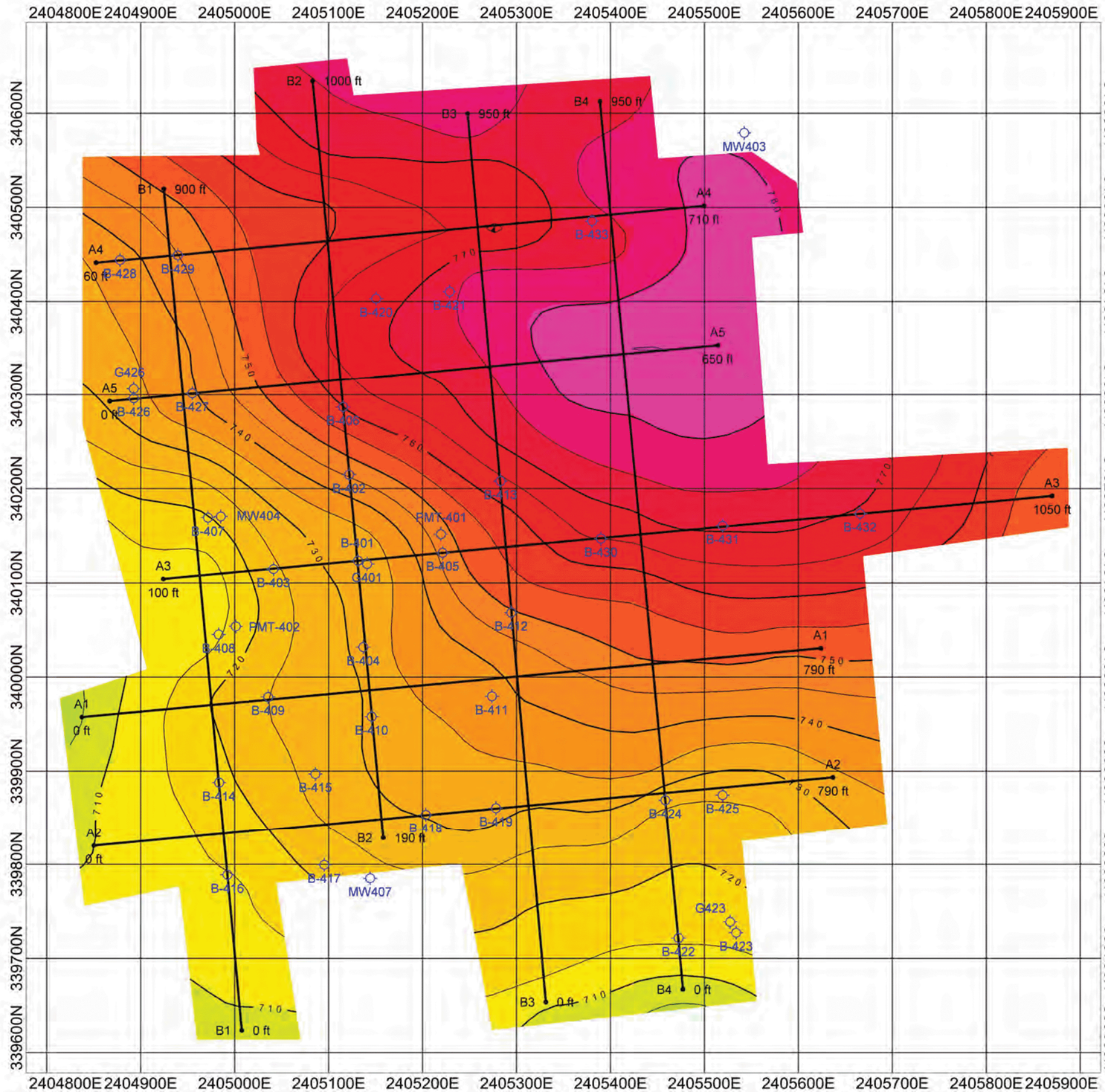
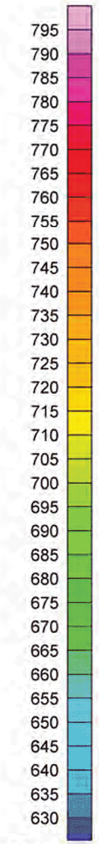




LEGEND

A1
0 ft — Seismic Line Location/Station

B-403 — Borehole Location

50 0 50 100 150 200 250 300
(feet)

Note: Coordinate System in Pennsylvania State Plane, NAD83, PA North, US Survey Feet

GEOVision geophysical services

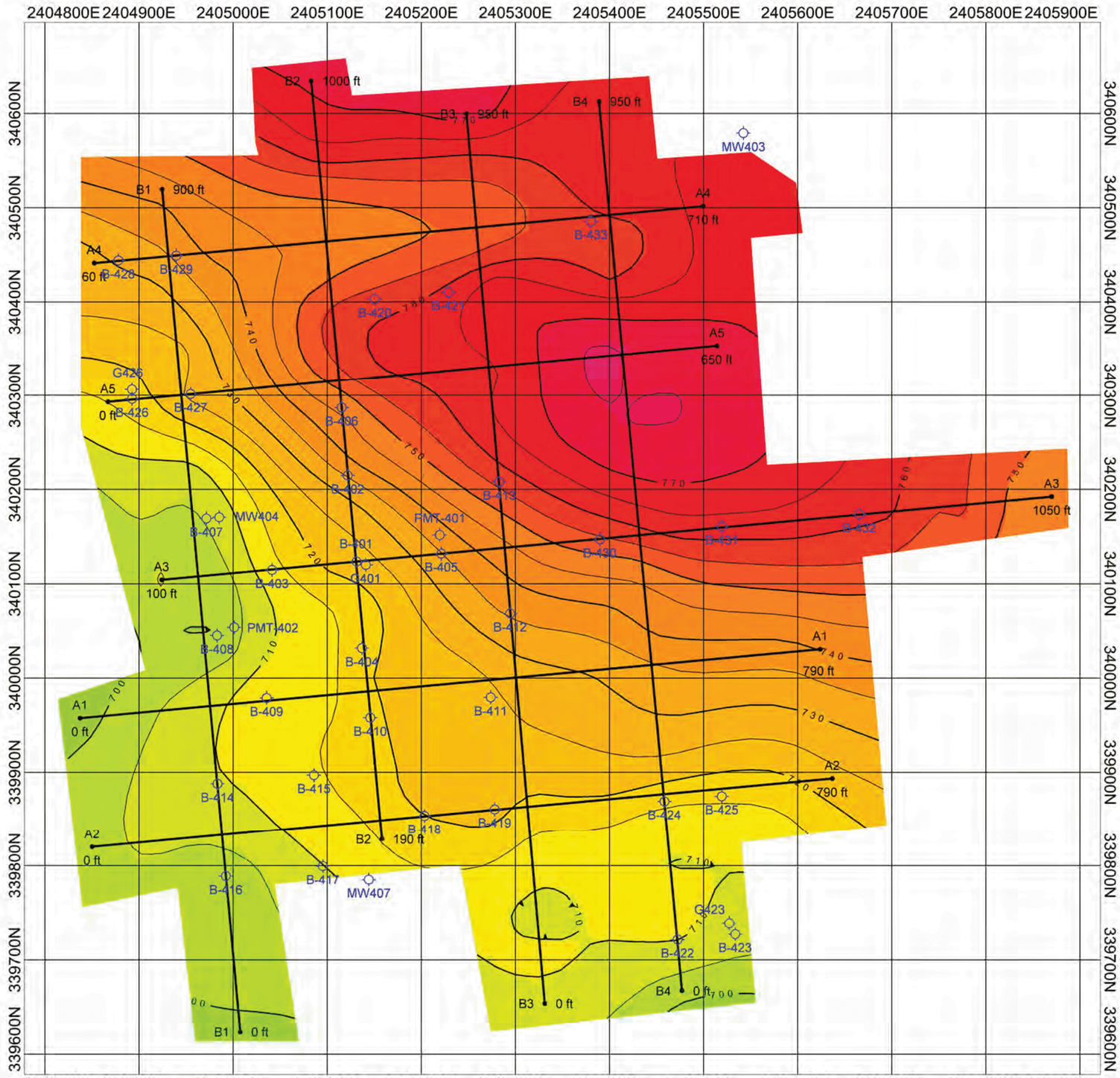
Figure 15

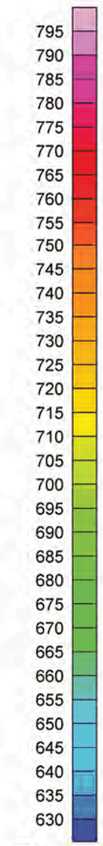
Elevation Map - Interpreted Top of Decomposed Shale

Bell Bend Nuclear Power Plant
Luzerne County, Pennsylvannia

Prepared for Paul C. Rizzo Associates, Inc.

Project No. 10171





Elevation
(ft)

LEGEND

A1
0 ft — Seismic Line Location/Station

B-403 — Borehole Location

50 0 50 100 150 200 250 300
(feet)

Note: Coordinate System in Pennsylvania State Plane, NAD83, PA North, US Survey Feet

GEOVision geophysical services

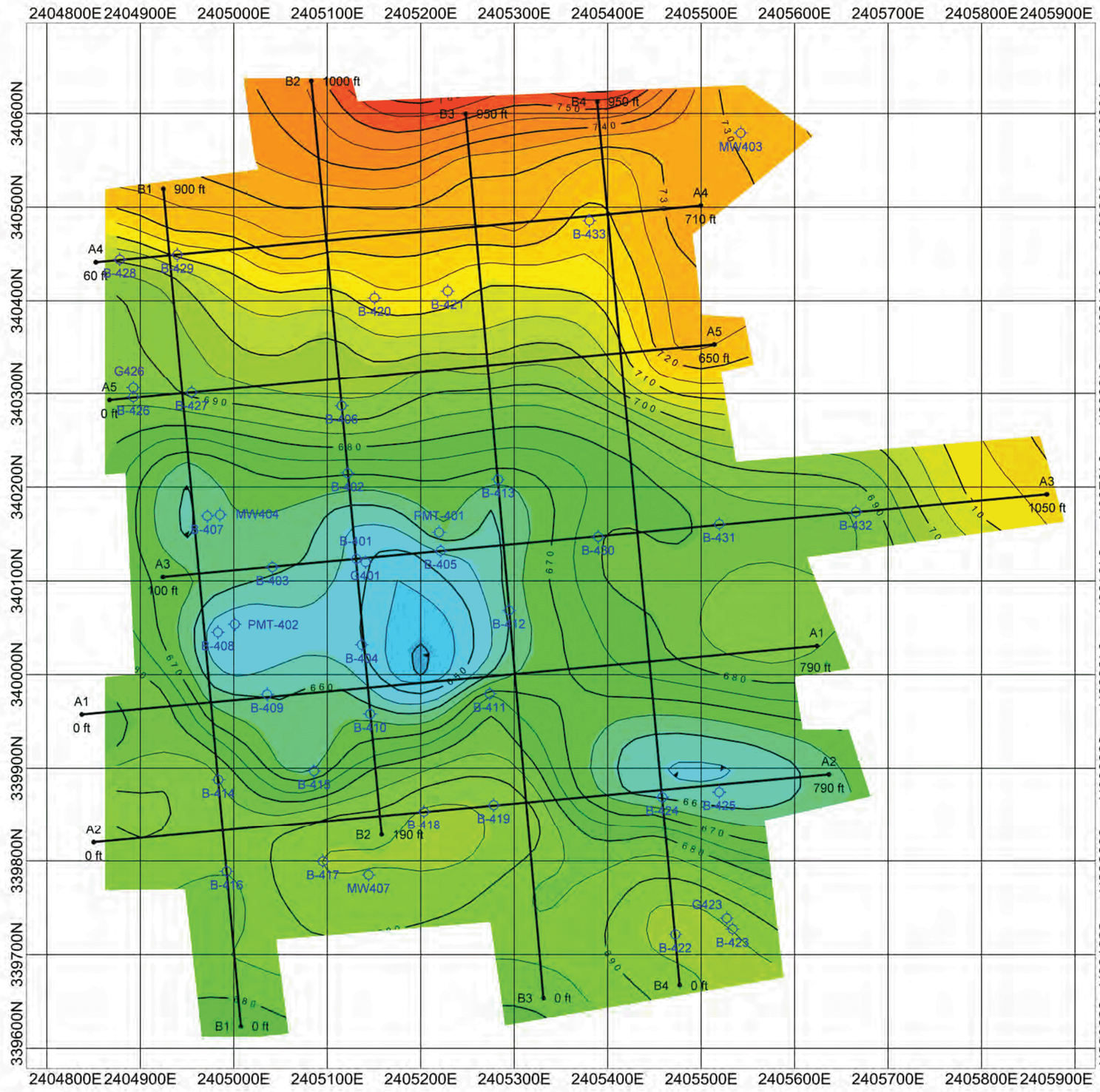
Figure 16

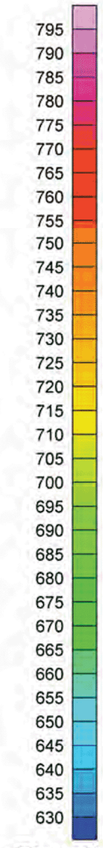
Elevation Map - Interpreted Top of Weathered Shale

Bell Bend Nuclear Power Plant
Luzerne County, Pennsylvannia

Prepared for Paul C. Rizzo Associates, Inc.

Project No. 10171





LEGEND

A1
0 ft — Seismic Line Location/Station

B-403 — Borehole Location

50 0 50 100 150 200 250 300
(feet)

Note: Coordinate System in Pennsylvania State Plane, NAD83, PA North, US Survey Feet

Project No. 10171

Figure 17

Elevation Map - Interpreted Top of Competent Shale

Bell Bend Nuclear Power Plant
Luzerne County, Pennsylvannia

Prepared for Paul C. Rizzo Associates, Inc.

APPENDIX A

SEISMOGRAPH CALIBRATION PROCEDURE AND SEISMOGRAPH CALIBRATION RECORDS

GEOVision SEISMIC LOGGER/RECORDER

CALIBRATION PROCEDURE

Reviewed 7/21/08

Objective

The timing/sampling accuracy of seismic recorders or data loggers is required for several GEOVision field procedures including Seismic Refraction, Downhole P-S Seismic Velocity Logging, and Suspension P-S Seismic Velocity Logging. This procedure describes the method for measuring the timing accuracy of a seismic data logger, such as the Geometrics Geode or Geometrics Strataview. The objective of this procedure is to verify that the timing accuracy of the recorder is accurate to within 1%.

Frequency of Calibration

The calibration of each GEOVision seismic data logger is twelve (12) months. In the case of rented seismic data loggers, calibration must be performed prior to use.

Test Equipment Required

The following equipment is required. Item #2 must have current NIST traceable calibration.

1. Function generator, Krohn Hite 5400B or equivalent
2. Frequency counter, HP 5315A or equivalent
3. Test cables, from item 1 to item 2, and from item 1 to subject data logger.

Procedure

This procedure is designed to be performed using the accompanying Seismic Logger/ Recorder Calibration Data Form with the same revision number. All data must be entered and the procedure signed by the technician performing the test.

1. Record all identification data on the form provided.
2. Connect function generator to data logger (such as Geometrics Geode) using test cable
3. Connect the function generator to the frequency counter using test cable.
4. Set signal generator to target frequency specified on data form, 0.25 volt (amplitude is approximate, modify as necessary to yield less than full scale waveforms on

logger display) peak sine wave. Verify frequency using the counter and note actual frequency on the data form.

5. Set data logger to file length specified on data form and record a data file to disk. Note file name on data form.

6. Measure the duration of 9 complete sine wave cycles on the data file. This measurement must be made using the analysis program PICKWIN95.EXE version 3.2.0.1, and saved as a .vs pick file. Note the duration in milliseconds in the spaces provided on the data form. Calculate average sine wave frequency for each channel pair (1-2, 3-4, etc.) by dividing the duration by 9. Note the frequency of each channel pair on the data form.

7. Repeat steps 4 through 6 until all target frequencies have been recorded, producing 6 separate data and pick files.

Criteria

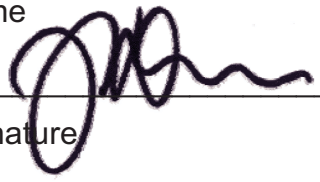
The average frequency for the nine cycles (obtained by dividing 9 cycles by the duration in seconds) must be within plus or minus 1% of the actual frequency for each of the 6 records.

If the results are outside this range, the data logger must be marked with a GEOVision REJECT tag until it can be repaired and retested.

If results are acceptable affix label indicating the initials of the person performing the calibration, the date of calibration, and the due date for the next calibration (12 months).

Procedure Approval

Approved by:

John G. Diehl	President
Name	Title
	July 21, 2008
Signature	Date

Calibration Laboratory Approval (if required):

Name	Title
Signature	Date

EDISON ESI℠

A SOUTHERN CALIFORNIA EDISON® Company

Calibration Report

TEST NUMBER
573796

Metrology
7300 Fenwick Lane
Westminster, CA 92683
Toll Free: 866-723-2257

GEOVision Geophysical Services
1124 Olympic Drive
Corona, CA 92881-3390

NVLAP®
Lab Code: 105014-0

Manufacturer:	Geometrics	**Ambient Temperature:**	23° C
Model Number:	GEODE	**Ambient Humidity:**	56% RH
Description:	Siesmograph	**Condition As Found:**	In Tolerance
Asset Number:	3459	**Condition As Left:**	In Tolerance - No Adjustment
Serial Number:	3459	**Calibration Date:**	07/17/2009
Cal. Procedure:	Customer	**Calibration Due Date:**	07/17/2010
PO Number:	9200-090716-01	**Calibration Interval:**	12 Months

Remarks:
The unit was calibrated with the customer's procedure and specification's which have been reviewed by Metrology Engineering and documented in SCE Document M013985. The data can be found on pages 2 and 3 of this report with the original observation data on page 4.

Standards Utilized

I.D. No.	Manufacturer	Model No.	Description	Cal. Date	Due Date
S1-01252	Hewlett Packard	5335A OPT 010,203040	Counter, Universal	01/29/2009	07/29/2009
S1-01347	Hewlett Packard	3325A	Generator, Function, Synthesizer	05/04/2009	11/04/2009
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/24/2009	01/24/2010

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A CAB	Metrologist	714-895-0714	[signature]	7/17/09
Name	Title	Phone	Name	Date

Custom Specification Report

Test No. 573796
Asset No. 3459

Geometrics GEODE Siesmograph,

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH1-CH2 Frequency Sine Wave	5.000 Hz	5.000	Same		4.950 to 5.050 Hz [EMU 0.000025]
	"	10.00 Hz	10.00	Same		9.90 to 10.10 Hz [EMU 0.000050]
	"	20.00 Hz	20.00	Same		19.80 to 20.20 Hz [EMU 0.000100]
	"	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]
	"	100.0 Hz	99.94	Same		99.0 to 101.0 Hz [EMU 0.000500]
	"	200.0 Hz	200.1	Same		198.0 to 202.0 Hz [EMU 0.001000]
	CH3-CH4 Frequency Sine Wave	5.000 Hz	5.000	Same		4.950 to 5.050 Hz [EMU 0.000025]
	"	10.00 Hz	10.00	Same		9.90 to 10.10 Hz [EMU 0.000050]
	"	20.00 Hz	20.00	Same		19.80 to 20.20 Hz [EMU 0.000100]
	"	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]
	"	100.0 Hz	99.94	Same		99.0 to 101.0 Hz [EMU 0.000500]
	"	200.0 Hz	200.1	Same		198.0 to 202.0 Hz [EMU 0.001000]
	CH5-CH6 Frequency Sine Wave	5.000 Hz	5.000	Same		4.950 to 5.050 Hz [EMU 0.000025]
	"	10.00 Hz	10.00	Same		9.90 to 10.10 Hz [EMU 0.000050]
	"	20.00 Hz	20.00	Same		19.80 to 20.20 Hz [EMU 0.000100]
	"	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]

Remarks:

MudCats CPM: Version 2.2.2 (Professional)
Src DUI: {DB1AB016-5CA1-4DB9-A38F-8513C661A726} (c)
Doc DUI: {E9DA0DF2-8132-4F9D-9CBD-620F1F25B45F} (o)

ATTACHMENT 2
Page 1 of 2

Customer

Custom Specification Report

Test No. 573796
Asset No. 3459

Geometrics GEODE Siesmograph,

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH5-CH6 Frequency Sine Wave	100.0 Hz	99.94	Same		99.0 to 101.0 Hz [EMU 0.000500]
	|	200.0 Hz	200.1	Same		198.0 to 202.0 Hz [EMU 0.001000]

Remarks:

MudCats CPM: Version 2.2.2 (Professional)
Src DUI: {DB1AB016-5CA1-4DB9-A38F-8513C661A726} (c)
Doc DUI: {E9DA0DF2-8132-4F9D-9CBD-620F1F25B45F} (o)

ATTACHMENT 2
Page 2 of 2

Customer

Pg 4 of 4
3459
573796

GEOVision
geophysical services

SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	Geometrics	Model no.:	Geode
Serial no.:	3459	Calibration date:	7/17/2009
By:	Craig Branson	Due date:	7/17/2010
Counter mfg.:	Hewlett-Packard	Model no.:	5335A
Serial no.:	2626A09881	Calibration date:	1/29/2009
By:	SCE #S1-01252	Due date:	7/29/2009
Signal generator mfg.:	Hewlett-Packard	Model no.:	3325A
Serial no.:	2652A25647	Calibration date:	5/4/2009
By:	SCE #S1-01347	Due date:	11/4/2009

SYSTEM SETTINGS:

Gain:	24 dB
Filter	None
Range:	See sample period in table below
Delay:	0
Stack (1 std)	1
System date = correct date and time	7/17/2009 1230

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Set file length to 2.0 seconds for 5 Hz test, 1.0 seconds for all others. Note actual frequency on data form. Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PICKWIN95.EXE program, note duration on data form, and save as .vs file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found -0.06% As left -0.06%

Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Ch 1-2 (millisec)	Average Frequency Ch 1-2 (Hz)	Time for 9 cycles Ch 3-4 (millisec)	Average Frequency Ch 3-4 (Hz)	Time for 9 cycles Ch 5-6 (millisec)	Average Frequency Ch 5-6 (Hz)
5.000	5.000	31.25	701	1800	5.000	1800	5.000	1800	5.000
10.00	10.00	20.83	702	900.0	10.00	900.0	10.00	899.9	10.00
20.00	20.00	20.83	703	450.0	20.00	450.0	20.00	450.0	20.00
50.00	50.00	20.83	704	180.0	50.00	180.0	50.00	180.0	50.00
100.0	100.0	20.83	705	90.05	99.94	90.05	99.94	90.05	99.94
200.0	200.0	20.83	706	44.98	200.1	44.98	200.1	44.98	200.1

Calibrated by: Craig Branson (Name) 7/17/2009 (Date) Craig Branson (Signature)

Witnessed by: Robert Steller (Name) 7/17/2009 (Date) (Signature)

Seismic Recorder/Logger Calibration Data Form Rev 2.0 July 21, 2008

EDISON ESI℠

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Calibration Report

TEST NUMBER
573797

Metrology
7300 Fenwick Lane
Westminster, CA 92683
Toll Free: 866-723-2257

GEOVision Geophysical Services
1124 Olympic Drive
Corona, CA 92881-3390

NVLAP®
Lab Code: 105014-0

Manufacturer:	Geometrics	**Ambient Temperature:**	23° C
Model Number:	GEODE	**Ambient Humidity:**	56% RH
Description:	Siesmograph	**Condition As Found:**	In Tolerance
Asset Number:	3458	**Condition As Left:**	In Tolerance - No Adjustment
Serial Number:	3458	**Calibration Date:**	07/17/2009
Cal. Procedure:	Customer	**Calibration Due Date:**	07/17/2010
PO Number:	9200-090716-01	**Calibration Interval:**	12 Months

Remarks:
The unit was calibrated with the customer's procedure and specification's which have been reviewed by Metrology Engineering and documented in SCE Document M013985. The data can be found on pages 2 and 3 of this report with the original observation data on page 4.

Standards Utilized

I.D. No.	Manufacturer	Model No.	Description	Cal. Date	Due Date
S1-01252	Hewlett Packard	5335A OPT 010,203040	Counter, Universal	01/29/2009	07/29/2009
S1-01347	Hewlett Packard	3325A	Generator, Function, Synthesizer	05/04/2009	11/04/2009
S1-03686	Fluke	910	Standard, Frequency, Controlled, Gps	01/24/2009	01/24/2010

Calibration Performed By:			Quality Reviewer:	
Branson, Craig A CAB	Metrologist	714-895-0714		7/17/09
Name	Title	Phone	Name	Date

Custom Specification Report

Test No. 573797
Asset No. 3458

Geometrics GEODE Siesmograph,

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH1-CH2 Frequency Sine Wave	5.000 Hz	5.000	Same		4.950 to 5.050 Hz [EMU 0.000025]
	"	10.00 Hz	10.00	Same		9.90 to 10.10 Hz [EMU 0.000050]
	"	20.00 Hz	20.00	Same		19.80 to 20.20 Hz [EMU 0.000100]
	"	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]
	"	100.0 Hz	99.99	Same		99.0 to 101.0 Hz [EMU 0.000500]
	"	200.0 Hz	200.0	Same		198.0 to 202.0 Hz [EMU 0.001000]
	CH3-CH4 Frequency Sine Wave	5.000 Hz	5.000	Same		4.950 to 5.050 Hz [EMU 0.000025]
	"	10.00 Hz	10.00	Same		9.90 to 10.10 Hz [EMU 0.000050]
	"	20.00 Hz	20.00	Same		19.80 to 20.20 Hz [EMU 0.000100]
	"	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]
	"	100.0 Hz	99.95	Same		99.0 to 101.0 Hz [EMU 0.000500]
	"	200.0 Hz	200.0	Same		198.0 to 202.0 Hz [EMU 0.001000]
	CH5-CH6 Frequency Sine Wave	5.000 Hz	5.000	Same		4.950 to 5.050 Hz [EMU 0.000025]
	"	10.00 Hz	10.00	Same		9.90 to 10.10 Hz [EMU 0.000050]
	"	20.00 Hz	20.00	Same		19.80 to 20.20 Hz [EMU 0.000100]
	"	50.00 Hz	50.00	Same		49.50 to 50.50 Hz [EMU 0.000250]

Remarks:

MudCats CPM: Version 2.2.2 (Professional)
Src DUI: {DB1AB016-5CA1-4DB9-A38F-8513C661A726} (c)
Doc DUI: {9612D17F-C1DC-4A7F-8777-407C23CE7ACC} (o)

ATTACHMENT 2
Page 1 of 2

Customer

Custom Specification Report

Test No. 573797
Asset No. 3458

Geometrics GEODE Siesmograph,

STEP NUM	FUNCTION TESTED	NOMINAL VALUE	AS FOUND	AS LEFT	Out of Tol	CALIBRATION TOLERANCE
	CH5-CH6 Frequency Sine Wave	100.0 Hz	99.99	Same		99.0 to 101.0 Hz [EMU 0.000500]
	|	200.0 Hz	199.9	Same		198.0 to 202.0 Hz [EMU 0.001000]

Remarks:

MudCats CPM: Version 2.2.2 (Professional)
Src DUI: {DB1AB016-5CA1-4DB9-A38F-8513C661A726} (c)
Doc DUI: {9612D17F-C1DC-4A7F-8777-407C23CE7ACC} (o)

ATTACHMENT 2
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Customer

Pg 4 of 4
3458
573797

GEOVision
geophysical services

SEISMIC LOGGER/RECORDER CALIBRATION DATA FORM

INSTRUMENT DATA

System mfg.:	Geometrics	Model no.:	Geode
Serial no.:	3458	Calibration date:	7/17/2009
By:	Craig Branson	Due date:	7/17/2010
Counter mfg.:	Hewlett-Packard	Model no.:	5335A
Serial no.:	2626A09881	Calibration date:	1/29/2009
By:	SCE #S1-01252	Due date:	7/29/2009
Signal generator mfg.:	Hewlett-Packard	Model no.:	3325A
Serial no.:	2652A25647	Calibration date:	5/4/2009
By:	SCE #S1-01347	Due date:	11/4/2009

SYSTEM SETTINGS:

Gain:	24 dB
Filter	None
Range:	See sample period in table below
Delay:	0
Stack (1 std)	1
System date = correct date and time	7/17/2009 1151

PROCEDURE:

Set sine wave frequency to target frequency with amplitude of approximately 0.25 volt peak
Set file length to 2.0 seconds for 5 Hz test, 1.0 seconds for all others. Note actual frequency on data form. Set sample period and record data file to disk. Note file name on data form.
Pick duration of 9 cycles using PICKWIN95.EXE program, note duration on data form, and save as .vs file. Calculate average frequency for each channel pair and note on data form.

Average frequency must be within +/- 1% of actual frequency at all data points.

Maximum error ((AVG-ACT)/ACT*100)% As found -0.05% As left -0.05%

Target Frequency (Hz)	Actual Frequency (Hz)	Sample Period (microS)	File Name	Time for 9 cycles Ch 1-2 (millisec)	Average Frequency Ch 1-2 (Hz)	Time for 9 cycles Ch 3-4 (millisec)	Average Frequency Ch 3-4 (Hz)	Time for 9 cycles Ch 5-6 (millisec)	Average Frequency Ch 5-6 (Hz)
5.000	5.000	31.25	601	1800	5.000	1800	5.000	1800	5.000
10.00	10.00	20.83	602	900.0	10.00	900.0	10.00	900.0	10.00
20.00	20.00	20.83	603	450.0	20.00	450.0	20.00	450.0	20.00
50.00	50.00	20.83	604	180.0	50.00	180.0	50.00	180.0	50.00
100.0	100.0	20.83	605	90.01	99.99	90.05	99.95	90.01	99.99
200.0	200.0	20.83	606	45.00	200.0	45.00	200.0	45.03	199.9

Calibrated by:	Craig Branson	7/17/2009	Craig Branson
	Name	Date	Signature
Witnessed by:	Robert Steller	7/17/2009	
	Name	Date	Signature

Seismic Recorder/Logger Calibration Data Form Rev 2.0 July 21, 2008

APPENDIX B

SEISMIC REFRACTION PROCEDURE

PROCEDURE FOR

SEISMIC REFRACTION METHOD

Reviewed 06/23/2008

Background

This procedure describes a method for measuring shear and compressional wave velocities in soil and rock. The Seismic Refraction Method is applied by generating compressional waves (*P*) (and sometimes shear (S_H)) on the land surface and measuring the travel time of the corresponding waves from the source to one or more geophones. These measurements are used to interpret subsurface conditions and materials. This travel time, along with distance between source and geophone(s), can also be interpreted to yield depth to refracting layer(s). The calculated seismic velocities can often be used to characterize some of the properties of natural and man-made subsurface materials.

This is a general procedure and does not address all the details and components of a seismic refraction survey. Please refer to the references provided for additional information.

Objective

The specific objective varies depending on the project. It can be simply to reconnoiter subsurface conditions, or to provide detailed subsurface information. For example, rippability studies require very few geophones and a very simple analysis. On the other hand, detailed studies require very careful design of geophone spacing, source energy and location, accurate measurement of geophone elevations, and so on. In general, the basic outcome is a measurement of seismic wave velocities. Detailed studies will also provide a profile of the depth to refractors.

Equipment

1. Seismic energy source. Four types of sources used by GEOVision include:

    1.1. Sledge hammers of various weights

    1.2. Mechanical or accelerated weight drop or impact devices, such as the Bison EWG-1, Geometrics Dynasource or a modified PEG-40Kg.

1.3. Projectile (gun) sources, such as the Betsy Seisgun, Betsy downhole percussion firing rod

1.4. Explosives

2. Multichannel seismograph, such as Geometrics Geode, OYO DAS-1, or equivalent. GEOVision uses 24 to 48 channel systems for detailed refraction surveys. Seismographs must provide for digital recording, and for signal enhancement (energy) stacking. Single - 12 channel systems are acceptable for simple surveys such as rippability studies.

3. 4 - 14 Hertz geophones (vertical for P-wave refraction studies, horizontal for S-wave studies), connected to the seismograph by cable. Geophone and take-out (electrical connection) spacing is determined by the depth of exploration and the resolution required

4. Trigger cable or radio link, to provide a timing signal to the seismograph at the time of source impact

5. Batteries to operate refraction system

Figure 1 is a sketch of the field layout for a typical refraction survey.

Environmental Conditions

Seismic refraction data are affected by ground vibrations from a variety of sources. These include ambient sources such wind, water movement (such as waves breaking on a nearby beach), natural seismic activity, and rainfall on the geophones. They also include cultural sources such as vehicular traffic, construction equipment, nearby motors, aircraft, or blasting. Frozen ground can contribute a high-velocity near-surface path that will obscure the contribution of deeper layers.

Such sources should be minimized as much as possible. Where possible, refraction data should not be collected during high winds or rain, or while vehicles are passing.

Calibration

Calibration of the multichannel seismograph is required. Calibration is limited to the timing accuracy of the recorder. GEOVision's Seismograph Calibration Procedure or equivalent should be used. Calibration must be performed on an annual basis.

Measurement Procedure

The specific procedure varies according to the objective for the survey, the design of the survey, and the method used to define the planar refractors. These are described in more detail in other references (1 - 6).

The most important considerations are:

1. Location of seismic refraction lines
2. Length and orientation of lines
3. Geophone spacing
4. Location of shots (sources)
5. Approach or interpretation method. These can include:
    5.1. Intercept-time or crossover method
    5.2. Delay-time methods and variations thereof
    5.3. Reciprocal methods, including:
        5.3.1. Common Reciprocal Method
        5.3.2. Generalized Reciprocal Method
    5.4. Ray-tracing methods
    5.5. Tomographic methods

Of these approaches, the two methods most often used by GEOVision for detailed refraction surveys are the Generalized Reciprocal Method (GRM) and the Tomographic Method. GRM is acknowledged to be superior to many other methods for modeling irregular dipping refractors and lateral velocity changes. Tomographic Methods are commonly used to image gradual velocity contacts and weathering profiles.

The general field procedures are as follows:

1. Check for adequate space to lay out a straight line in accordance with the survey design
2. Locate and position first geophone according to design and such that the location can be repeated or identified independently (the line should be referenced to absolute fiducials at several locations).

3. Accurately mark geophone locations. Locations must be surveyed to within a few percent of the geophone interval, including elevation

4. Lay out geophone cable

5. Place geophones at marked locations. Geophones must be vertical and well coupled to the ground using the spike provided. Where rock is exposed the spike may be replaced with a tripod base or rock plate.

6. Test geophones and cables for shorts or open circuits.

7. Set up source(s) at design locations. Shot locations must also be surveyed to within a few percent of the geophone interval.

8. Place trigger cable

9. Test seismic source and trigger cable

10. Input survey geometry into seismograph

11. Test noise level and set gains and filters

12. Proceed with refraction measurements

Required Field Records

1) Field log for each refraction measurement describing:

   a) Location of each geophone

   b) Date and time of test

   c) Tester or data recorder

   d) Description of source (location, amplitude, number of stacks)

   e) Any gain or filtering by channel during recording

   f) Any deviations from test plan and action taken as a result

   g) File name as recorded on disk

   h) QA Review

   Much of the above information will be automatically recorded in the seismograph header at the time of recording (gains, filtering, and survey geometry) and need not be recorded on the paper log.

2) Flash drives, CDs or equivalent with backup copies of data on hard disk, labeled with line and measurement designation, record ID numbers, date, and tester name.

Analysis and Interpretation

Following completion of field work, the recorded digital records are processed by computer and interactively analyzed by an experienced geophysicist to produce plots and tables of P and S_H wave velocity versus depth.

Again, the specific procedure varies according to the objective for the survey, the design of the survey, and the method used to define the planar refractors.

In general, GEOVision refraction data is processed with either the Generalized Reciprocal Method (GRM), one of the most advanced modeling methods currently available for seismic refraction data or the Tomographic Method. Processing steps consist of loading field records into a computer, picking the travel times of first arrivals, entering shot and spread geometry, phantoming data from all shots on a line to obtain one set of forward and reverse travel time curves for each refractor, and applying the GRM to obtain a depth section (model showing different geologic units and their velocities). The Tomographic Method requires a higher shot density than GRM. Processing steps consist of loading field records into a computer, picking the travel times of first arrivals and entering shot and spread geometry. Commonly a layer based, horizontal model is used as an initial base for the inversion routines. The inverted model is quality checked for geologic plausibility and RMS error data fit. Initial settings and input models are changed until the inverted model is of sufficient quality for interpretation.

Preliminary interpretations are carefully verified using available geologic and drilling data. If at all possible, GEOVision recommends performing P-S Suspension Logging or Downhole velocity survey in at least one borehole for a high-resolution constraint of the model. If such data is not available, the report will so mention.

Report

The final report will include the objective and scope of the survey, discussion of the geologic setting, any limitations of the survey, and any assumptions made. The field approach will be described including a description of equipment, procedures, and data acquisition parameters. The location of the seismic refraction line will be described along with a site map and the shot-point/geophone layout. Any corrections made to the field data will be discussed, including justification. The results of field measurements will be described including samples of raw data, and time-distance plots.

The methodology for picking first arrivals and for interpreting the results will be described along with any software program used. The interpreted results based on

these methods will be presented along with any qualifications and alternate interpretations. These will include depth sections and seismic velocities.

Appropriate references for any supporting data will be provided.

The report will be signed by the California Professional Geophysicist responsible for the refraction survey and data interpretation, and QA Reviewed in accordance with GEOVision QA Procedures.

Professional Geophysicist Anthony Martin Date 6-23-08

QA Review Date 6-23-08

References:

1. ASTM D5777 - 00(2006) "Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation"

2. Redpath, Bruce B. "Seismic Refraction Exploration for Engineering Site Investigations", Explosive Excavation Research Laboratory, Livermore, CA, distributed by NTIS, US Dept. of Commerce, Springfield, VA

3. "Geophysical Exploration for Engineering and Environmental Investigations", Technical Engineering and Design Guides as adapted from the US Army Corps of Engineers, No.23, published by ASCE Press, Reston, VA

4. Dobrin, M.B. 1960 *Introduction to Geophysical Prospecting*. 2nd Edition. McGraw-Hill Book Co. Inc, New York

5. Telford, W.M., et al, 1976 *Applied Geophysics* Cambridge University Press

6. Milsom, J. 1989 *Field Geophysics* Open University Press, Milton Keynes

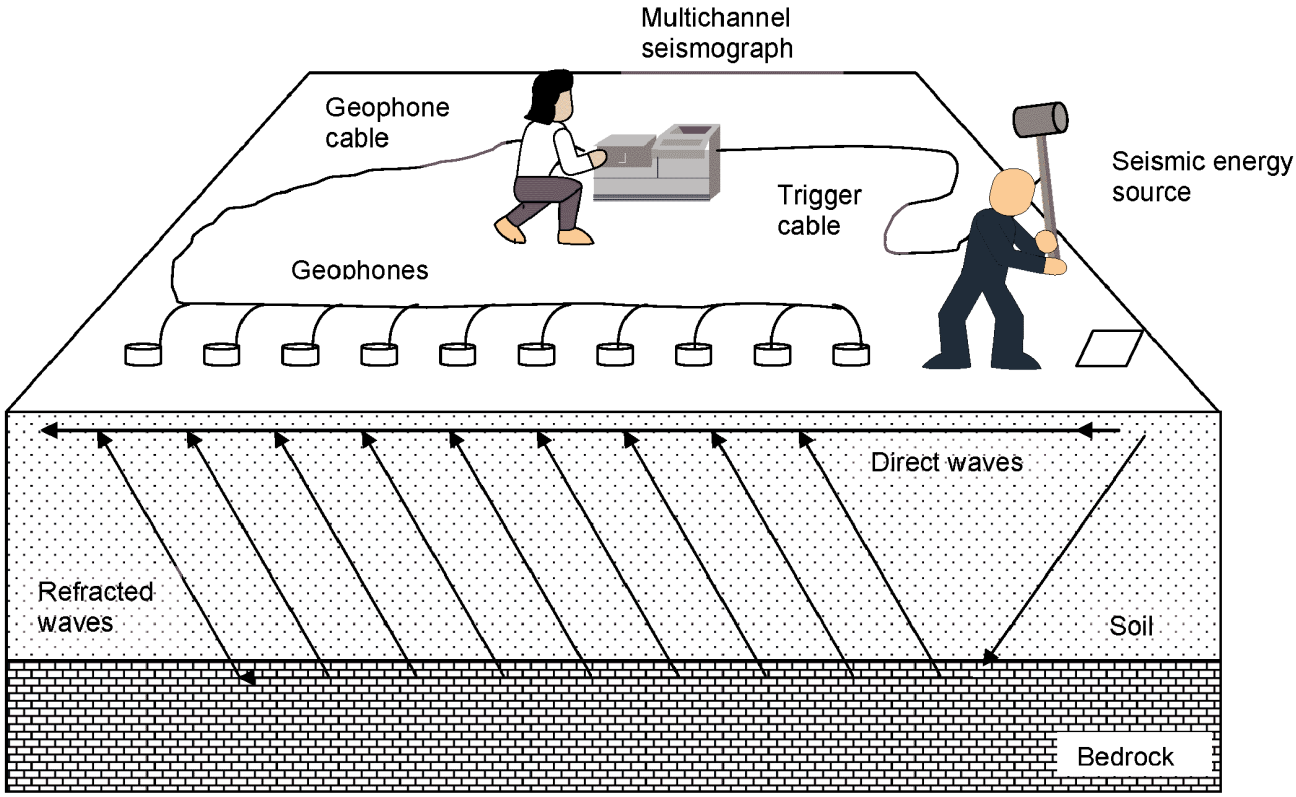

Figure 1 FIELD LAYOUT OF A MULTICHANNEL SEISMOGRAPH SHOWING WAVE PATHS

APPENDIX C

SEISMIC REFRACTION FIELD LOGS

GEOVision
geophysical services

A-1 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
DATE*: 5/31/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 1 OF * 4

CONTACT: Myra Au
PHONE: Off (Cell) 808 227 0549

CONTACT:
PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION: Trees test pit hole @ 180 to 190'
tall grass shin high vegetation, slopes up from West to East
Light wind

FIELD CREW*: E Vasquez, Cavallos, M. Cortez
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0700
ARRIVED ON SITE: 0745
STANDBY TIME:
CAUSE:
SEISMIC LINE STARTED: 1040 S1
1300 S2
SEISMIC LINE COMPLETED: 1215 S1
1440 S2

MAINTENANCE PERFORMED ON SITE*:

EQUIPMENT PROBLEMS OR FAILURES*:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: Offset not possible west side

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-1
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/31/10
JOB*: 10171
PAGE 2 OF *: 4

SURVEY TYPE (P OR S -WAVE)* P Wave
SEISMOGRAPH* Geode 3458 [X] 3459 [X] OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* AWD
GEOPHONE SPACING* 10
RECORD LENGTH 0.2s
SAMPLE RATE 0.125ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION* W to E

SPREAD NO. *	1	START STATION*	0	END STATION* 470
SPREAD NO.	2	START STATION	320	END STATION 490
SPREAD NO.		START STATION		END STATION
SPREAD NO.		START STATION		END STATION

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
11101	0	10	NA	AWD
11102	-20	10		
11103	35	10		
11104	75	10		
11105	115	10		
11106	155	10		
11107	195	10		
11108	235	7		
11109	275	10		
11110	315	7		
11111	355	10		
11112	395	10		
11113	435	10		
11114	470	11		
11115	475	10		
11116	490	10		
11117	515	10		
11118	555	10		
11119	590	10		
11120	790	10		
SPREAD	2	*	WD 5/21/10	
11201	320	10	NA	AWD
11202	315	10		
11203	300	10		
11204	275	10		

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	ELEV.
0		20.59	717.1
-20	22.55		
10	19.19		
20	18.04		
30	~~17.03~~ 17.62		
40	~~16.09~~ 17.02		
50	~~14.72~~ 16.10		
60	~~13.89~~ 14.82		
70	12.76		
80	12.00		
90	12.02		
100	10.75		
110	10.31		
120	9.28		
130	8.51		
140	7.22		
150	6.7		
160	5.84		
170	4.72		
180	2.24		
190	3.31		
200	2.65		735.0
210	1.78		
220	.79	21.12	
230	20.56		
240	19.77		

Dmh pile
Dmh pile

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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geophysical services

A-1 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/31/10
JOB*: 10171
PAGE* 3 OF * 4

SEISMIC DATA ACQUISITION					RELATIVE ELEVATION SURVEY			
FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	
11205	235	10	NA	AWD	250	18.75		
11206	200	10			260	17.85		
11207	0	10			270	15.87		
11208	355	10			280	15.06		
11209	395	10			290	14.8		
11210	435	10			300	13.77		
11211	475	10			310	13.00		
11212	515	9			320	12.24		
11213	555	8			330	11.45		
11214	595	8			340	10.55		
11215	635	9			350	9.67		
11216	675	10			360	8.46		
11217	715	10			370	7.31		
11218	755	10			380	6.1		
11219	790	10			390	4.61		
11220	810	10			400	3.22		754.8
11221	710	10			410	1.75		
					420	0.52	21.31	
					430	20.29		
					440	19.51		
					450	18.65		
					460	17.78		
					470	17.08		
					480	16.05		
					490	15.16		
					500	14.12		
					510	13.49		
					520	12.79		
					530	12.30		
					540	11.70		
					550	10.90		
					560	10.14		
					570	9.56		
					580	8.87		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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geophysical services

A-1
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: William Dalrymple
DATE*: 5/31
JOB*: 10171
PAGE* 4 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
					590	8.21		
					600	7.49		771.2
					610	6.98		
					620	6.37		
					630	6.02		
					640	5.68		
					650	5.18		
					660	4.73		
					670	4.09		
					680	3.44		
					690	2.99		
					700	2.47		
					710	2.08		
					720	1.86		
					730	1.63		
					740	1.40		
					750	1.34		
					760	1.31		
					770	1.74		
					780	2.02	7.02	776.4
					790	7.63		~~766.4~~
					810	9.52		X INCORRECT IN SURVEYORS NOTES cc 6/4/2010

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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A-2 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
DATE*: 5/30/10 - 5/31/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 1 OF * 4

CONTACT: Myra Au
PHONE: Off (Cell) 808-227-0549

CONTACT:
PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION: Shin to knee high vegetation, 1 test pit hole @ 450' to 440 ~5' deep

FIELD CREW*: E. Vasquez, C. Collins, M. Cortez
MOBILIZED FROM: Blacksburg
DEPARTURE TIME: 0700
ARRIVED ON SITE: 0745
STANDBY TIME:
CAUSE:
SEISMIC LINE STARTED: 0950 S1, 1240 S2
SEISMIC LINE COMPLETED: 1158 S1, 1430 S2

MAINTENANCE PERFORMED ON SITE*:

EQUIPMENT PROBLEMS OR FAILURES*: S2 weight drop plate sank too far @ shot 1220m and could not extend to lift back up (20 min delay)

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS:

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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A-2 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/30/10 - 5/31/10
JOB*: 10171
PAGE 2 OF * 4

SURVEY TYPE (P OR S -WAVE)* P-Wave
SEISMOGRAPH* Geode 3458 [X] 3459 [X] OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* AWD, 20lb
GEOPHONE SPACING* 10
RECORD LENGTH 0.2s
SAMPLE RATE 0.125 ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION* W-E

SPREAD NO. * 1	START STATION* 0	END STATION* 470
SPREAD NO. 2	START STATION 320	END STATION 790
SPREAD NO.	START STATION	END STATION
SPREAD NO.	START STATION	END STATION

SEISMIC DATA ACQUISITION / RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV
12101	0	10	NA	AWD	0		23.57	719.8
12102	35	10			-20	24.81		
12103	75	10			10	23.11		
12104	115	8			20	22.16		
12105	155	8			30	21.49		
12106	195	9			40	20.95		
12107	235	10			50	20.59		
12108	-120	10			60	19.94		
12109	-20	10			70	19.16		
12110	275	10			80	18.32		
12111	315	10			90	17.55		
12112	355	10			100	16.85		
12113	395	9			110	15.98		
12114	435	10			120	15.42		
12115	470	10			130	14.61		
12116	475	10			140	13.76		
12117	490	10			150	12.76		
12118	515	10			160	11.62		
12119	555	10			170	10.86		
12120	590	10			180	~~8.67~~ 9.75		
12121	790	10			190	8.60		
*SP READ	2 *				200	7.77		735.6
					210	7.26		
12201	320	10	NA	AWD	220	6.63		
12202	315	10		AWD	230	5.81		
12203	300	10		20lb	240	5.72		

Moved at Dirt/Rock

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

GEOVision geophysical services

A-2 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/30/10
JOB*: 10171
PAGE* 3 OF * 4

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
12204	275	10	NA	AWD
12205	235	10		
12206	200	10		
12207	0	10		
12208	355 INT'	10		
12209	395	10		
12210	435	10 5/30/10		
12211	475	~~10~~ 8		
12212	515	~~10~~ 7		
12213	555	8		
12214	595	8		
12215	635 WD 5/30/10	9		
12216	675 ~~655~~ ~~675~~	10		
12217	715 ~~790~~ ~~705~~	10		
12218	755 ~~745~~	10		
12219	790			
12220	810	10		

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	ELEV.
250	5.51		
260	4.71		
270	3.75		
280	3.08		
290	2.90	13.58	
300	10.46		
310	11.45		
320	11.56		
330	11.68		
340	11.13		
350	10.35		
360	9.78		
370	9.11		
380	8.64		
390	8.10		746.4 CC ~~741.4~~ 6/4 TRANSCRIBED INCORRECTLY
400	7.51		
410	6.81		
420	6.38		
430	5.87		
440	5.54		
450	5.24		
460	5.06		
470	5.04		
480	4.89		
490	4.98		
500	4.68		
510	4.92		
520	5.11		
530	5.66		
540	5.73		
550	6.16		
560	6.63		
570	6.72		
580	7.03		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

A-2
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: BELL BEND NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/31/10
JOB*: 10171
PAGE* 4 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	
					590	6.95		
					600	7.05		746.9
					610	7.13		
					620	7.13		
					630	7.38		
					640	7.43		
					650	7.53		
					660	7.59		
					670	8.32		
					680	8.04		
					690	7.96		
					700	8.13		
					710	8.15	CC 5/31	
					720	~~2.32~~ 8.09	~~2.32~~ 2.32	
					730	2.4		
					740	~~2.51~~ 2.53		
					750	5/31 ~~2.52~~ 2.55		
					760	2.79		
					770	2.87		
					780 CC 5/31	3.2		
					~~780 790~~	3.29		744.8
					~~800~~ 790	3.44		
					810	4.09		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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SEISMIC REFRACTION FIELD LOG REV 1.2

A-3
Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/2/10
JOB*: 10171
PAGE 1 OF *: 5

CONTACT: Myra Au PHONE: Off (Cell) 808 - 227 - 0549

CONTACT: _____ PHONE: Off Cell _____

GENERAL SITE CONDITIONS/LOCATION: Dirt / shin high vegetation. Woods on each end of the line. Tree lines @ ~270 to 290', gravel road @ 290' to 305' Light wind

FIELD CREW*: E. Vasquez M. Cortez, C. Collins
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0810
ARRIVED ON SITE: 0855
STANDBY TIME: _____ CAUSE: _____
SEISMIC LINE STARTED: 1040 S1
1310 S2
1525 S3
SEISMIC LINE COMPLETED: 1230 S1
1451 S2
1730 S3

MAINTENANCE PERFORMED ON SITE*: _____

EQUIPMENT PROBLEMS OR FAILURES*: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____

COMMENTS: PCRA Crews Returned. GP 240' on Dirt mound. Trench between 224' and 229'

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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geophysical services

A-3
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/2/10
JOB*: 10171
PAGE 2 OF * 5

SURVEY TYPE (P OR S -WAVE)* P-Wave
SEISMOGRAPH* Geode 3458 [X] 3459 [X] OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* DPFR, AWD
GEOPHONE SPACING* 10 ft
RECORD LENGTH 0.2 sec
SAMPLE RATE 0.125 ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION* W to E

SPREAD NO. * 1	START STATION* 100	END STATION* 570
SPREAD NO. 2	START STATION 340	END STATION 810
SPREAD NO. 3	START STATION 580	END STATION 1050
SPREAD NO.	START STATION	END STATION

SEISMIC DATA ACQUISITION

RELATIVE ELEVATION SURVEY CC

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
13101	100	3	NA	DPFR	108.5		8.56	724.2
13102	80	2			100	10.07		
13103	255	2			80	11.95		
13104	135	10		AWD	110	8.25		
13105	175	10			120	7.01		
13106	215 WO 6/2/10	10			130	5.78		
13107	295	10 7			140	4.53		
13108	335	7			150	3.72		
13109	375	8			160	2.3		
13110	415	10			170	0.84	13.81	
13111	455	10			180	12.04		
13112	495	10			190	11.56		
13113	535	10			200	10.69		735.0
13114	570	10			210	8.98		
13115	590	10			220	8.19		
13116	700	10			230	7.3		
13117	810				240	4.55		
# SPREAD		2 *			250	6.68		
					260	3.71	11.95	
13201	340 WO 6/4/10	340 10	NA	AWD	270	8.23		
13202	320	10			280	6.61		
13203	210	10			290	7.01		
13204	100	3		DPFR	300	6.92		
13205	375	10		AWD	310	6.89		
13206	415	10			320	4.71		
13207	455	10			330	3.09		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-3 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/2/10
JOB*: 10171
PAGE* 3 OF * 5

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
13208	495 wp 6/4/10 ~~10 8~~	NA	AWD	
13209	535	8		
13210	575	8		
13211	615	8		
13212	655	10		
13213	695	10		
13214	735	10		
13215	775 wp 6/4/10	~~10~~ 8		
13216	810	10		
13217	830	10		
13218	940	10		
13219	1050	3		DPFR
#	SPREAD	3 *		
13301	580	10	NA	AWD
13302	560	10		
13303	450	10		
13304	340	10		
13305	615	10		
13306	655	8		
13307	695	9		
13308	735	8		
13309	775	7		
13310	815	7		
13311	855	8		
13312	895	8		
13313	935	8		
13314	975	10		
13315	1015	10		
13316	1050	3		DPFR
13317	1070	3		DPFR

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	
340	3.53		
350	2.84		
360	1.32		
370	.03	24.56	
380	23.14		
390	21.69		
400	20.16		758.0
410	18.98		
420	18.15		
430	17.01		
440	15.94		
450	14.55		
460	13.05		
470	11.65		
480	10.33		
490	9.16		
500	8.16		
510	7.07		
520	6.38		
530	5.52		
540	4.9		
550	4.13		
560	3.47		
570	2.89		
580	2.25		
590	1.64		
600	0.89	18.01	777.3
610	17.35		
620	16.64		
630	15.84		
640	15.66		
650	15.41		
660	14.93		
670	14.49		

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-3
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: BELL BEND NPP
CLIENT*: PLRA
AUTHOR*: W. Dalrymple
DATE*: 6/3/10
JOB*: 10171
PAGE* 4 OF * 5

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	
					680	13.75		
					690	13.04		
					700	12.38		
					710	11.48		
					720	10.75		
					730	9.68		
					740	8.98		
					750	8.2		
					760	7.49		
					770	6.8		
					780	6.01		
					790	5.49		
					800	5.01		790.2
					810	4.76		
					820	4.54		
					830	5.02		
					840	5.47		
					850	5.97		
					860	6.66		
					870	7.55		
					880	8.47		
					890	9.83		
					900	11.72		
					910	13.46		
					920	15.74		
					930	17.57		
					940	19.69		
					950	21.19		
					960	22.97		
					970	24.06	3.33	
					980	4.61		
					990	5.91		
					1000	7.34		767.1
					1010	8.28		

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-3
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: BELL BEND NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/3/10
JOB*: 10171
PAGE* 5 OF * 5

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT
					1020	9.34	
					1030	10.16	
					1040	11.25	2.78
					1050	~~6.45~~ 6.54	
					1070	~~12.02~~ 11.96	
					END STAKE	15.09	
					1040	2.8	~~11.82~~ 11.96
					1000	7.12	
					950	0.22	20.13
					800	3.93	

750.7

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/3/10 - 6/4/10
JOB*: 10171
PAGE 1 OF * 4

CONTACT: Myra Au PHONE: Off (Cell) 808 227 0549

CONTACT: _____ PHONE: Off Cell _____

GENERAL SITE CONDITIONS/LOCATION: Shin High Vegetation, Section of weeds, trees, Gravel road. Slopes up from west to E-2

FIELD CREW*: E. Vasquez, M. Cortez, C. Collins
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0810
ARRIVED ON SITE: 0850
STANDBY TIME: _____ CAUSE: _____
SEISMIC LINE STARTED: S1 1550
6/4/10 S1 1515
SEISMIC LINE COMPLETED: S1 1735
S2 1650

MAINTENANCE PERFORMED ON SITE*: Replace S2GP5 @ shot 14205 (no change)

EQUIPMENT PROBLEMS OR FAILURES*: _____

SUGGESTIONS, ADDITIONS, CHANGES: _____

COMMENTS: GPO 280' on Rowpile

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-4 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/3/10
JOB*: 10171
PAGE 2 OF *: 4

SURVEY TYPE (P OR S -WAVE)*: P-Wave
SEISMOGRAPH*: Geode 3458 ☒ 3459 ☒ OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE*: AWD DPFR
GEOPHONE SPACING*: 10
RECORD LENGTH: 0.2 secs
SAMPLE RATE: 0.125 ms
NUMBER OF CHANNELS*: 48
LINE ORIENTATION*: W to E
WD 6/3/10

SPREAD NO. *: 1 START STATION*: 240 END STATION*: ~~470~~ 710
SPREAD NO.: 2 START STATION: 60 END STATION: 530
SPREAD NO.: START STATION: END STATION:
SPREAD NO.: START STATION: END STATION:

SEISMIC DATA ACQUISITION

RELATIVE ELEVATION SURVEY WD Elev

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	
14101	240	3	NA	DPFR	60	WD 6/5/10 14.87	~~18.78~~	747.7
14102	220	2			45	16.65		
14103	110	10		AWD	70	13.82		
14104	60	10			80	12.57		
14105	~~275~~ 265	2		DPFR	90	11.3		
14106	~~295~~ 315	10		AWD	100	10.62		
14107	285	10			110	9.9		
14108	355	10			120	~~8.66~~		
14109	395	10			130	~~7.18~~		
14110	435	10			140	6.19		
14111	475	8			150	4.95		
14112	515	8			160	3.71		
14113	555	10			170	2.34		
14114	595	10			180	1.31	14.31	
14115	635	10			190	12.92		
14116	675	11			200	11.64 16.75	~~16.75~~ ~~14.31~~	763.8
14117	710	10			210	~~9.69~~ 14.29		
14118	730	10			220	~~8.38~~ 12.85		
~~14119~~	SPREAD	2 ~~##~~			230 WD 6/5/10	~~7.29~~ 11.85		
					240	~~6.18~~ 10.77		
14201	60	10	NA	AWD 250	~~250~~ ~~260~~	~~4.98~~ 10.23	~~9.54~~	
14202	~~95~~ 40	10		260	~~260~~ ~~270~~	~~8.13~~ 9.56		
14203	~~135~~ 95	10		270	~~270~~ ~~280~~	~~5.5~~ 8.22		
14204	~~175~~ 135	10		280	~~280~~ ~~290~~	5.52		
14205	~~215~~ 175	~~10~~		~~DPFR~~ AWD	290	5.33		
14206	~~255~~ 215	2		DPFR	300	5.53		

WD 6/4/10

275 on Rock Can't use DPFR

only goes to 66

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

GEOVision
geophysical services

A-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/4/10
JOB*: 10171
PAGE* 3 OF * 4

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
14207	255	2	NB	DPFR
14208	295	8		AWD
14209	335	8		
14210	375	8		
14211	415	8		
14212	455	10		
14213	495	10		WD 6/5/10
14214	530	10		
14215	650	10		
14216	710	10		

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	
310	4.99		
320	4.57		
330	4.03		
340	3.32		
350	2.78		
360	2.34	13.4	
380 370	12.67		
380	12.15		
390	11.53		
400	11.14		780.0
410	10.49		
420	9.87		
430	9.3		
440	8.88		
450	8.19		
460	7.55		
470	7.07		
480	6.56		
490	5.94		
500	5.47		
510	4.67		
520	4.14		
530	3.55		
540	2.8		
550	2.25	12.05	
560	11.27		
570	10.44		
580	9.12		
590	8.17		
600	7.25		793.7
610	6.31		
620	5.45		
630	4.65		
640	3.74		

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/5/10
JOB*: 10171
PAGE* 4 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT
					650	3.01	
					660	2.23	
					670	1.74	
					680	1.15	5.00
					690	4.86	
					700	4.6	
					710? End	4.38	
					730	4.07	

800.5

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-5
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
DATE*: 6/3/10 to 6/4/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 1 OF * 4

CONTACT: Myra Au
PHONE: Off (Cell) 8082270549

CONTACT:
PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION: Dirt / Grass / Shrubs high vegetation, Rock Walls, trees. Slopes up from West to East

FIELD CREW*: E. Vasquez, M. Cortez, C. Collins
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0810
ARRIVED ON SITE: 0850
STANDBY TIME:
CAUSE:
SEISMIC LINE STARTED: S1 1125
S2 1330
SEISMIC LINE COMPLETED: S1 1205
S2 1505

MAINTENANCE PERFORMED ON SITE*: Replace GP45 S1 before 15/02.

EQUIPMENT PROBLEMS OR FAILURES*:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: GPS 210' in Rock pile, GPS 230, 240 in Gravel road

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

A-S
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/3/10 to 6/4/10
JOB*: 10171
PAGE 2 OF * 4

SURVEY TYPE (P OR S -WAVE)* P-wave
SEISMOGRAPH* Geode 3458 [X] 3459 [X] OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* AWD
GEOPHONE SPACING* 10
RECORD LENGTH 0.2 secs
SAMPLE RATE 0.125 ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION* West to East

SPREAD NO. * 1	START STATION* 0	END STATION* 470
SPREAD NO. 2	START STATION 180	END STATION 650
SPREAD NO.	START STATION	END STATION
SPREAD NO.	START STATION	END STATION

SEISMIC DATA ACQUISITION

RELATIVE ELEVATION SURVEY CC

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
15101	0	10	NA	AWD	0		23.07	741.5
15102	-20	10			10	21.41		
15103	35	10			20	20.05		
15104	75	10			30	19.03		
15105	115	10			40	17.79		
soft 15106	155 In1'	10			50	16.32		
15107	195	10			60	14.31		
15108	235	10			70	12.71		
15109	275	10			80	11.9		
15110	315	10			90	10.37		
15111	355	8			100	9.05		
15112	395	9			110	7.69		
15113	435	10			120	6.48		
15114	470	10			130	5.57		
15115	490	10			140	4.17		
15116	600	10			150	2.72		
15117	650	10			160	0.93	15.51	
*	SPREAD	2 *			170	14.62		
					180	13.52		
15201	180	10	NA	AWD	190	12.51		
15202	160	10			200	11.29		767.8
15203	50	10			210	8.06		
15204	0	10			220	7.5		
15205	215	10			230	6.89		
15206	255	10			240	6.19		
15207	295	8			250	5.2		

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

A-5 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/3/10 to 6/4/10
JOB*: 10171
PAGE* 3 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT
WP 6/3/10 15208	335	10	NA	AWD	260	4.75	
15209	375	10			270	3.88	
15210	415	8			280	3.23	
15211	455	8			290	2.45	
15212	495	8			300	1.81	
15213	535	10			310	1.16	
15214	575	10			320	.63	13.67
15215	615	10			330	13.08	
15216	650	10			340	12.45	
Obstruction @ 690 15217	660				350	11.76	
					360	11.18	
					370	10.55	
					380	10.01	
					390	9.46	
					400	8.73	783.1
					410	8.19	
					420	7.77	
					430	7.18	
					440	6.26	
					450	5.64	
					460	5.29	
					470	4.58	
					480	3.88	
					490	3.57	
					500	3.15	
					510	2.62	
					520	1.75	
					530	1.02	
					540	0.46	10.55
					550	10.04	
					560	9.37	
					570	9.18	
					580	8.26	
					590	7.83	

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

A-5
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/4/10
JOB*: 10171
PAGE* 4 OF * 4

SEISMIC DATA ACQUISITION

RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	
					600	7.46		794.6
					610	6.96		
					620	6.47		
					630	5.85		
					640	5.26		
					650	4.53		797.4
					~~670~~ 660	3.78		
					WD 6/4/10			

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

GEOVision
geophysical services

B-1
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
DATE*: 5/29/10 - 5/30/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 1 OF * 4

CONTACT: Myra Au
PHONE: Off (Cell) 808-227-0549

CONTACT:
PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION: Slopes up from South to North.
Low, shrubby high vegetation. Trees, fallen logs, stumps.

FIELD CREW*: E. Vasquez, C. Collins, M. Cortez
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0715
ARRIVED ON SITE: 0755
STANDBY TIME:
CAUSE:
SEISMIC LINE STARTED: 1305 S1
1530 S2
1550 S3
SEISMIC LINE COMPLETED: 1500 S1
1739 S2
1830 S3

MAINTENANCE PERFORMED ON SITE*: S3 GP40 checked + replaced before 21302
Reset GP4 S3 shot 21317

EQUIPMENT PROBLEMS OR FAILURES*: S3 before start, slow data acq. in laptop. Switch Geode 3458 and 3457. (Fix)

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: No space for a line longer than 900'. GP@ 455' & 440' in rock/trash mound. 435' in a trench.

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

B-1 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
DATE*: 5/29/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 2 OF * 4

SURVEY TYPE (P OR S -WAVE)* P-Wave
SEISMOGRAPH* Geode 3458 [X] 3459 [X] OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* AWD, 2015, DPPR
GEOPHONE SPACING* 10
RECORD LENGTH 0.2s
SAMPLE RATE 0.125ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION* S to N

SPREAD NO. *	1	START STATION*	0	END STATION* 470
SPREAD NO.	2	START STATION	240	END STATION 710
SPREAD NO.	3	START STATION	430	END STATION 900
SPREAD NO.		START STATION		END STATION

SEISMIC DATA ACQUISITION / RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
21101	470	10	NA	AWD	0		17.46	714.3
21102	490	10			-20	21.34		
21103	590	10			10	16.00		
21104	710	10			20	14.59		
21105	735	10		2016	30	13.72		
21106	424	10		AWD	40	12.73		
21107	395	10			50	12.36		
21108	355	10			60	11.85		
21109	315	10			70	11.08		
21110	275	10			80	9.98		
21111	235	10			90	8.82		
21112	195	10			100	7.71		
21113	155	10			110	6.78		
21114	115	10			120	5.97		
21115	75	10			130	5.22		
21116	35	10			140	4.76		
21117	0	10			150	4.20		
21118	-20	10			160	3.59		
*SPREAD		2 *			170	3.21		
					180	2.58		
21201	240	11	NA	AWD	190	2.09		
21202	120	10			200	2.16		729.6
21203	0	11			210	2.26		
21204	275	9			220	2.45		
21205	WD Flooded 315	8			230	2.35		
21206	355	8			240	2.36	6.57	

On Dirt Mound

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

GEOVision
geophysical services

B-1 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/29/10 - 5/30/10
JOB*: 10171
PAGE* 3 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT
21207 ~~22207~~	395	~~10~~ 8	NA	AWD	250	6.48	
21208 ~~22208~~	424	~~10~~ 8	NA	AWD	260	6.21	
~~22209~~	435	10	NA	20 lb	270	6.02	
~~22210~~	475	10	NA	AWD	280	5.77	
21209 21210 ~~22211~~	515	8			290	5.74	
21211 21212 ~~22212~~	555	8			300	5.47	
21213 ~~22213~~	595	10			310	5.26	
21214 ~~22214~~	635	10			320	4.86	
21215 ~~22215~~	675	10			330	5.21	
21216 ~~22216~~	710	10			340	5.45	
21217 ~~22217~~	730	10			350	5.85	
21218 ~~22218~~	830	10	WD 5/29/10	BSG AWD	360	6.20	
21219 ~~22219~~	900	4	DPFR	BSG SOG	370	6.88	
21220 ~~22220~~	220	10	NA	AWD	380	7.45	
1 SPREAD	3 *				390	7.71	
				WD 5/30/10	400	8.24	727.7
21301	410	10	NA	AWD	410	8.99	
21302	430	3	NA DPFR	BSG	420	9.06	
21303	340	10	NA	AWD	430	11.31	
21304	240	10			440	8.72	
21305	465	10			450	8.42	
21306	505 1 BAD	8			460	8.84	
21307	545	10			470	8.4	
21308	WD 5/30/10 ~~585~~	10			480	8.52	
21309	625	10			490	8.15	
21310	665	10			500	6.75	
21311	705	10			510	4.79	
21312	745	10			520	3.84	
21313	785	10			530	3.57	
21314	825	10			540	2.95	
21315	WD 5/30/10 ~~865~~ 920	3		DPFR	550	2.3	
21316	~~900~~ 900	3			560	1.00	
21317	920 865	3			570	0.32	20.77
					580	19.14	

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

B-1 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/30/10
JOB*: 10171
PAGE* 4 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
					590	17.71		
					600	16.1		740.2
					610	14.41		
					620	12.45		
					630	CP 5/30 ~~16.6~~ 10.62		
					640	8.63		
					650	7.29		
					660	6.13		
					670	4.93		
					680	3.99		
					690	2.93		
					700	2.33		
					710	2.18		
					720	1.97		
					730	2.31		
					740	2.11		
					750	1.54		
					760	1.62		
					770	1.54		
					780	CP 5/30 ~~0.5~~ 1.51		
					790	1.2		
					800	1.45		754.8
					810	1.3		
					820	.24	1.84	
					830	1.82		
					840	1.16		
					850	0.22	6.64	
					855	6.23		757.9
					860	6.00		
					870	5.41		
					880	4.53		
					890	3.49		
					900	2.72		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

B-2
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend Project
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/27/10
JOB*: ~~10176~~ 10171 WO 5102Rev
PAGE 1 OF * 4

CONTACT: Myra Au PHONE: Off (Cell) 808 227 0549

CONTACT: _____ PHONE: Off Cell _____

GENERAL SITE CONDITIONS/LOCATION: Slope up from South to North
Grass, Dirt, gravel road. Heavy Tree/Brush cover 0-200'. Survey Not to be performed in that area. Gravel road at 690' to 880'

FIELD CREW*: M. Cortez, C. Collins, E. Vasquez
MOBILIZED FROM: Bloomsburg, PA
DEPARTURE TIME: 0815
ARRIVED ON SITE: 0900
STANDBY TIME: 1hr, safety meeting, Access meeting
CAUSE: Safety Meeting, Access meeting
SEISMIC LINE STARTED: 1130 S1, 1445 S2
SEISMIC LINE COMPLETED: 1330 S1, 1840 S2

MAINTENANCE PERFORMED ON SITE*: _____

EQUIPMENT PROBLEMS OR FAILURES*: S2 GP3 rev. polarity. Replaced, does not fix
Replace Trigger Cable S2 shot 22216. Replace GP 15, 17, 18 @ shot 22218

SUGGESTIONS, ADDITIONS, CHANGES: _____

COMMENTS: S1GP9 on edge of excavation
Extreme, sand N off ends not poss. to
Drizzle @ 16K, Rain 1630
Lightning/Rain Delay 1630 → 1715

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision geophysical services

B-2
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/27/10
JOB*: ~~10176~~ 10171 WD 5/28/10
PAGE 2 OF * 4

SURVEY TYPE (P OR S -WAVE)* P-Wave
SEISMOGRAPH* Geode 3458 ☒ 3459 ☒ OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* AWD
GEOPHONE SPACING* 10
RECORD LENGTH 0.35 sec
SAMPLE RATE 0.125 ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION*

SPREAD NO. * ~~530~~ 1 WD 5/28/10 START STATION* 530 END STATION* 1000
SPREAD NO. 2 ~~190~~ 5/28/10 START STATION WD 5/28/10 ~~660~~ 190 END STATION 660
SPREAD NO. START STATION END STATION
SPREAD NO. START STATION END STATION

SEISMIC DATA ACQUISITION / RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	Elev
22101	1000	10	NA	AWD	200		~~740.1~~ 11.05	~~11.05~~ 740.1
22102	1020	10	NA		190	12.02		~~12.02~~ CL 5/28
22103	975	10			170	13.89		~~13.89~~
22104	945	10			210	8.44		~~8.44~~
22105	915	10			220	8.69		~~8.69~~
22106	885	10			230	7.04		~~7.04~~
22107	855	10			240	6.76		~~6.76~~
22108	825	10			250	6.52		~~6.52~~
22109	795	8			260	6.53		~~6.53~~
22110	765	7			270	6.28		~~6.28~~
22111	735	8			280	6.33		~~6.33~~
22112	705	8			290	6.69		~~6.69~~
22113	675	9			300	6.89		~~6.89~~
22114	645	10			310	6.69		~~6.69~~
22115	615	10			320	6.47		~~6.47~~
22116	585	10			330	6.59		~~6.59~~
22117	555	10			340	~~6.82~~ 6.26		~~6.82~~
22118	530	10			350	6.63		~~6.63~~
22119	410	10			360	6.95		~~6.95~~
22120	190	15			370	7.2		~~7.2~~
*SPREAD 2 *					380	7.09		~~7.09~~
					390	7.07		~~7.07~~
22201	190	11	NA	AWD	400	7.02	~~744.3~~	744.3 (~~7.02~~)
22202	170	10			410	7.41		~~7.41~~
22203	215.4	10			420	6.98		~~6.98~~
22204	245	10			430	6.77		~~6.77~~

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

B-2

SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/27/10
JOB*: ~~10176~~ 10171 WO 5/27/10
PAGE* 3 OF * 4

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
22205	275	10	NB	AWD
22206	305	10		
22207	335	10		
22208	365	10		
22209	395	10		
22210	425	10		
22211	455	10		
22212	485	10		
22213	515	10		
22214	545	10		
22215	575	10		
22216	605	10		
22217	635	10		
22218	660	12		
22219	675	10		
22220	680	10		
22221	705	10		
22222	735	10		
22223	780	10		
22224	1000	12		

Noise wet grounds

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	Elev
440	6.09		~~6.09~~ CC 5/28
450	5.02		~~5.02~~
460	4.49		~~4.49~~
470	4.39		~~4.39~~
480	3.79		~~3.79~~
490	3.39		~~3.39~~
500	2.37		~~2.37~~
510	1.26	22.33	~~1.26~~
520	20.97		
530	19.44		
540	17.88		
550	16.11		
560	13.97		
570	12.05		
580	10.43		
590	9.95		
600	6.36		765.3
610	4.61		
620	3.58		
630	2.33		
640	1.74 CC 5/28		
650	~~.450~~ .45	7.93	
660	7.44		
670	6.95		
680	6.26		
690	5.92		
700	5.36		
710	5.1		
720	4.63		
730	4.33		
740	4.31		
750	4.23		
760	4.21		
770	4.28		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

B-2
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W Dalrymple
DATE*: 5/28/10
JOB*: 10171
PAGE* 4 OF * 4

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV
					780	4.43		
					790	4.3		
					800	4.35		775.6
					810	4.46		
					820	4.81		
					830	4.62		
					840	4.72		
					850	4.19		
					860	3.64		
					870	3.28		
					880	3.37		
					890	3.38		
					900	3.01		
					910	2.44		
					920	1.71, 0.5/1.24		
					930	~~1.87~~ 1.87	7.21	
					940	6.29		
					950	5.62		
					960	5.2		
					970	4.81		
					980	4.43		
					990	4.15		
					1000	4.1		782.1
					1020	3.8		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

B-3
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/28/10 / 5/29/10
JOB*: 10171
PAGE 1 OF * 5

CONTACT: Myra Au PHONE: Off (Cell) 808-227-0549

CONTACT: _____ PHONE: Off Cell _____

GENERAL SITE CONDITIONS/LOCATION: Low shin high vegetation w/ trees and rock mounds, tree lines

FIELD CREW*: E. Vasquez, C. Collins, M. Cortez
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0700
ARRIVED ON SITE: 0745
STANDBY TIME: _____
CAUSE: WD 5/28/10
SEISMIC LINE STARTED: 0945 S1
5/29 1345 S2
0915 S3
SEISMIC LINE COMPLETED: 1222 S1
1603 S2
1125 S3

MAINTENANCE PERFORMED ON SITE*: Replace S1 GP1 shot 23101 during testing, before shot
Replace S1 G47 shot 23105 (No change) and again shot 23107 (No change)
Replace S1 G44 shot 23108 (No change) Replace S1 G36 shot 23114 (fix)
Replace S2 G38 BF shot 23201 (No change)
S2 G2 (No change)
S3 B11 (visual)

EQUIPMENT PROBLEMS OR FAILURES*: Replace Hammerswitch shot 23210
Replace S2 G7 shot 23216 WD 5/28/10 23216 (fix)
Replace S2 G18 shot 23218 (No change) : Replace S3 GP30 before first shot (Rx)

SUGGESTIONS, ADDITIONS, CHANGES: _____

COMMENTS: GP@ 340' offset West 4 ft.

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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B-3
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/28/10
JOB*: 10171
PAGE 2 OF *: 5

SURVEY TYPE (P OR S -WAVE)* P wave
SEISMOGRAPH* Geode 3458 [X] M1 3459 [X] S1 OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE* AWD
GEOPHONE SPACING* 10
RECORD LENGTH 0.2 s
SAMPLE RATE 0.125 ms
NUMBER OF CHANNELS* 48
LINE ORIENTATION* S to N

SPREAD NO. * 1	START STATION* 480	END STATION* 950
SPREAD NO. 2	START STATION 240	END STATION 710
SPREAD NO. 3	START STATION 0	END STATION 470
SPREAD NO.	START STATION	END STATION

SEISMIC DATA ACQUISITION / RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
23101	950	10	NA	AWD	0		11.9	716.3
23102	970	10			-20	15.21		
23103	1070	10			10	9.36		
23104	1190	10			20	8.94		
23105	915	10			30	6.11		
23106	875	10			40	4.72		
23107	835	10			50	3.64		
23108	795	10			60	2.76		
23109	755	10			70	2.01		
23110	715	10			80	1.2	18.28	
23111	675	10			90	17.58		
23112	635	10			100	16.21		
23113	595	10			110	15.36		
23114	555	10			120	13.65		
23115	515	10			130	11.72		
23116	480	10			140	9.31		
23117	460	10			150	7.64		
23118	420	10			160	6.9		
23119	360	10			170	3.68		
23120	240	10			180	1.82	20.6	
23*	* SPREAD 2		*		190	18.7		
					200	16.83		747.1
23201	240	10	NA	AWD	210	15.09		
23202	220	10			220	13.5		
23203	120	10			230	12.15		
23204	0	10			240	10.89		

Elec noise sucks PL to Martin @ Road By Trailer near GP-Rick pile

WP 5/29/10

WP 5/29/10

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

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B-3
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/28/10 - 5/29/10
JOB*: 10171
PAGE* 3 OF * 5

SEISMIC DATA ACQUISITION | RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
23205	275	10	NA	AWD	250	9.67		
23206	315	8			260	8.59		
23207	355	8			270	7.82		
23208	395	8			280	7.85		
WD 5/28/10 Ch-2 Sig. → 23209	435 434	8			290	6.00		
23210	475	8			300	5.17		
23211	515	8			310	4.61		
23212	555	8			320	3.85		
38 Sig. → 23213	595	8			330	2.84		
23214	635	10			~~9.67~~ 340	3.09		
23215	675	10			~~8.59~~ 350	2.57		
23216	710	11		CC	~~7.82~~ 360	2.41		
23217	730	10		5/29	~~7.85~~ 370	1.99		
23218	830	10			~~5.00~~ 380	1.61		
23219	950	10			390	1.72	11.13	
5/29/10 * SPREAD 3 *					400	10.72		762.5
					410	10.58		
23301	470	10	NA	AWD	420	9.90		
23302	490	10			430	9.19		
23303	590	10			440	8.93		
23304	710	10			450	7.8		
23305	434	10			460	8.00		
23306	395	8			470 CC 5/29	~~7.67~~ 7.7		
23307	355	8			480	7.61		
23308	315	8			490	7.04		
23309	275	8			500	6.32		
23310	235	8			510	5.67		
23311	195	8			520	5.10		
23312	155	8			530	3.64		
23313	115	10			540	2.61		
23314	75	10			550	1.88		
23315	35	10			560	0.65	16.42	
23316	0	10			570	15.34		
23317	-20	10			580	14.19		

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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geophysical services

B-3 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: BELL BEND NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple

DATE*: 5/29/10
JOB*: 10111
PAGE* 4 OF * 5

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	ELEV.
590	13.32		
600	12.05		776.9
610	11.12		
620	10.14		
630	9.06		
640	8.49		
650	7.48		
660	6.93		
670	6.02		
680	5.38		
690	4.91		
700	4.59		
710	3.95		
720	3.68		
730	3.25		
740	3.57		
750	3.88		
760	2.91		
770	3.1		
780	3.73		
790	3.82		
800	4.32		784.6
810	4.72		
820	5.40		
830	4.98		
840	4.77		
850	4.06		
860	~~5.09~~ 5.24		
870	5.07		
880	4.79		
890	5.06		
900	4.74		
910	4.57		
920	4.24		

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-3 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: BELL BEND NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 5/29/10
JOB*: 10171
PAGE* 5 OF * 5

SEISMIC DATA ACQUISITION / RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV
					930	4.06		
					940	3.57		
					950	3.36		
				cc 5lb	~~960~~ 970	2.86		
					~~970~~/1000	0.51		787.5
					~~980~~			
					~~990~~			
					~~1000~~			

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

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geophysical services

B-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
DATE*: 6/1/10 to 6/2/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 1 OF *: 5

CONTACT: Myra Au
PHONE: Off Cell (Cell) 808-227-0549

CONTACT:
PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION: Dirt / Grass / shrubs vegetation with Orchard trees & Rock/debris walls. Slopes up from south to north. Light wind. Sporadic light rain

WP 6/1/10

FIELD CREW*: E. Vasquez & M. Cortez, C. Collins
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0710
ARRIVED ON SITE: 0745
STANDBY TIME:
CAUSE:
SEISMIC LINE STARTED: S1 0850 S2 1129 S3 1335
SEISMIC LINE COMPLETED: S1 1042 S2 1255 S3 1535

MAINTENANCE PERFORMED ON SITE*: Replace GP 35 S1 before first shot (fix)
Replace S1G39 (fix). Replace S1GP30 before 24115 (noisy)

EQUIPMENT PROBLEMS OR FAILURES*:

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: GP@ 440' on Vegetation debris pile, on top of loose rock Dropoff + woods for southside no offend. Light Rain (short) @ 1015 GP@ 850' on a rock pile. GP@ 870', 880' in Gravel/Rock road.

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/1/10 to 6/2/10
JOB*: 10171
PAGE 2 OF *: 5

SURVEY TYPE (P OR S -WAVE)*: P-Wave
SEISMOGRAPH*: Geode 3458 [X] 3459 [X] OTHER
GEOPHONE TYPE: 10 Hz Vertical
ENERGY SOURCE*: AWD
GEOPHONE SPACING*: 10
RECORD LENGTH: 0.2s
SAMPLE RATE: 0.125ms
NUMBER OF CHANNELS*: 48
LINE ORIENTATION*: S to N

SPREAD NO. *: 1	START STATION*: 0	END STATION*: 470
SPREAD NO.:	START STATION: 240	END STATION: 710
SPREAD NO.:	START STATION: 480	END STATION: 950
SPREAD NO.:	START STATION:	END STATION:

SEISMIC DATA ACQUISITION / RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	ELEV.
24101	0	10	NA	AWD	0		19.18	716.7
24102	36	10			10	17.11		
24103	75	10			20	14.24		
24104	WD 6/1/10 115	10			30	13.02		
24105	175 155	10			40	12.17		
24106	195	10			50	11.23		
24107	235	10			60	10.39		
24108	275	10			70	9.93		
24109	315	10			80	9.2		
24110	355	10			90	8.38		
24111	395	10			100	7.18		
24112	425	10			110	6.02		
24113	445	10			120	4.66		
24114	470	10			130	3.31		
24115	490	10			140	1.92	24.09	
24116	610	10			150	22.51		
24117	710	10			160	20.98		
*	SPREAD	2 *			170	19.48		
					180	15.75		
24201	240	10	NA	AWD	190	15.86		
24202	220	10			200	13.64		744.7
24203	110	10			210	11.27		
24204	0	10			220	9.21		
24205	275	10			230	6.7		
24206	315	10			240	4.29		
24207	355	10			250	2.15	21.31	

WD 6/1/10

shot not possible @ 435

ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL

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B-4 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number*

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/1/10 to 6/2/10
JOB*: 10171
PAGE* 3 OF * 5

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
24208	395	10	NA	AWD
24209	425	10		
24210	445	10		
24211	475	9		
24212	515	10		
24213	555	10		
24214	595	10		
24215	635	10		
24216	675	10		
24217	710	10		
24218	730	10		
24219	840	10		
24220	950	10		
* SPREAD 3 *				
24301	480	10	NA	AWD
24302	460	10		
24303	350	10		
24304	240	10		
24305	515	10		
24306	555	10		
24307	595	10		
24308	635	10		
24309	675	6		
24310	715 w/ Gain	10		
24311	755 795	8 10		
24312	795	10		
24313	835	11		
24314	875	10		
24315	915	11		
24316	950	10		
24317	990	10		
24318	1070	10		

Light Rain clear

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT
260	19.19	
270	17.39	
280	15.75	
290	13.99	
300	12.28	
310	10.86	
320	9.4	
330	7.92	
340	6.31	
350	5.54	
360	4.69	
370	4.48	
380	4.74	
390	4.34	
400	4.55	
410	4.5	
420	4.17	
430	3.81	21.3
440	18.52	
450	18.64	
460	18.08	
470	17.66	
480	17.13	
490	16.41	
500	15.6	
510	15.06	
520	14.12	
530	13.17	
540	12.38	
550	11.45	
560	10.55	
570	9.7	
580	8.9	
590	8.02	

WD 772.7 6/5/10 check stake

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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B-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/2/10
JOB*: 10171
PAGE* 4 OF * 5

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT	ELEV.
600	7.32		787.2
610	6.89		
620	6.45		
630	5.85		
640	5.29		
650	4.6		
660	3.79		
670	3.05		
680	2.59		
690	2.39		
700	2.35		
710	2.49		
720	2.32		
730	2.08		
740	1.98		
750	1.8		
760	1.55		
770	1.33		
780	1.02		
790	0.81	4.34	
800	4.15		793.9
810	3.83		
820	3.66		
830	3.45		
840	3.25		
850	3.13		
860	4.29		
870	4.28		
880	4.52		
890	5.12		
900	5.23		
910	5.42		
920	5.63		
930	5.85		

4 613

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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B-4
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/2/10
JOB*: 10171
PAGE* 5 OF * 5

SEISMIC DATA ACQUISITION

RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT	
					940	6.22		
					950	6.25		
				cl 6/2	~~970~~ ~~980~~ ~~1000~~	6.34	cl 6/2	
				6/2	~~990~~ 1000	~~6.09~~ 6.09	~~6.09~~	792.0
					~~980~~ 800	4.14	~~4.14~~ 1.18	793.9
					~~990~~ 600	~~7.67~~ 7.92	0.59	787.2
					~~500~~ ~~1000~~ 400	8.87	1.94	~~772.7~~
					400 ~~200~~	8.26	3.03	772.7
					230	24.25	2.02	
					200	9.91	~~9.91~~ 0.18	744.7
					~~0~~ 30	21.51	3.45	~~716.7~~
					0	9.62		716.7

*ITEMS WITH * MUST BE COMPLETED . OTHER INFORMATION IS OPTIONAL*

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S-1 SEISMIC REFRACTION FIELD LOG REV 1.2

Seismic Line Number* On A3 - Use A3 Stationing + Elev

SITE*: Bell Bend NPP
DATE*: 6/4/10
CLIENT*: PCRA
JOB*: 10171
AUTHOR*: W. Dalrymple
PAGE 1 OF * 3

CONTACT: Myra Au
PHONE: Off Cell 808 227 0549

CONTACT:
PHONE: Off Cell

GENERAL SITE CONDITIONS/LOCATION: Grass / Dirt / Shrubs high vegetation
Slopes up from West to East, excavations to off end to West
+ Work @ 280' SD 6/4/10 / west

FIELD CREW*: E. Vasquez, M. Cortez, C. Collins
MOBILIZED FROM: Bloomsburg
DEPARTURE TIME: 0810
ARRIVED ON SITE: 0850
STANDBY TIME:
CAUSE:
SEISMIC LINE STARTED: 0945 S1
1200 S2
SEISMIC LINE COMPLETED: 1130 S1
1350 S2

MAINTENANCE PERFORMED ON SITE*:

EQUIPMENT PROBLEMS OR FAILURES*: Large plank end cap broken off. Switch to medium plank. Medium plank w/ end cracked off, one side usable (3/10/8)
↑ shot 3/10/3

SUGGESTIONS, ADDITIONS, CHANGES:

COMMENTS: Use A-3 Stationing + Elev. Work @ 280' + low

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

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S-1
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/4/10
JOB*: 10171
PAGE 2 OF * 3

SURVEY TYPE (P OR S -WAVE)* S-Wave
SEISMOGRAPH* Geode 3458 ☐ 3459 ☒ OTHER
GEOPHONE TYPE: Horizontal
ENERGY SOURCE* 20lb Hammer
GEOPHONE SPACING* 10
RECORD LENGTH 0.3s
SAMPLE RATE 0.125ms
NUMBER OF CHANNELS* 24
LINE ORIENTATION* W to E

SPREAD NO. * 1	START STATION* 400	END STATION* 630
SPREAD NO. 2	START STATION 610	END STATION 840
SPREAD NO.	START STATION	END STATION
SPREAD NO.	START STATION	END STATION

Use small plank

SEISMIC DATA ACQUISITION

RELATIVE ELEVATION SURVEY

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE	STATION	FORESIGHT	BACKSIGHT
3|101	399	10	N	20lb			
3|102	399	10	S				
3|103	340	10	N				
3|104	340	10	S				
3|105	~~340~~ 285	10	N				
3|106	285	10	S				
3|107	455	6	N				
3|108	455	6	S				
3|109	WD 6/4/10 ~~516~~ 515	6	N				
3|110	515	6	S				
3|111	WD 6/4/10 575	7	N				
3|112	~~630 631~~ 575	7	S				
3|113	~~630~~ 631	8	N				
3|114	631	8	S				
3|115	665	8	N				
3|116	665	8	S				
3|117	725	10	N				
3|118	725	10	S				
3|119	785	10	N				
3|120	785	10	S				
3|121	841	10	N				
3|122	841	10	S				
*	SPREAD 2 *						
3|201	609	10	N	20lbs			
3|202	609	10	S				

Plank Broken (1st stake) WD 6/4/10

Match Next Spread

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*

GEOVision
geophysical services

S-1
Seismic Line Number*

SEISMIC REFRACTION FIELD LOG REV 1.2

SITE*: Bell Bend NPP
CLIENT*: PCRA
AUTHOR*: W. Dalrymple
DATE*: 6/4/10
JOB*: 10171
PAGE* 3 OF * 3

SEISMIC DATA ACQUISITION

FILE*	SHOT LOCATION*	# STACKS	DIRECTION	SOURCE
31203	575	9	N	20 lbs
31204	575	8	S	
31205	515	8	N	
31206	515	8	S	
31207	455	10	N	
31208	455	10	S	
WD 6/4/10 X 31209	665 400 395	10	N	
31210	6 400 395	10	S	
31211	665	9	N	
31212	665	8	S	
31213	725	6	N	
31214	725	6	S	
31215	785	8	N	
31216	785	8	S	
31217	841	10	N	
31218	841	10	S	
31219	900	10	N	
31220	900	10	S	
31221	990	10	N	
31222	990	10	S	

RELATIVE ELEVATION SURVEY

STATION	FORESIGHT	BACKSIGHT

*ITEMS WITH * MUST BE COMPLETED. OTHER INFORMATION IS OPTIONAL*