

5 March 2001

Office of the Secretary / Case Control Unit
STB Finance Docket No. 33407
Surface Transportation Board
1925 K Street N. W.
Washington, DC 20423-0001

ENTERED
Office of the Secretary

MAR - 7 2001

Part of
Public Record



Subject: Proposed Upgrade of DM&E Trackage in Olmsted County, Minnesota

Ref. No. 1 High-Speed Ground Transportation , Noise and Vibration Impact Assessment
Manual; U. S. Department of Transportation , Federal Railroad Administration Report No.
293630-1, Dated December 1998.

To Whom It May Concern,

RECOMMENDATION: Allow the DM&E to upgrade its tracks through Olmsted County, Minnesota and through Rochester, Minnesota, but ONLY if robust mitigation as described later in this document is ordered. Rationale for the mitigation: Normal development in any area must maintain the impacts on surrounding area in a condition not worse than it was before said development.

In order to keep the impacts of the DM&E rail upgrade or development at or below current levels the top five impact areas must be mitigated. Those areas are:

1. Air Borne Noise
2. Ground Vibration
3. Engine Whistle Crossing Impact
4. Emergency Vehicle and general vehicle delay
5. General Safety

A mitigation proposal for each area will be made. If these mitigation are adopted then the effects of the significant increase in train traffic will be at or below present levels. If this condition is met then the effect of the increased train traffic will be minimal or Nearly Invisible to the general populace.

AUTHOR'S BACKGROUND AND AFFILIATION: I am an engineer holding a BS and MS in Electrical Engineering from the University of Missouri at Rolla, Missouri with 29 years of commercial experience in computer systems design at IBM, Rochester, where my last position was Chief Engineer, Manager. I am now retired. I am not affiliated with any group either for or against the DM&E rail upgrade, nor am I associated with any consulting firm hired by any group for or against the DM&E rail upgrade, nor do I work for any governmental unit involved in the issue. I do not live near the railroad nor do I live near the proposed Bypass through the Southern Olmsted County area.

ACOUSTIC MEASUREMENTS AND DATA: The author gathered acoustic measurements of DM&E trains in Olmsted County, MN; of Canadian Pacific trains at Kellogg MN, and of SOO Line trains at both Alma and Nelson, WI.

5 March 2001

- **METHODOLOGY:** A Radio Shack Audiometer Model 33-2055 (having a $\pm 2\%$ accuracy across the 32Hz to 10k Hz range with less than 2% distortion @ 1k Hz with 0 dB referenced to 0.0002 Micro Bar) was used to make continuous one (1) second average measurements on the "C" weighted scale for the purposes of making comparative (not absolute) acoustic measurements to determine the relative effects of the DM&E rail upgrade. The instrument was placed at a distance ranging from 12 to 20 feet from the rail centerline at a typical height of 3.5 to 4 feet above the rail. The observer then observed the digital output of the display and noted the minimum and maximum readouts during the duration of the train passage. Where feasible, based on conditions at the time, train speed measurements were made (time to cover measured distance).

The assumption is made that the Canadian Pacific and SOO line tracks and train units would fairly represent the DM&E tracks and train units after upgrade as the CP & SOO trackage are laid on heavy ballast with welded rails and the rolling stock was similar to the DM&E. Recognizing that from an acoustic point of view the empty trains and in particular a unit train of all empty hopper cars would represent the loudest or highest acoustic output type train unit. This type of train is represented in data from all three lines.

- **SUMMARY ACOUSTIC MEASUREMENT RESULTS:** Table 1.

<u>RAIL LINE</u>	<u>OBSERVED SOUND RANGE</u> dBC	<u>NUMBER OF TRAINS MEASURED</u>	<u>ESTIMATED SPEED</u>
DM&E	81 to 110 dBC	4	7.4 to 12.7 MPH
CANADIAN PACIFIC	94 to 109 dBC	6	45 to 58 MPH
SOO LINE	88 to 111 dBC	11	41 to 62 MPH

Note: Effects of engine whistle were eliminated by deleting measurements during the whistle period. All measurements taken at a distance of 12 to 20 feet, 15 feet being typical.

Note: detailed information relating to this data can be found in Attachment 1.

The results of the measurements indicate that the noise range of the trains, not including effects of whistles, was essentially the same and that the primary source of the noise is the wheel to rail interface. Thus, it is expected that noise for the DM&E trains after trackage upgrade would not be observably different for an individual train event. It is assumed that there are offsetting causes for the differences such as jointed versus welded track as a primary offset. Because of the cumulative effects (Ref. No. 1, Sect. 5.2.4) of the increasing number of trains in the proposal, it is asserted that noise reduction technology must be applied to effect a 10 to 15 dB reduction in direct airborne noise, so as to maintain the cumulative perception of noise impact at or below the present measured individual event noise levels.

It was significant that many of the higher readings on the CP and SOO lines were observed during passage of wheels having 'flat spots'. It is estimated that the frequency of

5 March 2001

occurrence of flat wheels on several of the trains on the CP and SOO lines was in the range of one set of flat wheels for every 10 to 15 cars. It asserted that this rate of flat wheels would be unacceptable in the DM&E upgrade plan, based on the noise impact to the community and that detection and marking equipment must be mandated to eliminate problem wheels.

- **RECOMMENDATION FOR AIR BORNE NOISE MITIGATION:** Based on the normal development rule that a development project in any area must maintain the impacts on surrounding area in a condition not worse than it was before said development the following is recommended:
 - **That low height sound absorbing faced barrier walls be mandated:**
 - HEIGHT: 6 foot to 8 foot
 - PROXIMITY: 9 to 10 foot from track center line, typical
 - MATERIAL: Concrete with rough decorative face on the public side
Sound absorbing material on trackage side
 - MITIGATION ZONE: Barrier on both sides of tracks from US Highway 52 on the west side of Rochester to Silver Creek Road on the east side of Rochester.
 - EFFECTIVE NOISE REDUCTION:
 - 6 to 10 dBA for unfaced barrier (Ref.: No. 1, Sect. 5.4.2, Paragraph 1)
 - 11 to 15 dBA for barrier with sound-absorbing material on inner surface (Ref.: No. 1, Sect. 5.4.2, Paragraph 1.)
 - PROJECTED COST: \$25 per foot square or \$400 per double wall foot @ 15,000 double wall feet yields a projected cost of \$6Million
 - GENERAL NOTE: The low height barrier also has the net effect of providing a mid-crossing track barrier, thus enhancing track safety. Furthermore, the walls could be engineered in critical areas to help provide containment in the event of a derailment.
- **That use of movable-point Frog switches be mandated:**
 - Mitigation Zone: All mainline switches in area from Olmsted County Hwy. 22 West to Olmsted County Hwy. 22 East.
- **That flat wheel detection sensors and wheel marking equipment be installed to detect and mark flat wheels:**
 - Mitigation Zone: At locations designated by DM&E
 - Mandated Effectiveness: Flat wheels must be detected, marked and maintained such that the flat wheel rate is at or below one wheel set per train passage.

VIBRATION MEASUREMENTS AND DATA: The author gathered seismic measurements of a DM&E train in Olmsted County, MN; of three Canadian Pacific trains at Kellogg MN.

- **METHODOLOGY:** A GeoSonics Model 3000LC Seismograph SN: 3203 that was shaketable calibrated 11 January 2001 was used to make triggered 15 sec records during

5 March 2001

the passage of a train. While the data recorded from these seismographs could be used to make absolute impact determinations the actual intent was to make comparative vibration measurements to determine the relative effects of the DM&E rail upgrade. The seismic sensing head was placed at a distance of 10.5 feet from the rail centerline in tight contact with the ground and held in place with a suitable sandbag. A microphone was also placed at 15.0 feet from the track centerline and 2 feet above the track rail. The acoustic data is for informational use only. Train speeds were assumed to be similar to those obtained for the acoustic data, as conditions during the seismic measurements precluded accurate measurement of train speeds.

The assumption is made that the Canadian Pacific and SOO line tracks and train units would fairly represent the DM&E tracks and train units after upgrade as the CP & SOO trackage are laid on heavy ballast with welded rails and the rolling stock was similar to the DM&E.

• **SUMMARY VIBRATION MEASUREMENT RESULTS:** Table 2.

(all PPV values in inches per second)

Event No.	RR Line	Resultant PPV	Vertical PPV	Vertical Freq. Hz	Longitudinal PPV	Longitudinal Freq. Hz	Transverse PPV	Transverse Freq. Hz
001	CP	0.250	0.243	55.6	.075	41.7	.073	55.6
002	CP	0.358	0.333	33.3	0.120	55.6	0.100	41.7
003	CP	0.413	0.338	55.6	0.145	33.3	0.110	83.3
006	CP	0.278	0.275	83.3	0.118	55.6	0.100	41.7
007	CP	0.635	0.590	83.3	0.365	55.6	0.175	83.3
009	DM&E	0.458	0.443	83.3	0.250	83.3	0.105	83.3
010	DM&E	0.353	0.338	55.6	0.243	83.3	0.085	83.3
011	DM&E	0.403	0.358	83.3	0.273	83.3	0.086	83.3
012	DM&E	0.448	0.375	83.3	0.270	83.3	0.110	83.3

Note: detailed information relating to this data can be found in Attachment 2.

Note: Event 001 is a Mixed Freight; Events 002,003 is a Mixed Freight; Events 006, 007 is a Unit Hopper train; Events 009 thru 010 is a Mixed Freight

The results of the measurements indicate that the vibration range of the trains, was essentially the same for both current DM&E and CP lines (using the CP data to approximate the DM&E line after upgrade). This data then tends to substantiate the relative noise measurements, indicating for both vibration and acoustics that the DM&E trains after trackage upgrade would not be substantially different for a typical individual train event. It is assumed that there are offsetting causes for the differences such as jointed versus welded track as a primary offset.

Because there will be a cumulative effect due to the increasing number of trains in the proposal there will be cumulative vibration impacts to sensitive receivers such as the MRI

5 March 2001

units at the MAYO Clinic or other businesses such as Pemstar. Further, since the ground vibration also results in the generation of air-borne noise, which is additive to the directly generated air borne noise, it is asserted that vibration reduction technology must be applied to the track sub-bed and track structure to effect a 10 to 15 dB reduction in ground vibration, so as to maintain the cumulative impacts of ground vibration and ground generated noise at or below the present measured individual event levels.

- **RECOMMENDATION FOR GROUND VIBRATION MITIGATION:** Based on the normal development rule that a development project in any area must maintain the impacts on surrounding area in a condition not worse than it was before said development the following is recommended:
 - That trackbed mitigation be ordered that achieves a 15 VdB reduction in ground vibration. It is imperative that the trackbed mitigation be ordered above all others as it cannot be retrofitted after the trackbed is upgraded in the standard manner and it impacts both ground vibration and ground generated air borne noise. A number of methodologies or technologies are recommended in Ref. No. 1, table 8-2. Because of the extent of frequencies that can expected to be present given the wide range of expected rail traffic it is expected that a number of mitigation technologies must be applied in order to attenuate the range of frequencies. One would expect that loaded coal trains would represent a train that would generate very low frequencies and that the returning unloaded or empty hopper trains would represent the opposite end of the spectrum. A variety of potential mitigation's are noted. It would appear that the most promising for heavy weight trains as planned is the sub-bed mitigation and the ballast mats. The vibration data presented indicate a peak of low frequency energy below approximately 15 Hz and a second peaking of higher frequency energy beginning at approximately 40 Hz and extending above 100 Hz. The final trackbed mitigation plan would require additional engineering.
 - Proposed sub-bed mitigation is a variation of "Floating Slab Trackbed" wherein a sub-base of granular material is placed and capped by a asphalt cap. This treatment would be expected to yield an attenuation of 10 to 15 VdB in the very low frequency range below 100 Hz.
 - **MATERIAL:** Selected granular material similar to ballast. Sub-bed material must be well drained condition after installation to prevent material voids from filling with water or other material, negating attenuation qualities of the granular material.
 - **CROSS-SECTION DIMENSIONS:** 12 to 15 feet wide by 2 feet thick
 - **CAP MATERIAL:** State Road Grade Asphalt being 6 inches thick and 12 feet wide
 - **MITIGATION ZONE:** From US Highway 52 on the west side of Rochester to Silver Creek Road on the east side of Rochester a distance of approximately 15,000 feet.
 - **PROJECTED SUB-BED MITIGATION COST:** \$1,000 per foot @ 15,000 feet for a cost of \$15 Million.

5 March 2001

- Proposed middle frequency trackbed mitigation is to be Elastomeric Ballast Mats laid on top of the asphalt Floating Slab, with the Ballast Mats and Floating Slab fully covered with ballast. This treatment would be expected to yield an attenuation of 10 VdB in the frequency range 40 to 150 Hz.
 - MATERIAL: Cast Elastomeric Pads, 2 to 3 inches thick
 - MITIGATION ZONE: From US Highway 52 on the west side of Rochester to Silver Creek Road on the east side of Rochester a distance of approximately 15,000 feet.
 - PROJECTED BALLAST MAT MITIGATION COST: \$15 per square foot @ 150,000 square feet for a cost of \$2.3 Million.
- Higher frequency mitigation is proposed to be High Resilience Fasteners. It is expected that the rails as a single body being excited by the wheels will cause higher frequency vibrations and that a High Resilience Fastener system would serve to isolate and attenuate those frequencies.
 - MATERIAL: High Resilience Fastener System
 - MITIGATION ZONE: From US Highway 52 on the west side of Rochester to Silver Creek Road on the east side of Rochester a distance of approximately 15,000 feet.
 - MITIGATION COST: Not Available

ENGINE WHISTLE IMPACT AT CROSSINGS: The impact on a community of engine whistles being blown for safety reasons at grade crossings is a well known and well documented problem. The DM&E plan calls for up to 37 trains per day or a train every 39 minutes. The impact of this will have an overwhelming effect on actual noise and a perception of an extreme increase in noise. It is essential that whistle free crossings be mandated for all at grade crossings.

- **RECOMMENDATION FOR WHISTLE FREE CROSSINGS:** Based on the normal development rule that a development project in any area must maintain the impacts on surrounding area in a condition not worse than it was before said development the following is recommended:
 - That all crossings in the mitigation zone be ordered to meet whistle free criteria.
 - METHODOLOGY: Four quadrant gates at all grade level crossings
 - GATE ENHANCEMENT: That the gates be equipped with object and vehicle sensors that hold the related exit lane gate open and at the same time actuate a local horn (horn located at the crossing) as a warning. This "object present" information could be transmitted to the approaching train as warning information.
 - MITIGATION ZONE: All grade level crossings between Olmsted County Highway 22 West and Olmsted County Highway 22 East.
 - PROJECTED MITIGATION COST: 12 crossings @ \$0.5Million per crossing or \$6Million.

EMERGENCY VEHICLE AND GENERAL VEHICLE DELAY: Increased delays to both Emergency Vehicle and general vehicle traffic will exceed the present delays at an approximate level of 10 to 12 trains per day. This is termed the delay parity point. The issue of Emergency Vehicle delay is a significant issue in Rochester because of the presence of a major medical institution, the presence of three hospital all on one side of the DM&E tracks. The initial issue will be the frequency of grade crossing closings up to the delay parity point at which point both the frequency and total delay will become significant issues. Additionally, U. S. Highway 63 bisects Rochester and conducts significant traffic.

- **RECOMMENDATION FOR MAINTENANCE OF DELAY PARITY:** Based on the normal development rule that a development project in any area must maintain the impacts on surrounding area in a condition not worse than it was before said development the following is recommended:

- That a grade separation be ordered for Broadway (U. S. Highway 63) in Rochester
 - Methodology: Under-rail or underpass grade separation.
 - Implementation point: At 5 total trains per day
 - Expected cost: \$10.1Million (source: City of Rochester)
- That a grade separation be ordered for 11th Avenue west in Rochester
 - Methodology: Under-rail or underpass grade separation.
 - Implementation point: At 9 total trains per day
 - Expected cost: \$7.5Million (Ave. of two City of Rochester underpass estimates)
- That a grade separation be ordered for 11th Avenue east in Rochester
 - Methodology: Underrail or underpass grade separation.
 - Implementation point: At 15 total trains per day
 - Expected cost: \$7.5Million (Ave. of two City of Rochester underpass estimates)
- That a grade separation be ordered for 2nd Avenue east in Rochester
 - Methodology: Underrail or underpass grade separation.
 - Implementation point: At 21 total trains per day
 - Expected cost: \$4.8Million (source: City of Rochester)
- That a grade separation be ordered for Olmsted Highway 22 east in Rochester
 - Methodology: Over-rail or overpass grade separation.
 - Implementation point: At 27 total trains per day
 - Expected cost: \$5.1Million (source: City of Rochester)

- Implementation of the above plan will cause the delay parity point to always exceed the actual number of trains per day, thus meeting the rule of development.

- **GENERAL RECOMMENDATION:** All mitigation that is based on traffic should be specified in terms of only trains per unit of time. Given that marketing demands could alter the carried cargo i. e. conversion of tonnage from coal to corn then the proper traffic based measure is trains per unit of time.

OVERALL COMMENT AND JUSTIFICATION:

5 March 2001

The above mitigation plan exceeds that unconsummated partnership agreement in some aspects principally, the trackbed mitigation, the acoustic barrier walls, and addition of three grade separations. The delta cost of the mitigation that exceeds the unconsummated partnership agreement is estimated at approximately \$40.3M to \$43M. Given that the mitigation does maintain the impact on the surrounding area in a condition not worse than it was before said development, then one should be able to justify the expense in reduced loss of property value and reduced or eliminated environmental, traffic delay, accident and emergency losses..

- With no mitigation the city of Rochester estimates:
 - Property value Loss @ \$10.7M
 - 20 year traffic delay costs @ \$33.9M
 - 20 year Train/Traffic Accident costs @ \$ 5.2M
 - 20 year Environmental @ \$14.6M
 - Total projected loss \$64.4M

- With the mitigation proposed in this letter which would then meet the "development rule" then the loss estimate should be justifiably reduced:
 - Property value loss @ \$0.0M
 - 20 year traffic delay costs @ \$0.0M
 - 20 year Train / Traffic Accident cost @ \$3.9M (assumed a 25% reduction)
 - 20 year Environmental Cost @ \$10.2M (assumed a 30% reduction)
 - Modified loss \$14.1M

- SAVINGS DUE TO INCREASED MITIGATION \$50.3M

This more than offsets the cost of the delta mitigation, with the delta mitigation meeting the development rule of maintaining the impacts on surrounding area in a condition not worse than it was before said development. Therefore it is justifiable to order the mitigation given the offsetting cost savings and the route through Rochester could be made viable without general impact.

Sincerely,



Arthur P Reckinger
4312 SW 8th Street
Rochester MN 55902

Phone: 507.282.8434

Attachment 1, Noise Measurement Results
Attachment 2, Seismic Measurement Detail

SUPPLEMENTAL ACOUSTIC MEASUREMENT DATA

line No.	LOCATION	TIME	DATE	RAIL LINE	TYPE TRN	TRAVEL DIRECTION	TRACK TYPE	DIST TO C/L	ROLLING STOCK - LOW dBc	ROLLING STOCK - HI dBc
1	Olm CH 3 & US 14 W	PM	01/21/01	DM&E	empty hopper	west	bolted	15	100	110
2	Dg CH 15 & US 14 W	PM	01/21/01	DM&E	same	west	bolted	15	92	102
3	Olm CH 104 & US 14 W	PM	01/21/01	DM&E	mixed frgt	east	bolted	15	81	87
4										
5	Wab CH 84 & US 63	PM	02/05/01	CP	mixed hopper	south	welded	20	97	104
6	Wab CH 84 & US 63	04:10 PM	02/05/01	CP	mix frt	north	welded	20	94	103
7	Wab CH 84 & US 63	04:40 PM	02/05/01	CP	mix frt & hop	north	welded	20	97	104
8	Wab CH 84 & US 63	04:50 PM	02/05/01	CP	mix frt	south	welded	20	94	102
9										
10	Alma @ Cenex	06:00 PM	02/05/01	SOO	not recorded	north	welded	15	100	107
11	Alma @ open road	06:20 PM	02/05/01	SOO	not recorded	north	welded	15	101	110
12										
13	Nelson @ RR yard		02/05/01	SOO	flats w/contain	south	welded	15	101	108
14	Nelson @ RR yard	07:15 PM	02/05/01	SOO	auto xport	north	welded	15	91	96
15					flats w/contain				92	100
16	Nelson @ RR yard	08:03 PM	02/05/01	SOO	piggy back	north	welded	15	88	96
17	Nelson @ RR yard	~ 8:40 PM	02/05/01	SOO	piggy back	south	welded	15	95	105
18										
19	Nelson @ RR yard	03:10 PM	02/06/01	SOO	mixed frt	south	welded	12	95	111
20	Nelson @ RR yard	03:25 PM	02/06/01	SOO	hopper	south	welded	12	97	106
21	Nelson @ RR yard	04:10 PM	02/06/01	SOO	piggy back	south	welded	12	101	107
22	Nelson @ RR yard	4:45 PM	02/06/01	SOO	piggy back	north	welded	12	93	107
23										
24	Alma @ open road Iron st	05:50 PM	02/06/01	SOO	auto carrier	north	welded	15	99	110
25										
26	Wab CH 84 & US 63	07:02 PM	02/18/01	CP	mixed frgt	south	welded	15	99	109
27	Wab CH 84 & US 63	08:26 PM	02/18/01	CP	unit hopper	south	welded	15	96	109
28										
29	Hwy 14 & Winona CH 115	09:04 AM	02/19/01	DM&E	mixed frgt	east	bolted	15	97	106

GeoSonics Seismic Analysis

SN:3203 v2.59

Date: 02/18/2001

Event: 1

Client: Reckinger

Operation: DM&E COMPARE

SSU Location: KELLOGG CH 84

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)
90 (dB)

Time: 18:01:09

Record Time: 15.0 sec

GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 1

Fast Fourier Amplitudes (PV=in/sec)

	Summary Data		
	L	T	V
PPV (in/s)	0.075	0.073	0.243
PD (.001")	0.75	0.72	3.12
PPA (g)	0.078	0.085	0.208
FREQ (Hz)	41.7	55.6	55.6
RESULTANT PPV (in/s) :	0.250		
PEAK AIR PRESSURE (dB):	128		
(psi):	0.0073		

Velocity Waveform Graph Scale

Time = 0.300 s

Seismic = +/- 0.32(in/s)

Sound = +/- 0.0091 psi

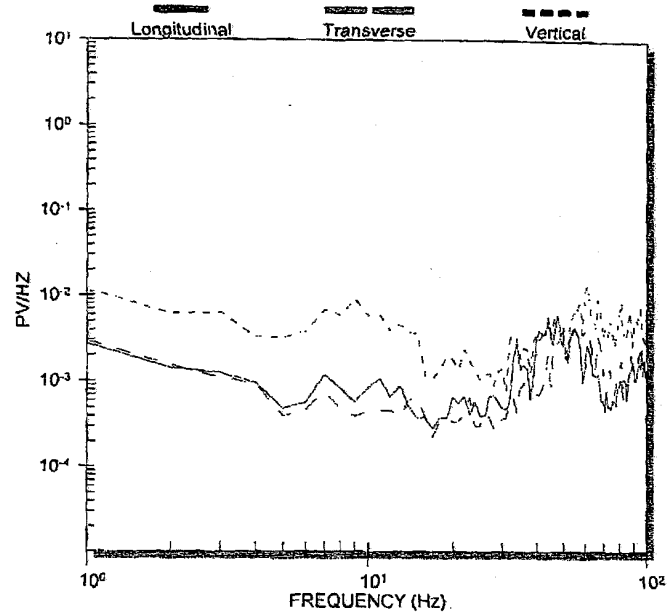
Shaketable Calibrated: 01/11/2001

By Vibra-Tech

111 East Kentucky Street

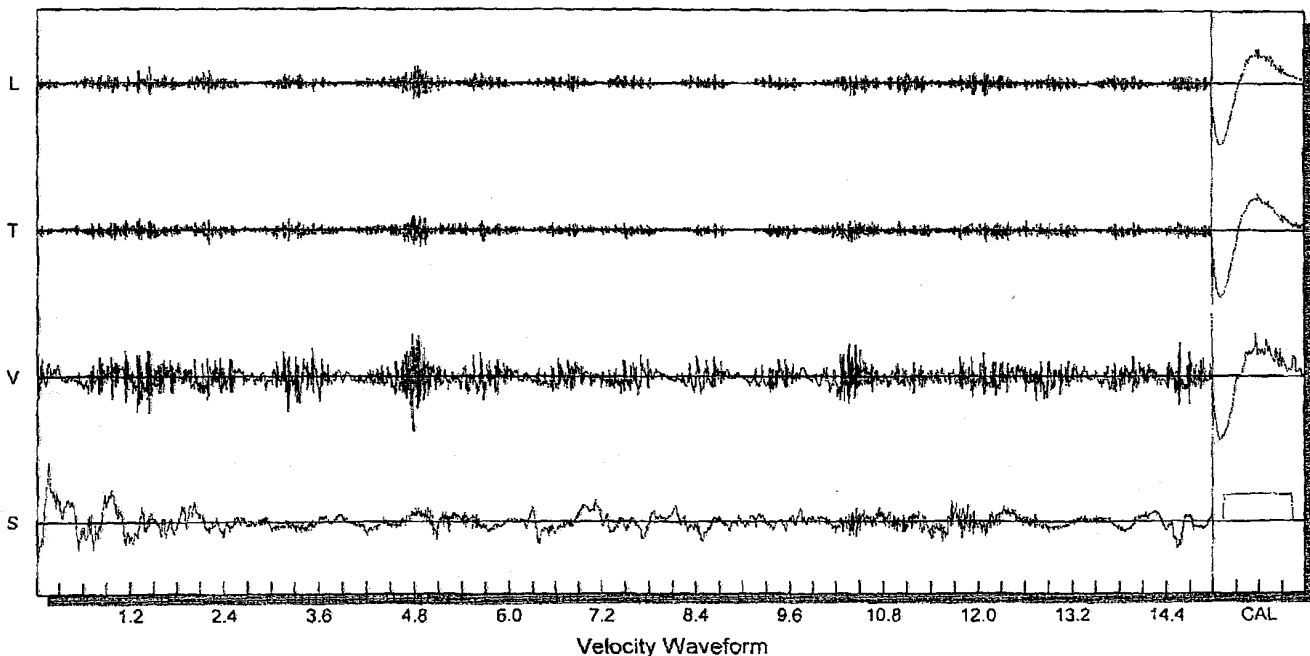
Louisville, Ky 40203 U.S.A

TEL: 502.587.7277 FAX: 502.568.6833



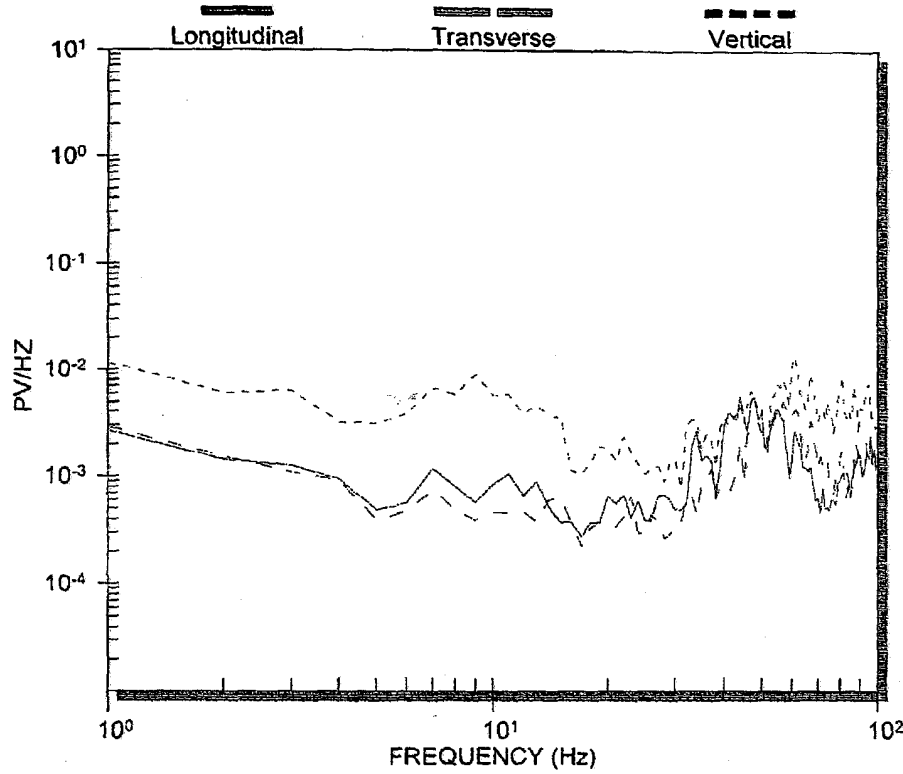
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 1



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 1
Fast Fourier Amplitudes (PV=in/sec)



Date: 02/18/2001
Event: 1
Client: Reckinger
Operation: DM&E COMPARE
SSU Location: KELLOGG CH 84
Distance to Ctr Ln: 10.5 ft
Operator: APR
Comments:
Trigger level: 0.005 (in/s)
90 (dB)

Time: 18:01:09
Record Time: 15.0 sec

Summary Data			
	L	T	V
PPV (in/s)	0.075	0.073	0.243
PD (.001")	0.75	0.72	3.12
PPA (g)	0.078	0.085	0.208
FREQ (Hz)	41.7	55.6	55.6
RESULTANT PPV (in/s)	0.250		
PEAK AIR PRESSURE (dB)	128		
(psi)	0.0073		

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES			
FRQ	PV / Hz.			FRQ	PV / Hz.			FRQ	PV / Hz.			FRQ	PV / Hz.			FRQ	PV / Hz.		
Hz.	L	T	V	Hz.	L	T	V	Hz.	L	T	V	Hz.	L	T	V	Hz.	L	T	V
1	0.268	0.290	1.159	21	0.055	0.034	0.139	41	0.399	0.070	0.302	61	0.274	0.422	1.358	81	0.106	0.178	0.884
2	0.142	0.152	0.605	22	0.067	0.042	0.237	42	0.359	0.085	0.346	62	0.226	0.399	1.051	82	0.102	0.079	0.399
3	0.124	0.109	0.635	23	0.041	0.066	0.170	43	0.344	0.119	0.388	63	0.200	0.294	0.601	83	0.110	0.063	0.347
4	0.094	0.091	0.321	24	0.059	0.030	0.128	44	0.574	0.202	0.456	64	0.120	0.184	0.574	84	0.098	0.090	0.406
5	0.048	0.039	0.313	25	0.040	0.030	0.104	45	0.352	0.087	0.317	65	0.120	0.140	0.428	85	0.063	0.096	0.346
6	0.057	0.047	0.382	26	0.038	0.044	0.119	46	0.268	0.246	0.467	66	0.112	0.175	0.454	86	0.096	0.092	0.434
7	0.118	0.074	0.681	27	0.066	0.038	0.123	47	0.511	0.278	0.643	67	0.124	0.338	0.928	87	0.123	0.173	0.694
8	0.080	0.048	0.583	28	0.069	0.027	0.089	48	0.565	0.272	0.537	68	0.087	0.287	0.726	88	0.138	0.204	0.486
9	0.057	0.039	0.909	29	0.060	0.030	0.134	49	0.341	0.326	0.438	69	0.060	0.192	0.495	89	0.161	0.162	0.258
10	0.084	0.046	0.582	30	0.049	0.036	0.141	50	0.390	0.258	0.453	70	0.062	0.119	0.325	90	0.147	0.158	0.451
11	0.106	0.046	0.588	31	0.048	0.037	0.077	51	0.210	0.303	0.193	71	0.046	0.154	0.420	91	0.102	0.141	0.423
12	0.066	0.046	0.383	32	0.056	0.064	0.300	52	0.169	0.193	0.184	72	0.078	0.120	0.423	92	0.105	0.136	0.460
13	0.089	0.038	0.466	33	0.180	0.066	0.347	53	0.302	0.253	0.549	73	0.050	0.124	0.341	93	0.143	0.131	0.567
14	0.051	0.061	0.366	34	0.273	0.044	0.324	54	0.393	0.351	0.572	74	0.052	0.143	0.520	94	0.166	0.226	0.696
15	0.037	0.062	0.351	35	0.141	0.086	0.183	55	0.442	0.411	0.747	75	0.048	0.085	0.365	95	0.147	0.230	0.748
16	0.038	0.038	0.114	36	0.158	0.093	0.250	56	0.367	0.362	0.689	76	0.062	0.080	0.353	96	0.240	0.205	0.383
17	0.028	0.022	0.104	37	0.137	0.116	0.228	57	0.337	0.513	0.825	77	0.061	0.070	0.261	97	0.151	0.118	0.340
18	0.037	0.034	0.135	38	0.066	0.062	0.124	58	0.187	0.433	0.658	78	0.054	0.105	0.354	98	0.182	0.179	0.317
19	0.037	0.038	0.192	39	0.120	0.080	0.288	59	0.096	0.346	0.459	79	0.084	0.104	0.525	99	0.117	0.154	0.282
20	0.065	0.033	0.178	40	0.302	0.071	0.358	60	0.142	0.385	1.088	80	0.092	0.152	0.654	100	0.139	0.156	0.300

GeoSonics Seismic Analysis

SN:3203 v2.59
 Date: 02/18/2001 Time: 19:02:15
 Event: 2 Record Time: 15.0 s
 Client: RECKINGER
 Operation: DM&E COMPARE
 SSU Location: KELLOGG CH 84
 Distance to Ctr Ln: 10.5 ft
 Operator: APR

GeoSonics Seismic Analysis

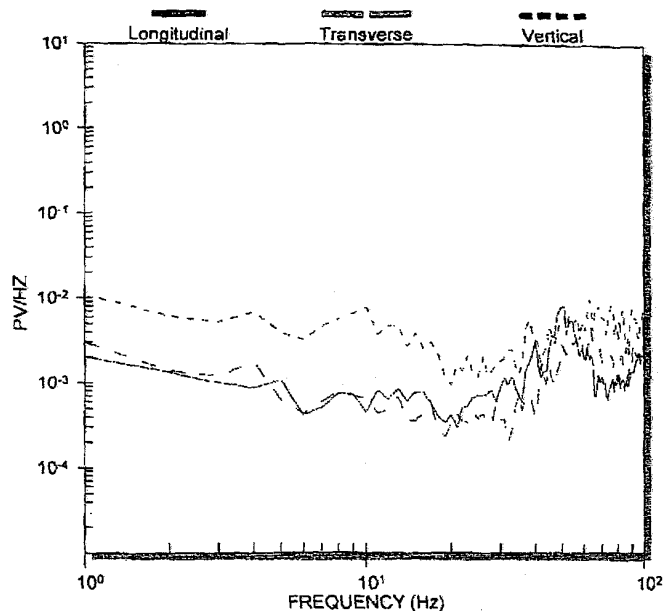
SN: 3203 v2.59 Event: 2
 Fast Fourier Amplitudes (PV-in/sec)

Comments:
 Trigger level: 0.005 (in/s)
 90 (dB)

	Summary Data		
	L	T	V
PPV (in/s)	0.120	0.100	0.333
PD (.001")	0.82	1.47	3.33
PPA (g)	0.130	0.124	0.326
FREQ (Hz)	55.6	41.7	33.3
RESULTANT PPV (in/s) :		0.358	
PEAK AIR PRESSURE (dB):		124	
(psi):		0.0046	

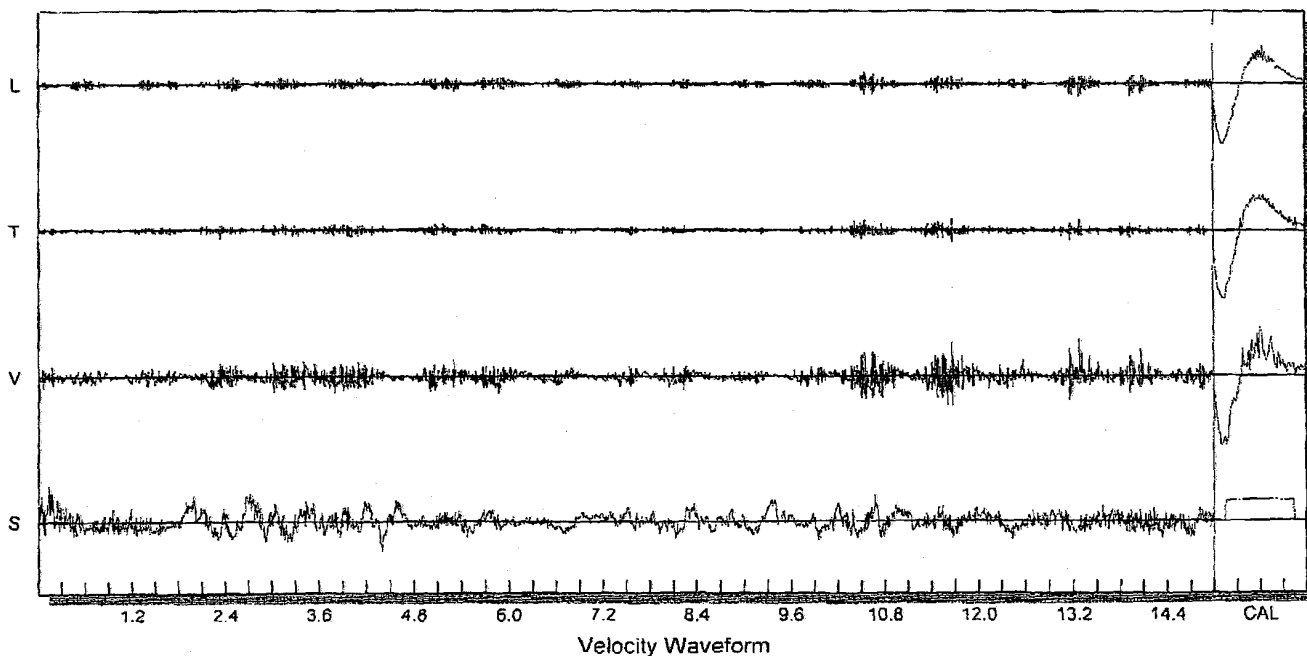
Velocity Waveform Graph Scale
 Time = 0.300 s
 Seismic = +/- 0.64(in/s)
 Sound = +/- 0.0091 psi

Shaketable Calibrated: 01/11/2001
 By Vibra-Tech
 111 East Kentucky Street
 Louisville, Ky 40203 U.S.A
 TEL: 502.587.7277 FAX: 502.568.6833



GeoSonics Seismic Analysis

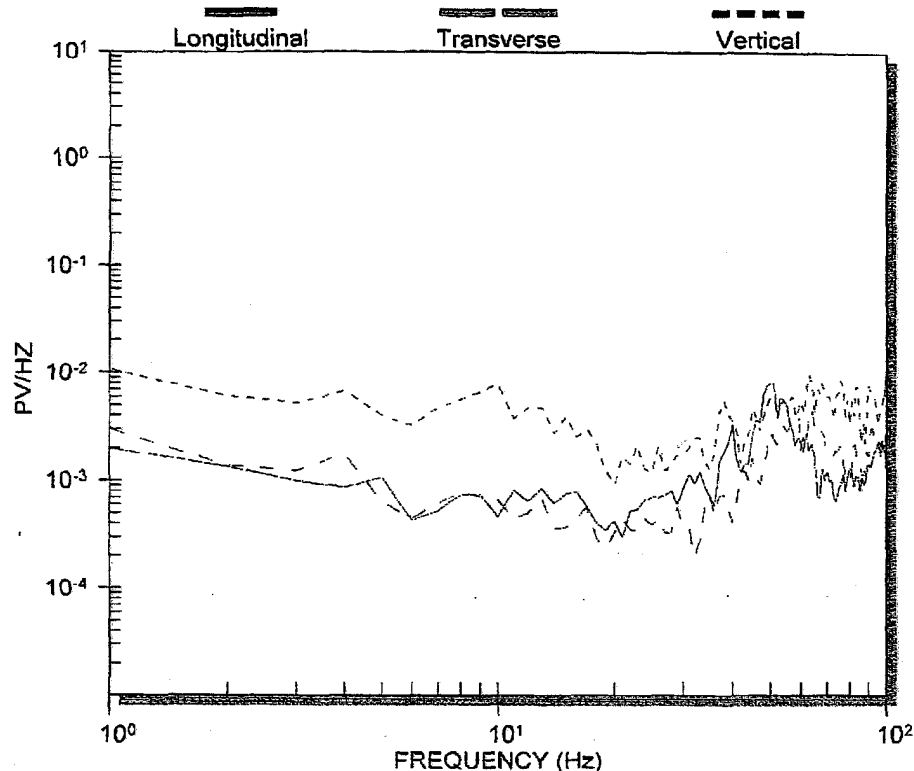
SN: 3203 v2.59 Event: 2



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 2

Fast Fourier Amplitudes (PV=in/sec)



Date: 02/18/2001

Time: 19:02:15

Event: 2

Record Time: 15.0 s

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: KELLOGG CH 84

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)
90 (dB)

Summary Data

	L	T	V
PPV (in/s)	0.120	0.100	0.333
PD (.001")	0.82	1.47	3.33
PPA (g)	0.130	0.124	0.326
FREQ (Hz)	55.6	41.7	33.3
RESULTANT PPV (in/s)	0.358		
PEAK AIR PRESSURE (dB)	124		
(psi)	0.0046		

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES			
FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V
Hz.				Hz.				Hz.				Hz.				Hz.			
1	0.200	0.298	1.067	21	0.030	0.045	0.166	41	0.163	0.066	0.293	61	0.194	0.259	0.431	81	0.128	0.129	0.562
2	0.133	0.137	0.606	22	0.053	0.035	0.142	42	0.120	0.123	0.147	62	0.278	0.216	0.654	82	0.089	0.210	0.406
3	0.099	0.122	0.523	23	0.055	0.034	0.215	43	0.142	0.122	0.233	63	0.197	0.420	0.980	83	0.113	0.223	0.723
4	0.086	0.174	0.683	24	0.066	0.045	0.130	44	0.144	0.099	0.279	64	0.220	0.471	0.849	84	0.110	0.146	0.766
5	0.107	0.064	0.398	25	0.072	0.039	0.120	45	0.265	0.165	0.475	65	0.172	0.289	0.429	85	0.082	0.150	0.354
6	0.043	0.045	0.321	26	0.071	0.045	0.209	46	0.369	0.109	0.388	66	0.072	0.272	0.718	86	0.110	0.118	0.231
7	0.052	0.061	0.474	27	0.075	0.033	0.124	47	0.351	0.093	0.299	67	0.070	0.299	0.658	87	0.093	0.113	0.348
8	0.075	0.079	0.573	28	0.082	0.033	0.141	48	0.642	0.143	0.386	68	0.133	0.261	0.823	88	0.105	0.147	0.225
9	0.075	0.071	0.669	29	0.060	0.056	0.173	49	0.751	0.169	0.509	69	0.102	0.262	0.697	89	0.138	0.193	0.584
10	0.046	0.066	0.785	30	0.086	0.038	0.186	50	0.817	0.290	0.611	70	0.124	0.180	0.607	90	0.144	0.169	0.776
11	0.082	0.045	0.377	31	0.116	0.038	0.201	51	0.815	0.251	0.604	71	0.099	0.179	0.614	91	0.137	0.307	0.666
12	0.065	0.050	0.484	32	0.095	0.020	0.253	52	0.385	0.219	0.381	72	0.105	0.185	0.526	92	0.148	0.314	0.600
13	0.086	0.069	0.482	33	0.121	0.027	0.253	53	0.529	0.299	0.644	73	0.072	0.176	0.378	93	0.191	0.233	0.587
14	0.062	0.037	0.272	34	0.090	0.054	0.158	54	0.570	0.326	0.570	74	0.065	0.195	0.617	94	0.191	0.211	0.505
15	0.077	0.037	0.396	35	0.073	0.076	0.130	55	0.526	0.291	0.510	75	0.084	0.189	0.683	95	0.226	0.222	0.338
16	0.079	0.045	0.253	36	0.060	0.048	0.175	56	0.348	0.318	0.564	76	0.096	0.219	0.864	96	0.212	0.239	0.411
17	0.058	0.057	0.304	37	0.142	0.073	0.427	57	0.300	0.348	0.619	77	0.115	0.190	0.777	97	0.176	0.214	0.499
18	0.041	0.030	0.222	38	0.180	0.076	0.567	58	0.217	0.343	0.393	78	0.081	0.100	0.363	98	0.223	0.250	0.556
19	0.035	0.024	0.122	39	0.219	0.057	0.405	59	0.253	0.405	0.462	79	0.111	0.096	0.571	99	0.220	0.310	0.723
20	0.043	0.033	0.093	40	0.329	0.041	0.358	60	0.234	0.197	0.555	80	0.132	0.103	0.337	100	0.130	0.196	0.420

GeoSonics Seismic Analysis

SN:3203 v2.59

Date: 02/18/2001

Event: 3

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: KELLOGG CH 84

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)
90 (dB)

Time: 19:02:52

Record Time: 15.0 s

GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 3

Fast Fourier Amplitudes (PV=in/sec)

	Summary Data		
	L	T	V
PPV (in/s)	0.145	0.110	0.388
PD (.001")	0.79	0.88	3.85
PPA (g)	0.150	0.143	0.462
FREQ (Hz)	33.3	83.3	55.6
RESULTANT PPV (in/s)	0.413		
PEAK AIR PRESSURE (dB):	120		
(psi):	0.0031		

Velocity Waveform Graph Scale

Time = 0.300 s

Seismic = +/- 0.64(in/s)

Sound = +/- 0.0045 psi

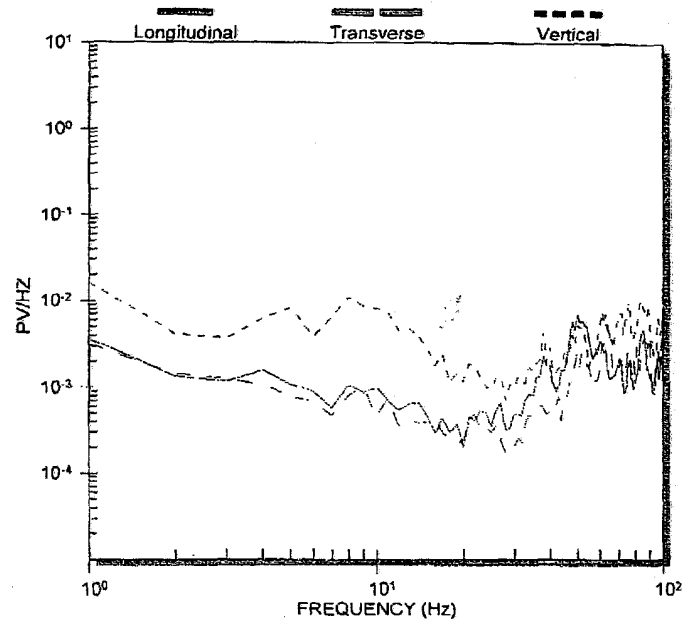
Shaketable Calibrated: 01/11/2001

By Vibra-Tech

111 East Kentucky Street

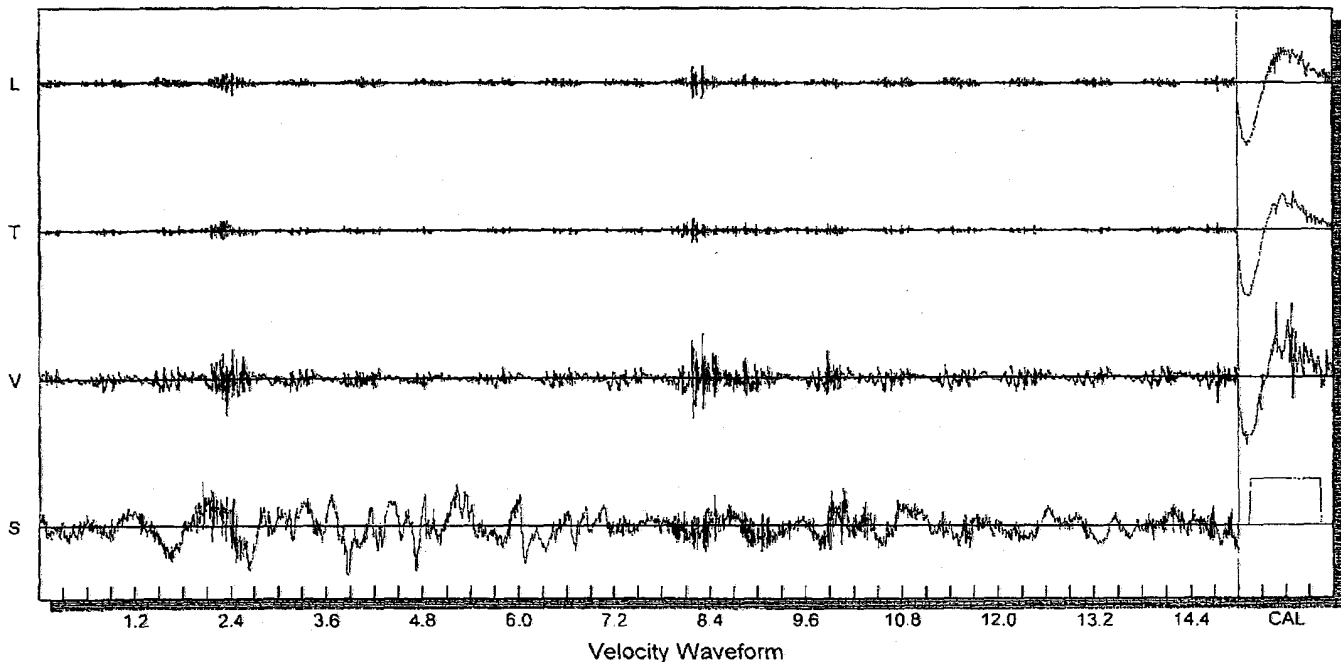
Louisville, Ky 40203 U.S.A.

TEL: 502.587.7277 FAX: 502.568.6833



GeoSonics Seismic Analysis

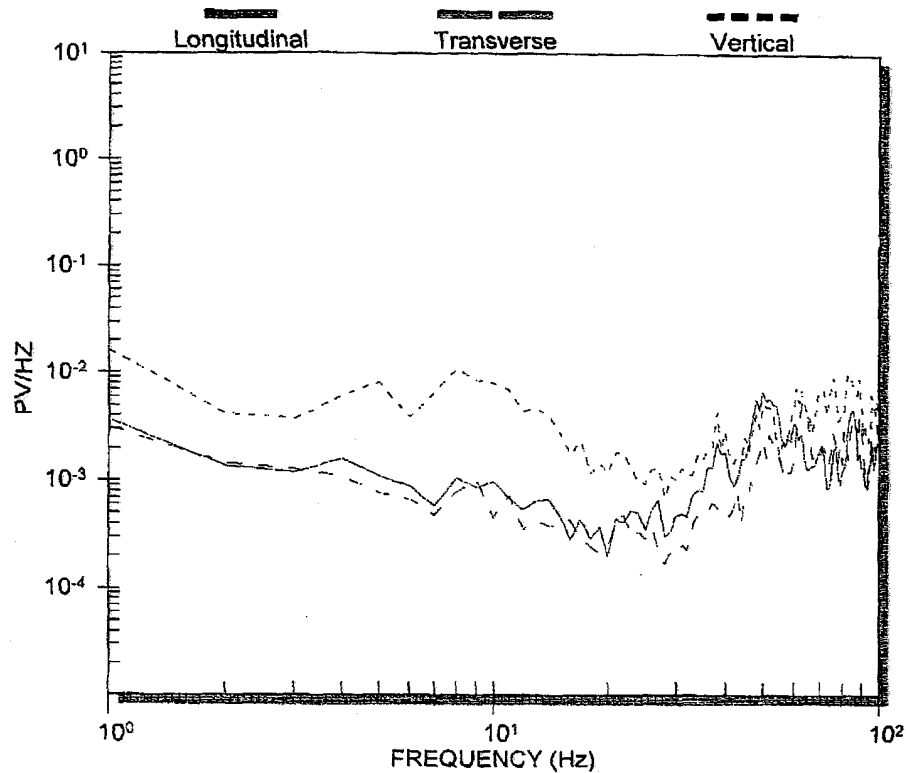
SN: 3203 v2.59 Event: 3



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 3

Fast Fourier Amplitudes (PV=in/sec)



Date: 02/18/2001

Time: 19:02:52

Summary Data

Event: 3

Record Time: 15.0

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: KELLOGG CH 84

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)

90 (dB)

PPV (in/s)

L

T

V

0.145 0.110 0.388

PD (.001")

0.79 0.88 3.85

PPA (g)

0.150 0.143 0.462

FREQ (Hz)

33.3 83.3 55.6

RESULTANT PPV (in/s) :

0.413

PEAK AIR PRESSURE (dB):

120

(psi): 0.0031

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES			
FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V
Hz.				Hz.				Hz.				Hz.				Hz.			
1	0.364	0.312	1.619	21	0.045	0.043	0.188	41	0.113	0.047	0.162	61	0.322	0.302	0.763	81	0.129	0.302	0.449
2	0.135	0.143	0.414	22	0.041	0.048	0.174	42	0.089	0.054	0.145	62	0.250	0.300	0.543	82	0.168	0.221	0.691
3	0.119	0.127	0.372	23	0.053	0.031	0.128	43	0.107	0.081	0.168	63	0.277	0.552	0.710	83	0.319	0.158	1.030
4	0.157	0.107	0.611	24	0.051	0.034	0.099	44	0.159	0.041	0.172	64	0.159	0.469	0.523	84	0.407	0.241	0.957
5	0.110	0.077	0.815	25	0.035	0.029	0.094	45	0.160	0.076	0.259	65	0.127	0.429	0.410	85	0.474	0.345	0.868
6	0.089	0.067	0.365	26	0.053	0.037	0.129	46	0.223	0.076	0.192	66	0.132	0.242	0.378	86	0.433	0.360	0.773
7	0.058	0.048	0.653	27	0.066	0.023	0.132	47	0.366	0.129	0.276	67	0.139	0.161	0.285	87	0.312	0.391	0.690
8	0.105	0.080	1.081	28	0.031	0.017	0.071	48	0.586	0.141	0.422	68	0.141	0.169	0.394	88	0.159	0.219	0.638
9	0.087	0.101	0.852	29	0.035	0.022	0.111	49	0.468	0.184	0.315	69	0.165	0.173	0.550	89	0.182	0.420	0.921
10	0.098	0.043	0.802	30	0.048	0.020	0.104	50	0.688	0.245	0.527	70	0.201	0.155	0.728	90	0.133	0.357	0.575
11	0.069	0.074	0.699	31	0.050	0.026	0.131	51	0.557	0.163	0.497	71	0.222	0.209	0.714	91	0.135	0.188	0.267
12	0.054	0.036	0.448	32	0.047	0.023	0.113	52	0.595	0.276	0.494	72	0.163	0.206	0.703	92	0.091	0.112	0.356
13	0.064	0.043	0.477	33	0.074	0.040	0.115	53	0.515	0.228	0.424	73	0.085	0.152	0.416	93	0.086	0.086	0.236
14	0.067	0.038	0.400	34	0.084	0.048	0.174	54	0.519	0.183	0.280	74	0.089	0.142	0.599	94	0.121	0.153	0.234
15	0.047	0.039	0.279	35	0.081	0.046	0.157	55	0.366	0.168	0.175	75	0.112	0.197	0.702	95	0.151	0.191	0.281
16	0.029	0.044	0.176	36	0.134	0.050	0.195	56	0.251	0.132	0.221	76	0.194	0.290	0.958	96	0.220	0.272	0.644
17	0.044	0.029	0.239	37	0.133	0.063	0.207	57	0.212	0.103	0.221	77	0.211	0.234	0.719	97	0.129	0.232	0.341
18	0.030	0.025	0.117	38	0.229	0.058	0.440	58	0.256	0.123	0.242	78	0.120	0.148	0.365	98	0.170	0.182	0.407
19	0.038	0.021	0.145	39	0.180	0.050	0.197	59	0.241	0.122	0.393	79	0.094	0.221	0.385	99	0.235	0.347	0.590
20	0.020	0.024	0.118	40	0.185	0.052	0.293	60	0.354	0.159	0.491	80	0.123	0.144	0.462	100	0.199	0.185	0.379

GeoSonics Seismic Analysis

SN:3203 v2.59

Date: 02/18/2001

Event: 6

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: KELLOGG CH 84

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)
90 (dB)

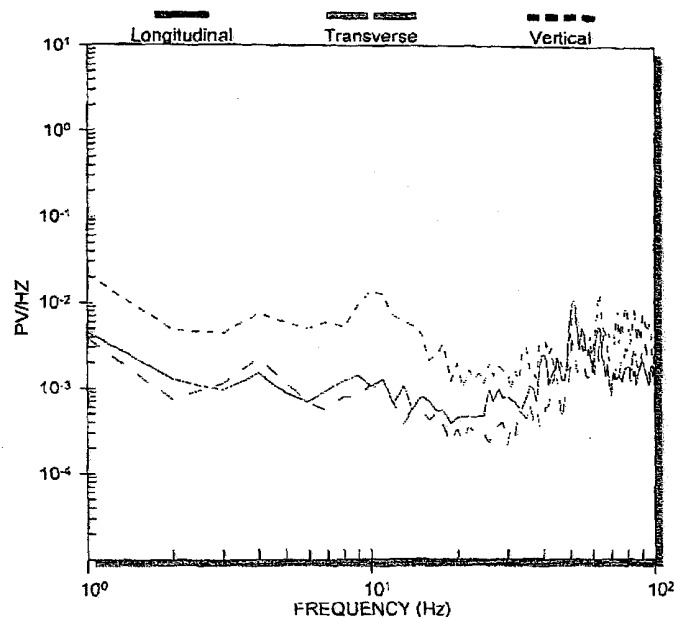
Time: 20:26:53

Record Time: 15.0 s

GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 6

Fast Fourier Amplitudes (PV=in/sec)



Summary Data

	L	T	V
PPV (in/s)	0.118	0.100	0.275
PD (.001")	0.89	1.55	3.77
PPA (g)	0.143	0.130	0.306
FREQ (Hz)	55.6	41.7	83.3
RESULTANT PPV (in/s)	0.278		
PEAK AIR PRESSURE (dB)	120		
(psi)	0.0030		

Velocity Waveform Graph Scale

Time = 0.300 s

Seismic = +/- 0.32(in/s)

Sound = +/- 0.0045 psi

Shaketable Calibrated: 01/11/2001

By Vibra-Tech

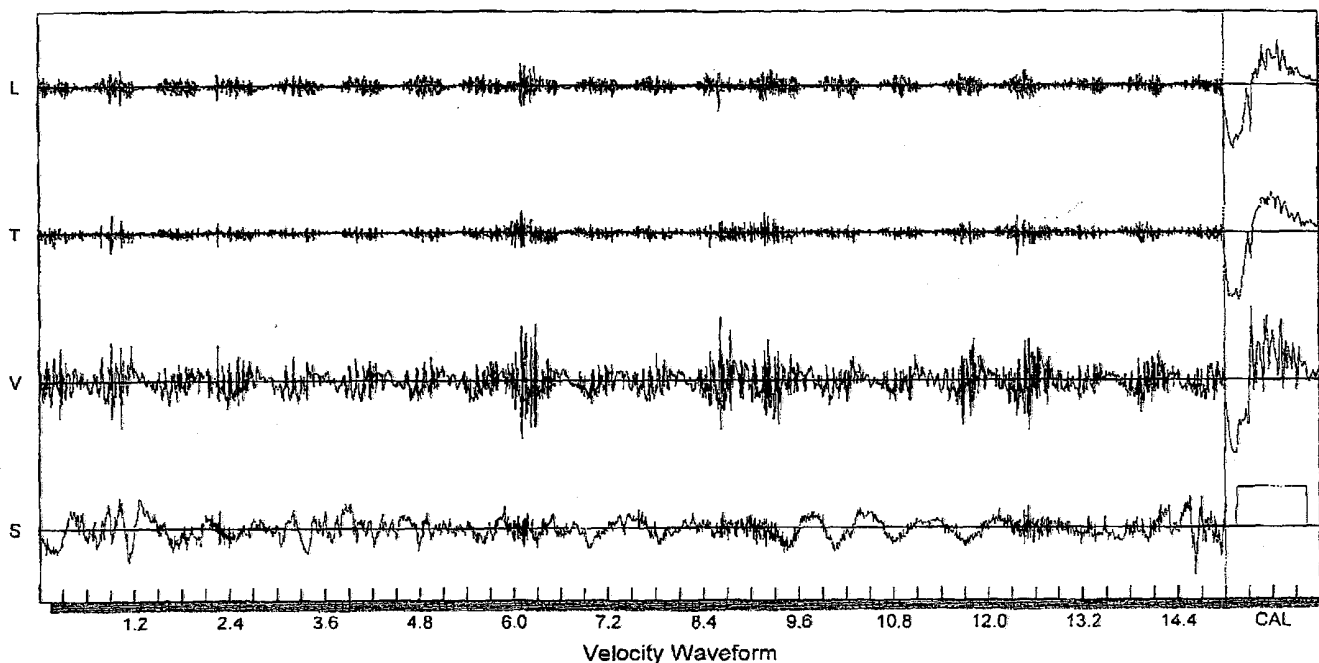
111 East Kentucky Street

Louisville, Ky 40203 U.S.A

TEL: 502.587.7277 FAX: 502.568.6833

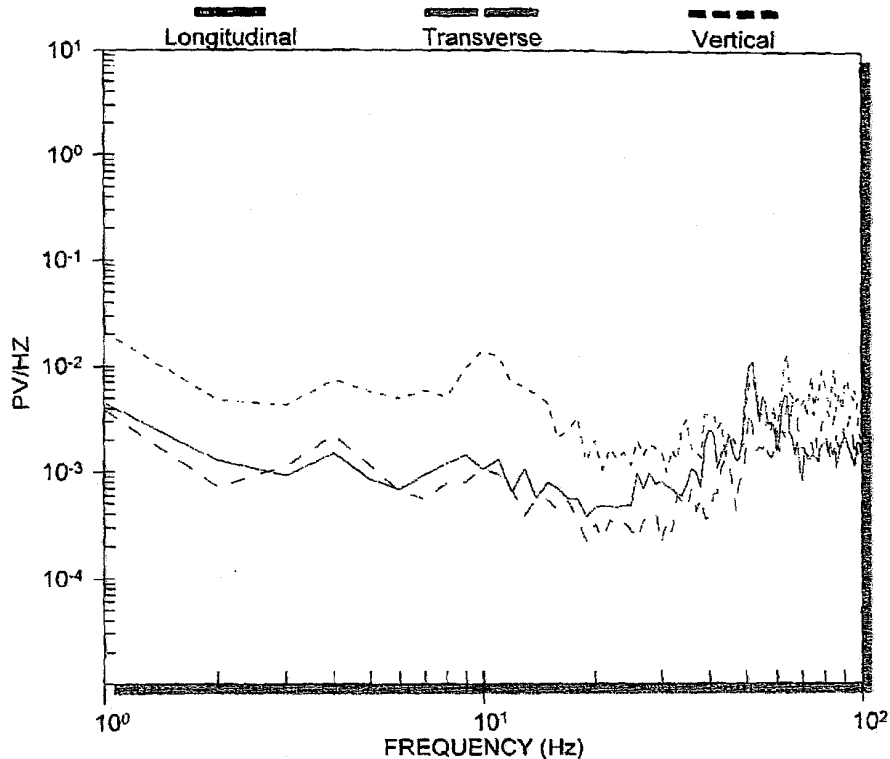
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 6



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 6
Fast Fourier Amplitudes (PV=in/sec)



Date: 02/18/2001 Time: 20:26:53
Event: 6 Record Time: 15.0 s
Client: RECKINGER
Operation: DM&E COMPARE
SSU Location: KELLOGG CH 84
Distance to Ctr Ln: 10.5 ft
Operator: APR
Comments:
Trigger level: 0.005 (in/s)
90 (dB)

		Summary Data		
		L	T	V
PPV (in/s)		0.118	0.100	0.275
PD (.001")		0.89	1.55	3.77
PPA (g)		0.143	0.130	0.306
FREQ (Hz)		55.6	41.7	83.3
RESULTANT PPV (in/s)	:		0.278	
PEAK AIR PRESSURE (dB)	:		120	
	(psi):		0.0030	

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES				
FRQ	PV / Hz.				FRQ	PV / Hz.				FRQ	PV / Hz.				FRQ	PV / Hz.				FRQ	PV / Hz.			
Hz.	L	T	V		Hz.	L	T	V		Hz.	L	T	V		Hz.	L	T	V		Hz.	L	T	V	
1	0.452	0.385	2.109		21	0.047	0.023	0.102		41	0.231	0.060	0.350		61	0.213	0.149	0.397		81	0.181	0.182	0.577	
2	0.128	0.072	0.480		22	0.047	0.035	0.164		42	0.106	0.061	0.245		62	0.411	0.243	0.579		82	0.163	0.120	0.326	
3	0.092	0.113	0.433		23	0.045	0.029	0.128		43	0.144	0.105	0.291		63	0.529	0.208	1.033		83	0.175	0.219	0.436	
4	0.149	0.222	0.737		24	0.048	0.033	0.150		44	0.162	0.133	0.130		64	0.510	0.511	1.297		84	0.140	0.260	0.684	
5	0.085	0.113	0.572		25	0.047	0.028	0.112		45	0.228	0.127	0.229		65	0.235	0.260	0.560		85	0.163	0.331	0.913	
6	0.068	0.065	0.495		26	0.095	0.022	0.193		46	0.157	0.071	0.206		66	0.197	0.449	0.496		86	0.106	0.194	0.359	
7	0.093	0.054	0.589		27	0.069	0.035	0.139		47	0.123	0.042	0.172		67	0.139	0.404	0.432		87	0.144	0.168	0.542	
8	0.120	0.078	0.509		28	0.096	0.036	0.182		48	0.130	0.077	0.183		68	0.193	0.326	0.489		88	0.163	0.146	0.465	
9	0.142	0.080	0.924		29	0.075	0.040	0.161		49	0.222	0.092	0.165		69	0.108	0.178	0.401		89	0.191	0.153	0.367	
10	0.104	0.106	1.386		30	0.080	0.021	0.157		50	0.614	0.167	0.428		70	0.081	0.165	0.427		90	0.213	0.254	0.570	
11	0.129	0.095	1.252		31	0.072	0.034	0.096		51	0.975	0.364	0.685		71	0.156	0.161	0.488		91	0.205	0.307	0.737	
12	0.064	0.067	0.699		32	0.069	0.026	0.159		52	1.064	0.258	0.761		72	0.143	0.129	0.317		92	0.169	0.264	0.691	
13	0.105	0.039	0.617		33	0.060	0.058	0.125		53	0.543	0.152	0.474		73	0.129	0.190	0.616		93	0.155	0.335	0.541	
14	0.055	0.056	0.542		34	0.058	0.049	0.259		54	0.288	0.167	0.365		74	0.139	0.180	0.791		94	0.134	0.267	0.535	
15	0.079	0.053	0.439		35	0.075	0.043	0.304		55	0.511	0.156	0.332		75	0.135	0.140	0.334		95	0.122	0.107	0.458	
16	0.069	0.042	0.208		36	0.105	0.067	0.158		56	0.443	0.191	0.273		76	0.131	0.206	0.550		96	0.108	0.132	0.584	
17	0.054	0.052	0.241		37	0.096	0.041	0.155		57	0.280	0.142	0.297		77	0.120	0.117	0.453		97	0.178	0.172	0.452	
18	0.054	0.035	0.323		38	0.069	0.055	0.130		58	0.289	0.132	0.244		78	0.163	0.211	0.737		98	0.188	0.129	0.257	
19	0.038	0.022	0.121		39	0.192	0.036	0.344		59	0.262	0.153	0.411		79	0.178	0.301	0.697		99	0.165	0.181	0.198	
20	0.045	0.033	0.195		40	0.246	0.037	0.344		60	0.153	0.192	0.195		80	0.180	0.283	0.665		100	0.119	0.141	0.355	

GeoSonics Seismic Analysis

SN:3203 v2.59
 Date: 02/18/2001 Time: 20:27:29
 Event: 7 Record Time: 15.0 s
 Client: RECKINGER
 Operation: DM&E COMPARE
 SSU Location: KELLOGG CH 84
 Distance to Ctr Ln: 10.5 ft
 Operator: APR
 Comments:
 Trigger level: 0.005 (in/s)
 90 (dB)

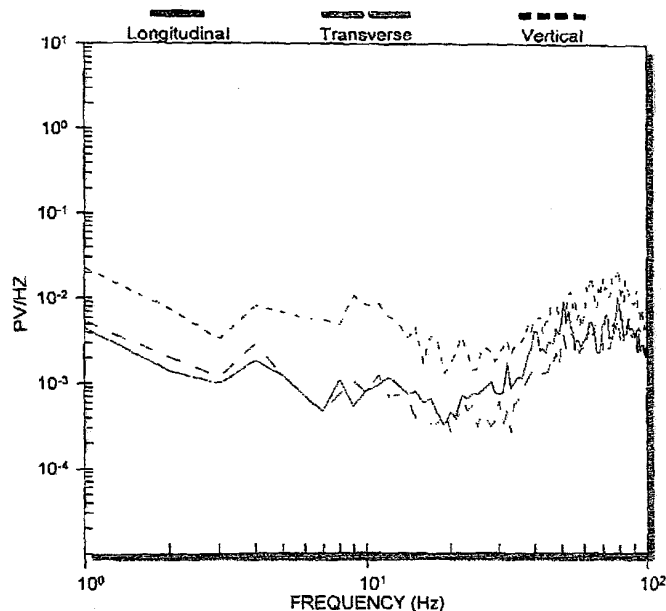
	Summary Data		
	L	T	V
PPV (in/s)	0.365	0.175	0.590
PD (.001")	1.14	1.57	5.75
PPA (g)	0.339	0.228	0.710
FREQ (Hz)	55.6	83.3	83.3
RESULTANT PPV (in/s)	0.635		
PEAK AIR PRESSURE (dB)	121		
(psi)	0.0035		

Velocity Waveform Graph Scale
 Time = 0.300 s
 Seismic = +/- 0.64(in/s)
 Sound = +/- 0.0045 psi

Shaketable Calibrated: 01/11/2001
 By Vibra-Tech
 111 East Kentucky Street
 Louisville, Ky 40203 U.S.A.
 TEL: 502.587.7277 FAX: 502.568.6833

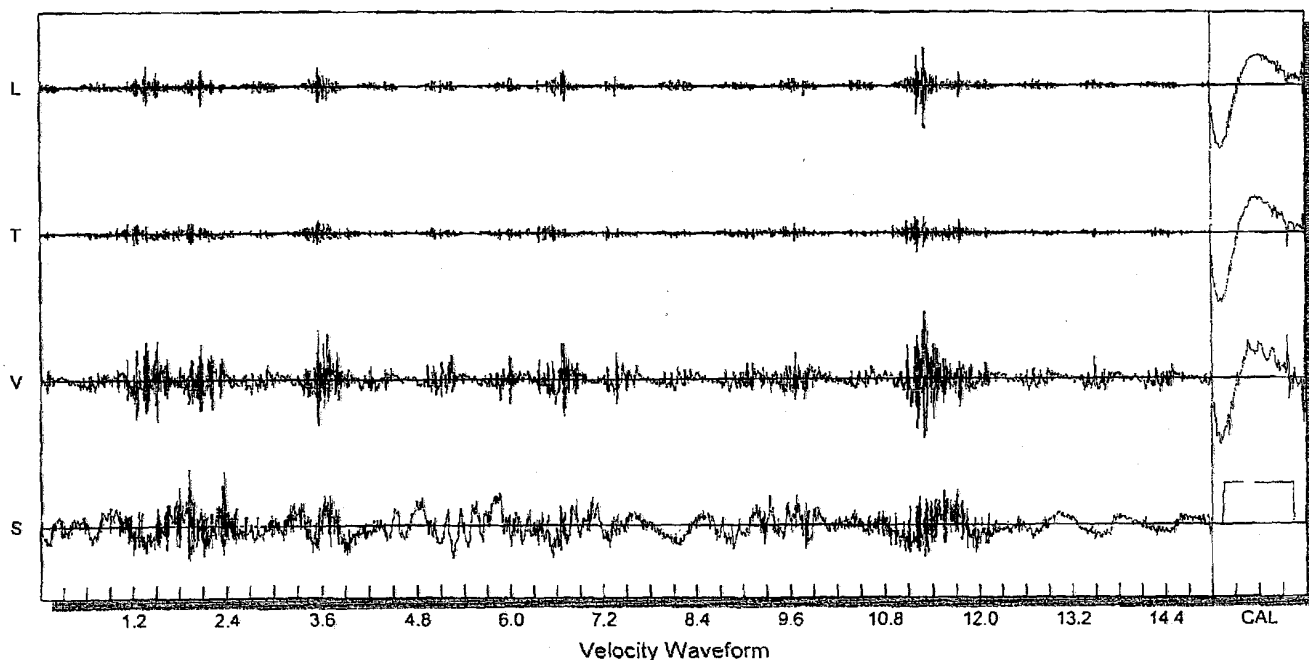
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 7
 Fast Fourier Amplitudes (PV=in/sec)



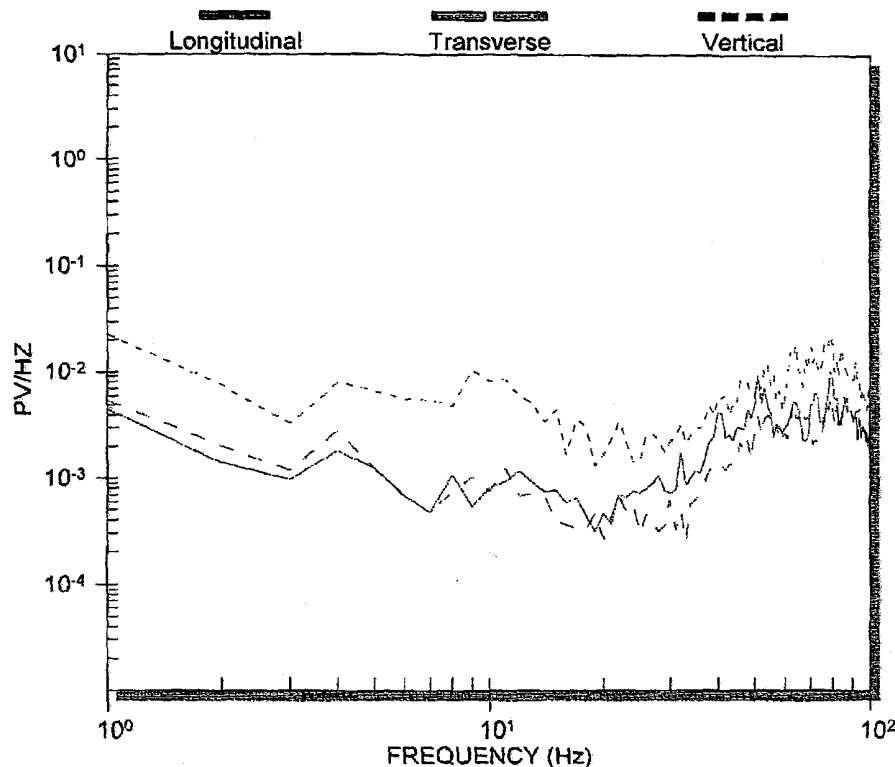
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 7



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 7
Fast Fourier Amplitudes (PV=in/sec)



Date: 02/18/2001

Time: 20:27:29

Event: 7

Record Time: 15.0 s

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: KELLOGG CH 84

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)
90 (dB)

Summary Data

	L	T	V
PPV (in/s)	0.365	0.175	0.590
PD (.001")	1.14	1.57	5.75
PPA (g)	0.339	0.228	0.710
FREQ (Hz)	55.6	83.3	83.3
RESULTANT PPV (in/s) :	0.635		
PEAK AIR PRESSURE (dB):	121		
(psi):	0.0035		

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES				
FRQ	L	T	V		FRQ	L	T	V		FRQ	L	T	V		FRQ	L	T	V		FRQ	L	T	V	
1	0.452	0.547	2.256		21	0.037	0.044	0.231		41	0.406	0.130	0.576		61	0.329	0.239	0.860		81	0.571	0.324	1.005	
2	0.140	0.202	0.752		22	0.071	0.069	0.347		42	0.240	0.120	0.620		62	0.394	0.308	1.585		82	0.600	0.510	1.276	
3	0.098	0.118	0.332		23	0.066	0.048	0.227		43	0.256	0.136	0.397		63	0.540	0.536	1.402		83	0.319	0.380	0.925	
4	0.183	0.284	0.800		24	0.076	0.055	0.142		44	0.227	0.135	0.558		64	0.527	0.376	1.825		84	0.366	0.318	1.659	
5	0.123	0.123	0.677		25	0.073	0.030	0.149		45	0.308	0.145	0.539		65	0.457	0.371	1.087		85	0.380	0.479	1.411	
6	0.069	0.066	0.575		26	0.081	0.046	0.257		46	0.298	0.220	0.844		66	0.334	0.500	0.931		86	0.602	0.518	1.227	
7	0.047	0.047	0.560		27	0.091	0.038	0.263		47	0.292	0.182	0.828		67	0.233	0.407	0.749		87	0.431	0.612	1.004	
8	0.108	0.074	0.485		28	0.105	0.031	0.233		48	0.458	0.232	0.809		68	0.229	0.360	1.345		88	0.461	0.375	0.897	
9	0.053	0.103	1.048		29	0.076	0.035	0.178		49	0.372	0.153	0.621		69	0.244	0.380	1.102		89	0.445	0.346	0.902	
10	0.083	0.076	0.824		30	0.074	0.062	0.223		50	0.511	0.273	0.618		70	0.508	0.323	1.767		90	0.412	0.429	0.832	
11	0.094	0.125	0.855		31	0.078	0.032	0.254		51	0.932	0.383	0.804		71	0.511	0.208	1.234		91	0.347	0.313	0.862	
12	0.118	0.069	0.614		32	0.176	0.048	0.322		52	0.524	0.261	0.704		72	0.662	0.231	1.423		92	0.471	0.442	1.267	
13	0.092	0.072	0.525		33	0.086	0.025	0.216		53	0.724	0.371	1.129		73	0.609	0.228	1.141		93	0.232	0.431	0.774	
14	0.075	0.068	0.338		34	0.101	0.057	0.254		54	0.477	0.402	1.200		74	0.342	0.273	1.020		94	0.388	0.473	0.810	
15	0.078	0.039	0.461		35	0.119	0.062	0.312		55	0.421	0.365	0.762		75	0.350	0.253	1.223		95	0.242	0.372	0.583	
16	0.058	0.037	0.170		36	0.114	0.079	0.299		56	0.243	0.282	0.944		76	0.324	0.503	1.996		96	0.290	0.307	0.723	
17	0.066	0.033	0.358		37	0.154	0.094	0.365		57	0.332	0.334	0.563		77	0.514	0.514	1.961		97	0.289	0.278	0.558	
18	0.044	0.033	0.312		38	0.218	0.119	0.486		58	0.303	0.220	0.694		78	0.636	0.449	1.826		98	0.273	0.221	0.444	
19	0.031	0.047	0.130		39	0.249	0.138	0.398		59	0.267	0.247	0.448		79	1.036	0.608	2.276		99	0.206	0.265	0.522	
20	0.047	0.026	0.167		40	0.423	0.141	0.592		60	0.303	0.269	0.597		80	0.845	0.432	1.820		100	0.332	0.356	0.923	

GeoSonics Seismic Analysis

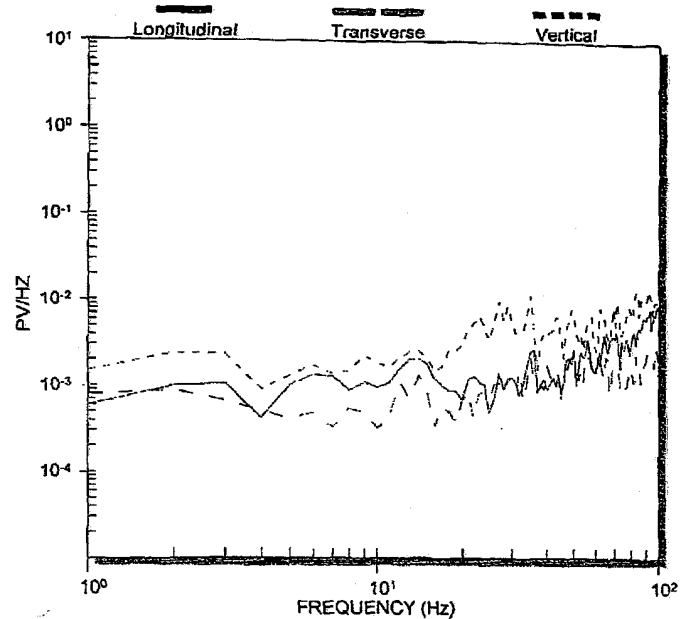
SN:3203 v2.59
 Date: 02/19/2001 Time: 09:04:07
 Event: 9 Record Time: 15.0 s
 Client: RECKINGER
 Operation: DM&E COMPARE
 SSU Location: HWY 14 & WIN CH 115
 Distance to Ctr Ln: 10.5 ft
 Operator: APR
 Comments:
 Trigger level: 0.005 (in/s)
 90 (dB)

GeoSonics Seismic Analysis
 SN: 3203 v2.59 Event: 9
 Fast Fourier Amplitudes (PV=in/sec)

Summary Data			
	L	T	V
PPV (in/s)	0.250	0.105	0.443
PD (.001")	1.41	1.66	1.71
PPA (g)	0.378	0.156	0.677
FREQ (Hz)	83.3	83.3	83.3
RESULTANT PPV (in/s)	0.458		
PEAK AIR PRESSURE (dB):	120		
(psi):	0.0029		

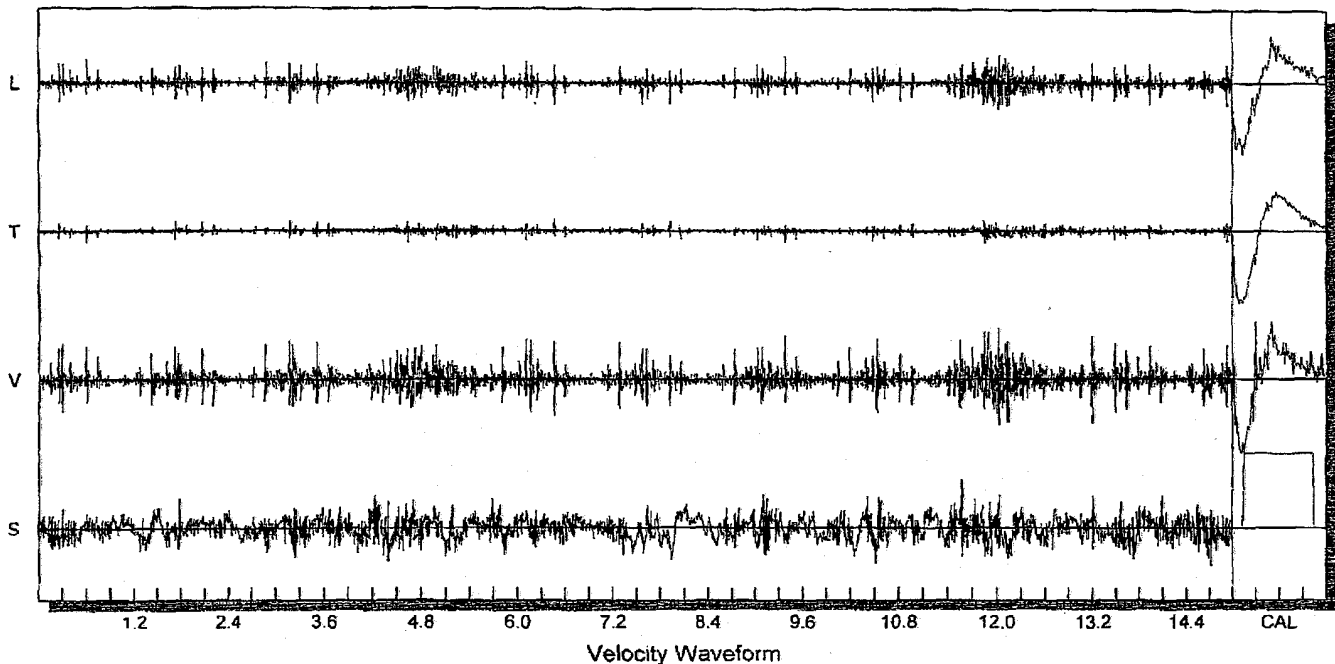
Velocity Waveform Graph Scale
 Time = 0.300 s
 Seismic = +/- 0.64(in/s)
 Sound = +/- 0.0045 psi

Shaketable Calibrated: 01/11/2001
 By Vibra-Tech
 111 East Kentucky Street
 Louisville, Ky 40203 U.S.A
 TEL: 502.587.7277 FAX: 502.568.6833



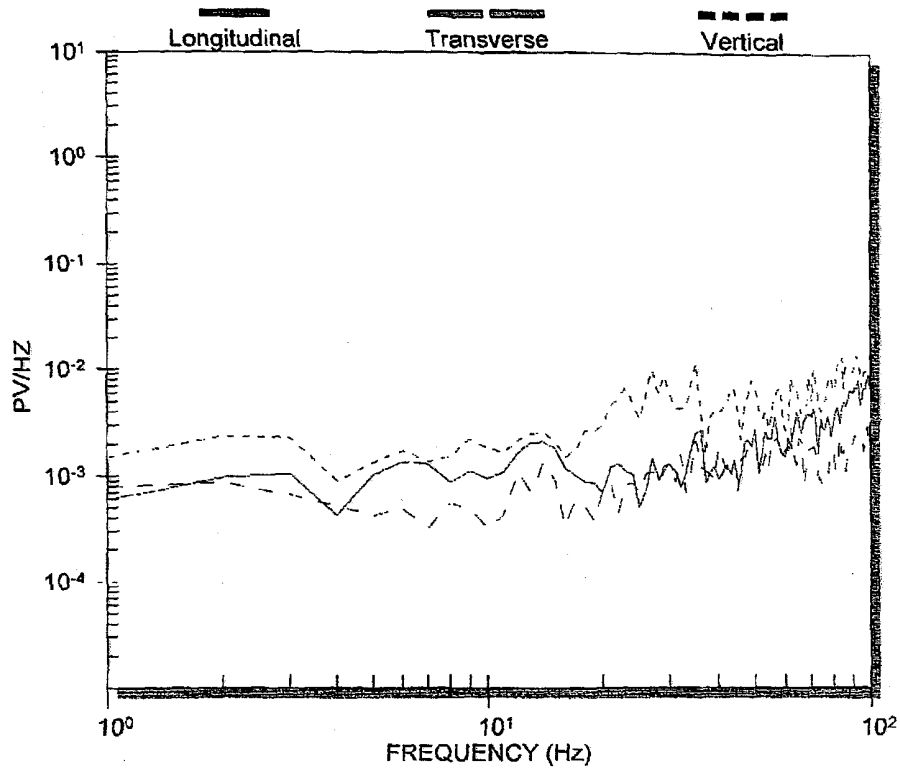
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 9



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 9
Fast Fourier Amplitudes (PV=in/sec)



Date: 02/19/2001

Time: 09:04:07

Event: 9

Record Time: 15.0 s

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: HWY 14 & WIN CH 115

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)

90 (dB)

Summary Data

	L	T	V
PPV (in/s)	0.250	0.105	0.443
PD (.001")	1.41	1.66	1.71
PPA (g)	0.378	0.156	0.677
FREQ (Hz)	83.3	83.3	83.3
RESULTANT PPV (in/s) :	0.458		
PEAK AIR PRESSURE (dB):	120		
(psi):	0.0029		

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES			
FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V
Hz.				Hz.				Hz.				Hz.				Hz.			
1	0.059	0.078	0.149	21	0.121	0.087	0.456	41	0.109	0.141	0.434	61	0.232	0.169	0.335	81	0.395	0.112	0.672
2	0.099	0.088	0.240	22	0.131	0.044	0.548	42	0.127	0.116	0.461	62	0.182	0.285	0.843	82	0.444	0.116	1.121
3	0.105	0.066	0.231	23	0.111	0.083	0.662	43	0.103	0.129	0.662	63	0.267	0.157	0.658	83	0.309	0.235	1.261
4	0.042	0.052	0.090	24	0.102	0.086	0.477	44	0.138	0.147	0.631	64	0.403	0.125	0.660	84	0.412	0.163	1.335
5	0.103	0.042	0.133	25	0.050	0.071	0.339	45	0.085	0.069	0.385	65	0.309	0.232	0.486	85	0.501	0.177	0.674
6	0.136	0.049	0.172	26	0.071	0.105	0.574	46	0.109	0.146	0.218	66	0.255	0.210	0.365	86	0.451	0.110	1.059
7	0.129	0.032	0.138	27	0.145	0.109	0.978	47	0.207	0.148	0.478	67	0.340	0.081	0.275	87	0.522	0.149	1.028
8	0.088	0.055	0.151	28	0.090	0.087	0.579	48	0.221	0.188	0.583	68	0.362	0.128	0.438	88	0.647	0.172	1.051
9	0.111	0.049	0.224	29	0.125	0.114	0.867	49	0.186	0.220	0.805	69	0.382	0.175	0.846	89	0.622	0.194	0.980
10	0.095	0.032	0.185	30	0.139	0.132	0.582	50	0.274	0.217	0.641	70	0.357	0.181	0.506	90	0.615	0.201	0.956
11	0.109	0.042	0.164	31	0.109	0.086	0.423	51	0.105	0.130	0.431	71	0.437	0.188	1.007	91	0.695	0.249	1.090
12	0.162	0.108	0.216	32	0.076	0.158	0.425	52	0.167	0.120	0.341	72	0.293	0.155	0.736	92	0.683	0.220	1.383
13	0.207	0.072	0.248	33	0.108	0.068	0.437	53	0.262	0.160	0.405	73	0.164	0.095	0.486	93	0.804	0.224	1.138
14	0.211	0.133	0.257	34	0.177	0.115	0.701	54	0.225	0.116	0.277	74	0.343	0.092	0.397	94	0.461	0.241	0.940
15	0.180	0.090	0.209	35	0.254	0.216	1.141	55	0.228	0.228	0.403	75	0.281	0.081	0.457	95	0.583	0.226	0.695
16	0.119	0.034	0.151	36	0.272	0.120	0.377	56	0.362	0.215	0.564	76	0.282	0.096	0.530	96	0.601	0.169	0.933
17	0.101	0.058	0.169	37	0.084	0.111	0.156	57	0.261	0.233	0.643	77	0.369	0.102	0.688	97	0.674	0.216	0.987
18	0.088	0.051	0.269	38	0.108	0.102	0.351	58	0.178	0.149	0.674	78	0.301	0.130	0.863	98	0.835	0.303	0.948
19	0.087	0.037	0.257	39	0.122	0.092	0.400	59	0.154	0.152	0.333	79	0.236	0.178	0.831	99	0.901	0.206	0.939
20	0.069	0.067	0.300	40	0.093	0.183	0.372	60	0.150	0.177	0.264	80	0.335	0.171	0.641	100	0.574	0.233	0.698

GeoSonics Seismic Analysis

SN:3203 v2.59

Date: 02/19/2001

Event: 10

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: HWY 14 & WIN CH 115

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)

90 (dB)

Time: 09:04:44

Record Time: 15.0 s

GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 10

Fast Fourier Amplitudes (PV=in/sec)

Summary Data			
	L	T	V
PPV (in/s)	0.243	0.085	0.388
PD (.001")	0.91	0.91	1.23
PPA (g)	0.332	0.143	0.475
FREQ (Hz)	83.3	83.3	55.6
RESULTANT PPV (in/s) :	0.353		
PEAK AIR PRESSURE (dB):	118		
(psi):	0.0025		

Velocity Waveform Graph Scale

Time = 0.300 s

Seismic = +/- 0.64(in/s)

Sound = +/- 0.0045 psi

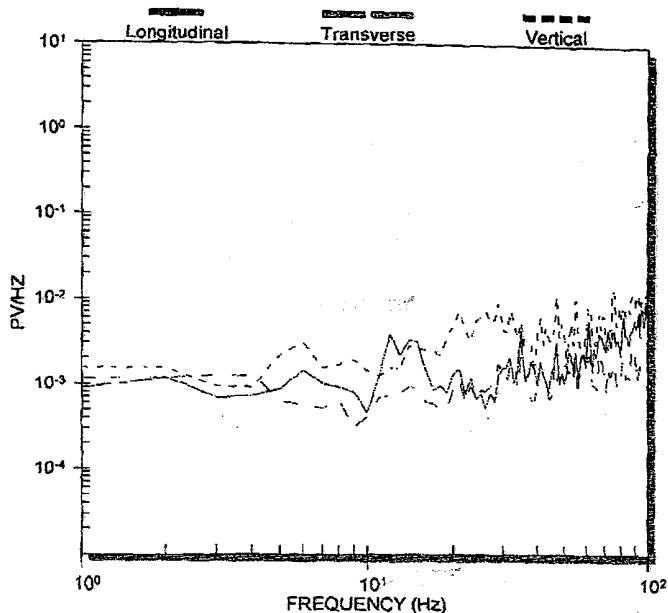
Shaketable Calibrated: 01/11/2001

By Vibra-Tech

111 East Kentucky Street

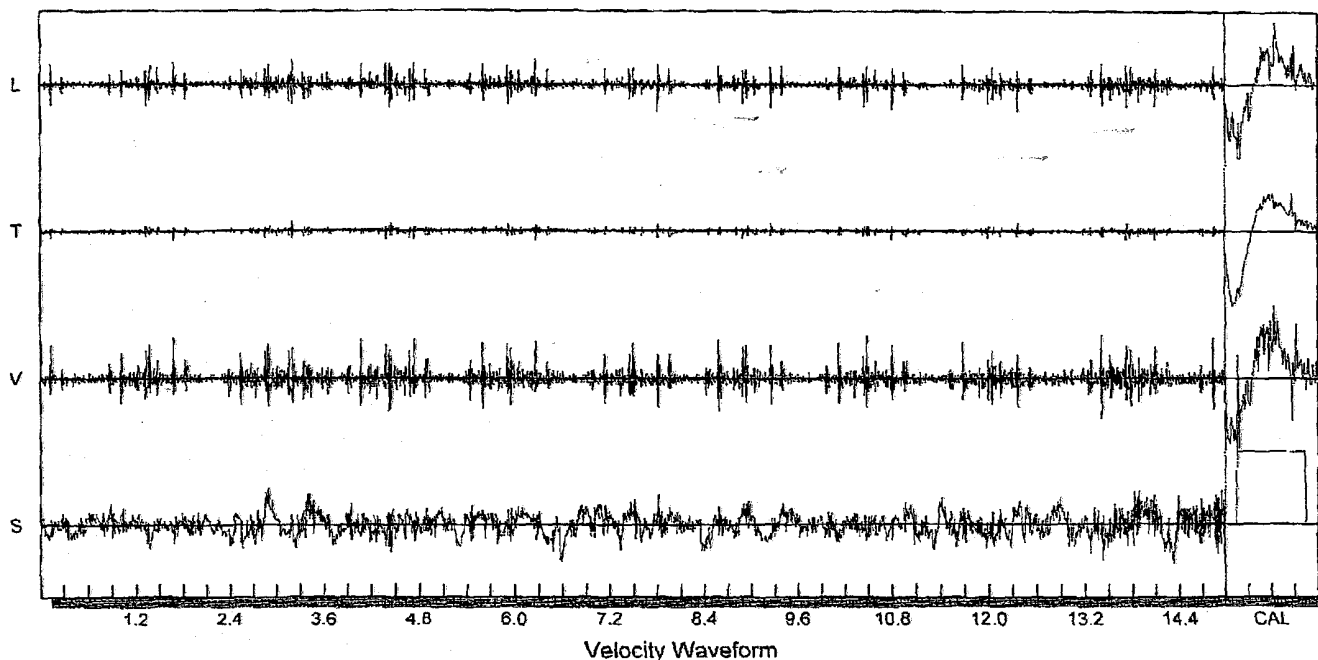
Louisville, Ky 40203 U.S.A

TEL: 502.587.7277 FAX: 502.568.6833



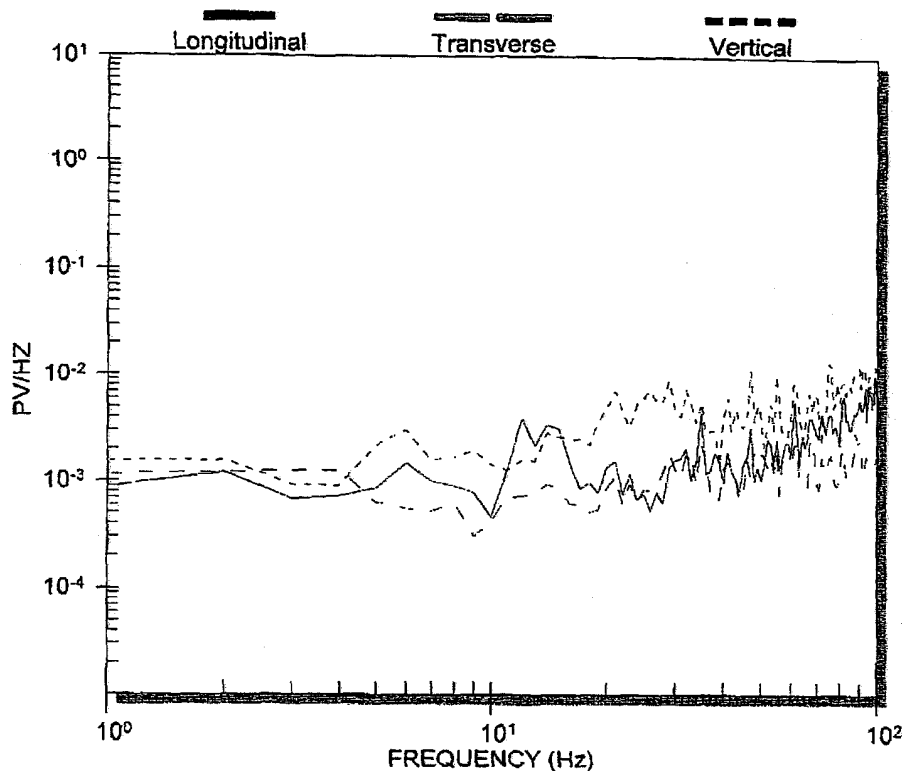
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 10



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 10
Fast Fourier Amplitudes (PV=in/sec)



Date: 02/19/2001 Time: 09:04:44
Event: 10 Record Time: 15.0 s
Client: RECKINGER
Operation: DM&E COMPARE
SSU Location: HWY 14 & WIN CH 115
Distance to Ctr Ln: 10.5 ft
Operator: APR
Comments:
Trigger level: 0.005 (in/s)
90 (dB)

Summary Data			
	L	T	V
PPV (in/s)	0.243	0.085	0.388
PD (.001")	0.91	0.91	1.23
PPA (g)	0.332	0.143	0.475
FREQ (Hz)	83.3	83.3	55.6
RESULTANT PPV (in/s) :	0.353		
PEAK AIR PRESSURE (dB):	118		
(psi):	0.0025		

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES			
FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V
Hz.	PV / Hz.			Hz.	PV / Hz.			Hz.	PV / Hz.			Hz.	PV / Hz.			Hz.	PV / Hz.		
1	0.088	0.115	0.152	21	0.155	0.114	0.718	41	0.193	0.154	0.623	61	0.571	0.222	0.861	81	0.579	0.196	0.862
2	0.119	0.119	0.154	22	0.076	0.061	0.433	42	0.128	0.137	0.300	62	0.309	0.225	0.750	82	0.664	0.203	0.872
3	0.068	0.124	0.093	23	0.117	0.096	0.319	43	0.107	0.111	0.485	63	0.143	0.100	0.377	83	0.385	0.116	0.670
4	0.073	0.126	0.091	24	0.067	0.065	0.563	44	0.082	0.068	0.341	64	0.274	0.098	0.318	84	0.393	0.126	0.807
5	0.087	0.063	0.219	25	0.077	0.085	0.621	45	0.144	0.076	0.320	65	0.214	0.092	0.301	85	0.314	0.128	0.836
6	0.147	0.055	0.301	26	0.052	0.083	0.725	46	0.170	0.164	0.440	66	0.255	0.091	0.593	86	0.308	0.120	0.733
7	0.100	0.052	0.155	27	0.080	0.093	0.541	47	0.317	0.107	1.123	67	0.404	0.256	0.700	87	0.442	0.181	1.016
8	0.091	0.063	0.170	28	0.062	0.119	0.580	48	0.101	0.191	0.366	68	0.383	0.205	0.462	88	0.433	0.293	1.106
9	0.079	0.031	0.194	29	0.134	0.182	0.906	49	0.135	0.159	0.532	69	0.338	0.186	0.687	89	0.490	0.232	1.205
10	0.046	0.042	0.144	30	0.157	0.179	0.450	50	0.104	0.180	0.398	70	0.285	0.096	0.628	90	0.592	0.242	1.189
11	0.127	0.071	0.127	31	0.164	0.108	0.399	51	0.136	0.172	0.212	71	0.254	0.086	0.322	91	0.473	0.185	0.776
12	0.386	0.073	0.158	32	0.208	0.182	0.742	52	0.251	0.138	0.316	72	0.434	0.167	0.244	92	0.493	0.111	1.196
13	0.217	0.077	0.154	33	0.104	0.178	0.525	53	0.226	0.176	0.545	73	0.359	0.124	0.436	93	0.748	0.151	1.197
14	0.335	0.084	0.282	34	0.149	0.097	0.359	54	0.145	0.127	0.301	74	0.284	0.130	0.485	94	0.379	0.175	0.434
15	0.314	0.087	0.259	35	0.441	0.229	0.568	55	0.250	0.109	1.027	75	0.429	0.161	1.333	95	0.826	0.148	1.019
16	0.149	0.062	0.251	36	0.119	0.145	0.284	56	0.128	0.076	0.407	76	0.430	0.180	1.209	96	0.681	0.148	0.982
17	0.085	0.059	0.247	37	0.126	0.083	0.300	57	0.172	0.174	0.293	77	0.294	0.112	0.504	97	0.564	0.156	0.502
18	0.097	0.051	0.218	38	0.188	0.065	0.304	58	0.234	0.203	0.264	78	0.340	0.095	0.580	98	0.568	0.146	0.807
19	0.079	0.054	0.363	39	0.148	0.066	0.141	59	0.232	0.226	0.271	79	0.290	0.093	0.880	99	1.000	0.148	1.224
20	0.136	0.087	0.503	40	0.099	0.131	0.397	60	0.183	0.140	0.491	80	0.223	0.133	0.582	100	0.652	0.192	0.671

GeoSonics Seismic Analysis

SN:3203 v2.59
 Date: 02/19/2001 Time: 09:05:21
 Event: 11 Record Time: 15.0
 Client: RECKINGER
 Operation: DM&E COMPARE
 SSU Location: HWY 14 & WIN CH 115
 Distance to Ctr Ln: 10.5 ft
 Operator: APR
 Comments:
 Trigger level: 0.005 (in/s)
 90 (dB)

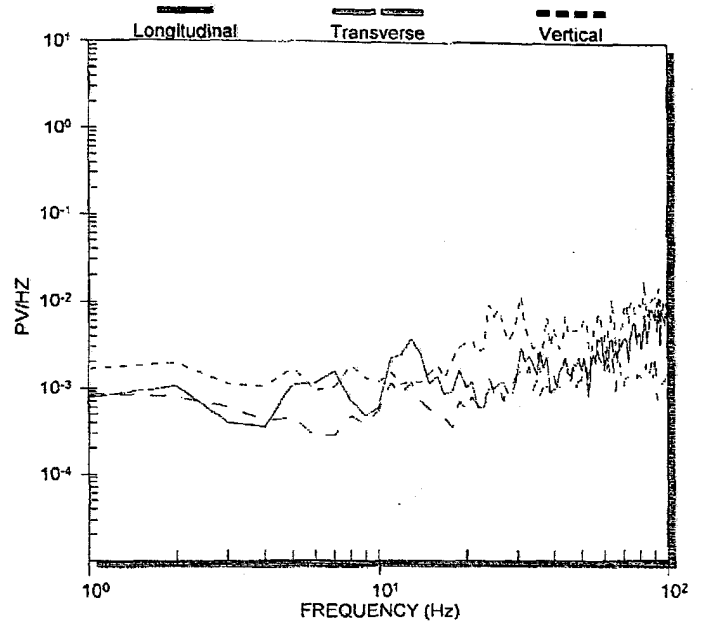
	Summary Data		
	L	T	V
PPV (in/s)	0.273	0.068	0.358
PD (.001")	0.77	0.61	1.22
PPA (g)	0.365	0.104	0.495
FREQ (Hz)	83.3	83.3	83.3
RESULTANT PPV (in/s)	0.403		
PEAK AIR PRESSURE (dB)	119		
(psi):	0.0028		

Velocity Waveform Graph Scale
 Time = 0.300 s
 Seismic = +/- 0.64(in/s)
 Sound = +/- 0.0045 psi

Shaketable Calibrated: 01/11/2001
 By Vibra-Tech
 111 East Kentucky Street
 Louisville, Ky 40203 U.S.A
 TEL: 502.587.7277 FAX: 502.568.6833

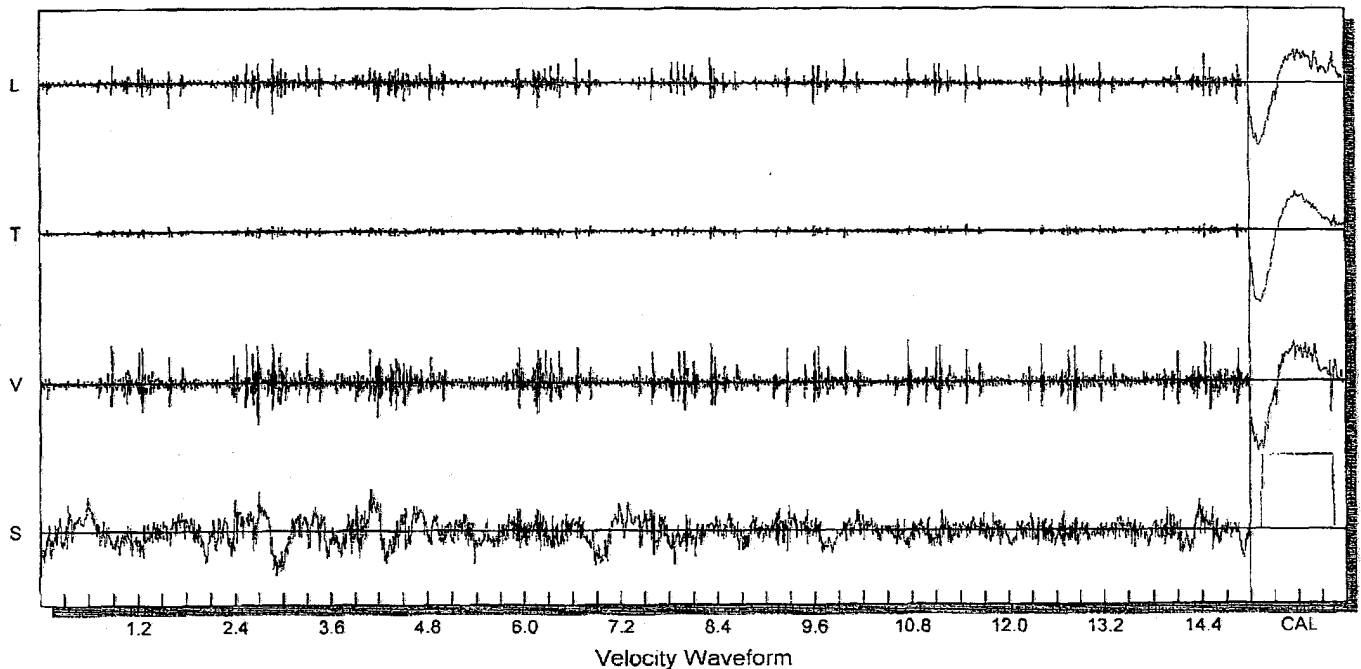
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 11
 Fast Fourier Amplitudes (PV=in/sec)



GeoSonics Seismic Analysis

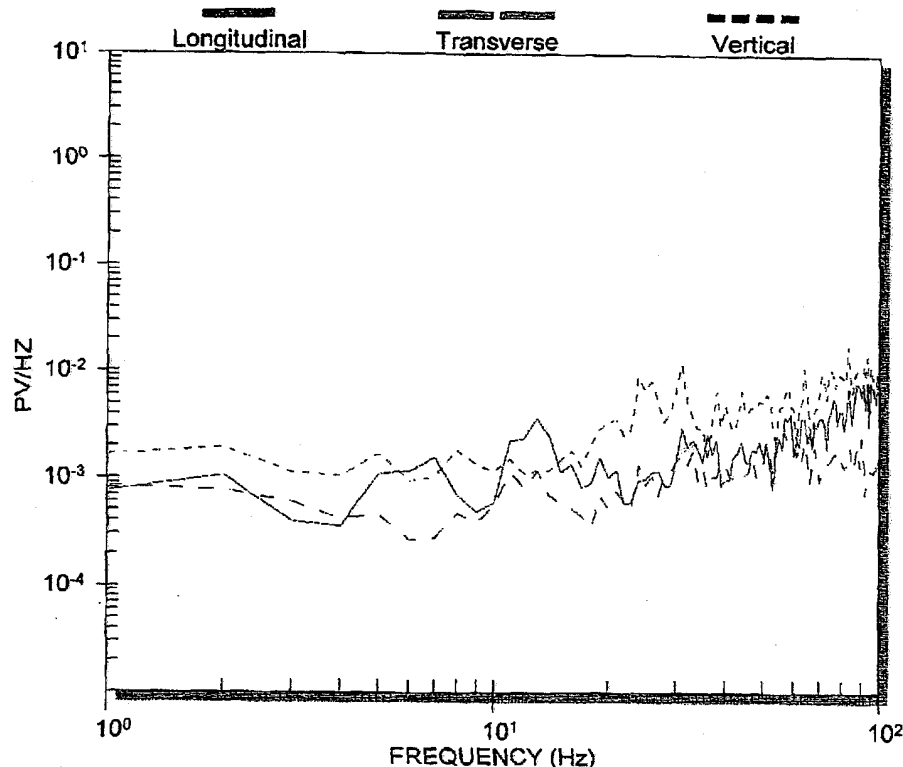
SN: 3203 v2.59 Event: 11



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 11

Fast Fourier Amplitudes (PV=in/sec)



Date: 02/19/2001

Time: 09:05:21

Event: 11

Record Time: 15.0 s

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: HWY 14 & WINCH 115

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)
90 (dB)

Summary Data

	L	T	V
PPV (in/s)	0.273	0.068	0.358
PD (.001")	0.77	0.61	1.22
PPA (g)	0.365	0.104	0.495
FREQ (Hz)	83.3	83.3	83.3
RESULTANT PPV (in/s) :		0.403	
PEAK AIR PRESSURE (dB):		119	
(psi):		0.0028	

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES					RESULTANT FOURIER AMPLITUDES				
FRQ	L	T	V	PV / Hz.	FRQ	L	T	V	PV / Hz.	FRQ	L	T	V	PV / Hz.	FRQ	L	T	V	PV / Hz.	FRQ	L	T	V	PV / Hz.
1	0.075	0.085	0.166		21	0.120	0.078	0.357		41	0.098	0.104	0.362		61	0.232	0.163	0.219		81	0.288	0.125	0.878	
2	0.106	0.077	0.192		22	0.058	0.062	0.253		42	0.157	0.103	0.284		62	0.207	0.197	0.472		82	0.368	0.137	0.813	
3	0.039	0.060	0.112		23	0.059	0.050	0.288		43	0.175	0.121	0.336		63	0.369	0.150	0.540		83	0.715	0.136	1.768	
4	0.035	0.042	0.104		24	0.096	0.133	0.906		44	0.228	0.111	0.682		64	0.375	0.225	1.086		84	0.490	0.197	1.032	
5	0.109	0.045	0.169		25	0.099	0.087	0.664		45	0.147	0.112	0.416		65	0.225	0.153	0.591		85	0.337	0.128	0.658	
6	0.115	0.027	0.094		26	0.115	0.105	0.817		46	0.140	0.119	0.432		66	0.281	0.092	0.304		86	0.487	0.124	0.739	
7	0.155	0.028	0.102		27	0.117	0.070	0.500		47	0.191	0.167	0.476		67	0.197	0.158	0.190		87	0.738	0.171	0.983	
8	0.070	0.047	0.183		28	0.087	0.108	0.342		48	0.178	0.104	0.460		68	0.339	0.200	0.444		88	0.812	0.206	1.034	
9	0.048	0.038	0.130		29	0.087	0.112	0.428		49	0.226	0.123	0.545		69	0.302	0.128	0.492		89	0.733	0.129	1.108	
10	0.059	0.056	0.116		30	0.147	0.145	0.669		50	0.158	0.125	0.509		70	0.374	0.095	0.666		90	0.608	0.253	1.120	
11	0.223	0.114	0.150		31	0.298	0.161	1.174		51	0.225	0.206	0.629		71	0.385	0.133	0.961		91	0.822	0.152	1.154	
12	0.238	0.082	0.110		32	0.198	0.129	0.498		52	0.134	0.168	0.555		72	0.343	0.135	0.878		92	0.455	0.071	0.876	
13	0.369	0.117	0.119		33	0.235	0.182	0.379		53	0.080	0.112	0.323		73	0.195	0.139	0.568		93	0.810	0.112	1.446	
14	0.248	0.070	0.117		34	0.190	0.095	0.294		54	0.180	0.221	0.203		74	0.392	0.143	0.882		94	0.316	0.122	0.533	
15	0.113	0.057	0.147		35	0.142	0.126	0.303		55	0.246	0.238	0.460		75	0.431	0.151	1.048		95	0.815	0.118	1.105	
16	0.137	0.053	0.184		36	0.263	0.079	0.148		56	0.191	0.218	0.495		76	0.583	0.167	0.971		96	0.713	0.114	1.132	
17	0.085	0.045	0.131		37	0.169	0.103	0.325		57	0.382	0.281	0.641		77	0.532	0.174	0.725		97	0.605	0.124	0.657	
18	0.091	0.035	0.211		38	0.232	0.104	0.666		58	0.356	0.215	0.741		78	0.327	0.132	0.831		98	0.601	0.124	0.513	
19	0.158	0.069	0.293		39	0.087	0.146	0.307		59	0.407	0.193	0.471		79	0.436	0.146	0.960		99	0.698	0.148	0.986	
20	0.102	0.053	0.334		40	0.098	0.140	0.484		60	0.164	0.205	0.450		80	0.434	0.146	0.911		100	0.572	0.145	0.715	

GeoSonics Seismic Analysis

SN:3203 v2.59
 Date: 02/19/2001
 Event: 12
 Client: RECKINGER
 Operation: DM&E COMPARE
 SSU Location: HWY 14 & WIN CH 115
 Distance to Ctr Ln: 10.5 ft
 Operator: APR
 Comments:
 Trigger level: 0.005 (in/s)
 90 (dB)

Time: 09:05:57
 Record Time: 15.0

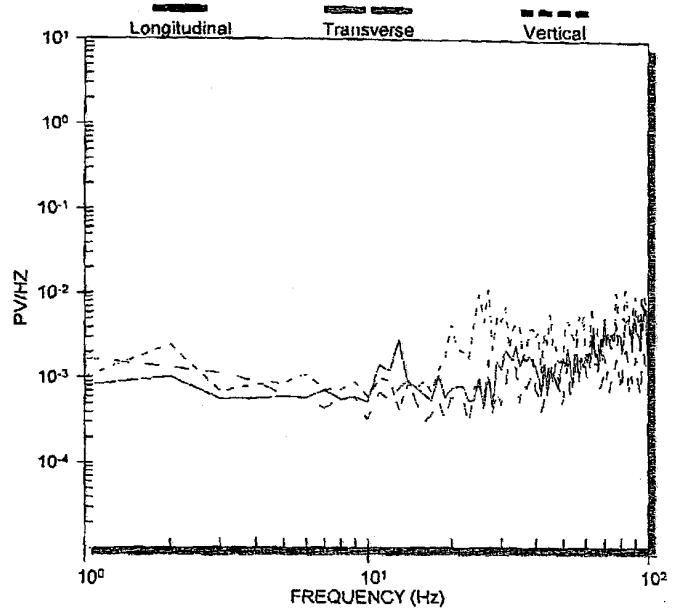
GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 12
 Fast Fourier Amplitudes (PV=in/sec)

Summary Data			
	L	T	V
PPV (in/s)	0.270	0.110	0.375
PD (.001")	0.76	0.85	0.97
PPA (g)	0.417	0.156	0.638
FREQ (Hz)	83.3	83.3	83.3
RESULTANT PPV (in/s)	0.448		
PEAK AIR PRESSURE (dB):	113		
(psi):	0.0014		

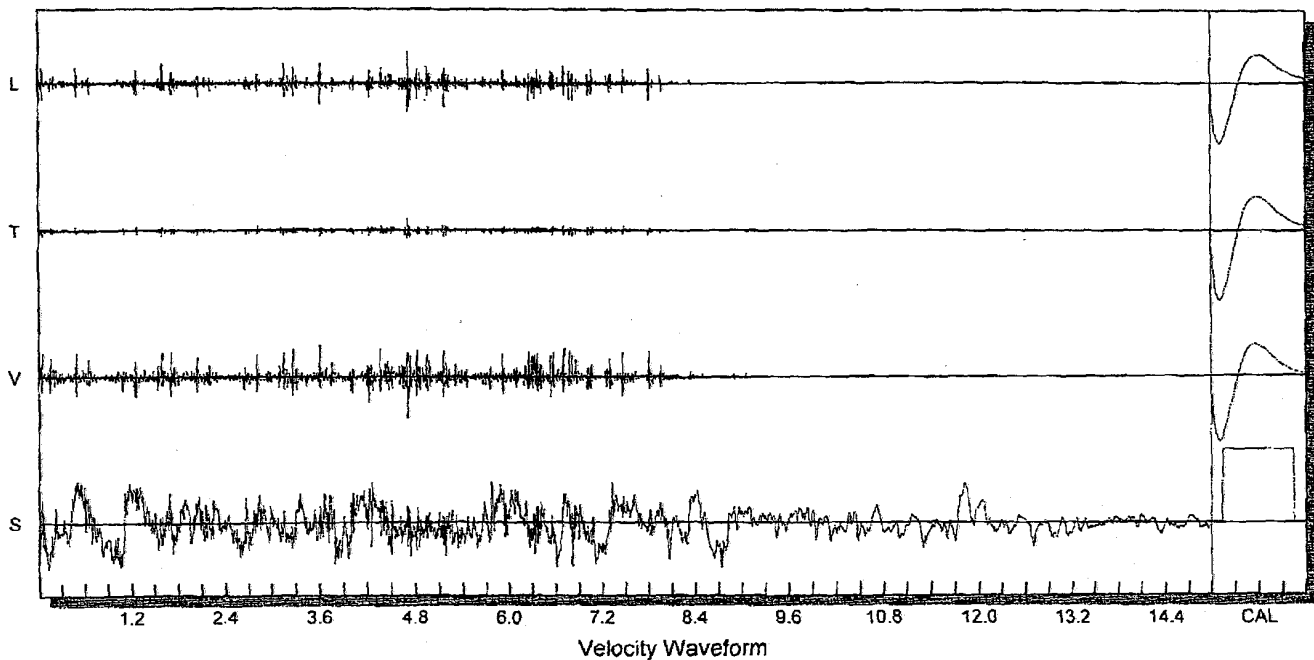
Velocity Waveform Graph Scale
 Time = 0.300 s
 Seismic = +/- 0.64(in/s)
 Sound = +/- 0.0023 psi

Shaketable Calibrated: 01/11/2001
 By Vibra-Tech
 111 East Kentucky Street
 Louisville, Ky 40203 U.S.A
 TEL: 502.587.7277 FAX: 502.568.6833



GeoSonics Seismic Analysis

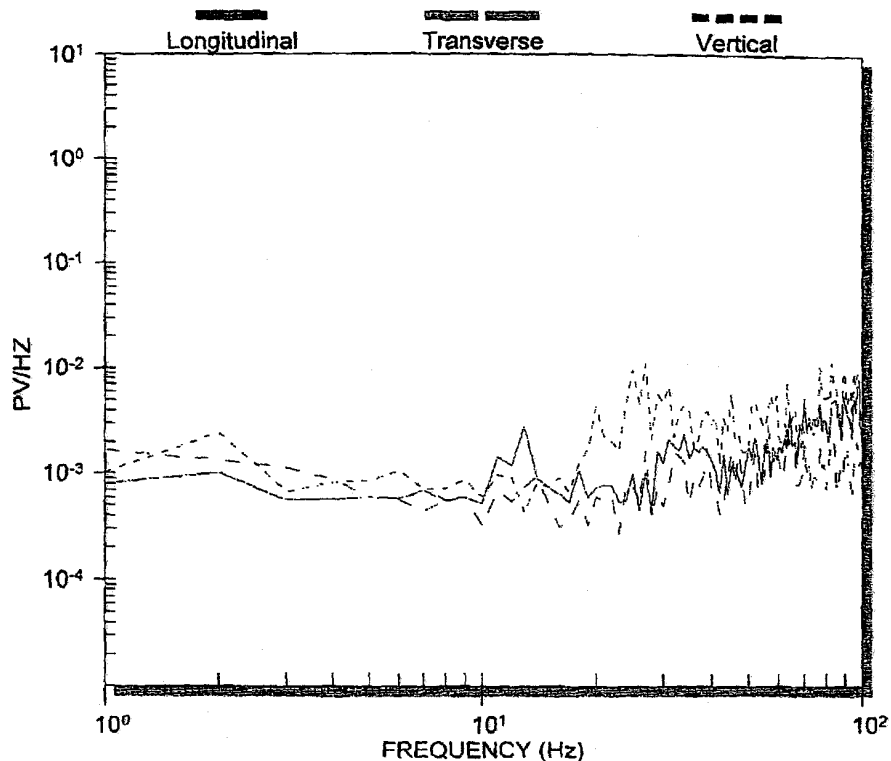
SN: 3203 v2.59 Event: 12



GeoSonics Seismic Analysis

SN: 3203 v2.59 Event: 12

Fast Fourier Amplitudes (PV=in/sec)



Date: 02/19/2001

Time: 09:05:57

Event: 12

Record Time: 15.0 s

Client: RECKINGER

Operation: DM&E COMPARE

SSU Location: HWY 14 & WINCH 115

Distance to Ctr Ln: 10.5 ft

Operator: APR

Comments:

Trigger level: 0.005 (in/s)

90 (dB)

Summary Data			
	L	T	V
PPV (in/s)	0.270	0.110	0.375
PD (.001")	0.76	0.85	0.97
PPA (g)	0.417	0.156	0.638
FREQ (Hz)	83.3	83.3	83.3
RESULTANT PPV (in/s)	0.448		
PEAK AIR PRESSURE (dB)	113		
(psi)	0.0014		

Levels Are Resultant Fourier Particle Velocity - Not Equivalent to Peak Particle Velocity
ALL LEVELS ARE MULTIPLIED BY: 100

RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES				RESULTANT FOURIER AMPLITUDES			
FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V	FRQ	L	T	V
Hz.				Hz.				Hz.				Hz.				Hz.			
1	0.081	0.168	0.102	21	0.078	0.053	0.220	41	0.106	0.065	0.345	61	0.157	0.092	0.178	81	0.200	0.107	0.553
2	0.101	0.133	0.242	22	0.078	0.059	0.203	42	0.064	0.040	0.118	62	0.210	0.118	0.201	82	0.277	0.185	0.499
3	0.056	0.112	0.067	23	0.053	0.027	0.165	43	0.150	0.056	0.337	63	0.175	0.328	0.730	83	0.487	0.205	1.127
4	0.056	0.088	0.083	24	0.055	0.077	0.465	44	0.063	0.094	0.248	64	0.399	0.179	0.289	84	0.500	0.217	0.706
5	0.059	0.061	0.085	25	0.101	0.080	0.970	45	0.120	0.166	0.578	65	0.182	0.148	0.336	85	0.512	0.086	0.715
6	0.057	0.056	0.107	26	0.044	0.051	0.461	46	0.113	0.078	0.216	66	0.204	0.155	0.416	86	0.339	0.067	0.479
7	0.070	0.044	0.072	27	0.103	0.165	1.111	47	0.091	0.156	0.243	67	0.123	0.077	0.214	87	0.383	0.110	0.258
8	0.055	0.057	0.072	28	0.044	0.038	0.214	48	0.075	0.094	0.159	68	0.301	0.081	0.246	88	0.212	0.089	0.332
9	0.059	0.059	0.088	29	0.161	0.072	0.566	49	0.120	0.048	0.160	69	0.238	0.097	0.162	89	0.549	0.101	0.828
10	0.052	0.032	0.060	30	0.124	0.048	0.476	50	0.177	0.056	0.107	70	0.529	0.198	0.407	90	0.453	0.185	0.948
11	0.143	0.068	0.097	31	0.215	0.076	0.687	51	0.137	0.100	0.444	71	0.252	0.097	0.290	91	0.361	0.180	0.380
12	0.119	0.054	0.092	32	0.166	0.158	0.222	52	0.224	0.155	0.483	72	0.320	0.124	0.345	92	0.349	0.092	0.571
13	0.279	0.075	0.043	33	0.163	0.145	0.375	53	0.138	0.066	0.364	73	0.264	0.068	0.261	93	0.308	0.084	0.617
14	0.089	0.095	0.082	34	0.240	0.127	0.455	54	0.080	0.078	0.317	74	0.338	0.094	0.234	94	0.222	0.065	0.342
15	0.076	0.051	0.075	35	0.137	0.052	0.399	55	0.195	0.100	0.273	75	0.286	0.089	0.343	95	0.519	0.126	0.939
16	0.064	0.031	0.092	36	0.174	0.090	0.173	56	0.199	0.303	0.364	76	0.287	0.098	0.341	96	0.382	0.125	0.678
17	0.053	0.035	0.067	37	0.158	0.074	0.215	57	0.095	0.182	0.559	77	0.463	0.174	1.060	97	0.689	0.204	0.917
18	0.185	0.055	0.123	38	0.182	0.092	0.367	58	0.182	0.129	0.441	78	0.254	0.114	0.579	98	0.674	0.119	0.773
19	0.059	0.032	0.170	39	0.157	0.173	0.390	59	0.135	0.179	0.562	79	0.336	0.125	0.534	99	0.290	0.131	0.347
20	0.074	0.060	0.429	40	0.132	0.071	0.294	60	0.182	0.131	0.231	80	0.309	0.071	0.526	100	0.193	0.107	0.356