Docket Nos. 50-352
and 50-353

JUN 11 1981

Mr. Frank Romano, Chairman
Air and Water Pollution Patrol
61 Forest Avenue
Ambler, Pennsylvania 19002

Dear Mr. Romano:

Reference is made to your telephone conversation of June 2, 1981, with Don Calkins relative to our meeting here on June 18, 1981. During that conversation he indicated that there had been early concern about levels of vibration from quarry blasting. Enclosed is a report dated June 30, 1970, to document that statement. In addition, the report from Philadelphia Electric Company enclosed with my letter to you of June 2, 1981, references other early studies of the blasting vibrations.

During the subject conversation you brought up a new concern about voids and workmanship in concrete work. I believe that topic can be discussed best in a separate meeting with the NRC Senior Residence Inspector, Mr. Jacque Durr, at Limerick, rather than our meeting here. Mr. Calkins will request Mr. Durr to call you relative to this subject when he returns from travel on June 15, 1981.

We wish to repeat our offer to you to add items of your choice to the agenda for the June 18th meeting. Please give as much time as possible in the event that we need to line up additional members of the staff here to meet with you.

Distribution
Docket TERA
NRC /PDR NSIC
L/PDR NIC
LB2 IE (3)
DGEisenhut/RPurple
RTedesco MService
ASchwencer
DCalkins

bcc:
ACRS (16)

Sincerely,

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure:
As stated

cc:
See next page

OFFICE	LB2	LB2					
SURNAME	DCalkins:sp	ASchwencer					
DATE	6/11/81	6/11/81					

Mr. Edward G. Bauer, Jr.
Vice President & General Counsel
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

cc: Troy B. Conner, Jr., Esq.
Conner, Moore & Corber
1747 Pennsylvania Avenue, N. W.
Washington, D. C. 20006

Deputy Attorney General
Room 512, Main Capitol Building
Harrisburg, Pennsylvania 17120

Mr. Robert W. Adler
Assistant Attorney General
Bureau of Regulatory Counsel
505 Executive House
P. O. Box 2357
Harrisburg, Pennsylvania 17120

Honorable Lawrence Coughlin
House of Representatives
Congress of the United States
Washington, D. C. 20515

Roger B. Reynolds, Jr., Esq.
324 Swede Street
Norristown, Pennsylvania 19401

Lawrence Sager, Esq.
Sager & Sager Associates
45 High Street
Pottstown, Pennsylvania 19464

Joseph A. Smyth
Assistant County Solicitor
County of Montgomery
Courthouse
Norristown, Pennsylvania 19404

Eugene J. Bradley
Philadelphia Electric Company
Associate General Counsel
2301 Market Street
Philadelphia, Pennsylvania 19101

Mr. Jacque Durr
Resident Reactor Inspector
U. S. Nuclear Regulatory Commission
P. O. Box 47
Sanatoga, Pennsylvania 19464

Mr. Vincent Boyer
Senior Vice President
Nuclear Operations
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Karl Abraham
Public Affairs Officer
Region I, OIE
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19806

Allan Kanner, Esq.
1622 Locust Street
Philadelphia, Pennsylvania 19103

Ms. Phyllis Zitzer
Limerick Ecology Action
P. O. Box 761
Pottstown, Pennsylvania 19464

Box 1601

ENGINEERS INCORPORATED

REPORT

Dames & Moore
100 Church Street
New York, New York 10007

Attention: Mr. Tom Tully

DATE June 30, 1970

SUBJECT VIBRATION STUDY FOR DAMES & MOORE
Limerick Generating Station Project
Primary Blast - West Face
Pottstown Trap Rock
Sanatoga Quarry
June 24, 1970

COPY NUMBER 2 OF 4

8001210 283

Hazleton, Penna.
June 30, 1970

VIBRATION STUDY
FOR
DAMES & MOORE

Pottstown Trap Rock - Sanatoga Quarry
Primary Blast - West Face
June 24, 1970

PURPOSE

The purpose of this study was to measure the vibration effects from the primary blast on June 24, 1970 at the above named operation and to determine their capacity to cause structural damage and to certify conformance to the Pennsylvania State Law.

THE BLAST

This blast consisted of 14 vertical holes, 6½ inches in diameter, drilled to an average depth of 36 to 59 feet. The spacing and burden of the holes was 15 x 20 feet with an average of 12 feet of stemming material confining the charge in each hole. The total load of 6631 pounds of Dupont Powder Company's HDP-1 Primers, Pourvex Extra, and ANFO "P" explosives was detonated in 14 separate firing periods by means of Millisecond Electric Delay Blasting Caps #1 thru #14. The maximum amount of explosives per delay period was 629 pounds. Time of detonation was 11:03 A.M.

WEATHER CONDITIONS

1. Type of day - Clear
2. Wind direction - From the Southwest
3. Temperature - Approximately 78°F

SEISMOGRAPH STATIONS

For registration of the vibration effects from the subject blast two Vibra-Log 3-Component Seismographs were employed.

Station #1:

Velocity Seismograph #178 (0.2 Range) was placed on the ground about 100 feet west southwest of Stack #A-20, approximately 250 feet west of the blast.

Station #2:

Velocity Seismograph #151 (1.0 Range) was placed on the ground at the Limerick Generating Station Site at Coordinate 3780 east and 6680 north, approximately 2800 feet south southeast of the blast.

THE SEISMOGRAPH RECORD

The seismograph record represents a photograph of the velocity of vibrations of the surface on which the instrument is sitting, at the recording location, in the form of 3 lines. The bottom line (longitudinal) represents horizontal velocity on a line joining the blast and the recording location; the top line (transverse) represents velocity at right angles to this; and the middle line represents vertical velocity. Deviations of these lines from their positions of rest amount to the velocity of the ground magnified by an instrument factor depending on the range used for the seismograph test. In this case the range was set at 0.2 and 1.0 and the velocities were obtained by measuring the deviations of the traces in inches and dividing by the proper calibration factor. Vertical lines on the record indicate the passage of time in 0.02 seconds, with every second being indicated by an accent mark.

RESULTS

Recent studies by the United States Bureau of Mines and other Authorities in the field of blast vibrations and their effects on structures have resulted in a new criteria based on velocity in inches per second. Below is a table of standards based on a velocity criteria.

VELOCITY	PROBABLE DEGREE OF DAMAGE
Below 2.0 inches per second	Recommended safe vibration level.
Above 4.0 inches per second	Threshold - very minor perceptible damage; plaster cracks, etc.
Above 5.5 inches per second	Minor - no apparent weakening of the structure; glass, plaster, masonry damage.
Above 7.5 inches per second	Major - serious structural failure through cracking, distortion or shifting.

The above table is based on the Maximum Velocity on any one component of an instrument measuring motion in three mutually perpendicular planes.

RESULTS CONTINUED

The Commonwealth of Pennsylvania Law states that in blasting operations the "Peak Particle Velocity" of the ground shall not exceed 2.0 inches per second in any one of three mutually perpendicular planes, in the vertical and horizontal directions, at the immediate location of any dwelling house, public building, school, church, commercial or institutional building.

Tabulated below are the measurements resulting from this blast.

SEISMOGRAPH NO. & LOCATION	COMPONENT	MAXIMUM VELOCITY (in/sec)
#178 Quarry Location	Transverse	1.60
	Vertical	1.50
	Longitudinal	1.90
#151 Project Site	Transverse	0.03
	Vertical	0.02
	Longitudinal	0.02

Note: The safety of the recorded vibration effects is further substantiated by the New Jersey and Massachusetts Blasting Codes.

CONCLUSIONS

According to all recognized damage indices, the recorded vibration effects from the subject blast were below that necessary to cause structural damage to even old pre-stressed plaster, normally the weakest material of construction, at the seismograph stations, in the immediate vicinity of the stations, or beyond the seismograph stations in the same general direction and also conformed to the Pennsylvania State Law governing blast vibrations.

Respectfully submitted,

VIBRA-TECH ENGINEERS, INC.

John J. Resetar
Field Engineer

Anthony J. Petro, P. E.
President

Client DAMES & MOORE Operation LIMERICK GENERATING STATION (Job Location)

Specific Blast Location WEST FACE of POTTSTOWN TRAP ROCK - SANATOGA QUARRY

Blast No. — Date 6-24-70 Time of Blast 11:03 A.M.

No. of ~~Horizontal~~ Vertical (cross out one) Holes 14 Hole Diameter 6 1/2" Average Depth 56' To 59'

Average Subgrade Drilling 4' Hole Spacings 15' Burdens 20'

Average Stemming to Top Charge 12' Type and Delay Nos. Used MS 25 To 500

Decking Information (if ary) —

Total Weight of Explosives 6631 Lbs. Average Explosives Load per Hole 475 Lbs.

Make and Type of Explosives DUPONT: POWERFLEX EXTRA 302 5#, ANFO "P" 3550#, HDP-1 PRIMERS 56# E2145

Maximum Amount of Explosives Per Firing Period 629 Lbs.

If Supplementary Holes, Snake Holes, etc., were used give information as above.

Weather and Sky Conditions CLEAR Wind from the S.W.

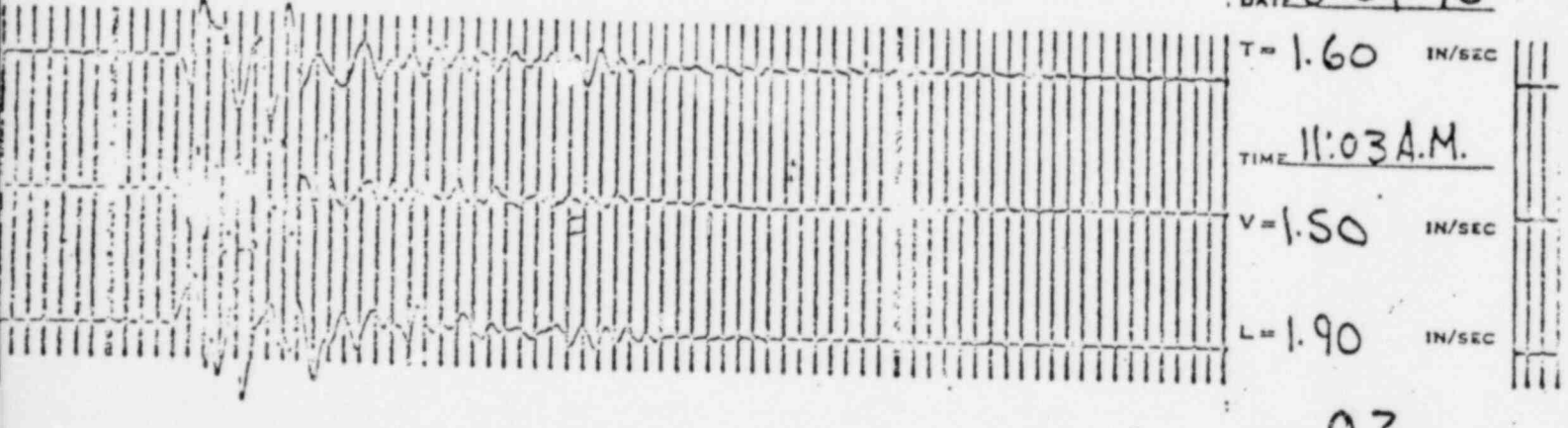
Temperature Approx 78°

Instrument Location ON GROUND AT REAR of SHOT - Approx. 100' WEST SOUTHWEST of STACK # A-20

Instrument Located Approximately 250 Feet WEST (Direction) from the Blast

Remarks if Blast produced any unusual effects

Seismograph No. 178 ~~Camera No.~~ RANGE 0.2 Operated by J. RESETA



VIBRA-TECH ENGINEERS, INC.

by John J. Reseta

A-18 Use reverse side for rough sketches of plan or profile of shot if indicated)

BLAST AND SEISMOGRAPHIC REPORT

Client DAMES & MOORE Operation LIMERICK GENERATING STATION (Job Location)

Specific Blast Location WEST FACE OF POTTSTOWN TRAP ROCK - SANATOGA QUARRY

Blast No. —— Date 6-24-70 Time of Blast 11:03 A.M.

No. of Vertical / Horizontal Holes 14 Hole Diameter 6½" Average Depth 36' TO 59'
(cross out one)

Average Subgrade Drilling 4' Hole Spacings 15' Burdens 20'

Average Stemming to Top Charge 12' Type and Delay Nos. Used MS 25 TO 500

Decking Information (if any) ——

Total Weight of Explosives 6631 Lbs. Average Explosives Load per Hole 475 Lbs.

Make and Type of Explosives DUPONT: POWERFLEX EXTRA 3025#, ANFO "P" 3550#, HDP-1 PRIMERS 56#

Maximum Amount of Explosives Per Firing Period 629 Lbs.

If Supplementary Holes, Snake Holes, etc., were used give information as above.

Weather and Sky Conditions CLEAR Wind from the S.W.

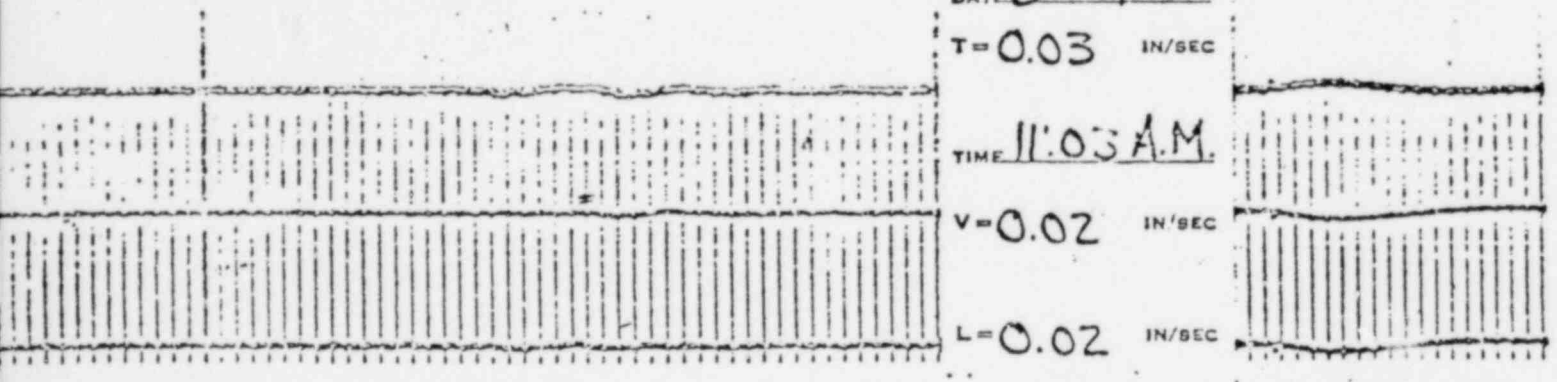
Temperature APPROX 78°

Instrument Location ON GROUND AT → LIMERICK GENERATING STATION SITE AT COORDINATE 3730 EAST & 6680 N. 2TH

Instrument Located Approximately 2800? 3500? Feet S.S.E. (Direction) from the Blast

Remarks if Blast produced any unusual effects

Seismograph No. 151 RANGE 1.0 Operated by H. KINTER



RANGE 1.0

VIBRA-TECH ENGINEERS, INC.

by John J. Keenan

A-18 (Use reverse side for rough sketches of blast or profile of shot if indicated)

Docket Nos. 50-352
and 50-353

JUN 11 1981

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Air and Water Pollution Patrol
61 Forest Avenue
Ambler, Pennsylvania 19002

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Docket
NRC /PDR
L/PDR
LB2
DGEisenhut/RPurple
RTedesco MService
ASchwencer
DCalkins
TERA
NSIC
NIC
IE (3)

bcc:
ACRS (16)

Sincerely,

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosure:
As stated

cc:
See next page

OFFICE	LB2	LB2					
SURNAME	DCalkins:sp	ASchwencer					
DATE	6/ /81	6/11/81					

NRC FORM 318 (10-80) NRCM 0240

OFFICIAL RECORD COPY

Mr. Edward G. Bauer, Jr.
Vice President & General Counsel
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

cc: Troy B. Conner, Jr., Esq.
Conner, Moore & Corber
1747 Pennsylvania Avenue, N. W.
Washington, D. C. 20006

Deputy Attorney General
Room 512, Main Capitol Building
Harrisburg, Pennsylvania 17120

Mr. Robert W. Adler
Assistant Attorney General
Bureau of Regulatory Counsel
505 Executive House
P. O. Box 2357
Harrisburg, Pennsylvania 17120

Honorable Lawrence Coughlin
House of Representatives
Congress of the United States
Washington, D. C. 20515

Roger B. Reynolds, Jr., Esq.
324 Swede Street
Norristown, Pennsylvania 19401

Lawrence Sager, Esq.
Sager & Sager Associates
45 High Street
Pottstown, Pennsylvania 19464

Joseph A. Smyth
Assistant County Solicitor
County of Montgomery
Courthouse
Norristown, Pennsylvania 19404

Eugene J. Bradley
Philadelphia Electric Company
Associate General Counsel
2301 Market Street
Philadelphia, Pennsylvania 19101

Mr. Jacque Durr
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U. S. Nuclear Regulatory Commission
P. O. Box 47
Sanatoga, Pennsylvania 19464

Mr. Vincent Boyer
Senior Vice President
Nuclear Operations
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Karl Abraham
Public Affairs Officer
Region I, OIE
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19806

Allan Kanner, Esq.
1622 Locust Street
Philadelphia, Pennsylvania 19103

Ms. Phyllis Zitzer
Limerick Ecology Action
P. O. Box 761
Pottstown, Pennsylvania 19464

Box 16011

ENGINEERS INCORPORATED

REPORT

Dames & Moore
100 Church Street
New York, New York 10007

Attention: Mr. Tom Tully

DATE June 30, 1970

SUBJECT VIBRATION STUDY FOR DAMES & MOORE
Limerick Generating Station Project
Primary Blast - West Face
Pottstown Trap Rock
Sanatoga Quarry
June 24, 1970

COPY NUMBER 2 OF 4

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FOR
DAMES & MOORE

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2. Wind direction - From the Southwest
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Respectfully submitted,

VIBRA-TECH ENGINEERS, INC.

John J. Resetar
Field Engineer

Anthony J. Petro, P. E.
President

Client DAMES & MOORE Operation LIMERICK GENERATING STATION (Job Location)

Specific Blast Location WEST FACE of POTTSTOWN TRAP ROCK - SANATOGA QUARRY

Blast No. ——— Date 6-24-70 Time of Blast 11:03 A.M.

No. of ~~Horizontal~~ Vertical Holes 14 Hole Diameter 6½" Average Depth ± 6' To 59'
(cross out one)

Average Subgrade Drilling 4' Hole Spacings 15' Burdens 20'

Average Stemming to Top Charge 12' Type and Delay Nos. Used MS 25 To 500

Decking Information (if any) ———

Total Weight of Explosives 6631 Lbs. Average Explosives Load per Hole 475 Lbs.

Make and Type of Explosives DUPONT: POWERFLEX EXTRA 30 2.5#, ANFO "P" 35.5#, HDP-1 PRIMERS 5.6#

Maximum Amount of Explosives Per Firing Period 629 Lbs.

If Supplementary Holes, Snake Holes, etc., were used give information as above.

Weather and Sky Conditions CLEAR Wind from the S.W.

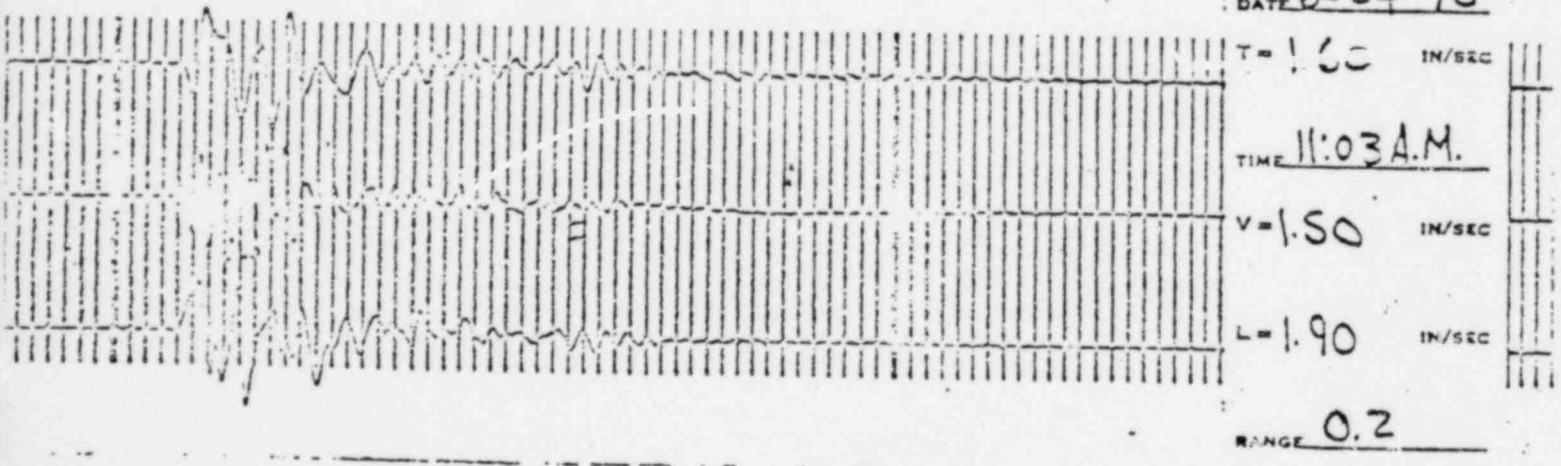
Temperature Approx 78°

Instrument Location ON GROUND AT REAR of SHOT - Approx. 100' WEST SOUTHWEST of STACK ± A-20

Instrument Located Approximately 250 Feet WEST (Direction) from the Blast

Remarks if Blast produced any unusual effects

Seismograph No. 178 ~~Camera No.~~ RANGE 0.2 Operated by J. KESETA



VIBRA-TECH ENGINEERS, INC.

by John J. Keleton

A-10 (Use reverse side for rough sketches of plan or profile of shot if indicated)

BLAST AND SEISMOGRAPHIC REPORT

Client DAMES & MOORE Operation LIMERICK GENERATING STATION (Job Location)

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———

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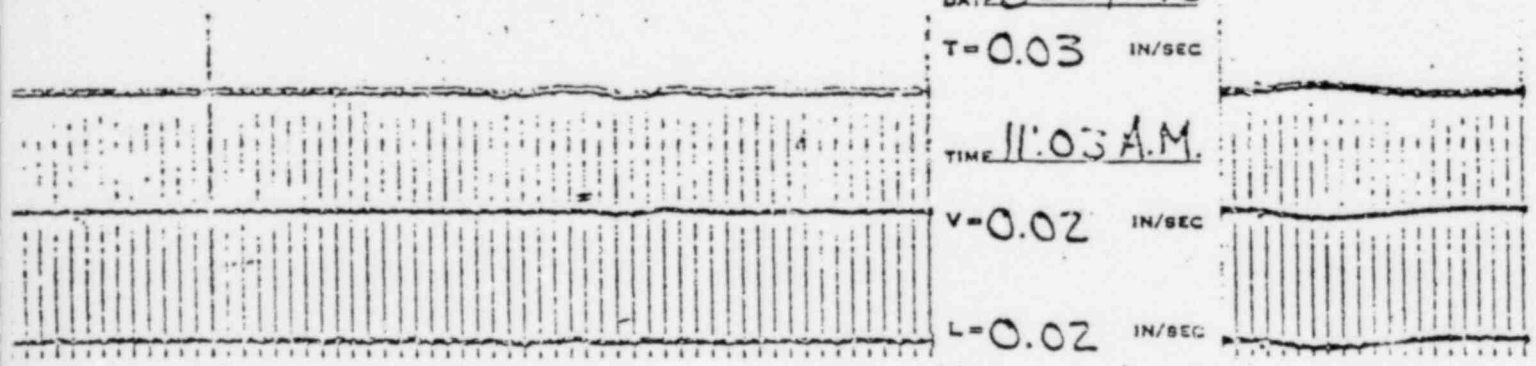
Temperature APPROX 78°

Instrument Location ON GROUND AT ☐ LIMERICK GENERATING STATION SITE AT COORDINATE 3780 EAST & 6680 N. 2TH

Instrument Located Approximately 2800? 3500? Feet S.S.E. (Direction) from the Blast

Remarks if Blast produced any unusual effects

Seismograph No. 151 RANGE 1.0 Operated by T. KINTER



VIBRA-TECH ENGINEERS, INC.

by John J. Keenan

A-10 (Use reverse side for rough sketches of plan or profile of shot if indicated)