Pennsylvania's Blasting Complaint Protocol

Types of Blasting Complaints

- Annoyance

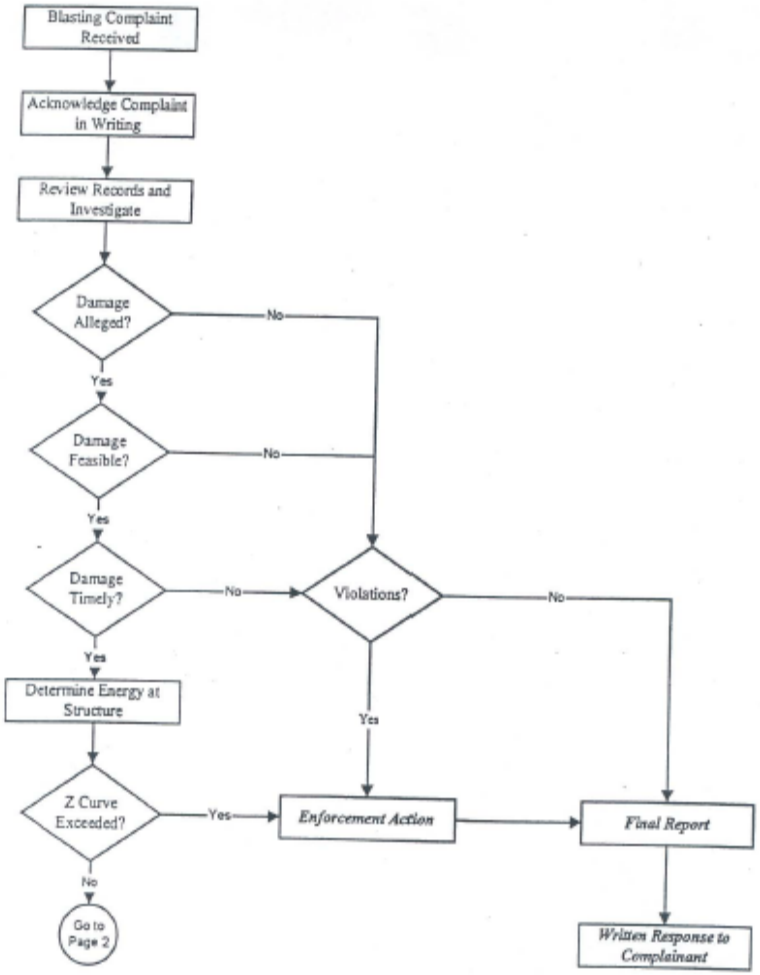
  (Just don't like the idea of blasting being near them or their homes)

  (Potential for damage)

- Damage

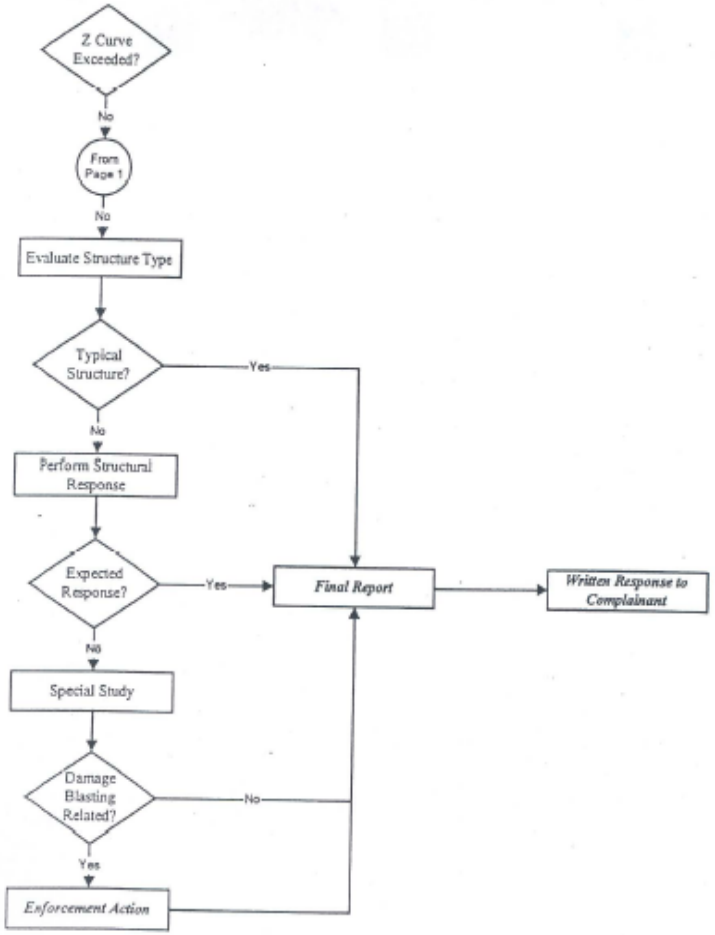
Blasting Complaint Protocol Flow Chart

(Page 1 of 2)



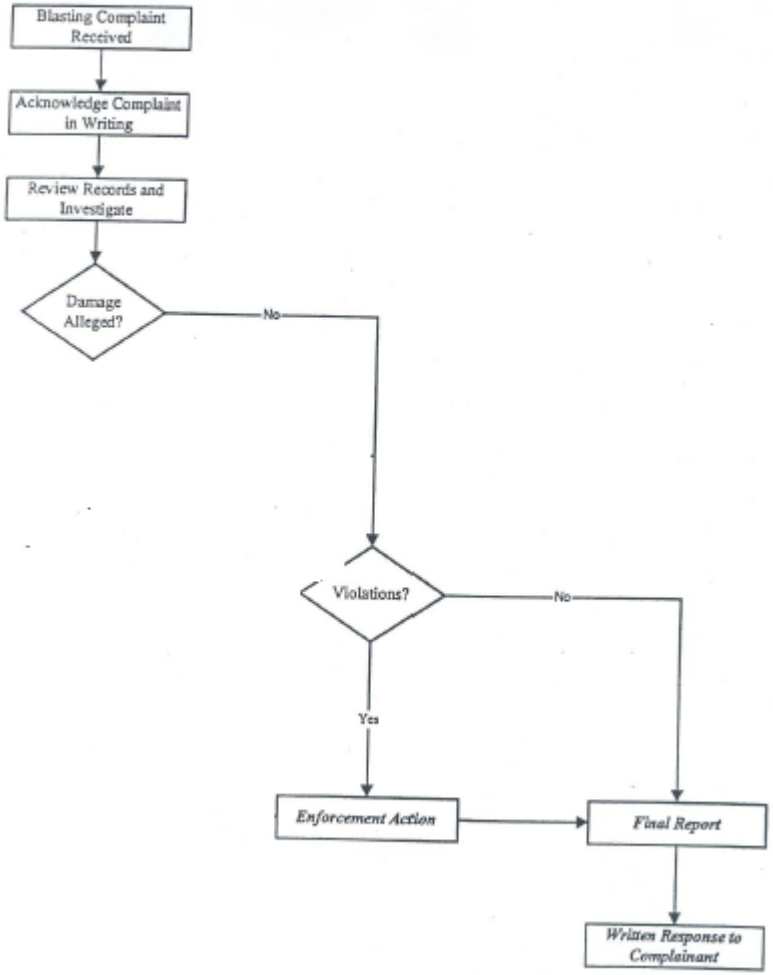
Blasting Complaint Protocol Flow Chart

(Page 2 of 2)



Blasting Complaint Protocol Flow Chart

(Page 1 of 2)



Blasting Complaint Protocol Flow Chart

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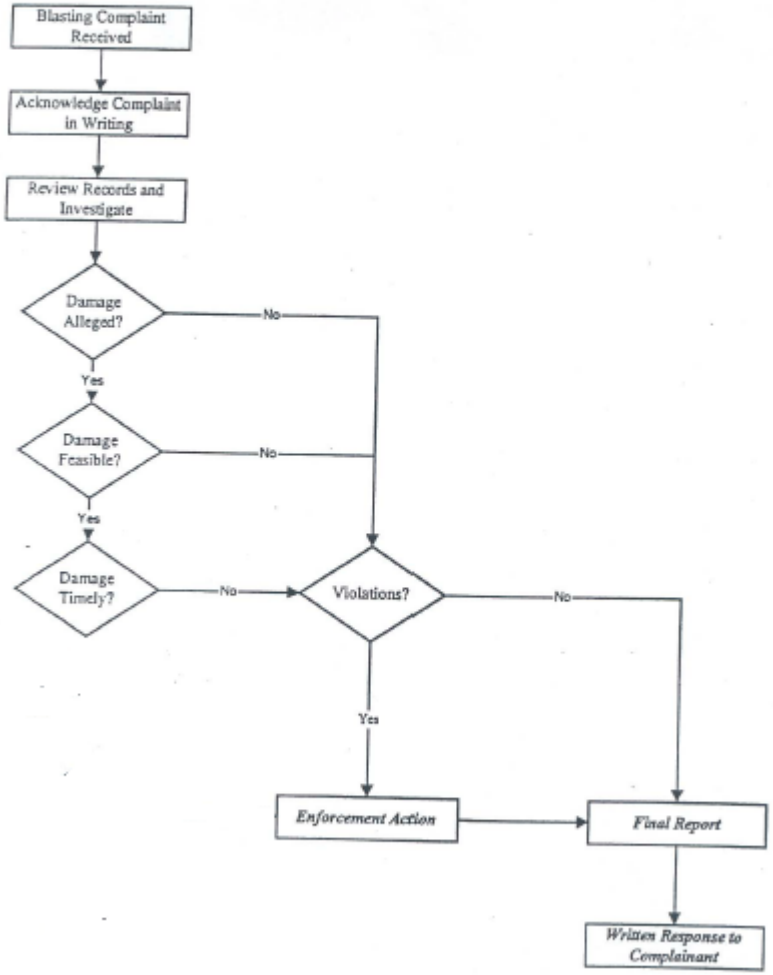
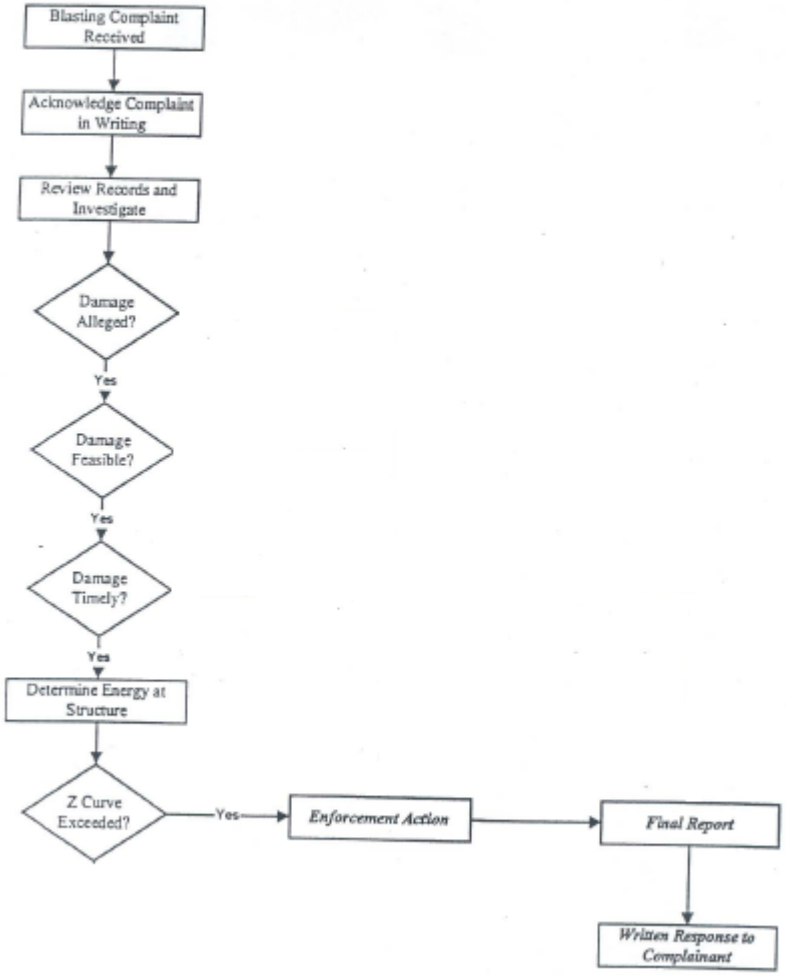


Blasting Complaint Protocol Flow Chart

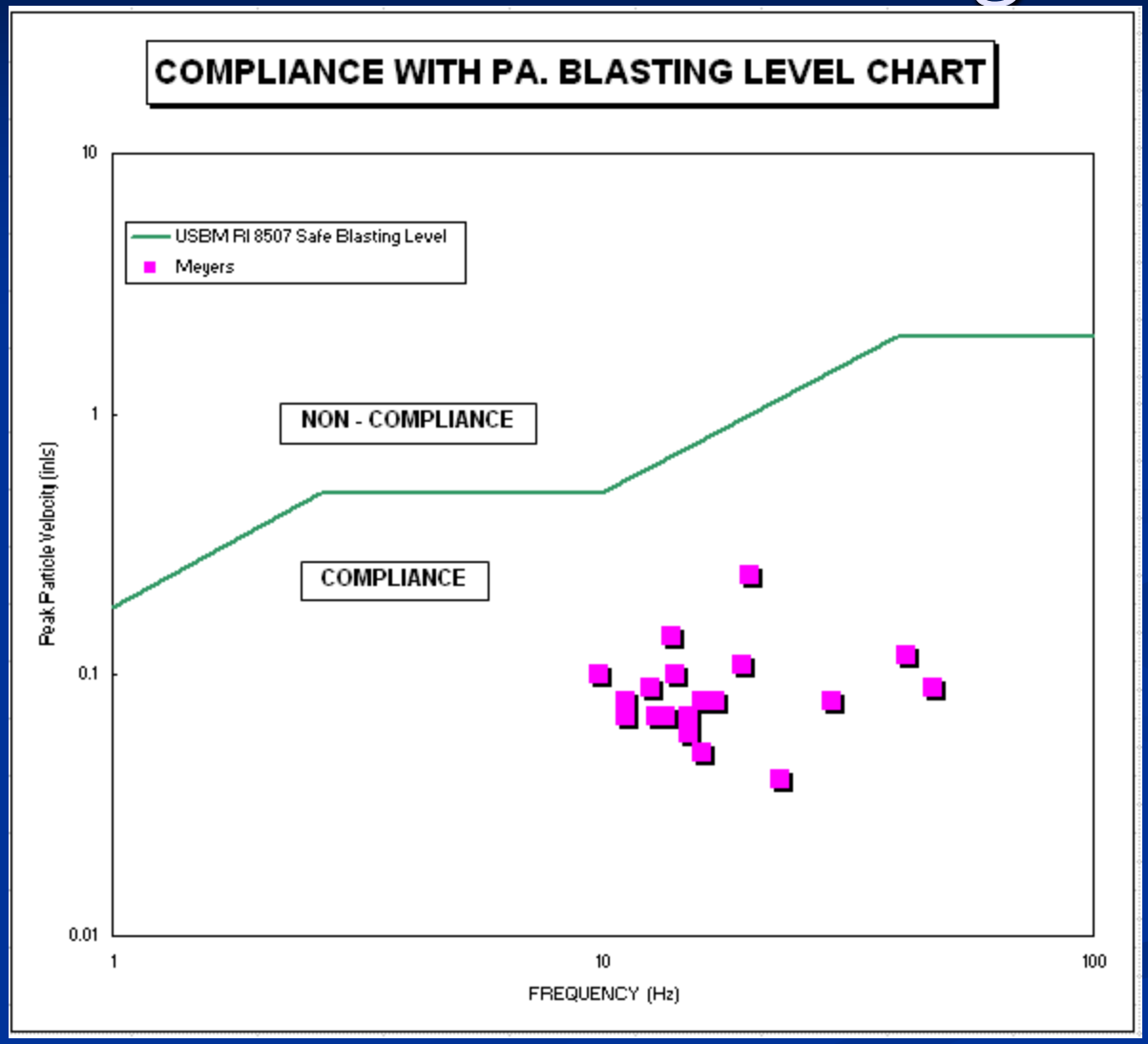
(Page 1 of 2)



Determining Energy at the Structure

- Direct Monitoring
- Excel Tools
- Regression Analysis
- Mapping

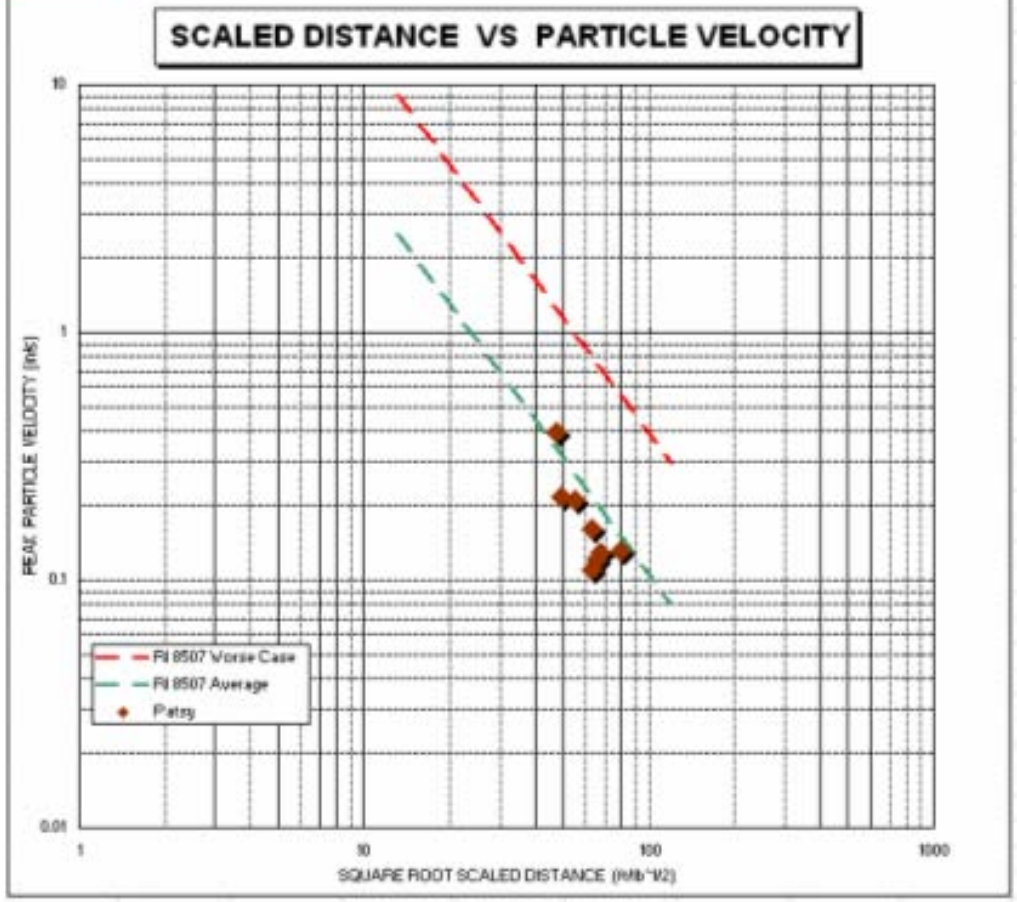
Direct Monitoring



BLEP

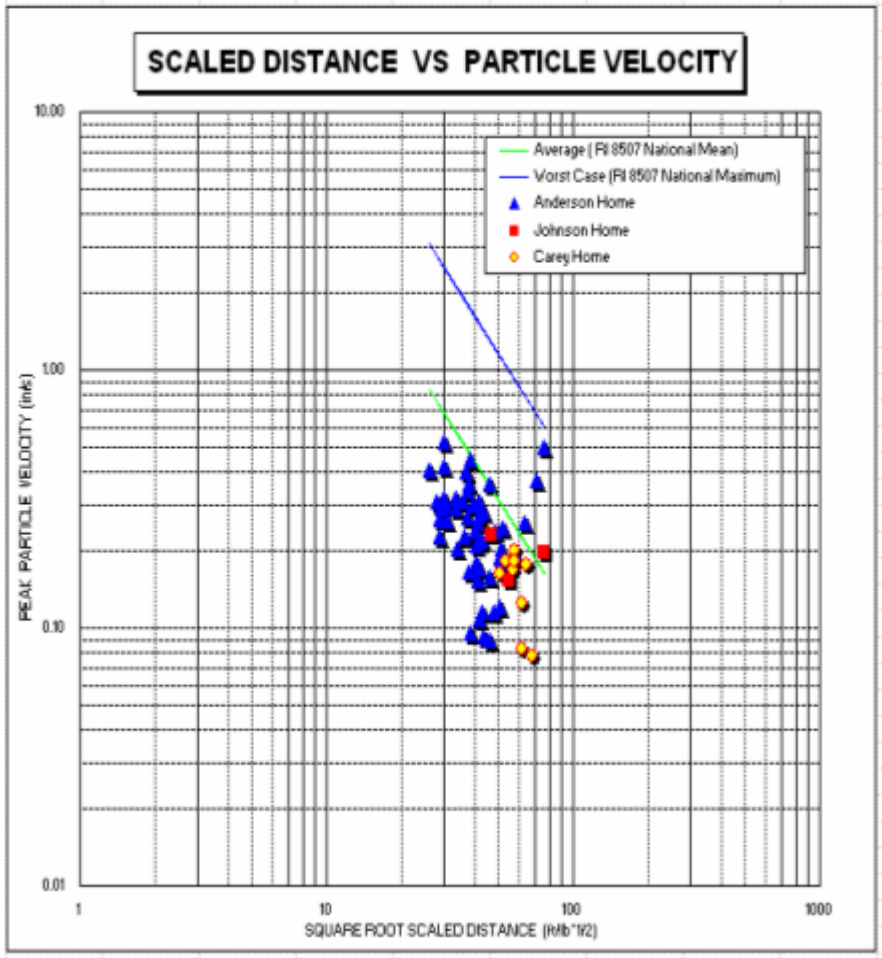
Available from OSM/TIPS Training either class room or online.

Figure 2.



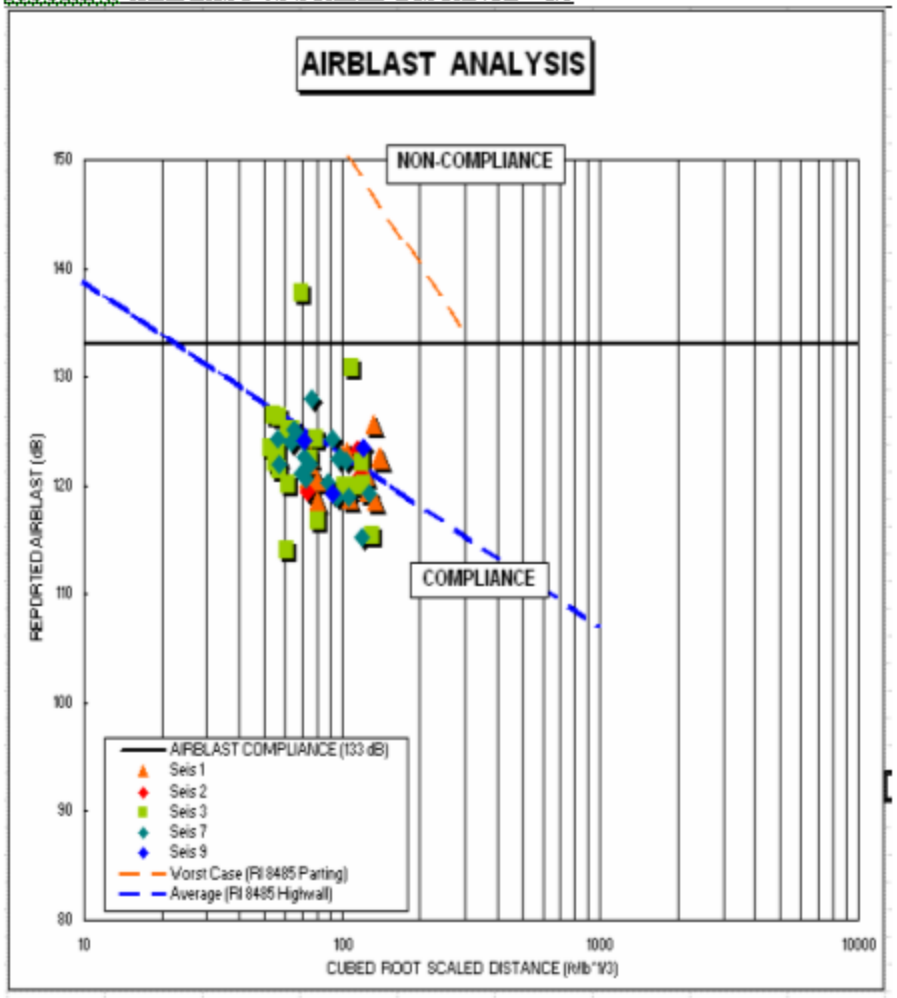
BLEP GRAPH

FIGURE 3. GROUND VIBRATION (PPV) VS SCALED DISTANCE ^1/2



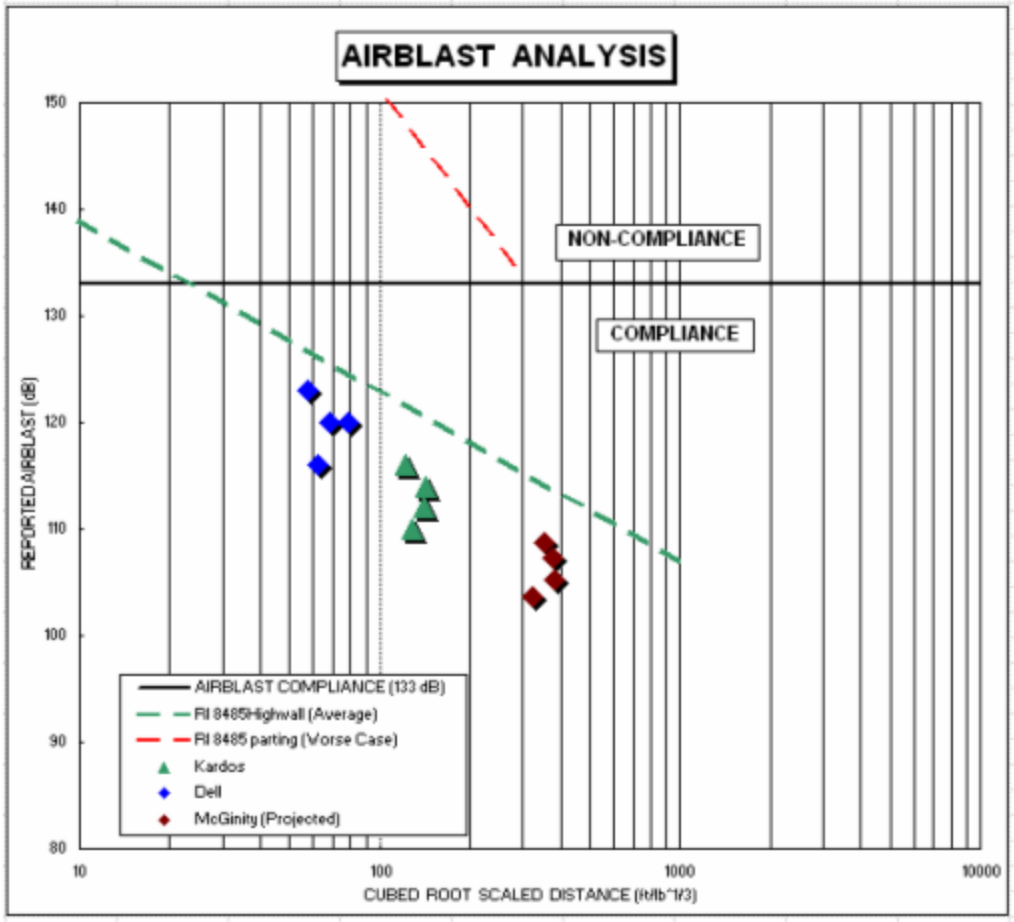
BLEP GRAPH

FIGURE 4. AIRBLAST VS SCALED DISTANCE ^ 1/3



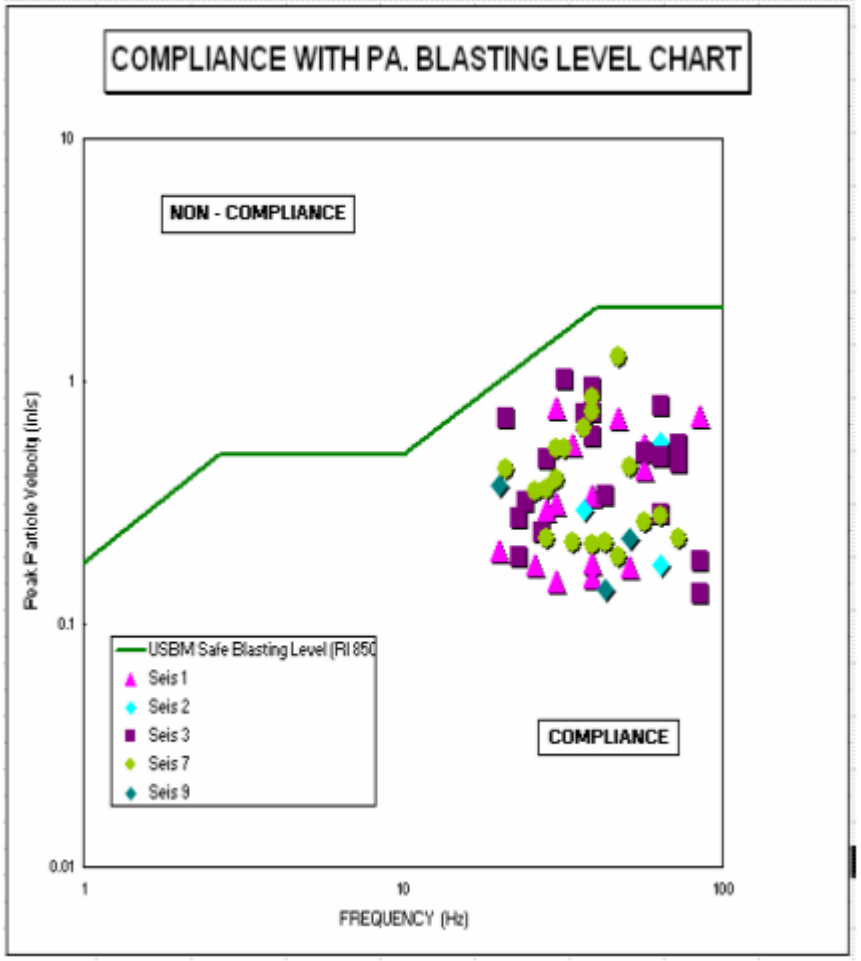
BLEP GRAPH

FIGURE 4 AIRBLAST (dBL) VS SCALED DISTANCE ^1/3



BLEP GRAPH

FIGURE 5. PEAK PARTICLE VELOCITY VS FREQUENCY VS SAFE BLASTING LEVELS/PA REGULATORY LIMITS



Excel Tool Spread Sheets

LBS	DIST	(SD^.5)	(PPV)	
3200	2300	40.65864	1.568779	**Upper Bounds RI 8507 (Bituminous Coal Mines Worst Case)**
3200	2300	40.65864	0.426221	**Mean Line RI 8507 (Bituminous Coal Mines Average)**
13	108	29.95381	1.050732	**Upper Bounds Oriard (Construction Worst Case-Not Highly Confined)**
1000	1200	37.94733	0.071371	**Lower Bounds Oriard (Construction Best Case Lightly Confined)**
13	187	51.86447	1.091349	**Unusually High Confinement Oriard (Construction, i.e. Trenching With low PF)**
310	950	53.95637	0.561901	**Upper Bounds BU 656 (Quarry Production Blasts Worst Case)**
310	950	53.95637	0.211731	**Average BU 656 (Quarry Production Blasts Average)**
DIST 1	**DIST 2**	**PPV 1**	PPV 2	
45	121	1.1	0.244592	**Bituminous Coal Mines**
45	121	1.1	0.225983	**Construction Blasting**
450	1050	0.4	0.127436	**Quarry Blasting**

In all cases enter your values (under the bolded labels) over the sample values!!

Enter data in the fields under the bolded labels (LBS, DIST-DIST 1, DIST 2, PPV 1, PPV below) to solve for values under the labels not bolded (SD^2, PPV, PPV 2, and SD^2 below). Note: Only solve for PPV 2 if you have a reasonable degree of certainty that the ground vibration travel path to DIST 2 is similar to that of DIST 1.

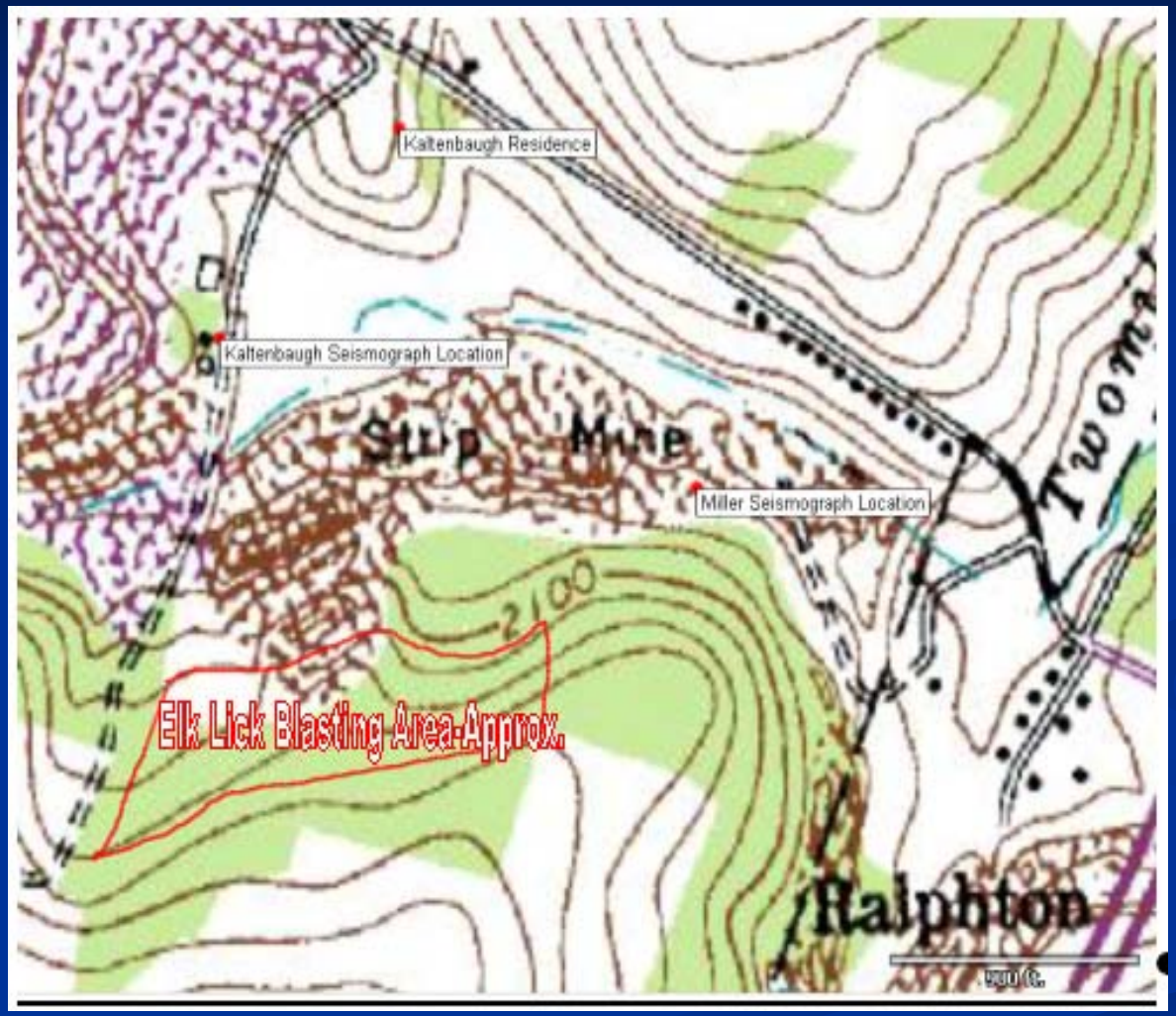
LBS	**Maximum amount of explosives per delay in pounds.**
DIST	**Distance to the point of concern.**
SD^.5	**Square root (.5) scaled distance.**
PPV	**Predicted peak particle velocity.**
DIST 1	**Distance to the point of the known peak particle velocity.**
DIST 2	**Distance to the point of the point of concern.**
PPV 1	**The known peak particle velocity measurement.**
PPV 2	**The peak particle velocity at the point of concern.**

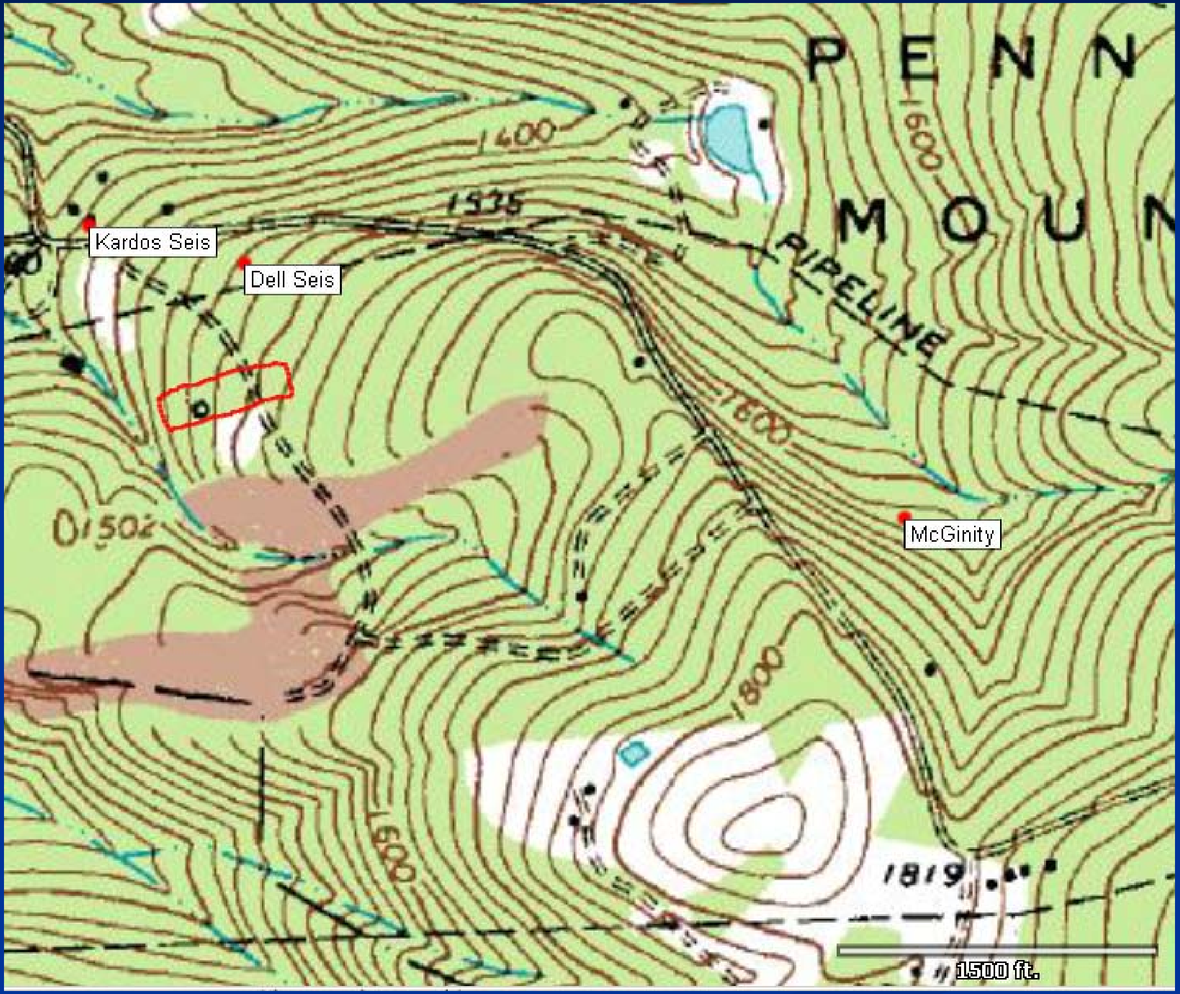
Excel Tool Spread Sheets
(Airblast and Ground Vibration)

- XL

- XL2

GPS
(Distance and Direction)


Kaltenbaugh Residence
Kaltenbaugh Seismograph Location
Slurry Mine
Miller Seismograph Location
2100
Elk Lick Blasting Area-Approx.
Ralphton


PENN
MOUN
1400
1535
1600
PIPELINE
Kardos Seis
Dell Seis
McGinity
1502
1800
1819
1500 ft.

Regression Analysis

- Provides site specific data.

- Scope of study determines broadness of use.

  (Did study encompass sufficient data on all benches/seams and all directions?)

Multiple Seismographs arrayed either linearly, radially, or both!

Take great care in your set-up!

Make sure you have accurate location information!

Take good field notes!

SSU 2000 DK **SET-UP NOTES**

DATE: ____________ MINE: ____________

BLAST TIME: ____________ COUNTY: ____________

SSU OPERATOR: ____________ STATE: ____________

2000 DK # ________ LOCATION: ____________

AZIMUTH (LONG.): ________ deg. DISTANCE TO BLAST: ________ ft.

PPV: ________ in/sec FREQ: ________ Hz AIR: ________ dB

MS # ________ LOCATION: ____________

AZIMUTH (LONG.): ________ deg. DISTANCE TO BLAST: ________ ft.

PPV: ________ in/sec FREQ: ________ Hz AIR: ________ dB

MS # ________ LOCATION: ____________

AZIMUTH (LONG.): ________ deg. DISTANCE TO BLAST: ________ ft.

PPV: ________ in/sec FREQ: ________ Hz AIR: ________ dB

MS # ________ LOCATION: ____________

AZIMUTH (LONG.): ________ deg. DISTANCE TO BLAST: ________ ft.

PPV: ________ in/sec FREQ: ________ Hz AIR: ________ dB

MS # ________ LOCATION: ____________

AZIMUTH (LONG.): ________ deg. DISTANCE TO BLAST: ________ ft.

PPV: ________ in/sec FREQ: ________ Hz AIR: ________ dB

MS # ________ LOCATION: ____________

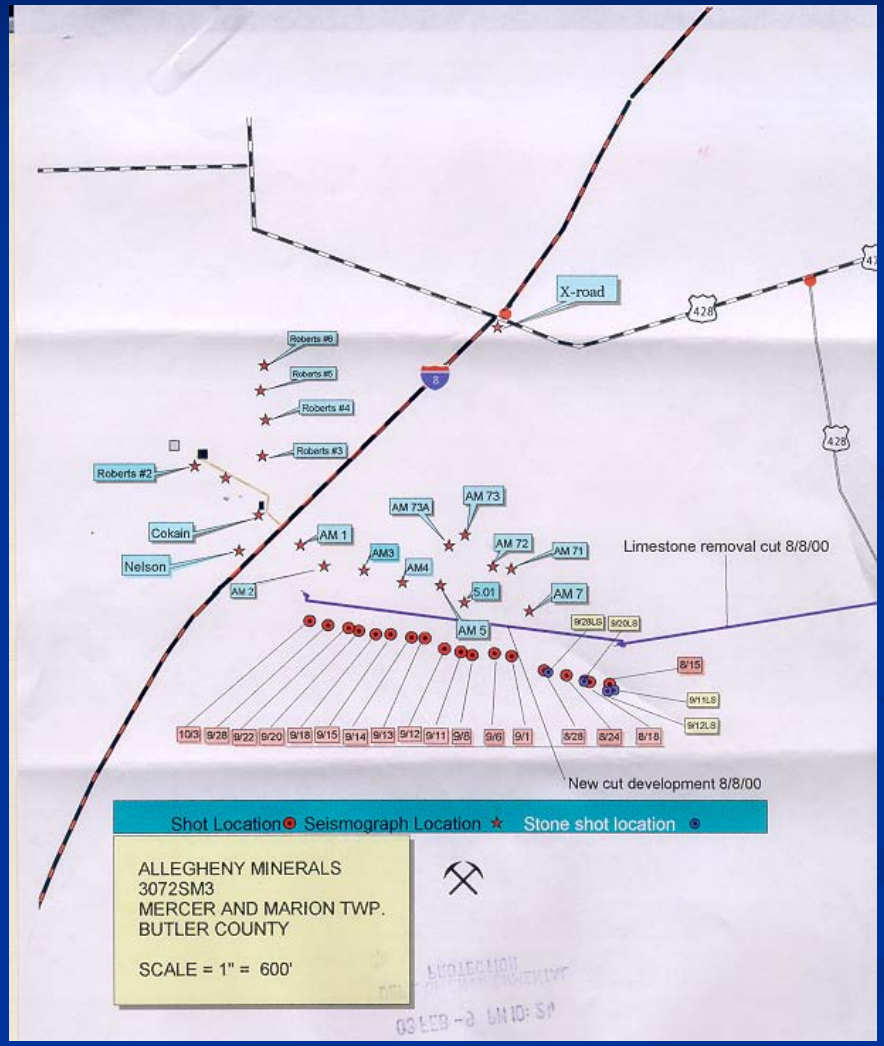
AZIMUTH (LONG.): ________ deg. DISTANCE TO BLAST: ________ ft.

PPV: ________ in/sec FREQ: ________ Hz AIR: ________ dB

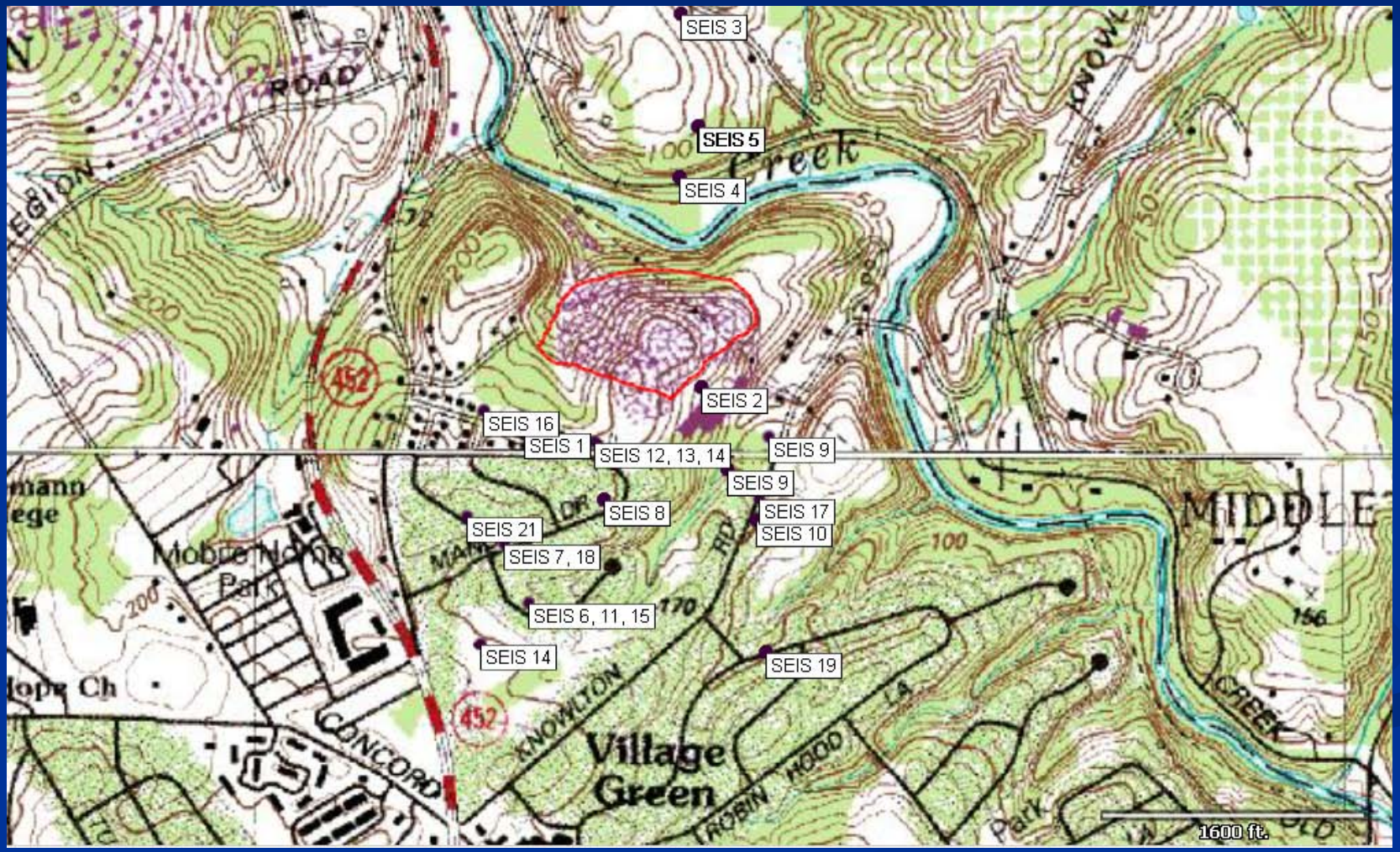
COMMENTS: ____________________

Linear Array(s)

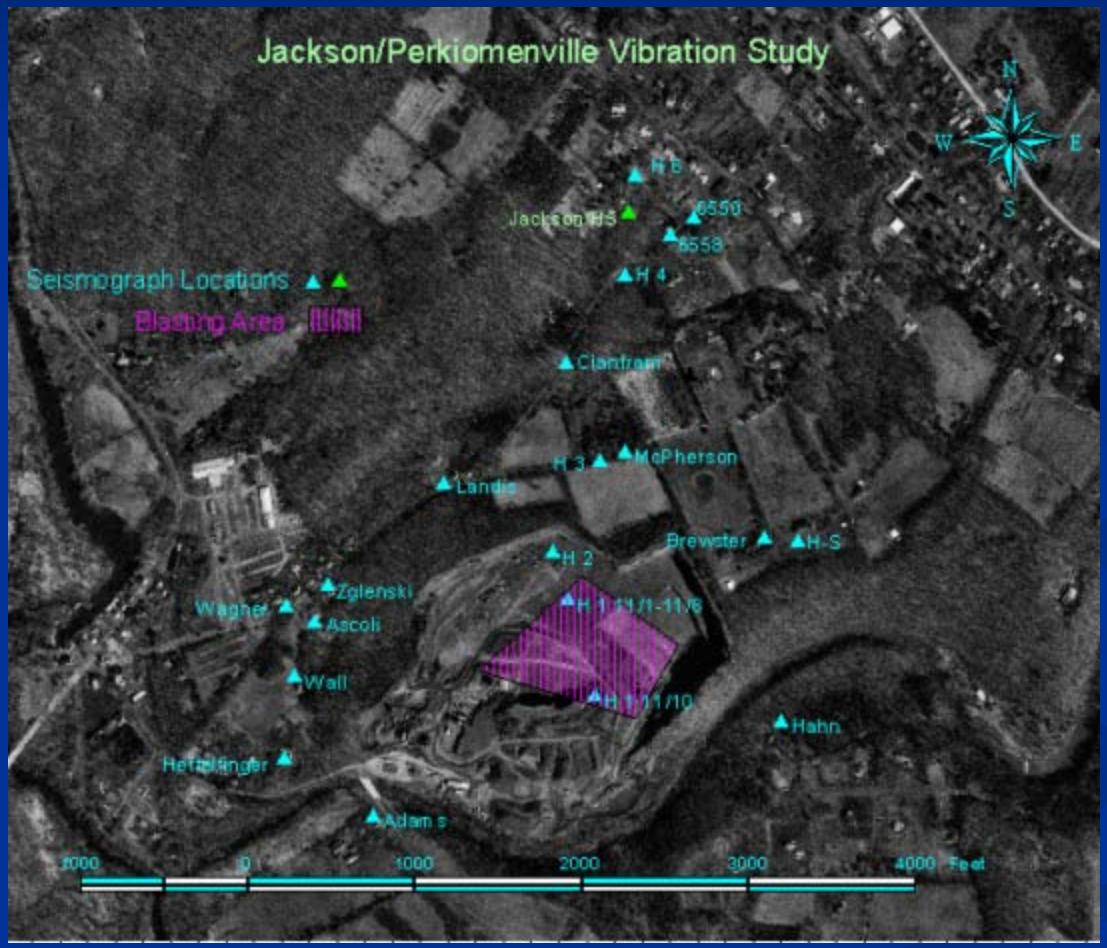
Radial Array(s)



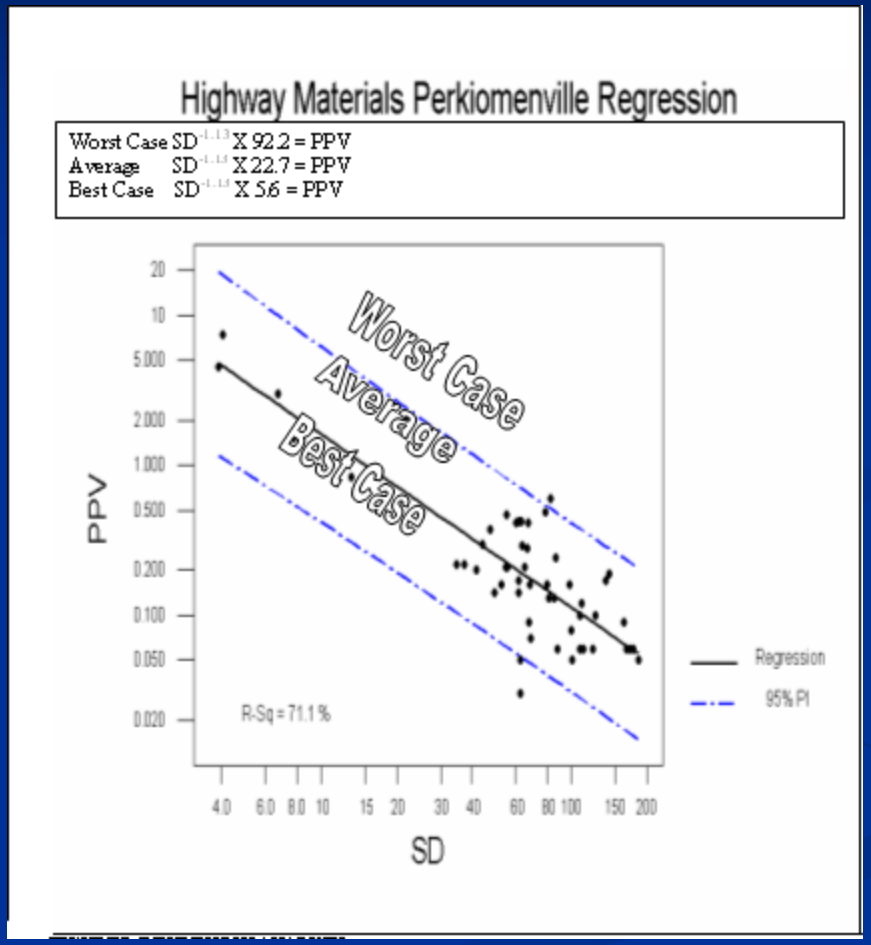
Radial Array(s)



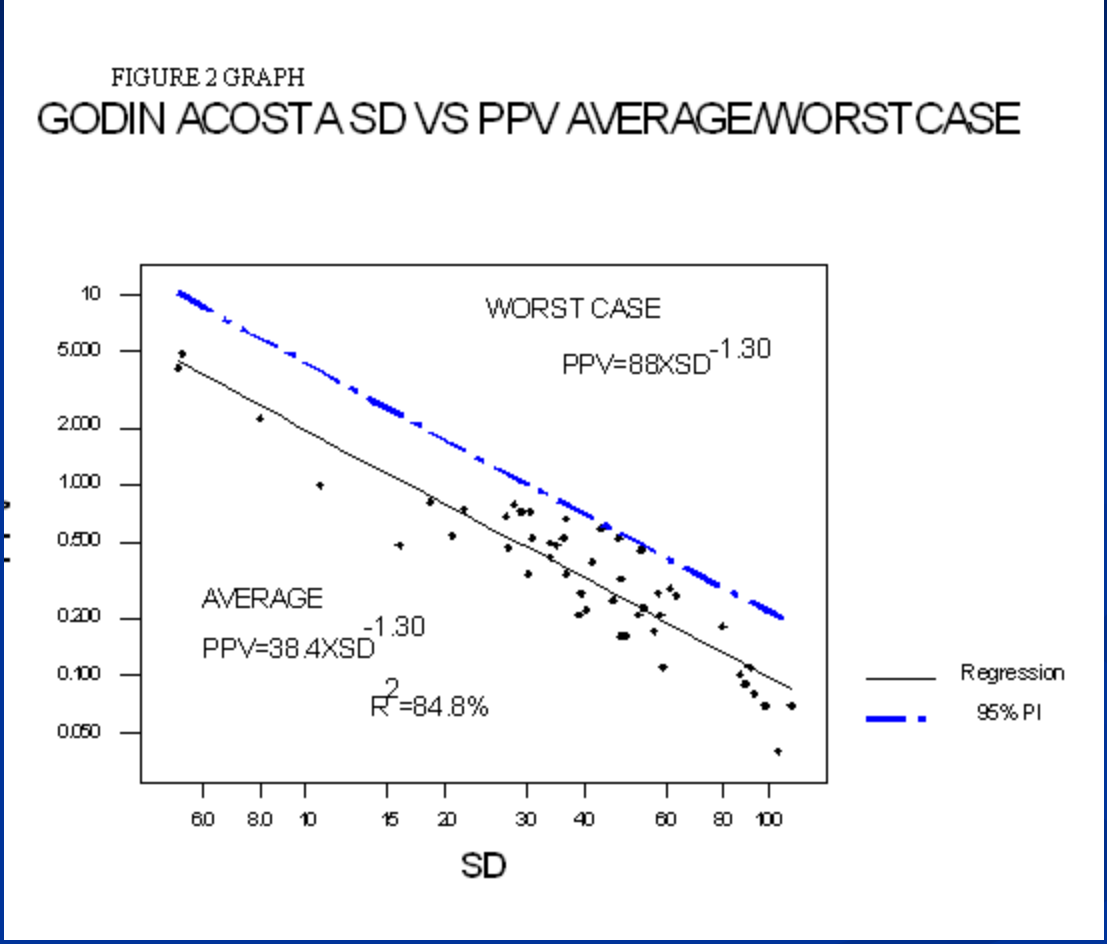
Linear Array(s)



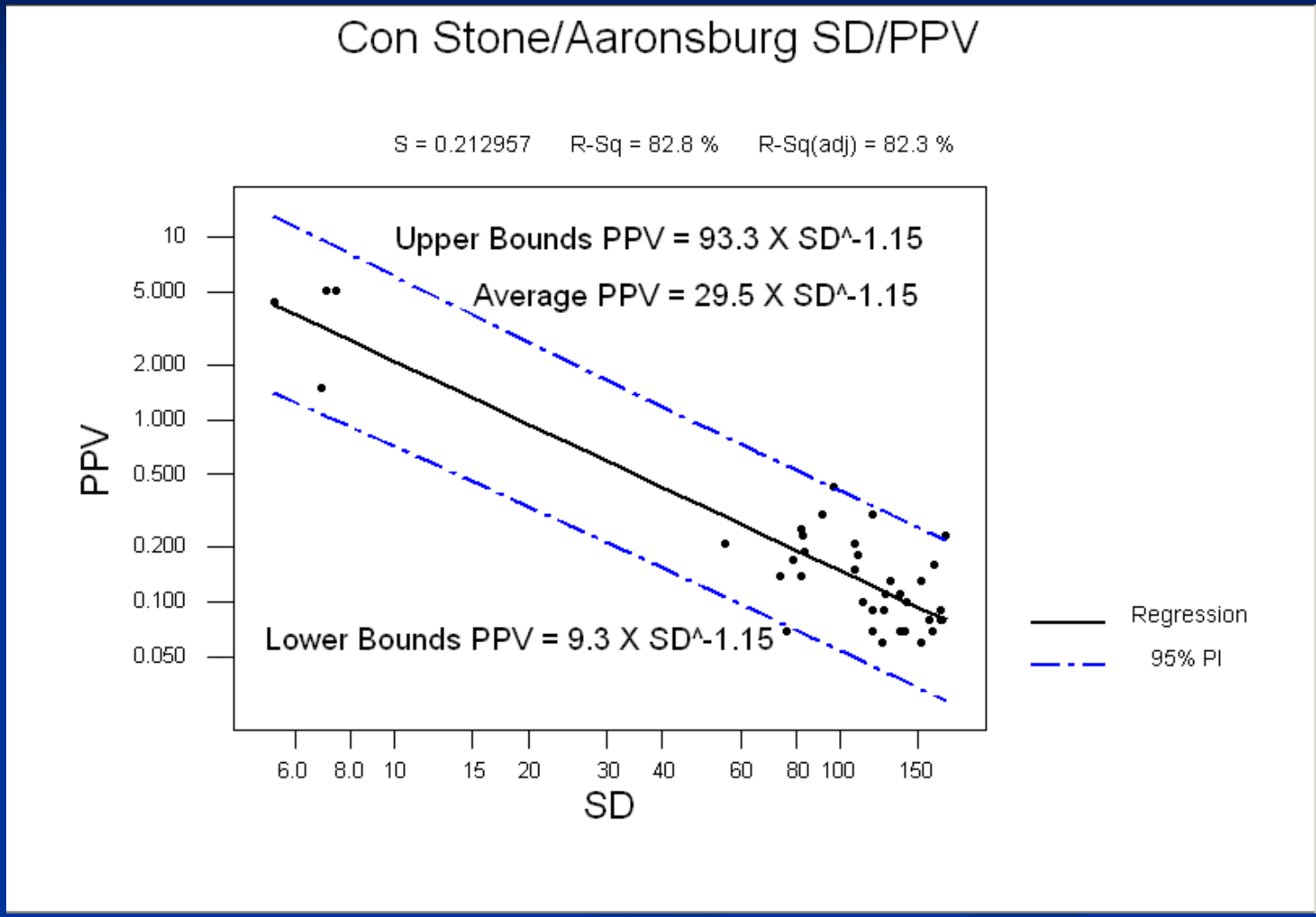
Regression Graph



Regression Graph

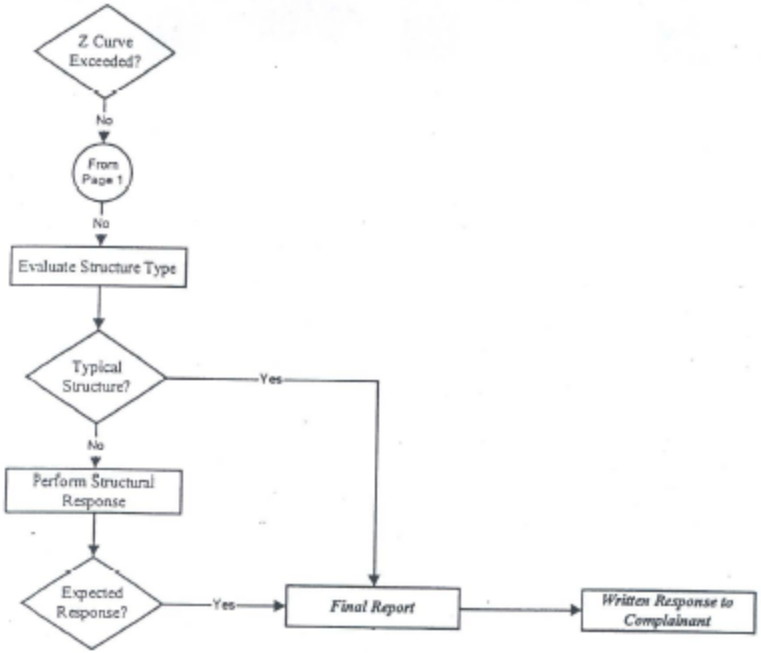


Regression Graph



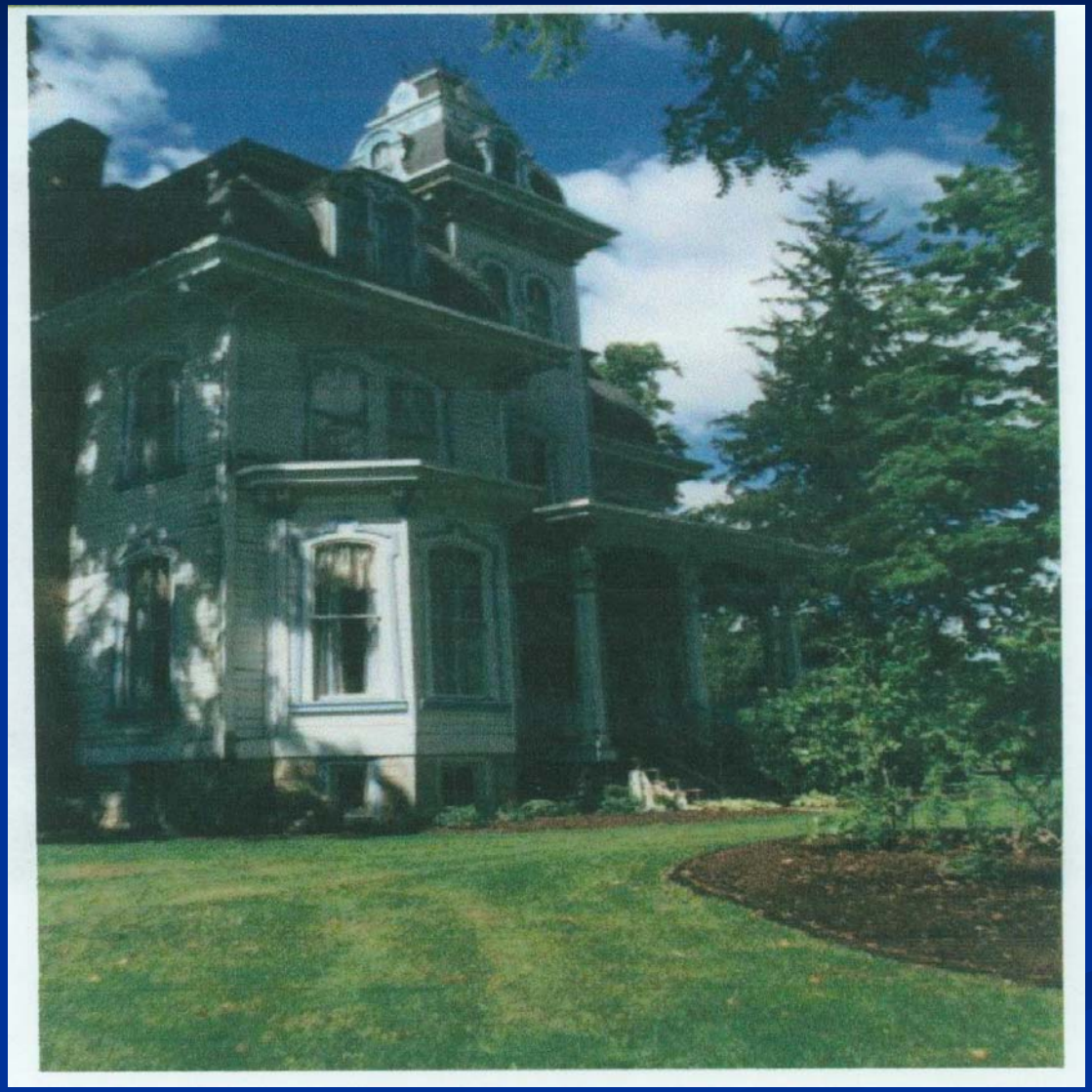
Blasting Complaint Protocol Flow Chart

(Page 2 of 2)



Typical House

Atypical House



Atypical House

PHOTOGRAPH 11

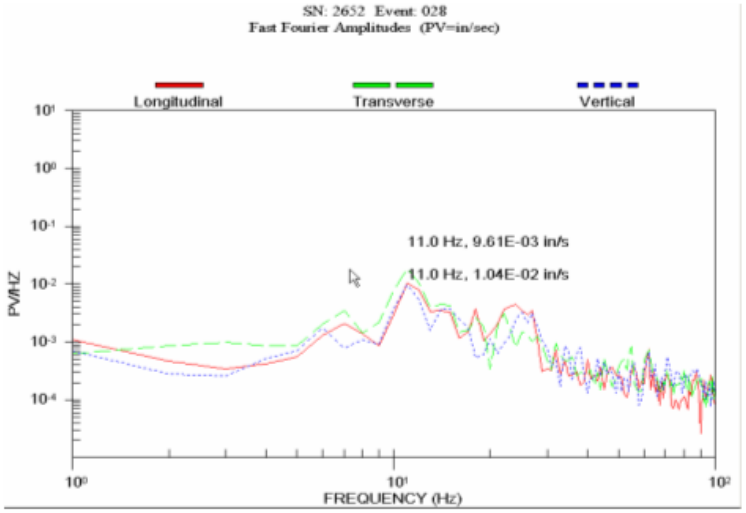
Structure Response

Table 2 Outside and Inside Measurements/Amplification Factor

Date	Outside(L)	Outside(T)	Inside(L)	Inside(T)	O(L)FQ(Hz)	O(T)FQ(Hz)	Res Ratio(L)	Res Ratio(T)
8/12/2003	0.02	0.04	0.05	0.07	8.2	11.4	2	1.75
8/21/2003	0.05	0.04	0.06	0.06	21.7	21.7	1.2	1.5
9/3/2003	0.05	0.04	0.06	0.08	13.5	13.9	1.2	2
9/10/2003	0.03	0.04	0.05	0.06	8.8	26.3	1.7	1.5

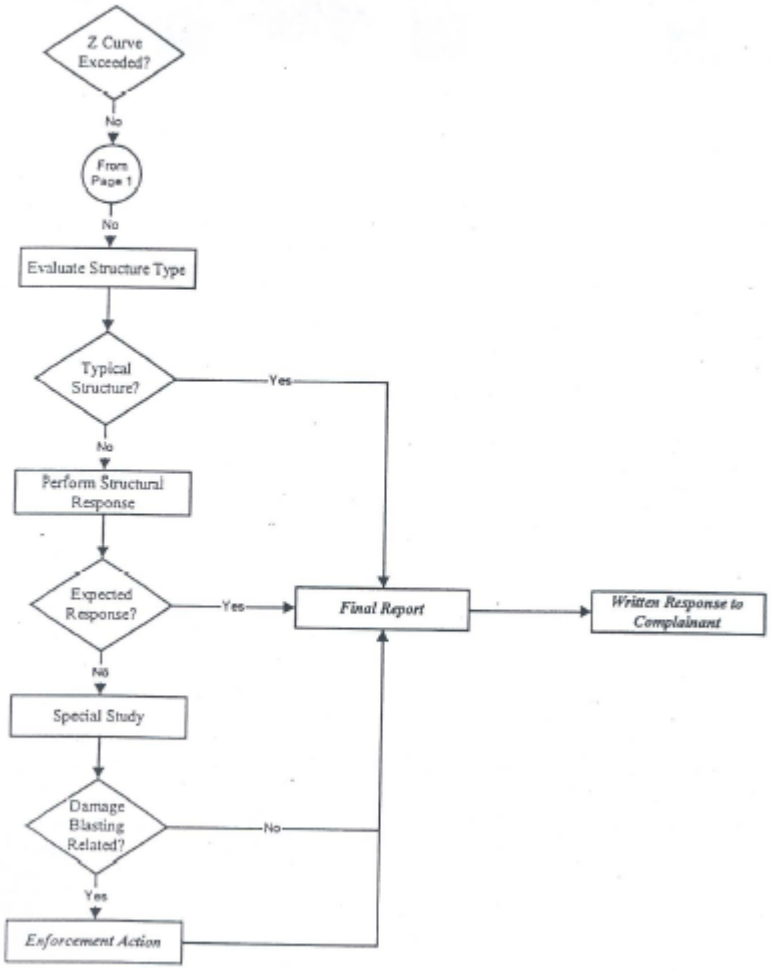
L-Longitudinal T-Transverse FQ-Peak Frequency

Figure 5 FFT Analysis 9/03/03 Vibration Response



Blasting Complaint Protocol Flow Chart

(Page 2 of 2)



Blasting Complaint Protocol Flow Chart

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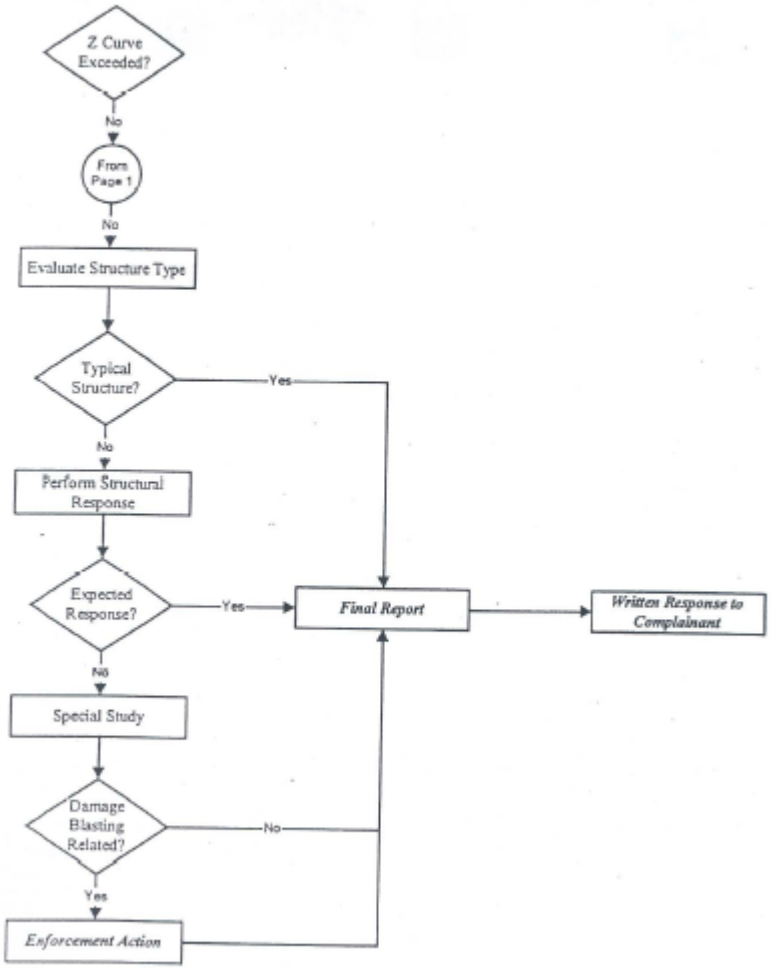


Structural Engineer Studies

URS

December 14, 2004
19995211

Department of Environmental Protection
District Mining Operations
5th Floor, Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105-2063

Attn: Mr. Richard Lamkie

Ref: **Damage Assessment**
Jackson Residence
Green Lane, PA

Dear Mr. Lamkie:

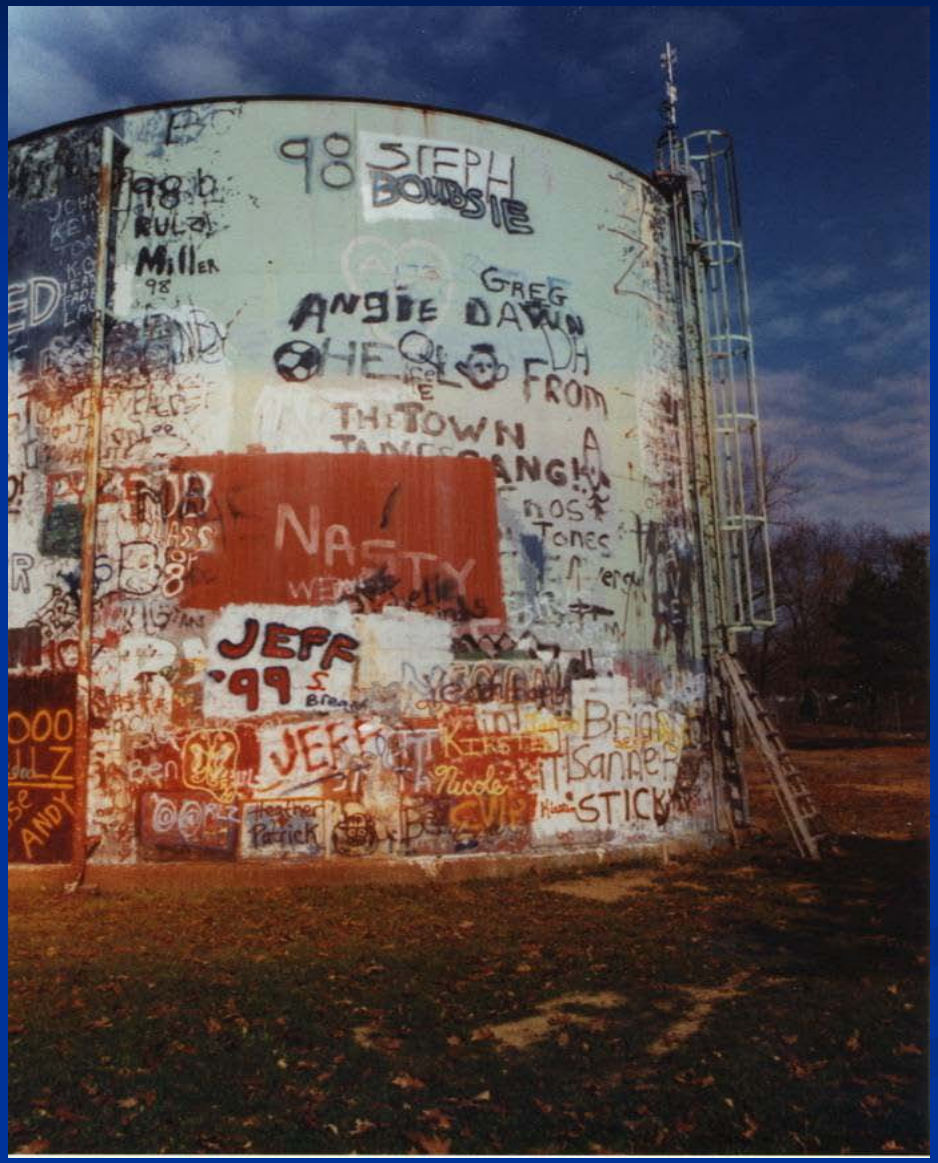
In accordance with the request from the Pennsylvania Department of Environmental Protection (DEP), Mr. Richard E. Mabry, P.E. performed an inspection of specific conditions at the residence of Mr. Bruce Jackson. This residence is located at 508 Green Street in Green Lane, Marlborough Township, in the northwestern portion of Montgomery County. The inspection was performed on November 19, 2004, and there were related discussions with DEP personnel to review the findings. Mr. Jackson was present during the inspection. Additional pertinent documents of blast monitoring and some previous inspection of the Jackson residence were provided in the Jackson Structure Response Study report prepared by the DEP. An additional study of the records from the blast monitoring at the quarry was performed by the DEP. The observations, evaluations, and conclusions from this inspection are summarized and presented herein. Copies of the photographs taken during the inspection, together with captions and descriptions, are attached to this report.

1.0 PROPERTY DESCRIPTION

The Jackson Residence property is located on the south side of Green Street, about 300 feet north of its intersection with Upper Ridge Road. The property is nearly level from Green Street to the front of the house, and then slopes down at a gentle to moderate slope in the vicinity of the house. The house is a converted barn of considerable age, with the first floor a few feet above the ground surface at the front and an at grade entrance to the basement level at the rear as indicated on Photograph 11. This photograph also shows the exterior construction consisting of stucco and wood siding on the end walls, and glass window and door panels for the south wall at the first and second floor levels. The interior structure appears to be heavy timber framing as shown in Photographs 4 and 5. Mr. Jackson has owned this house since about 1986, and the south wall of sealed, double pane glass window and door panels was installed by another owner about five years previously.

URS Corporation
335 Commerce Drive, Suite 300
Fort Washington, PA 19034
Tel: 215.367.2500
Fax: 215.367.1000

Special Cases



DATA TABLE

DATE	PEAK PARTICLE VELOCITY	PEAK FREQUENCY	LOCATION
11/01/99	L 0.11 T 0.13	L 6.9 L 7.5	WATER TANK
11/01/99	L 0.03 T 05	L 5.3 L 4.6	WATER TANK GND
11/03/99	L 0.43 T 0.34	L 8.3 T 7.8	WATER TANK
11/03/99	L 0.11 T 0.06	L 7.5 T 5.7	WATER TANK GND
11/04/99	L 0.13 T 0.12	L 6.9 T 15.6	WATER TANK
12/03/99	L 0.25 T 0.16	L 7.8 T 7.0	WATER TANK
12/03/99	L 0.07 T 0.10	L 22.7 T 13.2	WATER TANK GND

PEAK PARTICLE VELOCITIES AND PEAK FREQUENCIES MEASURED LONGITUDIALLY (L) AND TRANSVERSE (T)
LOCATION DESIGNATES SEISMOGRAPH LOCATION
PEAK PARTICLE VELOCITIES ARE MEASURED IN INCHES PER SECOND
PEAK FREQUENCIES ARE MEASURED IN HERTZ
GND DESIGNATES GROUND, WATER TANK DESIGNATES TOP OF TANK

The maximum response of a structure to ground vibration occurs when the natural frequency of the structure matches the frequency of the ground vibration affecting that structure. Thus a ground vibration at nine hertz **(9Hz)** would generate the most response from the Rockwood Borough water tank. Since the Rockwood Borough water tank is resistant to damage from a seismic event generating two tenth g's (0.2g) of acceleration a determination can be made to calculate a ground vibration level that will generate two tenth g's **(0.2g)** or less of acceleration at nine hertz 9(Hz). The equation V=A/2(3.14) F where V=velocity, (3.14)=Pi, F=frequency and A=acceleration in g's can be used to determine the appropriate peak particle velocity. To express the peak particle velocity in inches per second 2 (3.14) F must first be divided by three hundred eighty-six (386). The peak particle velocity that generates two tenth g's (0.2g) of acceleration at nine hertz 9(Hz) is one and thirty-three hundredth **(1.33)** inches per second. A peak particle velocity of one **(1.0)** inch per second is an appropriate limit for blasting generated ground vibration at the Rockwood Borough water tank

Other (real world) Considerations

- Political intervention usually results in "pulling the stops out."
- If it's going to court it usually gets the "full monty."

Questions?