.

Question: How does weather affect the Wireless Deer Fence?

Answer: The Wireless Deer Fence may be discharged by heavy rainfall, or by ice and snow. I less active during periods of rain or snow, and they feed less during these times. The Wireless recharged in about 12 minutes after the rain stops. To be effective in the winter, the Wireless D kept clear of snow and ice. It will not harm the device to be buried under snow and ice and it wi battery life.

Question: Is the Wireless Deer Fence Guaranteed?

Answer: Absolutely. The Wireless Deer Fence will provide satisfactory deer control or you car we will immediately refund your purchase price plus the postage to return the devices to us. If a be defective within one year of purchase, we will replace it with two units. Our liability is limited purchase price and return postage or replacement of the device as stated. All other liabilities a

Additional Questions? Click here.

Back to top


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WIRELESS DEER FENCE

You are here > Home > Contact Us

# Contact Us

The Wireless Deer Fence

I am very interested to hear about your experiences with the Wireless Deer Fence. I will respond by E-mail, fax or by mail to all questions and comments that you send. Also, your questions and comments may be posted on the FAQ page so that everyone can benefit from your experiences.

**Keith M. Betzen, D.M.V.**

**E-mail**: keith@wirelessdeerfence.com
**Fax**: (812) 335-8242

**US Mail:**
PO Box 5604
Bloomington, IN 47407-5604


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WIRELESS DEER FENCE



# How it Works

The Wireless Deer Fence

Product Description | The Deer Problem | Safety | Deer Training | Weather | Competitors' Products

The operation of the Wireless Deer Fence is based on deer behavior. Deer are creatures live in a specific area with set travel paths. Once shocked by the Wireless Deer Fence, the their living area and change their travel paths to avoid the area they associate with the ne experience. Deer are also herd animals. When one deer is shocked, the violent reaction s deer nearby and they are also frightened from the area. When one deer is too frightened t area, other deer will avoid it as well. Fear is a powerful motivator, especially for deer.

**Product highlights**

- Operates silently and efficiently with extended battery life--two years with 2 AA batteries
- Very economical. Protects an area for less than other alternatives.
- *Easy* to deploy. *Easy* to remove. *Easy* to maintain.
- Monthly maintenance simply involves refreshing attractant oil.
- Sweet-smelling, perfumed oil used as an attractant. Smells great!
- Field tested for more than two years with outstanding results.
- The Wireless Deer Fence works!

The Wireless Deer Fence works by affecting the deer's brain, not by containing its body. A instantly trained by a single contact with a Wireless Deer Fence unit, a deer thereafter ass discomfort of the shock, not only with the area, but also with the smell of the perfumed oil device. The sense of smell is very basic and the association of the discomfort of the shock of the perfumed oil will lead to a profound learning experience for the deer and it will not re area when it smells the devices.

Wireless Deer Fence Satisfaction Guarantee:

The Wireless Deer Fence will provide satisfactory deer control or you can return it to us ar immediately refund your purchase price plus the postage to return the devices to us. If any found to be defective within one year of purchase, we will replace it with two units. Our liat to refund of the purchase price and return postage or replacement of the device as stated. liabilities are excluded.


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WIRELESS DEER FENCE

*I would like to order the satisfaction-guaranteed Wireless Deer Fence patented deer control system.*

**Product Description:**

Each package contains three (3) units. A one 1 oz. bottle of attractant oil (enough to last a year) is included in each package. Two AA batteries per unit are required. BATTERIES NOT INCLUDED.

Price: $59.95

# Four ways to order

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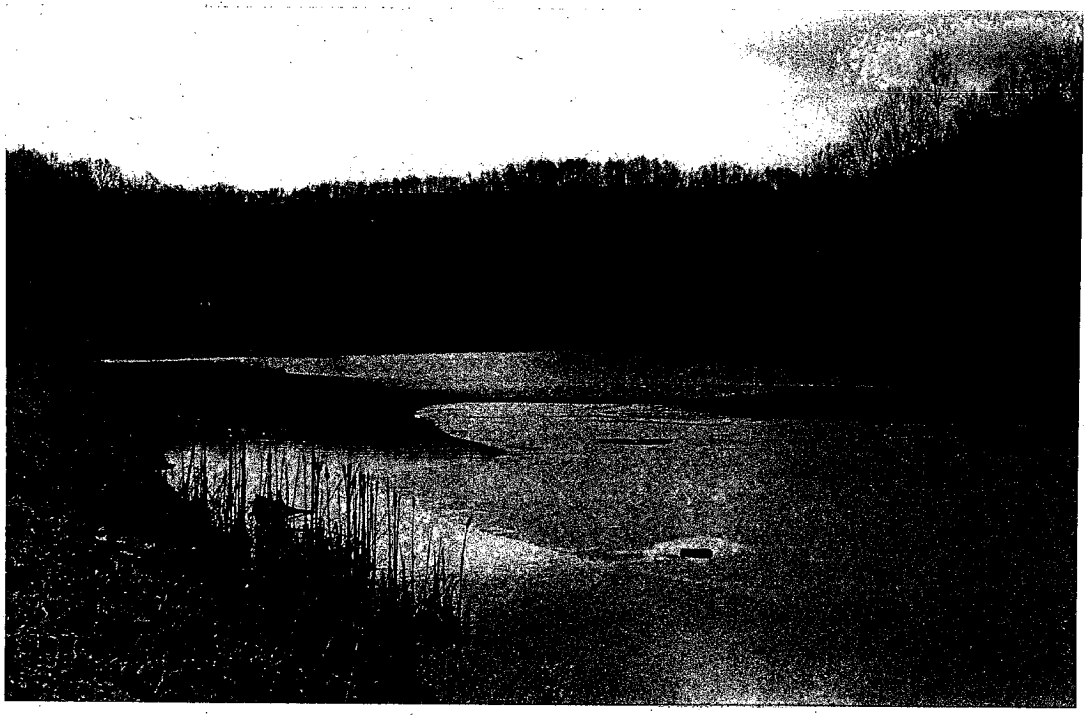
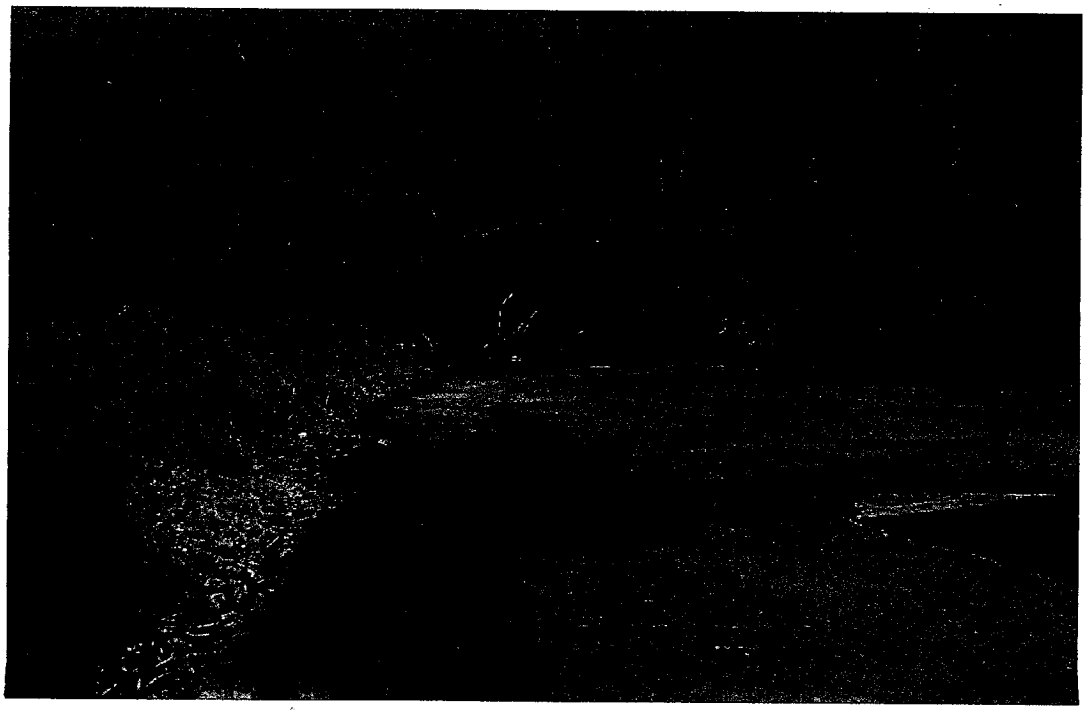
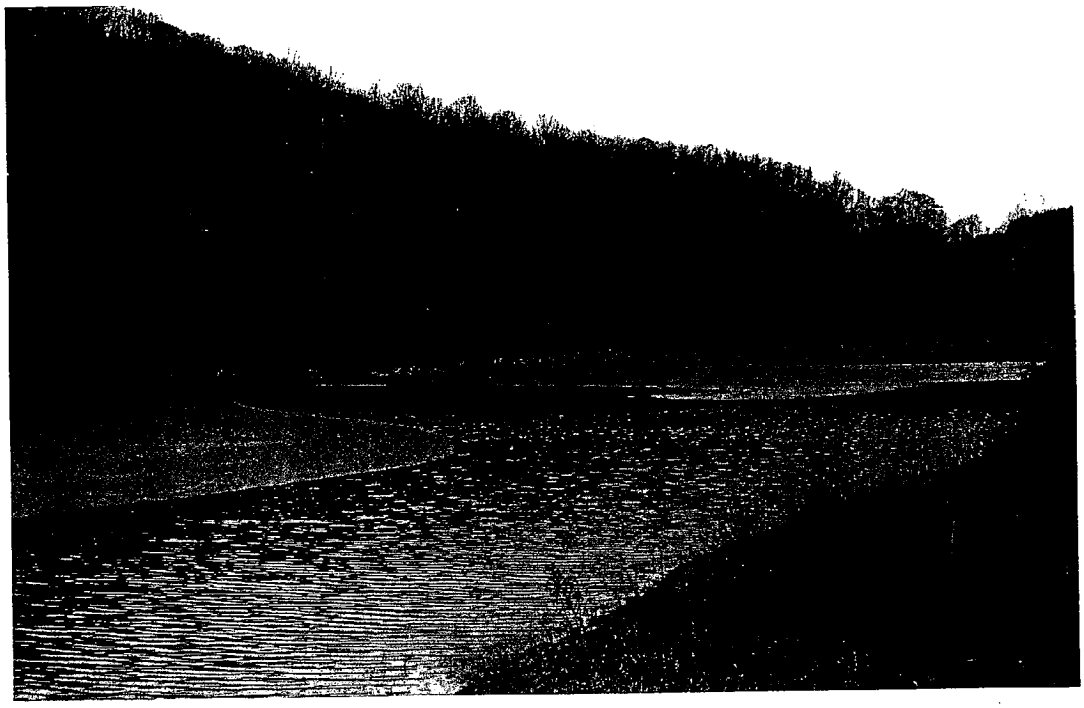


1. Long Run Pond. 29 January 2002
Downstream view, emergency spillway on right (west) side.



2. Long Run Pond. 29 January 2002
Pond embankment, east to west view. Pond depth 2 to 3 feet.

3. Long Run Pond. 29 January 2002
Downstream view from headwaters (north) end. Cattails abundant in headwaters.

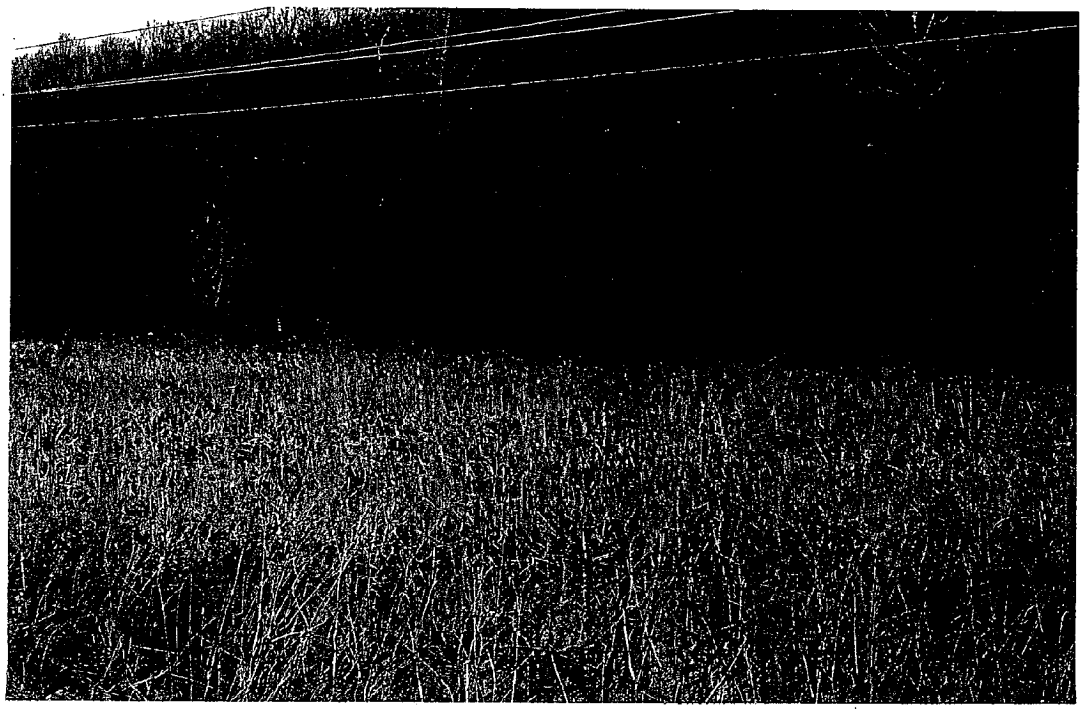


4. Long Run Pond. 29 January 2002
Upstream view from east bank.

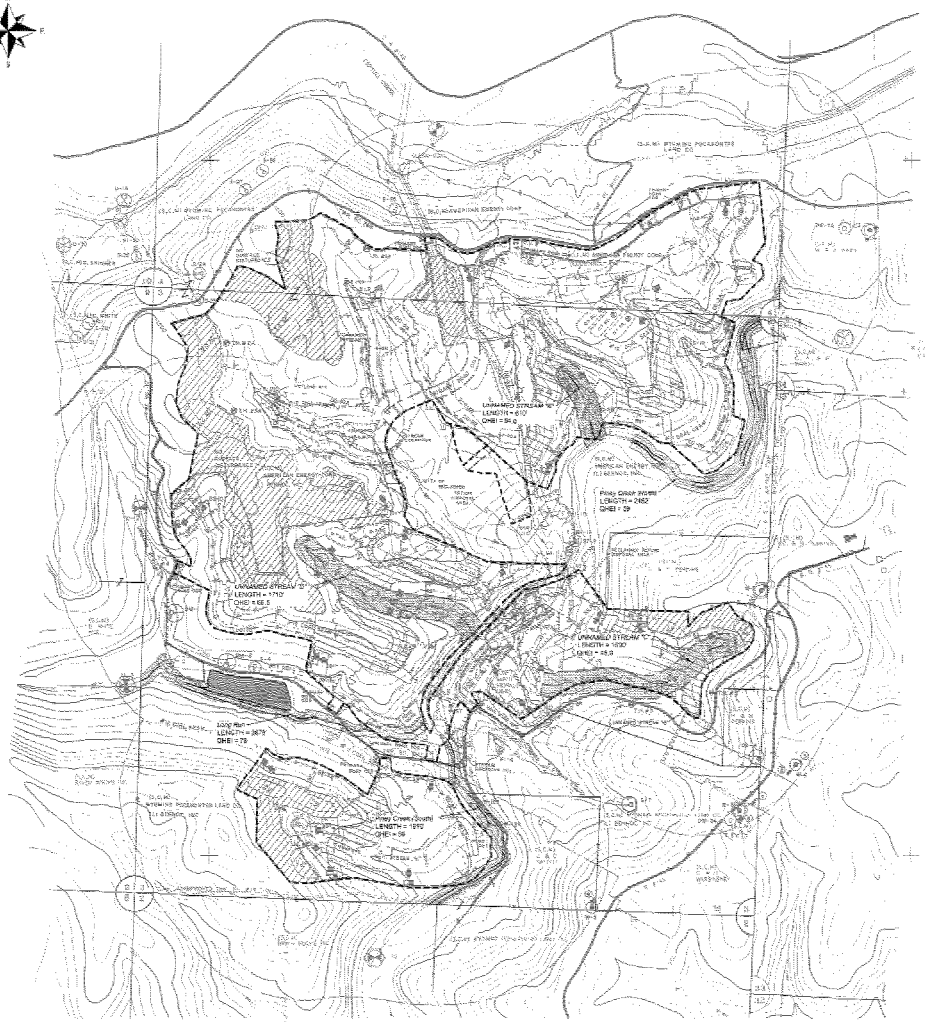
5. Long Run Pond. 29 January 2002
Upstream view from pond embankment.

6. Long Run Pond. 29 January 2002
Upstream view of headwaters from east bank.

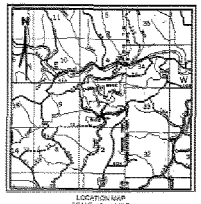
7. Long Run Pond. 29 January 2002
Headwaters section. Water depth 6 to 12 inches.



8. Long Run Pond. 29 January 2002
Headwaters section. Cattails dominant plant species.




NOTE: MAPPING SHOWN HEREON IS BASED ON THE YEAR TWO ANNUAL MAP PERMIT 0-1159



LOCATION MAP
SCALE: 1" = 1 MILE
PERMIT SITE IS LOCATED ON THE HUNTER QUAD
DRAINAGE BASIN: OHIO RIVER

**LEGEND**

- 300' Conservation Easement
- Stream Reach to be Mitigated
- Pond to be Breached and Mitigated
- Watercourse to be affected
- Forest Limits (CDRR-D-1159)

Conservation Easement

| | |
|---|---|
| Unnamed Stream "D" Length = | 1690' |
| Unnamed Stream "C" Length = | 1710' |
| Unnamed Stream "B" Length = | 610' |
| Total = | 4010' |

Channel Improvement / Reconstruction

| | |
|---|---|
| Long Run Length = | 2679' |
| Piney Creek (North) Length = | 2452' |
| Piney Creek (South) Length = | 1970' |
| Total = | 7101' |

OPERATOR

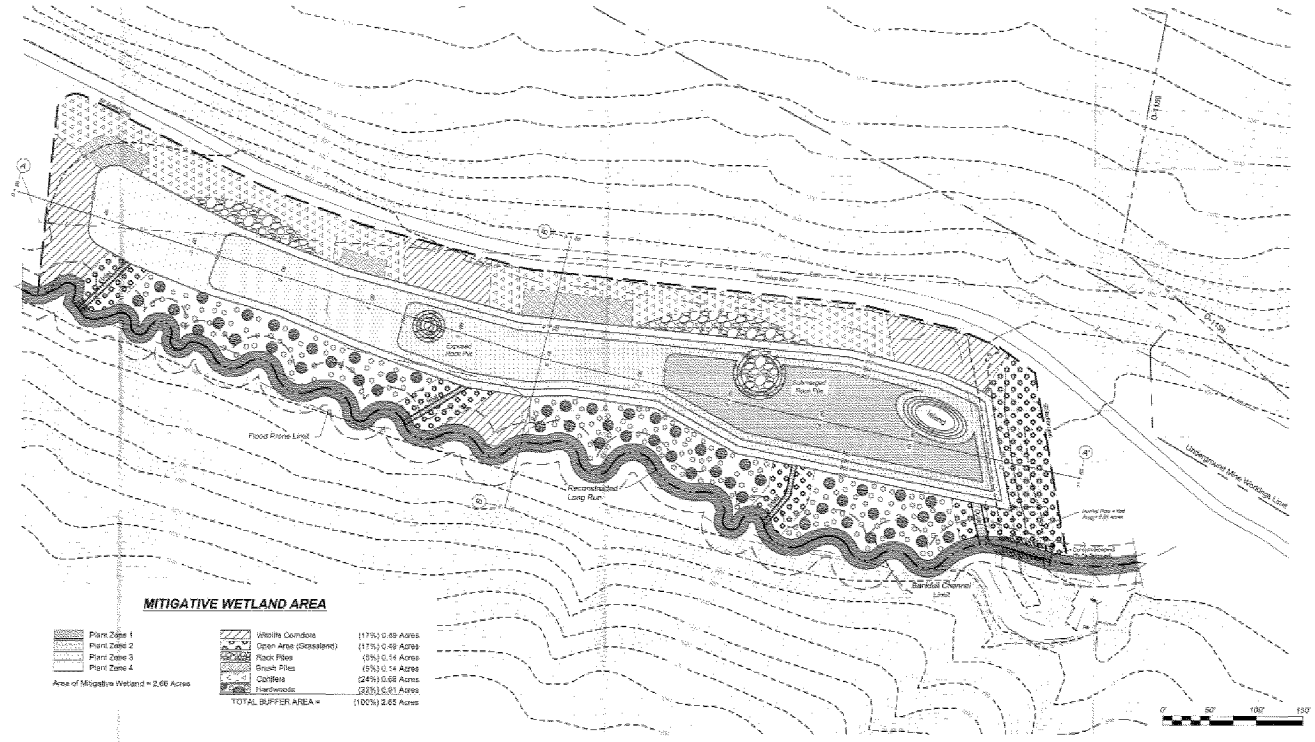
**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

*WETLANDS MITIGATION PLAN*
*COARSE COAL REFUSE DISPOSAL PROJECT*

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 5 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=400' |
| Drawn by: JCK | Drawing: MITIGATION PLAN | MINE NO. |
| Designed by: W.R. | Date prepared: January 7, 2002 | CENTURY |
| JACK A. HAMILTON & ASSOC., INC. BOX 471, 543 HIGH STREET PLAINFIELD, OHIO 43075 | Revised: | DRAWING NO. 16 |

STATE OF OHIO
WILLIAM A. RIBLEY
S-8810
REGISTERED PROFESSIONAL ENGINEER

16 Sept 2002

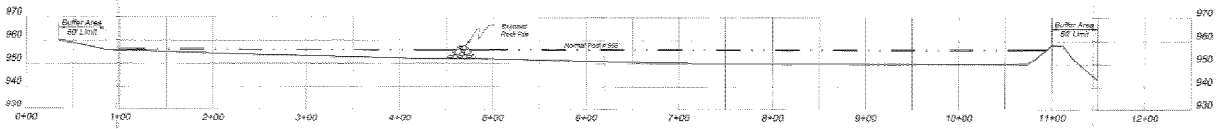



## MITIGATIVE WETLAND AREA

| | | |
|---|---|---|
| Plant Zone 1 | Wildlife Corridors | (17%) 0.69 Acres |
| Plant Zone 2 | Open Area (Grassland) | (17%) 0.49 Acres |
| Plant Zone 3 | Rock Piles | (5%) 0.14 Acres |
| Plant Zone 4 | Brush Piles | (5%) 0.14 Acres |
| | Conifers | (24%) 0.68 Acres |
| | Hardwoods | (32%) 0.91 Acres |
| | TOTAL BUFFER AREA = | (100%) 2.85 Acres |

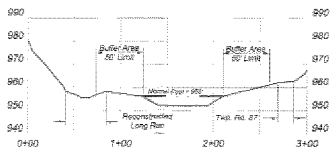
Area of Mitigative Wetland = 2.66 Acres

*Note: Stream to be reconstructed based on dimensions of upstream reaches.




**Wetland Mitigation Area Section A - A'**

Horiz. Scale: 1" = 50'
Vert. Scale: 1" = 30'




**Wetland Mitigation Area Section B - B'**

Horiz. Scale: 1" = 50'
Vert. Scale: 1" = 20'

OPERATOR

**AMERICAN ENERGY CORPORATION**
CENTURY MINE
43521 MAYHUGH HILL ROAD
TOWNSHIP HIGHWAY 88
BEALLSVILLE, OHIO 43716

*PROPOSED WETLANDS CONSTRUCTION*
*COARSE COAL REFUSE DISPOSAL PROJECT*

| | | |
|---|---|---|
| SECTIONS: 3 & 4 | T. - 9 R. - 5 | TOWNSHIP: WAYNE |
| COUNTY: BELMONT | | SCALE: 1"=50' |
| Drawn by: JCC | Drawing: mitigate.dwg | MRP NO |
| Checked by: JMR | Date prepared: JANUARY 7, 2002 | CENTURY |
| SACKA, HAMILTON & ASSOC., INC. | Revised: 9/02 | DRAWING NO |
| 301 HIGH STREET | | 28 |

WILLIAM J. SELVEY 54863

19 August 2002

ARC 11978