



**FINAL REPORT**

***GROUND MOTION STUDY***

**FORGE 3D**

**Paragon Geophysical  
Beaver County Utah**

**November 22nd through November 24 2017**

**Urban Seismic Specialists, Inc.  
PO Box 1266  
New Ulm, Texas 78950  
Ph. 979.885.7235**

## **INTRODUCTION**

Paragon Geophysical contracted Urban Seismic Specialists to conduct A Ground Motion Study, on their Forge 3D project located near in Milford Utah .The test was conducted to measure the effects of the vibrator array on a pipeline owned by Kern River. Roger Nagel was the technician assigned to the project. The USSI crew mobilized to the job on site November 22<sup>nd</sup>, the testing was completed on November 23<sup>rd</sup> and demobilizing on November 24, 2017

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All efforts were made to ensure that all Urban Seismic personnel maintained professionalism, and integrity throughout operations to ensure that Paragon maintained a positive working relationship with the local community. All efforts were made to work very closely with the Recording crew to complete the test in a timely manner.

## **SWEEP TESTING:**

The purpose of the study is to measure the effects of the vibrator array on a pipeline owned by Kern River. The test was conducted  $\frac{3}{4}$  mile NW of the University of Utah's Geothermal plant next to a two track. The soil conditions at the test site were Sandy with grass and scrub brush growing in the field. The vibrators are setup 500' west of the Kern River pipeline, and 81 ft. east of receiver point 503171

The geophysical crew utilized a Vibrator array consisting of Two I/O AHV IV vibrators. The vibrators had a hold down weight of 62,000 lbs. The frequencies of the sweep that the crew was testing were a 4.0 Hz. to 84 Hz. Sweep, with 0.3 ms. start tapers and 0.3 ms, end tapers The crew tested two different Sweeps. The sweeps were recorded 5 times. To prove the repeatability of the sweeps.

The first sweep tested was a 70% drive level sweep with a 12 second sweep length. The second sweep tested was a 40% drive level sweep with a 12 second sweep length. The energy generated by the Vibrator array was recorded into a Sensor array. The sensor array was deployed in an easterly direction with the 500 f.t offset located at the Kern River pipeline.

The sensor array consisted of seven white seismology Mini Seis seismographs. The first seismograph was setup at 25ft. from the source array. The second seismograph was setup at 50 ft. from the source array. The remaining seismographs were deployed in increments of 50ft out to a distance of 300ft. After the conclusion of the testing of both of the sweeps the first four seismographs were picked up and redeployed at the 350ft, 400ft, 450ft. and 500ft. offsets from the source array. The trigger levels of the seismographs were lowered to 0.01 in/sec in an attempt to record any ground vibrations at these distances. The two sweep test were repeated to complete the testing process, the seismographs were downloaded and sent to our office for further processing and evaluation.

## RECOMMENDATIONS AND CONCLUSIONS

The results from the ground motion study indicate the data recorded from each of the two sweeps tested was highly repeatable in both particle motion and frequency content. All of the sweeps tested were conducted utilizing a vibrator array consisting of Two I/O AHV IV vibrators. The vibrators had a hold down weight of 62,000 lbs.

The first chart on page 6 shows the PPV levels of all of the sweeps. The second chart on page 7 shows the PPV levels of the five high force sweeps. The maximum Peak Particle Velocity (PPV) reading for the high force sweeps was a 0.338 in/sec reading with a frequencies ranging between 23 Hz and 25 Hz. These values were recorded utilizing Sweep 1, the 70% drive level sweep, and the third chart on page 8 shows the PPV levels of the five low force sweeps. The maximum Peak Particle Velocity (PPV) reading for the low force sweeps was a 0.161 in/sec reading with a frequencies ranging between 23 Hz and 25 Hz. These values were recorded utilizing Sweep 2, the 40% drive level,

All of the readings were below a PPV level of 0.4 in/sec at the 25 ft. offset from the vibrator array. The PPV data plots on Pages 9 and 10 show all three axis of each of the sweeps tested at the 25ft offset distance. A series of spreadsheets showing the Peak Particle Velocity and frequency that was recorded into the seismograph sensor array. The PPV values for the Radial, Vertical and the Transverse axis of the geophones are highlighted. There are five records recorded for each of the three sweeps tested, are on pages 13 and 25 of the report.

The full PPV wave form plots for the first High Force Sweep (70%) are included on pages 14 through 24 of the report. The full PPV wave form plots for the first Low Force (40%) Sweep are included on pages 26 through 33 of the report.

The ground motion study confirms that the 300ft, safe distance offset established prior to the commencement of the project is more than adequate to protect the Kern River pipeline. The ground motion study also established that the vibrators could operate within 50ft. of the Kern River pipeline safely.

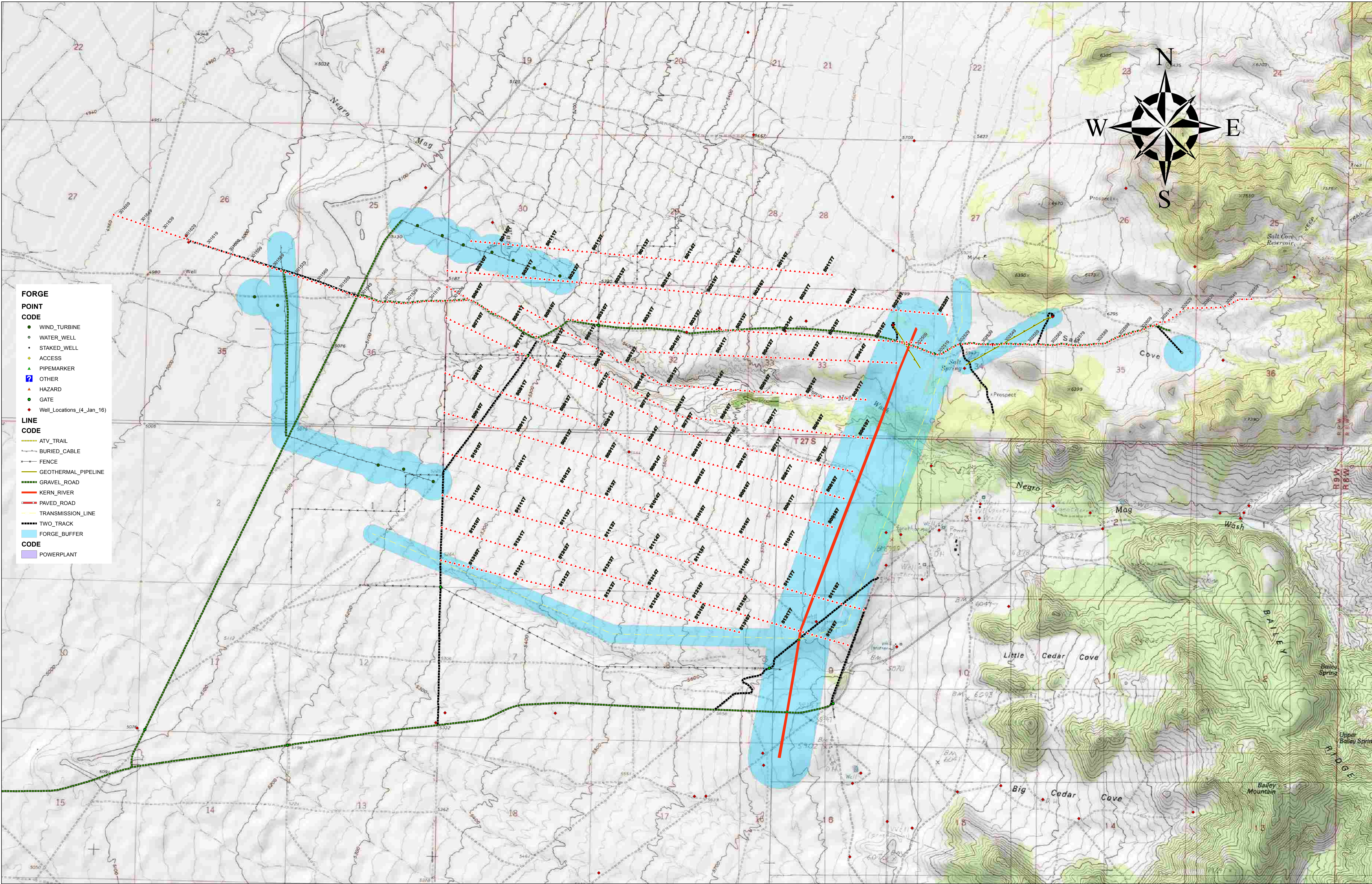
Respectfully Submitted,

*Jan Moles*

President

Urban Seismic Specialist Inc.





**FORGE**

**POINT**

**CODE**

- WIND\_TURBINE
- WATER\_WELL
- STAKED\_WELL
- ACCESS
- ▲ PIPEMARKER
- OTHER
- ▲ HAZARD
- GATE
- Well\_Locations\_4\_Jan\_16

**LINE**

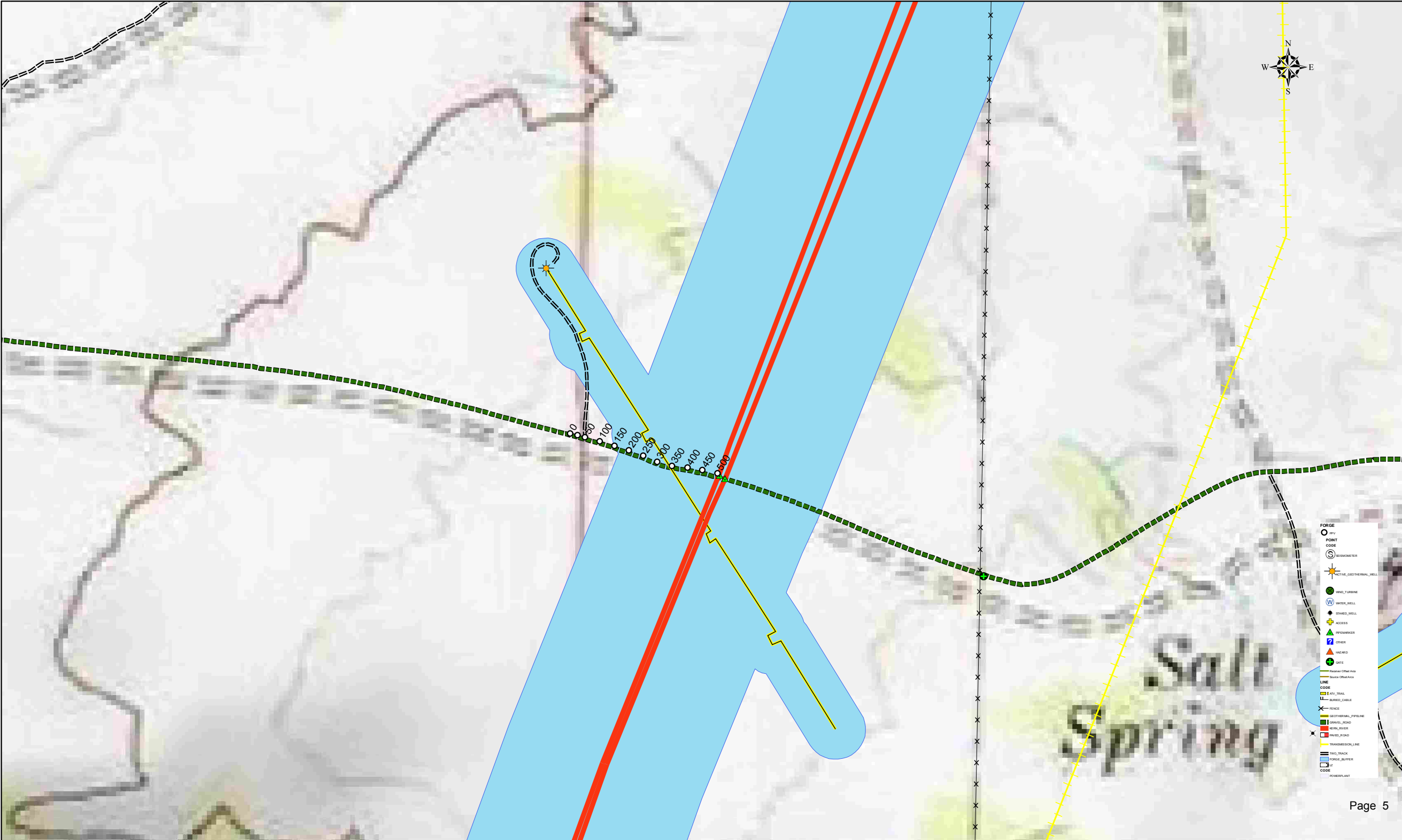
**CODE**

- ATV\_TRAIL
- BURIED\_CABLE
- FENCE
- GEOHERMAL\_PIPELINE
- GRAVEL\_ROAD
- KERN\_RIVER
- PAVED\_ROAD
- TRANSMISSION\_LINE
- TWO\_TRACK
- FORGE\_BUFFER

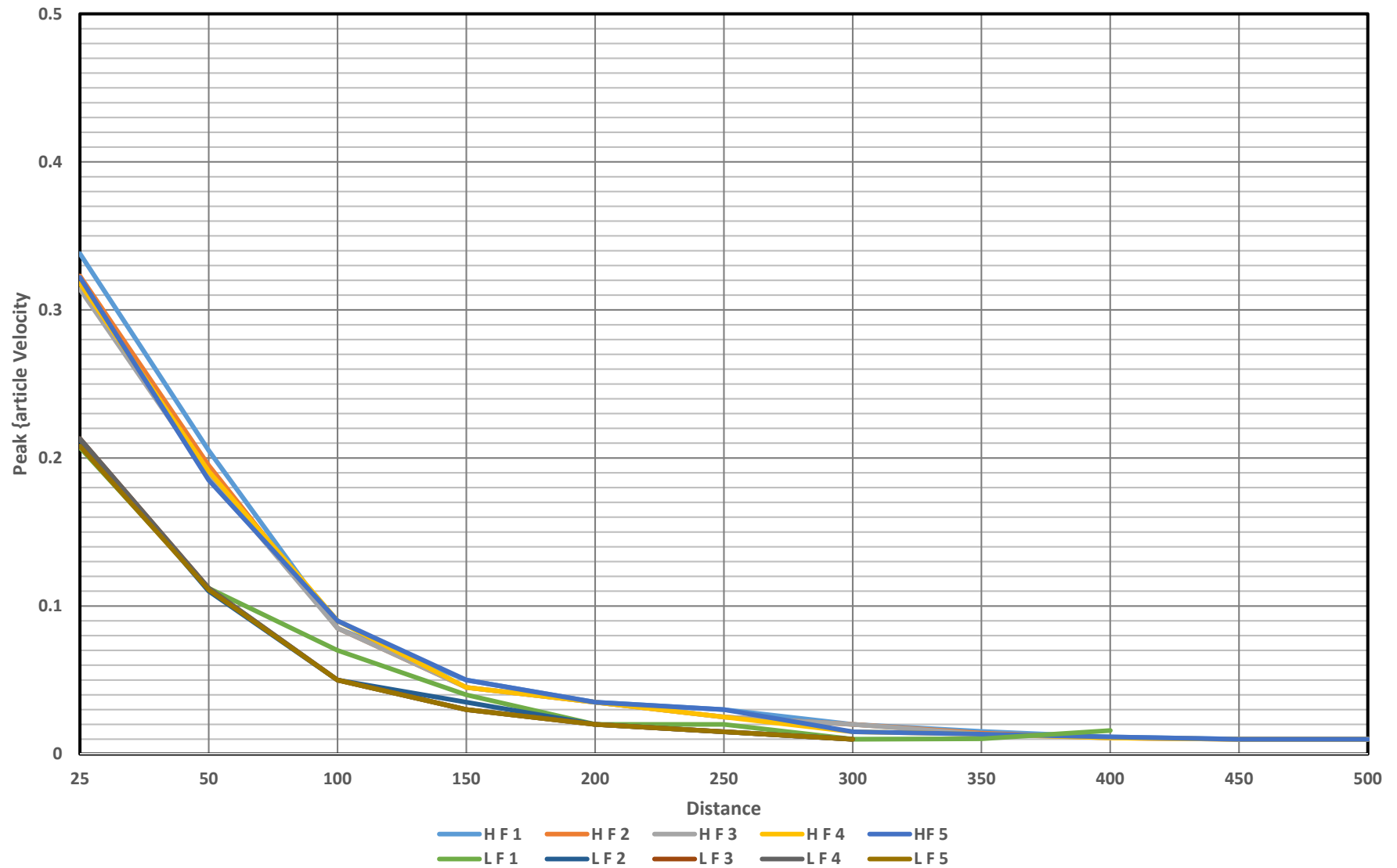
**CODE**

- POWERPLANT

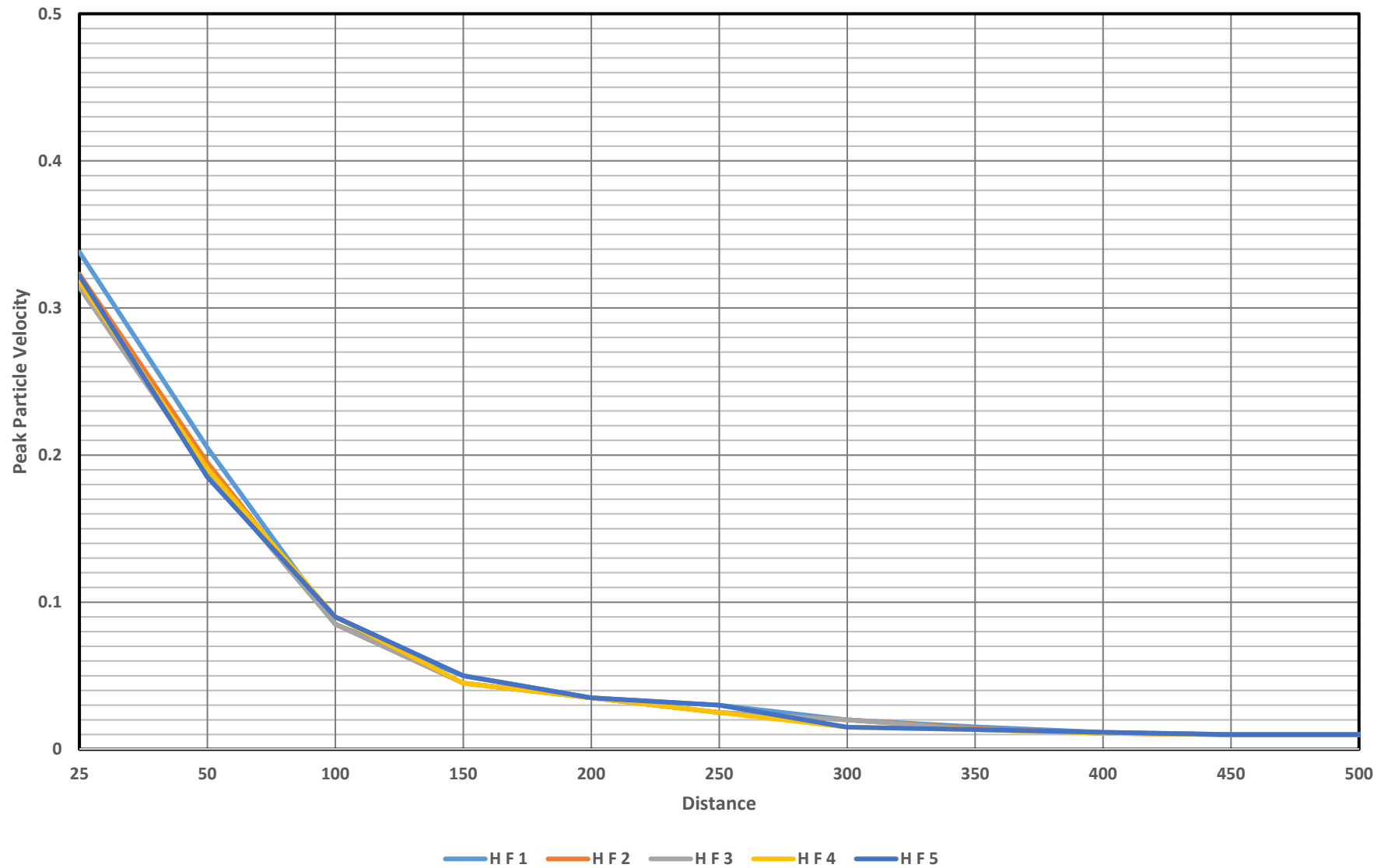




FORGE 3D  
GROUND MOTION STUDY  
ALL SWEEPS

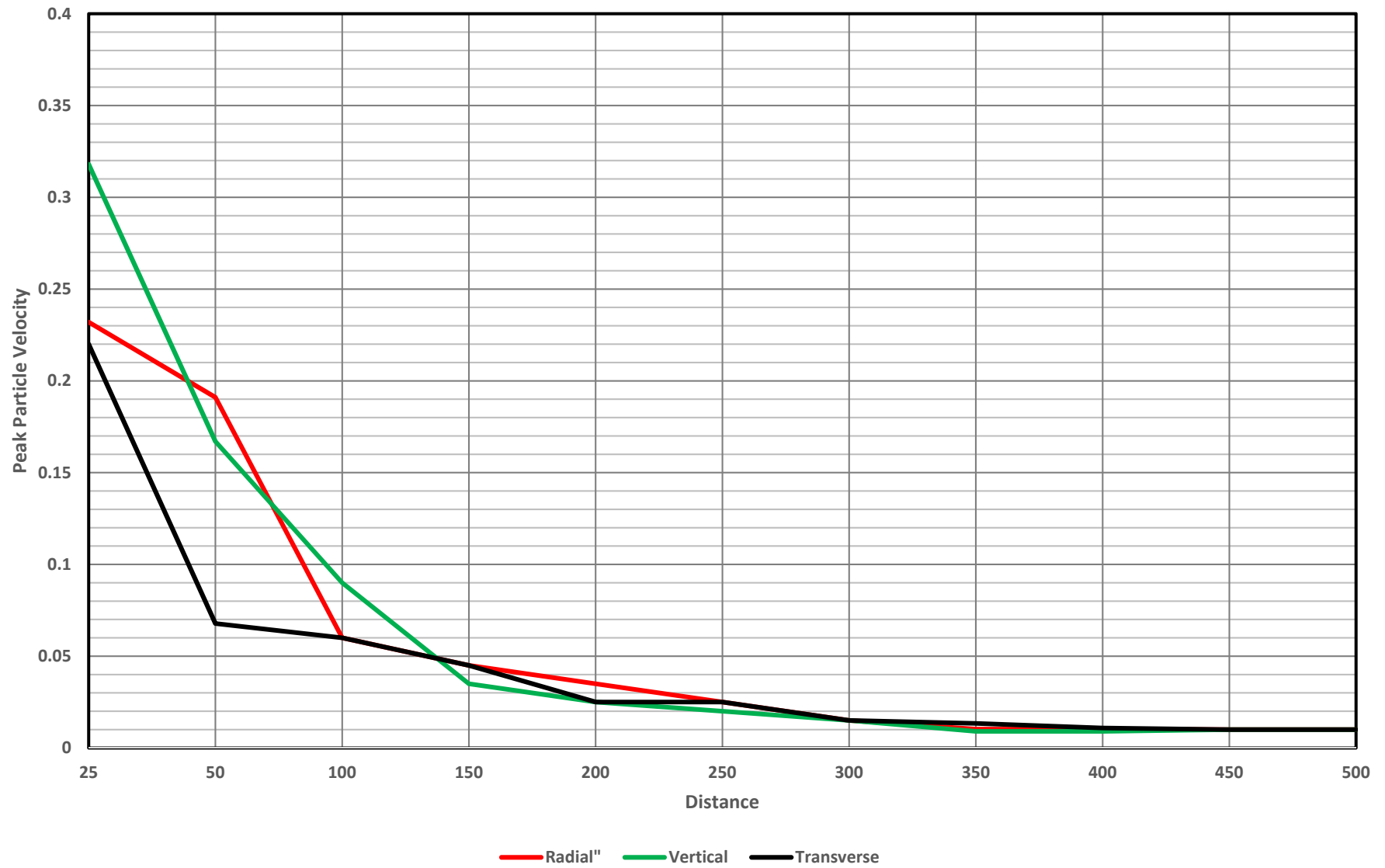


FORGE 3D  
GROUND MOTION STUDY  
HIGH FORCE SWEEPS





FORGE 3D  
HIGH FORCE SWEEPS  
ALL AXIS





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 25ft.**

**DRIVE LEVEL: HF 70%**

File: 7013201711231144340001.evt

Number: 0001

Date and Time: 11/23/2017 11:44:34 AM

SN: 7013

Seismic Trigger: 0.0500 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.338 in/sec (-1.0000 sec)

Radial: 0.236 in/sec @ 170.7 Hz (-1.0000 sec)

Vertical: 0.338 in/sec @ 56.9 Hz (-1.0000 sec)

Transverse: 0.231 in/sec @ 7.1 Hz (-1.0000 sec)

Displacement: 0.166 in

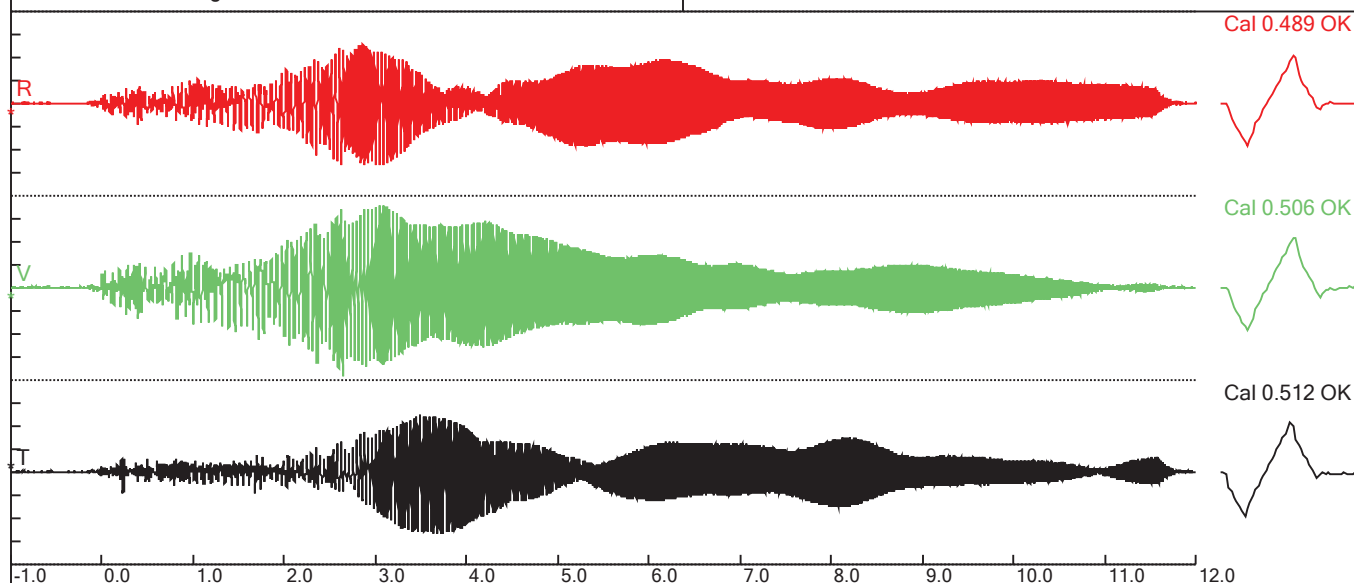
Acceleration: 0.165 g's

**Graph Information**

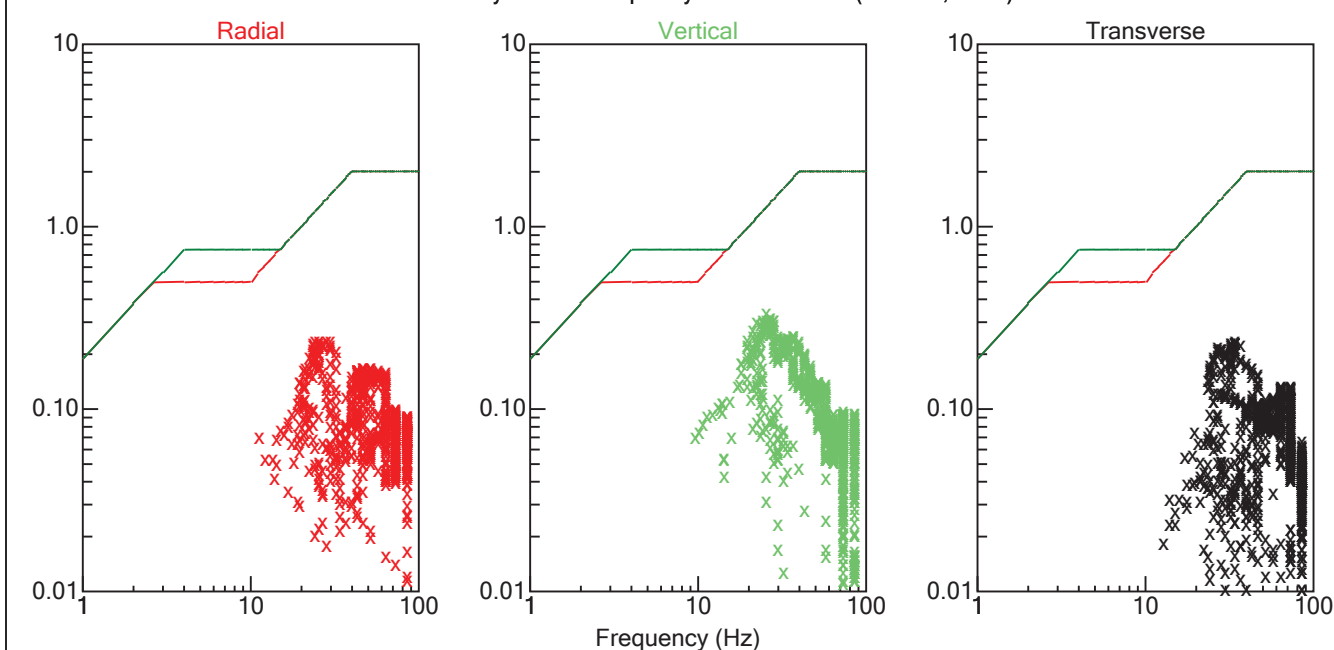
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.350 in/sec (0.0875 in/sec/div)

Time Intervals: 1.00 sec

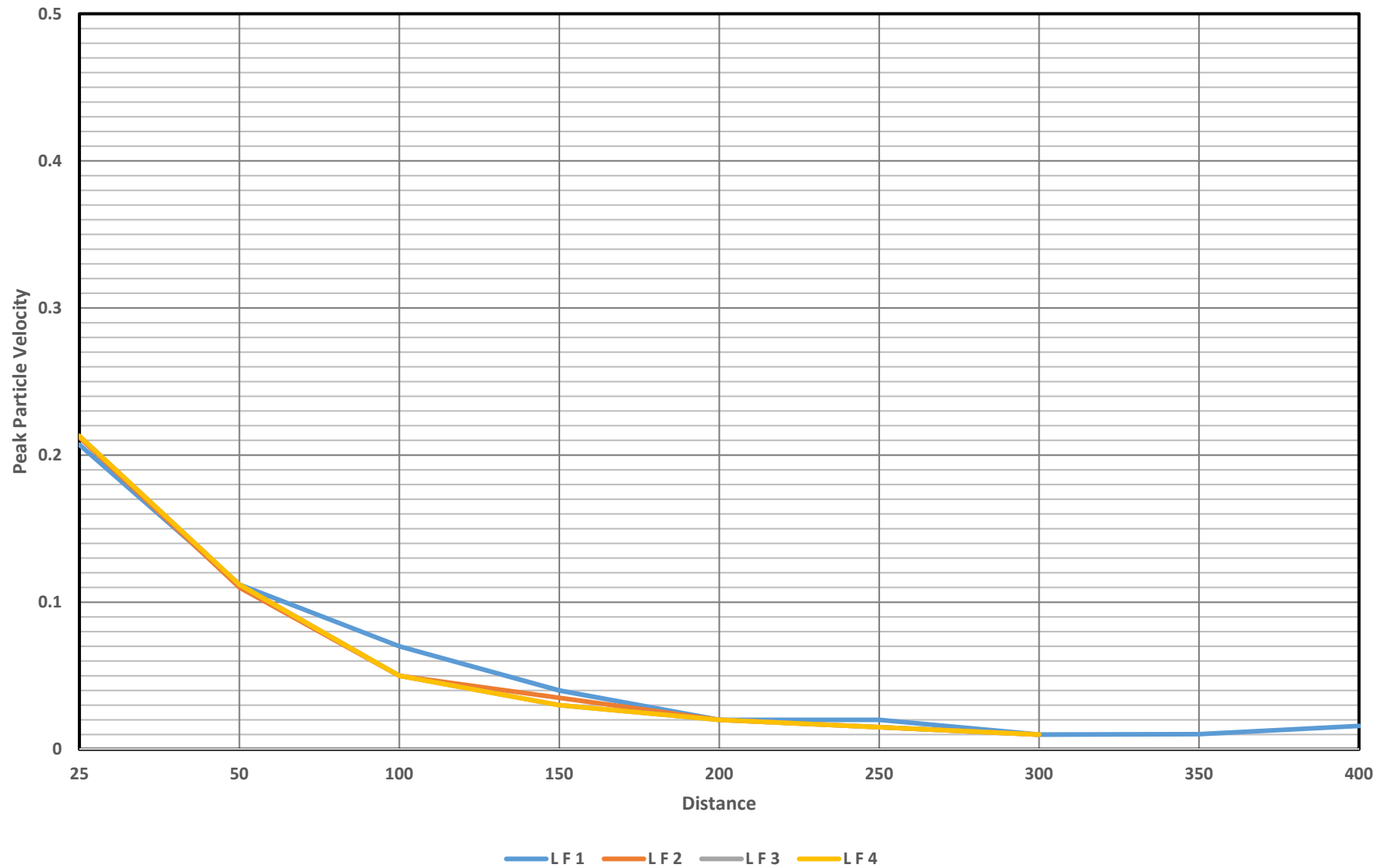


**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



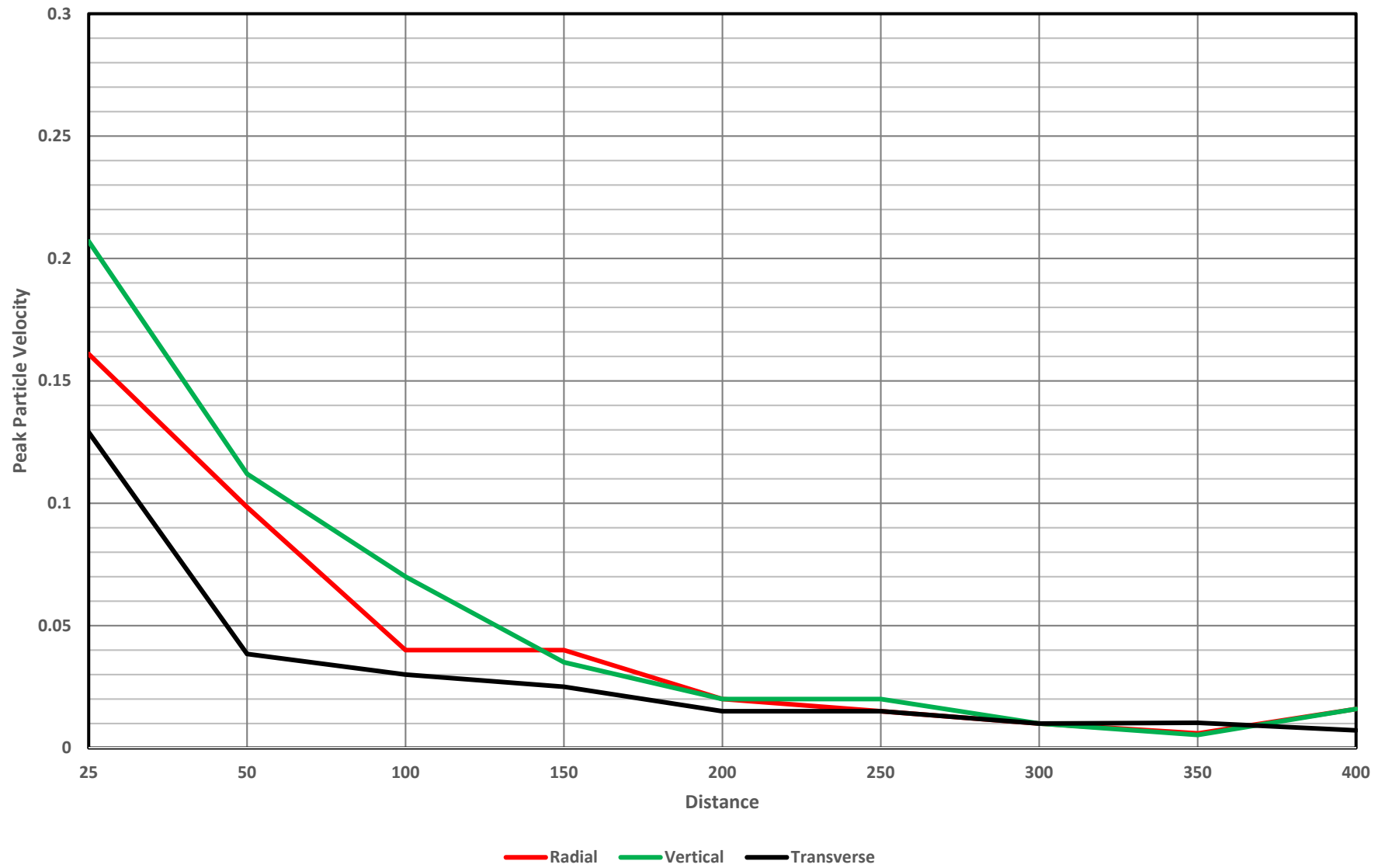


**FORGE 3D  
GROUND MOTION STUDY  
LOW FORCE SWEEPS**





FORGE 3D  
LOW FORCE SWEEPS  
ALL AXIS





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 25 ft.**

**DRIVE LEVEL: LF 40%**

File: 7013201711231153380006.evt

Number: 0006

Date and Time: 11/23/2017 11:53:38 AM

SN: 7013

Seismic Trigger: 0.0500 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.207 in/sec (1.5059 sec)

Radial: 0.161 in/sec @ 18.3 Hz (1.0000 sec)

Vertical: 0.207 in/sec @ 17.7 Hz (1.5059 sec)

Transverse: 0.129 in/sec @ 19.7 Hz (2.2275 sec)

Displacement: 0.100 in

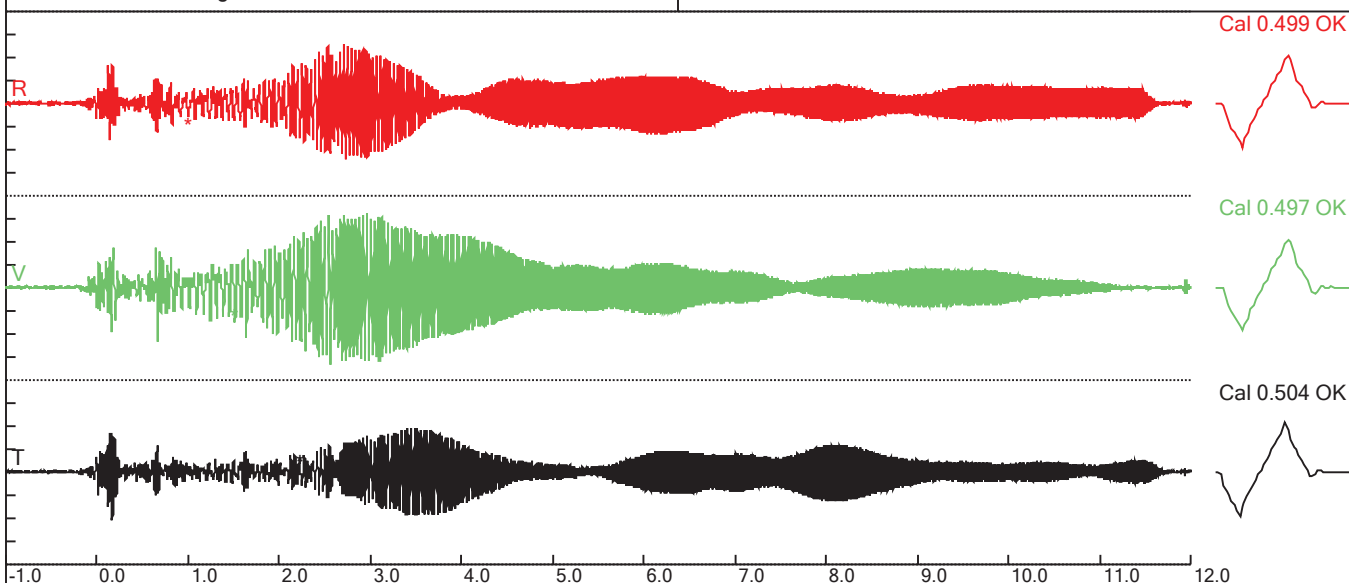
Acceleration: 0.0994 g's

**Graph Information**

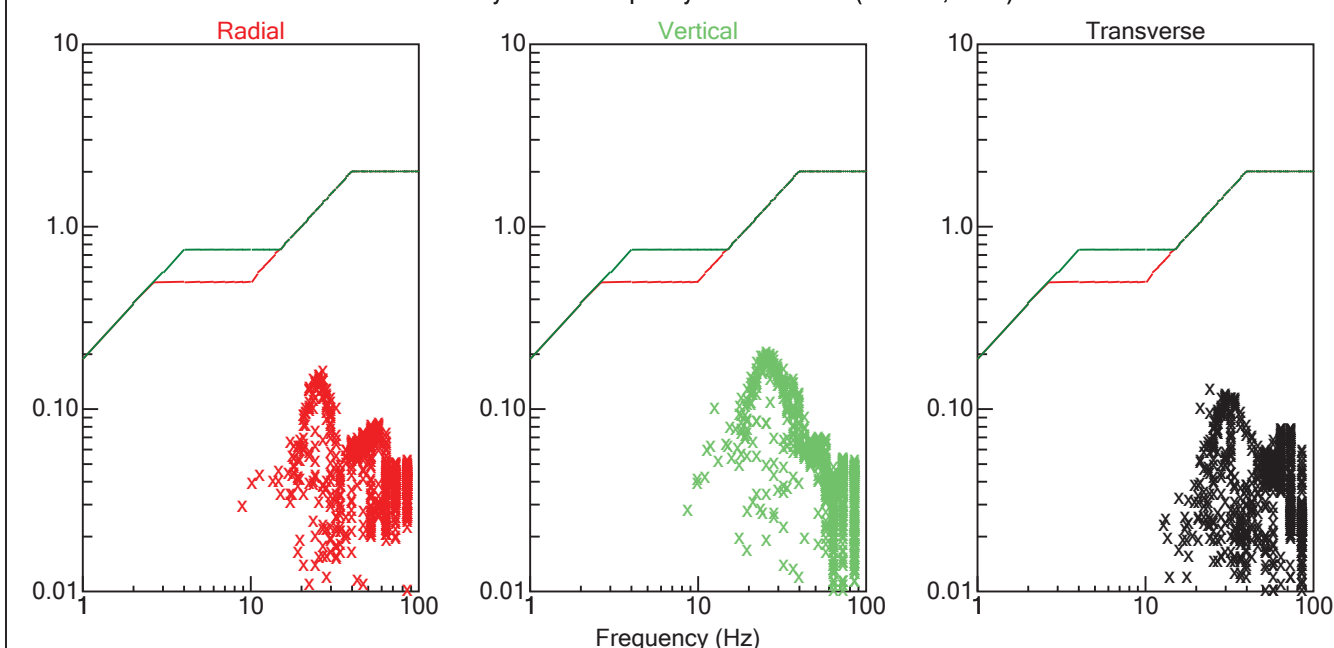
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.250 in/sec (0.0625 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 2D  
GROUND MOTION STUDY  
PARAGON GEOPHYSICAL  
BEAVER COUNTY UTAH**

| Seq | Drive Level | Sweep Number | Distance | Date       | Time        | PPV   | PPV Hz | Radial | Radial Hz | Vertical | Vertical Hz | Transverse | Transverse Hz | Vector Sum | Voltage | Seismic Trigger | Serial Number | Event Number | Record                     |
|-----|-------------|--------------|----------|------------|-------------|-------|--------|--------|-----------|----------|-------------|------------|---------------|------------|---------|-----------------|---------------|--------------|----------------------------|
| 1   | H.F         | 1            | 25       | 11/23/2017 | 11:44:34 AM | 0.338 | 24.4   | 0.236  | 23.3      | 0.338    | 24.4        | 0.231      | 32            | 0.358      | 6.3     | 0.05            | 7013          | 0001         | 7013201711231144340001.evt |
| 1   | H.F         | 1            | 50       | 11/23/2017 | 11:45:15 AM | 0.205 | 42.7   | 0.205  | 42.7      | 0.17     | 21.3        | 0.0791     | 28.4          | 0.21       | 6.5     | 0.05            | 7121          | 0001         | 7121201711231145150001.evt |
| 1   | H.F         | 1            | 100      | 11/23/2017 | 11:45:00 AM | 0.085 | 23.2   | 0.06   | 39.3      | 0.085    | 23.2        | 0.065      | 39.3          | 0.09       | 6.7     | 0.015           | 4355          | 002          | 4355201711231145002.dtb    |
| 1   | H.F         | 1            | 150      | 11/23/2017 | 11:46:00 AM | 0.05  | 19.6   | 0.05   | 19.6      | 0.04     | 17.6        | 0.045      | 36.5          | 0.065      | 6.3     | 0.01            | 4955          | 002          | 4955201711231146002.dtb    |
| 1   | H.F         | 1            | 200      | 11/23/2017 | 11:46:00 AM | 0.035 | 34.1   | 0.035  | 34.1      | 0.025    | 23.2        | 0.03       | 36.5          | 0.04       | 6.3     | 0.01            | 4956          | 002          | 4956201711231146002.dtb    |
| 1   | H.F         | 1            | 250      | 11/23/2017 | 11:48:00 AM | 0.03  | 32     | 0.025  | 23.2      | 0.02     | 20.4        | 0.03       | 32            | 0.035      | 6.5     | 0.01            | 5132          | 002          | 5132201711231148002.dtb    |
| 1   | H.F         | 1            | 300      | 11/23/2017 | 11:48:00 AM | 0.02  | 34.1   | 0.015  | 25.6      | 0.02     | 24.3        | 0.02       | 34.1          | 0.025      | 6.5     | 0.01            | 5134          | 002          | 5134201711231148002.dtb    |
| 1   | H.F         | 1            | 350      | 11/23/2017 | 12:12:29 PM | 0.015 | 25.6   | 0.0109 | 15.5      | 0.0103   | 34.1        | 0.0153     | 25.6          | 0.0156     | 6.3     | 0.01            | 7013          | 0011         | 7013201711231212290011.evt |
| 1   | H.F         | 1            | 400      | 11/23/2017 | 12:13:09 PM | 0.012 | 26.9   | 0.0103 | 15.5      | 0.00781  | 20.5        | 0.0116     | 26.9          | 0.0136     | 6.5     | 0.01            | 7121          | 0011         | 7121201711231213090011.evt |
| 1   | H.F         | 1            | 450      | 11/23/2017 | 12:13:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.015      | 6.6     | 0.01            | 4355          | 015          | 4355201711231213015.dtb    |
| 1   | H.F         | 1            | 500      | 11/23/2017 | 12:14:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.3     | 0.01            | 4955          | 015          | 4955201711231214015.dtb    |
|     |             |              |          |            |             |       |        |        |           |          |             |            |               |            |         |                 |               |              |                            |
| 2   | H.F         | 2            | 25       | 11/23/2017 | 11:45:53 AM | 0.323 | 23.3   | 0.239  | 24.4      | 0.323    | 23.3        | 0.236      | 32            | 0.35       | 6.3     | 0.05            | 7013          | 0002         | 7013201711231145530002.evt |
| 2   | H.F         | 2            | 50       | 11/23/2017 | 11:46:33 AM | 0.195 | 42.7   | 0.195  | 42.7      | 0.165    | 23.3        | 0.0722     | 26.9          | 0.197      | 6.4     | 0.05            | 7121          | 0002         | 7121201711231146330002.evt |
| 2   | H.F         | 2            | 100      | 11/23/2017 | 11:46:00 AM | 0.085 | 23.2   | 0.055  | 39.3      | 0.085    | 23.2        | 0.06       | 39.3          | 0.095      | 6.6     | 0.015           | 4355          | 003          | 4355201711231146003.dtb    |
| 2   | H.F         | 2            | 150      | 11/23/2017 | 11:47:00 AM | 0.045 | 36.5   | 0.045  | 20.4      | 0.035    | 18.2        | 0.045      | 36.5          | 0.06       | 6.3     | 0.01            | 4955          | 003          | 4955201711231147003.dtb    |
| 2   | H.F         | 2            | 200      | 11/23/2017 | 11:48:00 AM | 0.035 | 36.5   | 0.035  | 36.5      | 0.025    | 24.3        | 0.025      | 25.6          | 0.045      | 6.3     | 0.01            | 4956          | 003          | 4956201711231148003.dtb    |
| 2   | H.F         | 2            | 250      | 11/23/2017 | 11:49:00 AM | 0.025 | 32     | 0.025  | 25.6      | 0.02     | 20.4        | 0.025      | 32            | 0.035      | 6.5     | 0.01            | 5132          | 003          | 5132201711231149003.dtb    |
| 2   | H.F         | 2            | 300      | 11/23/2017 | 11:49:00 AM | 0.02  | 36.5   | 0.015  | 26.9      | 0.015    | 20.4        | 0.02       | 36.5          | 0.025      | 6.5     | 0.01            | 5134          | 003          | 5134201711231149003.dtb    |
| 2   | H.F         | 2            | 350      | 11/23/2017 | 12:14:20 PM | 0.014 | 24.4   | 0.0109 | 15.1      | 0.0109   | 15.1        | 0.0141     | 24.4          | 0.0145     | 6.3     | 0.01            | 7013          | 0012         | 7013201711231214200012.evt |
| 2   | H.F         | 2            | 400      | 11/23/2017 | 12:15:02 PM | 0.011 | 28.4   | 0.0097 | 34.1      | 0.00844  | 28.4        | 0.0109     | 28.4          | 0.0129     | 6.4     | 0.01            | 7121          | 0012         | 7121201711231215020012.evt |
| 2   | H.F         | 2            | 450      | 11/23/2017 | 12:14:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.6     | 0.01            | 4355          | 016          | 4355201711231214016.dtb    |
| 2   | H.F         | 2            | 500      | 11/23/2017 | 12:15:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.3     | 0.01            | 4955          | 016          | 4955201711231215016.dtb    |
|     |             |              |          |            |             |       |        |        |           |          |             |            |               |            |         |                 |               |              |                            |
| 3   | H.F         | 3            | 25       | 11/23/2017 | 11:47:15 AM | 0.314 | 24.4   | 0.23   | 24.4      | 0.314    | 24.4        | 0.227      | 32            | 0.359      | 6.3     | 0.05            | 7013          | 0003         | 7013201711231147150003.evt |
| 3   | H.F         | 3            | 50       | 11/23/2017 | 11:47:56 AM | 0.188 | 39.4   | 0.188  | 39.4      | 0.164    | 22.3        | 0.0716     | 26.9          | 0.191      | 6.4     | 0.05            | 7121          | 0003         | 7121201711231147560003.evt |
| 3   | H.F         | 3            | 100      | 11/23/2017 | 11:47:00 AM | 0.085 | 23.2   | 0.055  | 39.3      | 0.085    | 23.2        | 0.06       | 39.3          | 0.09       | 6.6     | 0.015           | 4355          | 004          | 4355201711231147004.dtb    |
| 3   | H.F         | 3            | 150      | 11/23/2017 | 11:48:00 AM | 0.045 | 34.1   | 0.045  | 20.4      | 0.035    | 17.6        | 0.045      | 34.1          | 0.055      | 6.3     | 0.01            | 4955          | 004          | 4955201711231148004.dtb    |
| 3   | H.F         | 3            | 200      | 11/23/2017 | 11:49:00 AM | 0.035 | 34.1   | 0.035  | 34.1      | 0.025    | 23.2        | 0.025      | 25.6          | 0.04       | 6.3     | 0.01            | 4956          | 004          | 4956201711231149004.dtb    |
| 3   | H.F         | 3            | 250      | 11/23/2017 | 11:51:00 AM | 0.025 | 30.1   | 0.025  | 25.6      | 0.02     | 23.2        | 0.025      | 30.1          | 0.035      | 6.5     | 0.01            | 5132          | 004          | 5132201711231151004.dtb    |
| 3   | H.F         | 3            | 300      | 11/23/2017 | 11:50:00 AM | 0.02  | 36.5   | 0.015  | 25.6      | 0.015    | 28.4        | 0.02       | 36.5          | 0.02       | 6.4     | 0.01            | 5134          | 004          | 5134201711231150004.dtb    |
| 3   | H.F         | 3            | 350      | 11/23/2017 | 12:15:34 PM | 0.013 | 23.3   | 0.0109 | 17.1      | 0.00969  | 18.3        | 0.0134     | 23.3          | 0.014      | 6.3     | 0.01            | 7013          | 0013         | 7013201711231215340013.evt |
| 3   | H.F         | 3            | 400      | 11/23/2017 | 12:16:15 PM | 0.011 | 26.9   | 0.0097 | 34.1      | 0.00906  | 30.1        | 0.0109     | 26.9          | 0.0129     | 6.4     | 0.01            | 7121          | 0013         | 7121201711231216150013.evt |
| 3   | H.F         | 3            | 450      | 11/23/2017 | 12:16:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.6     | 0.01            | 4355          | 017          | 4355201711231216017.dtb    |
| 3   | H.F         | 3            | 500      | 11/23/2017 | 12:17:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.3     | 0.01            | 4955          | 017          | 4955201711231217017.dtb    |
|     |             |              |          |            |             |       |        |        |           |          |             |            |               |            |         |                 |               |              |                            |
| 4   | H.F         | 4            | 25       | 11/23/2017 | 11:48:19 AM | 0.318 | 23.3   | 0.232  | 24.4      | 0.318    | 23.3        | 0.22       | 30.1          | 0.363      | 6.3     | 0.05            | 7013          | 0004         | 7013201711231148190004.evt |
| 4   | H.F         | 4            | 50       | 11/23/2017 | 11:48:59 AM | 0.191 | 42.7   | 0.191  | 42.7      | 0.167    | 22.3        | 0.0678     | 28.4          | 0.193      | 6.4     | 0.05            | 7121          | 0004         | 7121201711231148590004.evt |
| 4   | H.F         | 4            | 100      | 11/23/2017 | 11:48:00 AM | 0.09  | 23.2   | 0.06   | 39.3      | 0.09     | 23.2        | 0.06       | 39.3          | 0.095      | 6.6     | 0.015           | 4355          | 005          | 4355201711231148005.dtb    |
| 4   | H.F         | 4            | 150      | 11/23/2017 | 11:49:00 AM | 0.045 | 34.1   | 0.045  | 19.6      | 0.035    | 16.5        | 0.045      | 34.1          | 0.06       | 6.3     | 0.01            | 4955          | 005          | 4955201711231149005.dtb    |
| 4   | H.F         | 4            | 200      | 11/23/2017 | 11:50:00 AM | 0.035 | 34.1   | 0.035  | 34.1      | 0.025    | 24.3        | 0.025      | 25.6          | 0.045      | 6.3     | 0.01            | 4956          | 005          | 4956201711231150005.dtb    |
| 4   | H.F         | 4            | 250      | 11/23/2017 | 11:52:00 AM | 0.025 | 32     | 0.025  | 25.6      | 0.02     | 23.2        | 0.025      | 32            | 0.035      | 6.5     | 0.01            | 5132          | 005          | 5132201711231152005.dtb    |
| 4   | H.F         | 4            | 300      | 11/23/2017 | 11:52:00 AM | 0.015 | 36.5   | 0.015  | 26.9      | 0.015    | 26.9        | 0.015      | 36.5          | 0.02       | 6.4     | 0.01            | 5134          | 005          | 5134201711231152005.dtb    |
| 4   | H.F         | 4            | 350      | 11/23/2017 | 12:16:29 PM | 0.013 | 25.6   | 0.0103 | 16        | 0.00906  | 19.7        | 0.0134     | 25.6          | 0.0143     | 6.3     | 0.01            | 7013          | 0014         | 7013201711231216290014.evt |
| 4   | H.F         | 4            | 400      | 11/23/2017 | 12:17:09 PM | 0.011 | 26.9   | 0.0103 | 15.5      | 0.00906  | 28.4        | 0.0109     | 26.9          | 0.0133     | 6.4     | 0.01            | 7121          | 0014         | 7121201711231217090014.evt |
| 4   | H.F         | 4            | 450      | 11/23/2017 | 12:17:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.6     | 0.01            | 4355          | 018          | 4355201711231217018.dtb    |
| 4   | H.F         | 4            | 500      | 11/23/2017 | 12:18:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.3     | 0.01            | 4955          | 018          | 4955201711231218018.dtb    |
|     |             |              |          |            |             |       |        |        |           |          |             |            |               |            |         |                 |               |              |                            |
| 5   | H.F         | 5            | 25       | 11/23/2017 | 11:49:52 AM | 0.322 | 23.3   | 0.237  | 24.4      | 0.322    | 23.3        | 0.212      | 30.1          | 0.367      | 6.3     | 0.05            | 7013          | 0005         | 7013201711231149520005.evt |
| 5   | H.F         | 5            | 50       | 11/23/2017 | 11:50:32 AM | 0.185 | 39.4   | 0.185  | 39.4      | 0.17     | 20.5        | 0.0653     | 26.9          | 0.188      | 6.4     | 0.05            | 7121          | 0005         | 7121201711231150320005.evt |
| 5   | H.F         | 5            | 100      | 11/23/2017 | 11:50:00 AM | 0.09  | 23.2   | 0.06   | 39.3      | 0.09     | 23.2        | 0.065      | 39.3          | 0.095      | 6.6     | 0.015           | 4355          | 006          | 4355201711231150006.dtb    |
| 5   | H.F         | 5            | 150      | 11/23/2017 | 11:51:00 AM | 0.05  | 19.6   | 0.05   | 19.6      | 0.04     | 18.2        | 0.045      | 34.1          | 0.065      | 6.3     | 0.01            | 4955          | 006          | 4955201711231151006.dtb    |
| 5   | H.F         | 5            | 200      | 11/23/2017 | 11:52:00 AM | 0.035 | 36.5   | 0.035  | 36.5      | 0.025    | 23.2        | 0.025      | 25.6          | 0.045      | 6.3     | 0.01            | 4956          | 006          | 4956201711231152006.dtb    |
| 5   | H.F         | 5            | 250      | 11/23/2017 | 11:53:00 AM | 0.03  | 36.5   | 0.025  | 25.6      | 0.02     | 23.2        | 0.03       | 36.5          | 0.035      | 6.5     | 0.01            | 5132          | 006          | 5132201711231153006.dtb    |
| 5   | H.F         | 5            | 300      | 11/23/2017 | 11:53:00 AM | 0.015 | 39.3   | 0.015  | 23.2      | 0.015    | 26.9        | 0.015      | 39.3          | 0.02       | 6.4     | 0.01            | 5134          | 006          | 5134201711231153006.dtb    |
| 5   | H.F         | 5            | 350      | 11/23/2017 | 12:17:51 PM | 0.013 | 25.6   | 0.0103 | 17.7      | 0.0103   | 34.1        | 0.0134     | 25.6          | 0.0142     | 6.3     | 0.01            | 7013          | 0015         | 7013201711231217510015.evt |
| 5   | H.F         | 5            | 400      | 11/23/2017 | 12:18:32 PM | 0.012 | 28.4   | 0.0091 | 25.6      | 0.00844  | 28.4        | 0.0116     | 28.4          | 0.0132     | 6.4     | 0.01            | 7121          | 0015         | 7121201711231218320015.evt |
| 5   | H.F         | 5            | 450      | 11/23/2017 | 12:18:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.6     | 0.01            | 4355          | 019          | 4355201711231218019.dtb    |
| 5   | H.F         | 5            | 500      | 11/23/2017 | 12:19:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.01       | 6.3     | 0.01            | 4955          | 019          | 4955201711231219019.dtb    |



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 25 ft.**

**DRIVE LEVEL: HF 70%**

File: 7013201711231144340001.evt

Number: 0001

Date and Time: 11/23/2017 11:44:34 AM

SN: 7013

Seismic Trigger: 0.0500 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.338 in/sec (-1.0000 sec)

Radial: 0.236 in/sec @ 170.7 Hz (-1.0000 sec)

Vertical: 0.338 in/sec @ 56.9 Hz (-1.0000 sec)

Transverse: 0.231 in/sec @ 7.1 Hz (-1.0000 sec)

Displacement: 0.166 in

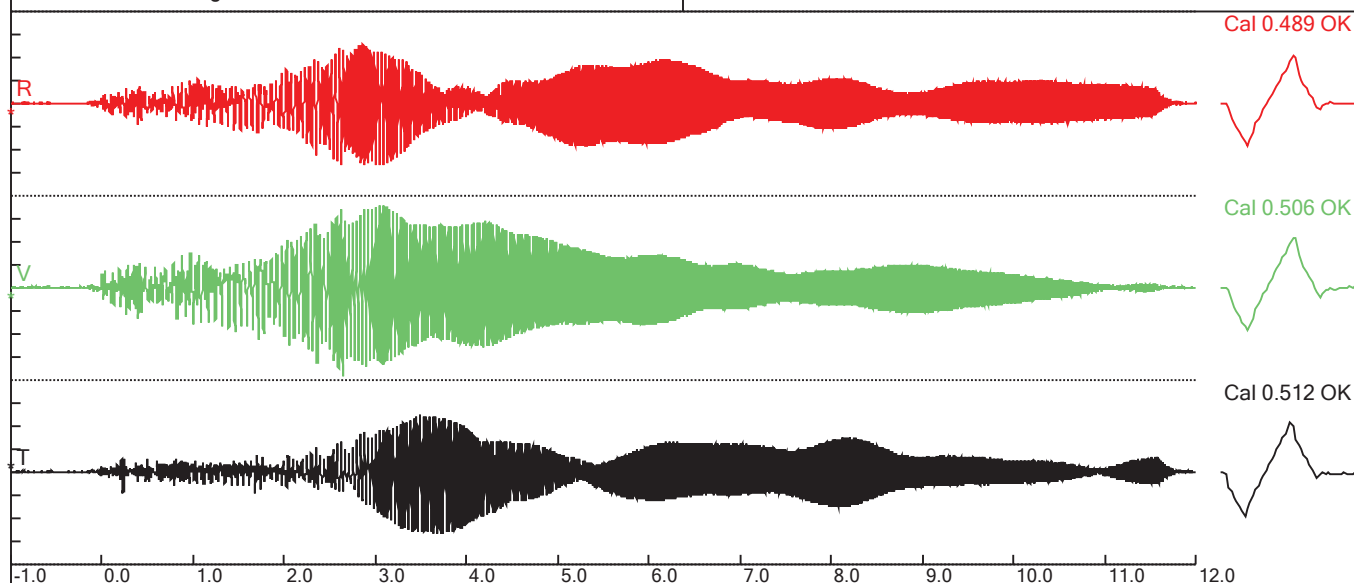
Acceleration: 0.165 g's

**Graph Information**

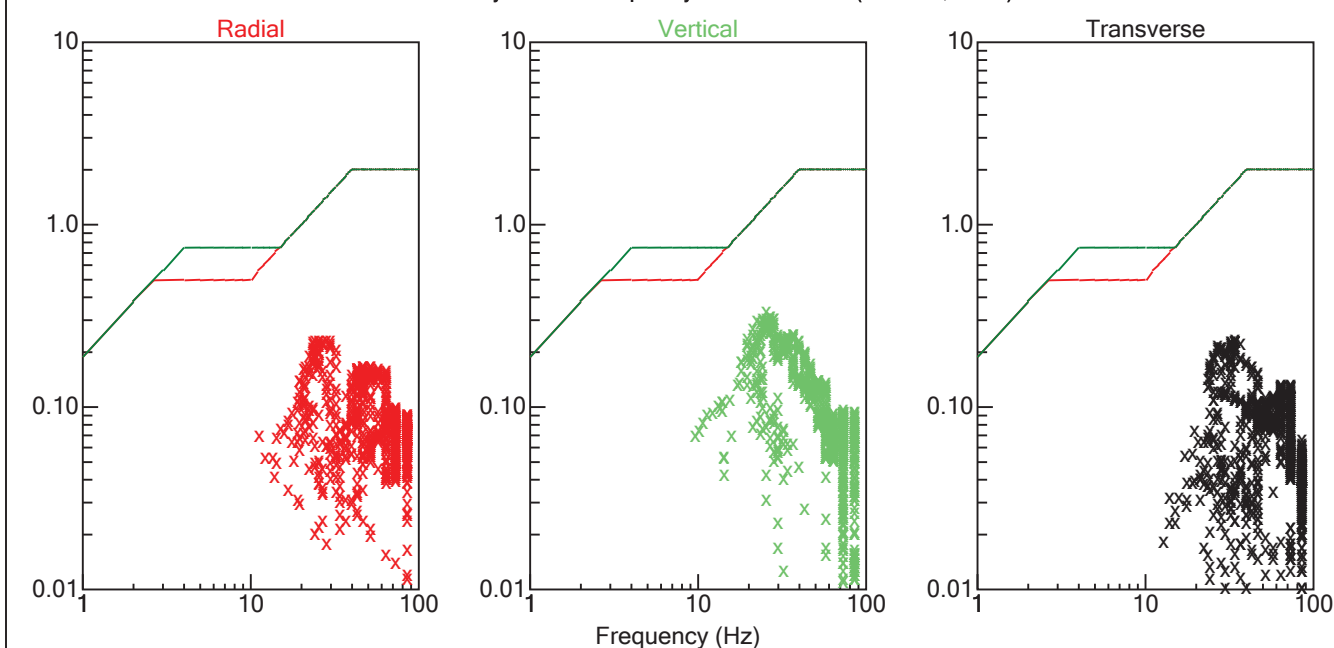
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.350 in/sec (0.0875 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 50 ft.**

**DRIVE LEVEL: HF 70%**

File: 7121201711231145150001.evt

Number: 0001

Date and Time: 11/23/2017 11:45:15 AM

SN: 7121

Seismic Trigger: 0.0500 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.49

**Peaks and Frequencies**

PPV Maximum: 0.205 in/sec (3.4697 sec)

Radial: 0.205 in/sec @ 39.4 Hz (3.4697 sec)

Vertical: 0.170 in/sec @ 17.1 Hz (1.7637 sec)

Transverse: 0.0791 in/sec @ 28.4 Hz (3.8613 sec)

Displacement: 0.138 in

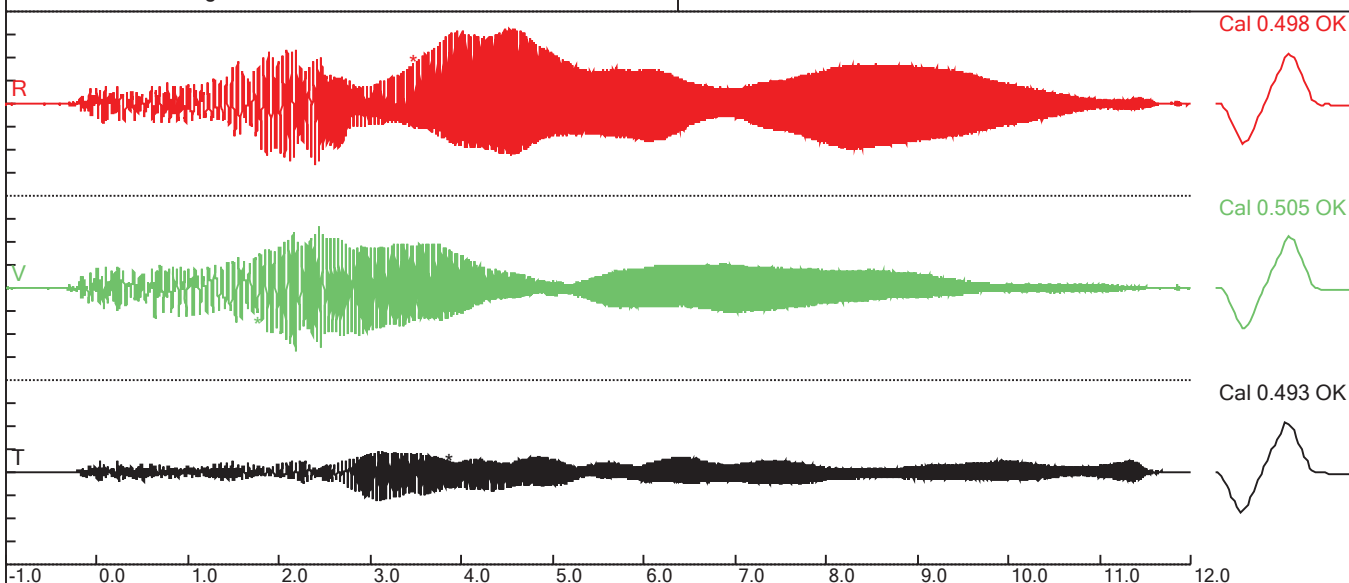
Acceleration: 0.137 g's

**Graph Information**

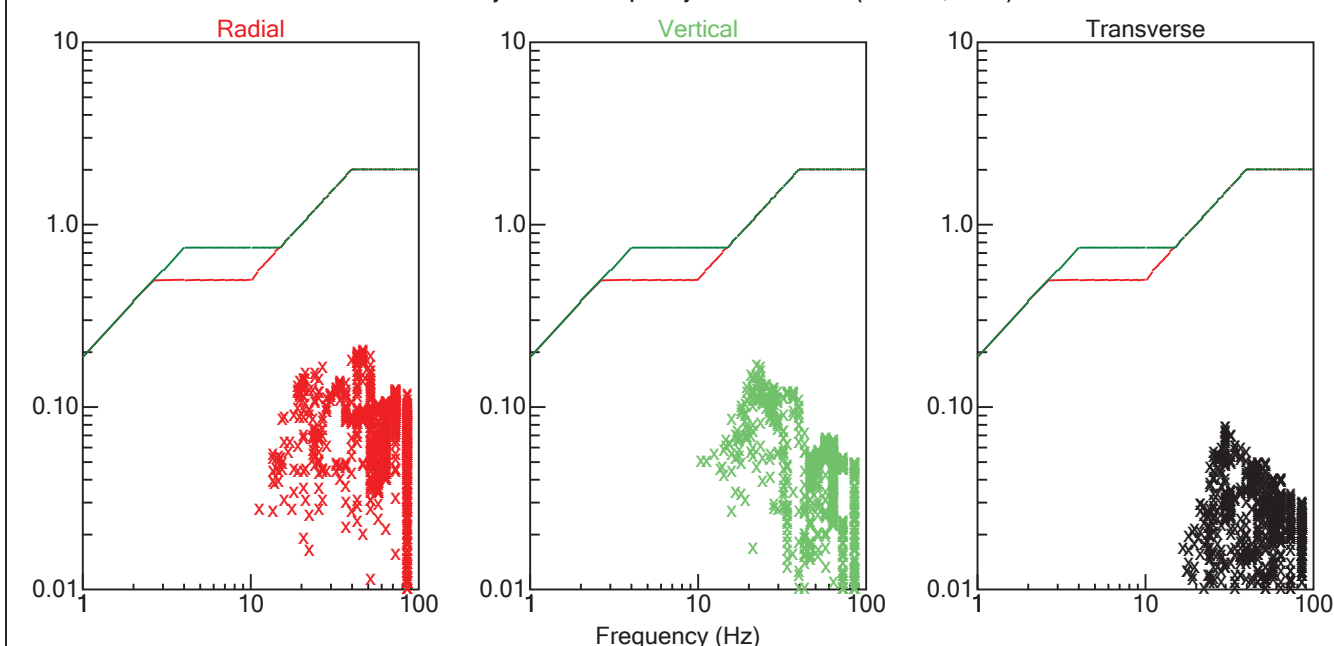
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.250 in/sec (0.0625 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 100 ft.**

**DRIVE LEVEL: HF 70%**

File: 4355201711231145002.dtb

Number: 002

Date and Time: 11/23/2017 11:45:00 AM

SN: 4355

Seismic Trigger: 0.0150 in/sec

Air Trigger: 146 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 148 dBL

Gain: 2.0x

Voltage: 6.70

**Peaks and Frequencies**

PPV Maximum: 0.0850 in/sec (2.2637 sec)

Radial: 0.0600 in/sec @ 39.4 Hz (3.9697 sec)

Vertical: 0.0850 in/sec @ 22.3 Hz (2.2637 sec)

Transverse: 0.0650 in/sec @ 39.4 Hz (4.3613 sec)

Displacement: 0.0480 in

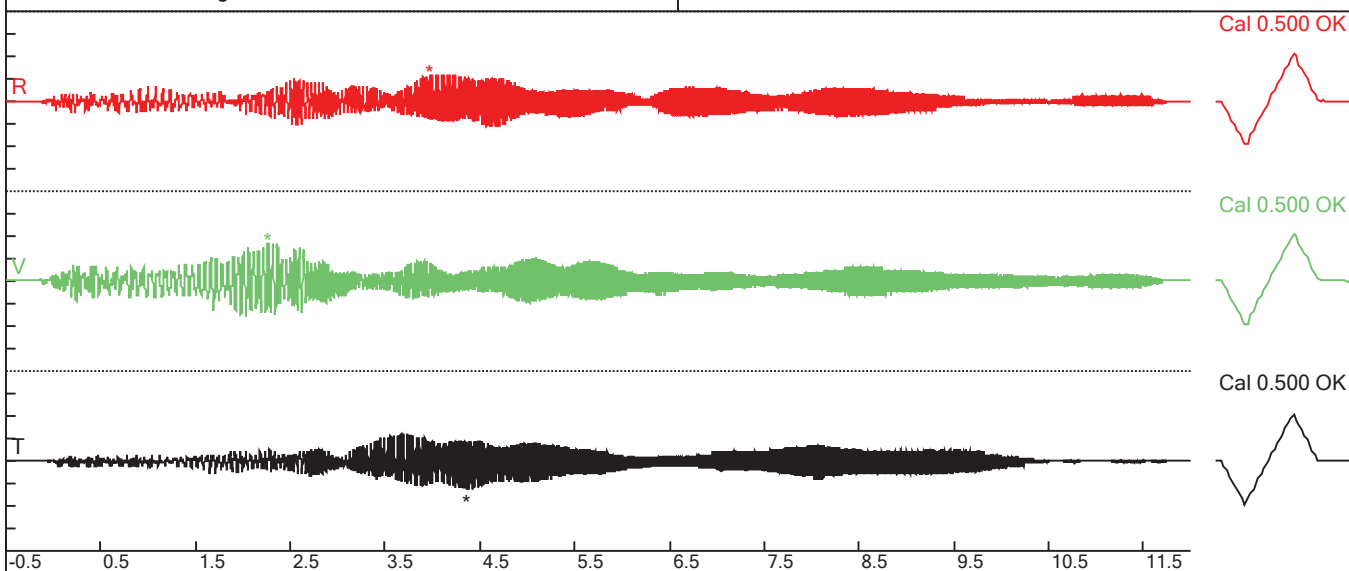
Acceleration: 0.0464 g's

**Graph Information**

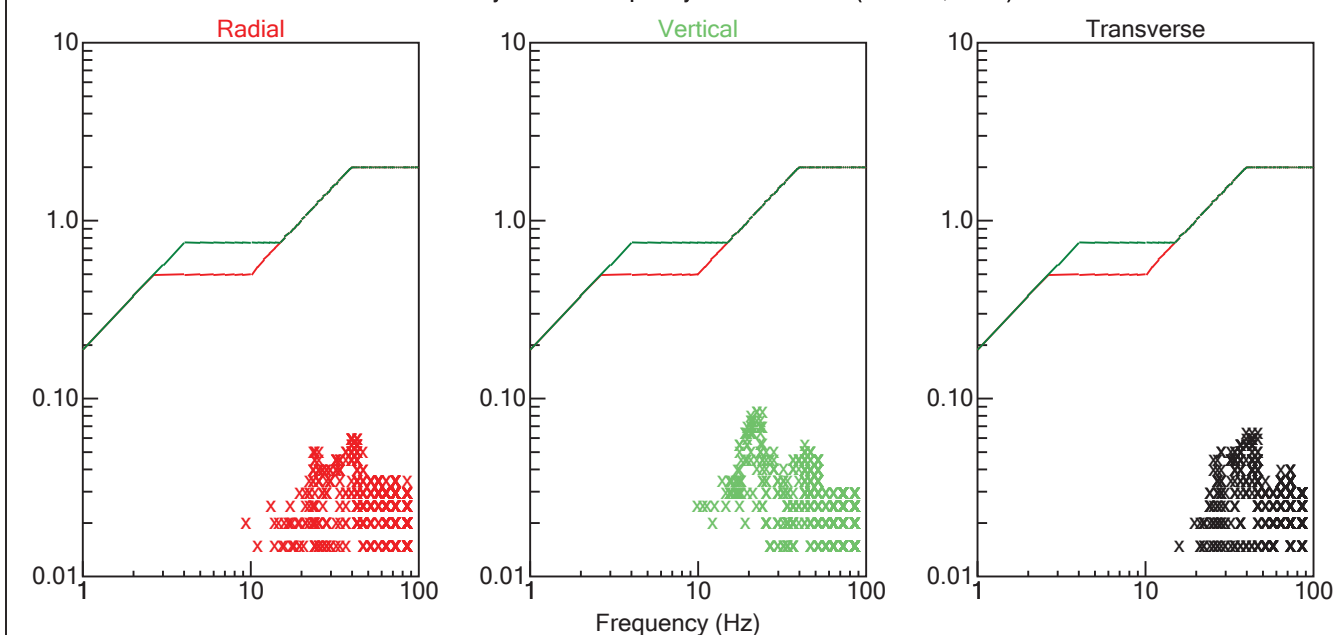
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 150 ft.**

**DRIVE LEVEL: HF 70%**

File: 4955201711231146002.dtb

Number: 002

Date and Time: 11/23/2017 11:46:00 AM

SN: 4955

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0500 in/sec (1.9766 sec)

Radial: 0.0500 in/sec @ 19.0 Hz (1.9766 sec)

Vertical: 0.0400 in/sec @ 16.5 Hz (1.6348 sec)

Transverse: 0.0450 in/sec @ 34.1 Hz (4.1729 sec)

Displacement: 0.0340 in

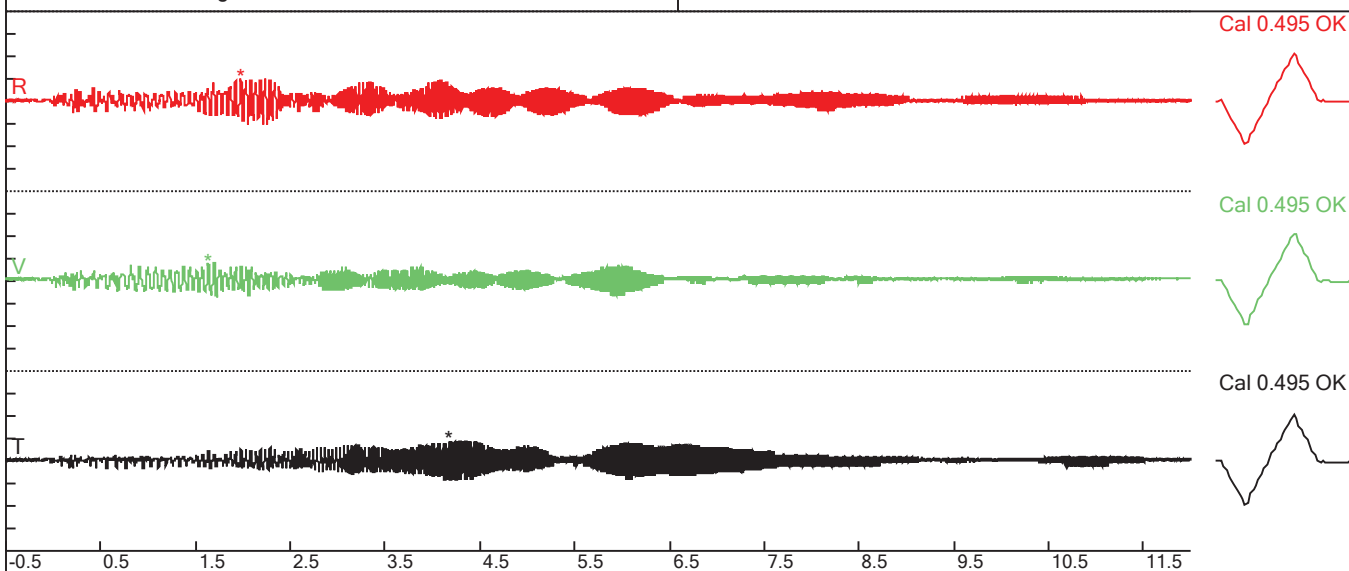
Acceleration: 0.0331 g's

**Graph Information**

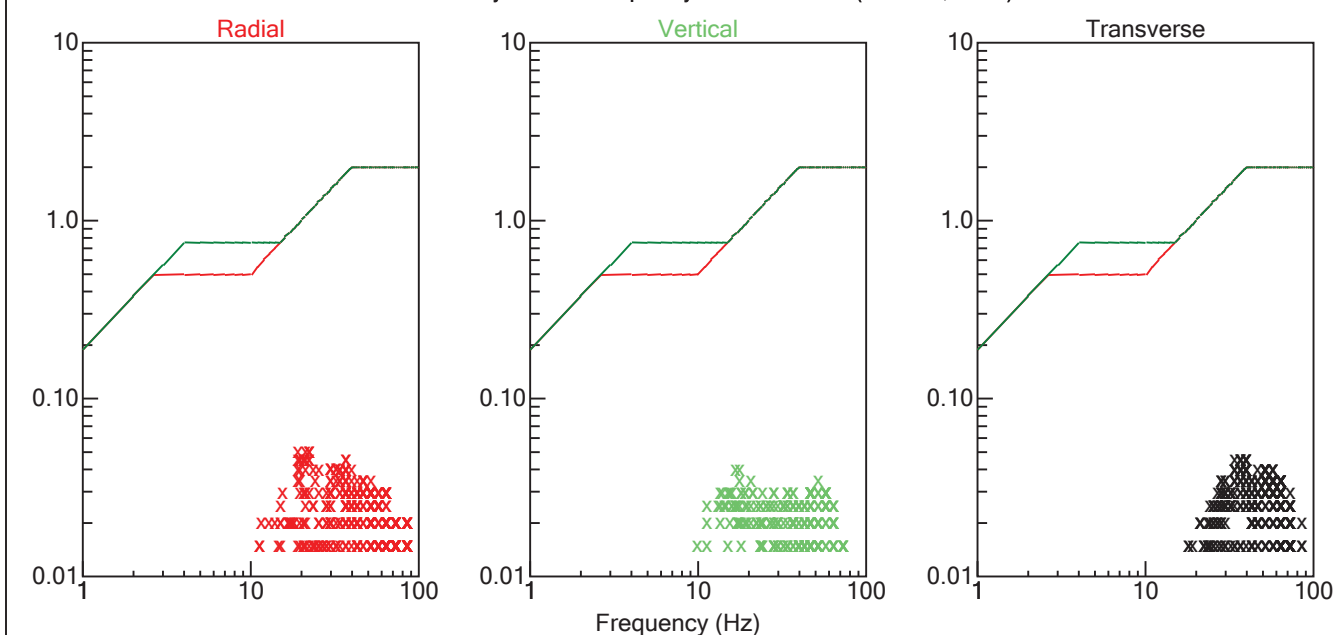
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 200 ft.**

**DRIVE LEVEL: HF 70%**

File: 4956201711231146002.dtb

Number: 002

Date and Time: 11/23/2017 11:46:00 AM

SN: 4956

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0350 in/sec (3.9395 sec)

Radial: 0.0350 in/sec @ 30.1 Hz (3.9395 sec)

Vertical: 0.0250 in/sec @ 21.3 Hz (2.1680 sec)

Transverse: 0.0300 in/sec @ 36.6 Hz (4.3418 sec)

Displacement: 0.0280 in

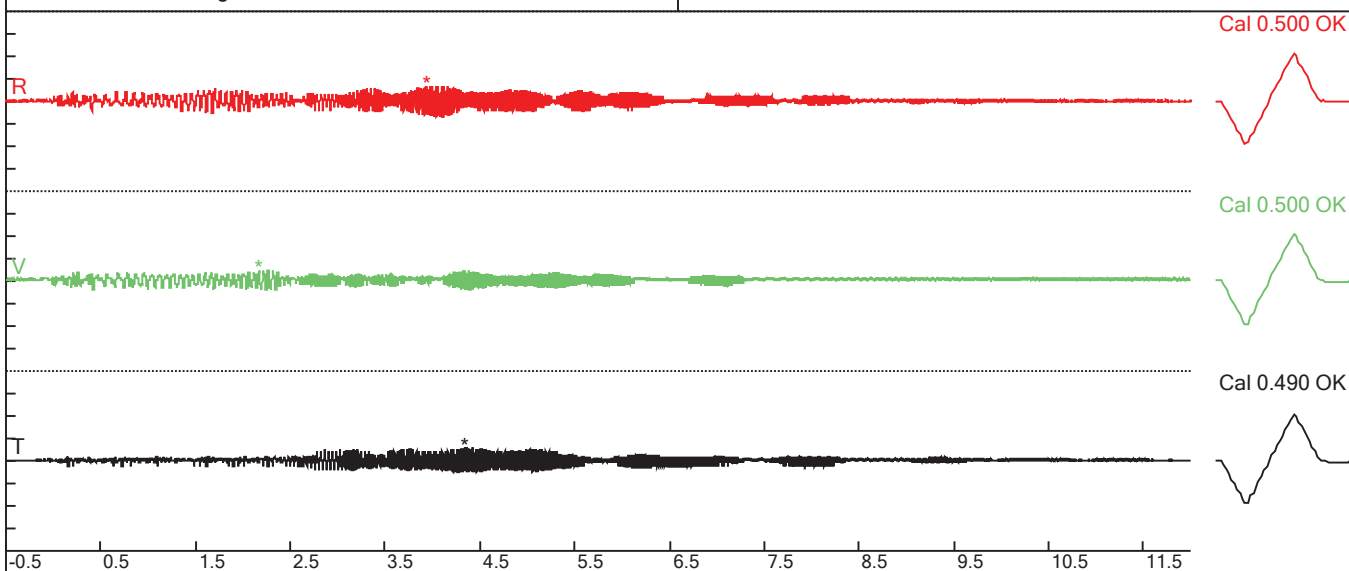
Acceleration: 0.0265 g's

**Graph Information**

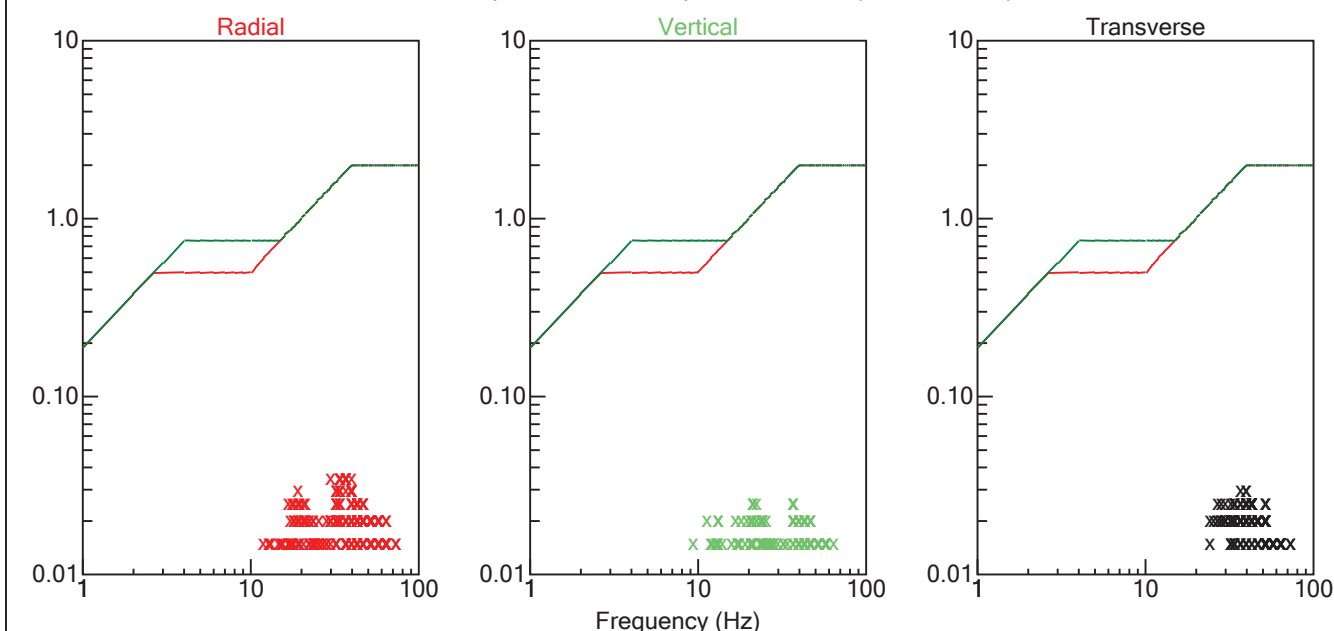
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 250 ft.**

**DRIVE LEVEL: HF 70%**

File: 5132201711231148002.dtb

Number: 002

Date and Time: 11/23/2017 11:48:00 AM

SN: 5132

Seismic Trigger: 0.0100 in/sec

Air Trigger: 110 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.50

**Peaks and Frequencies**

PPV Maximum: 0.0300 in/sec (3.2617 sec)

Radial: 0.0250 in/sec @ 21.3 Hz (2.0059 sec)

Vertical: 0.0200 in/sec @ 18.3 Hz (0.8164 sec)

Transverse: 0.0300 in/sec @ 30.1 Hz (3.2617 sec)

Displacement: 0.0200 in

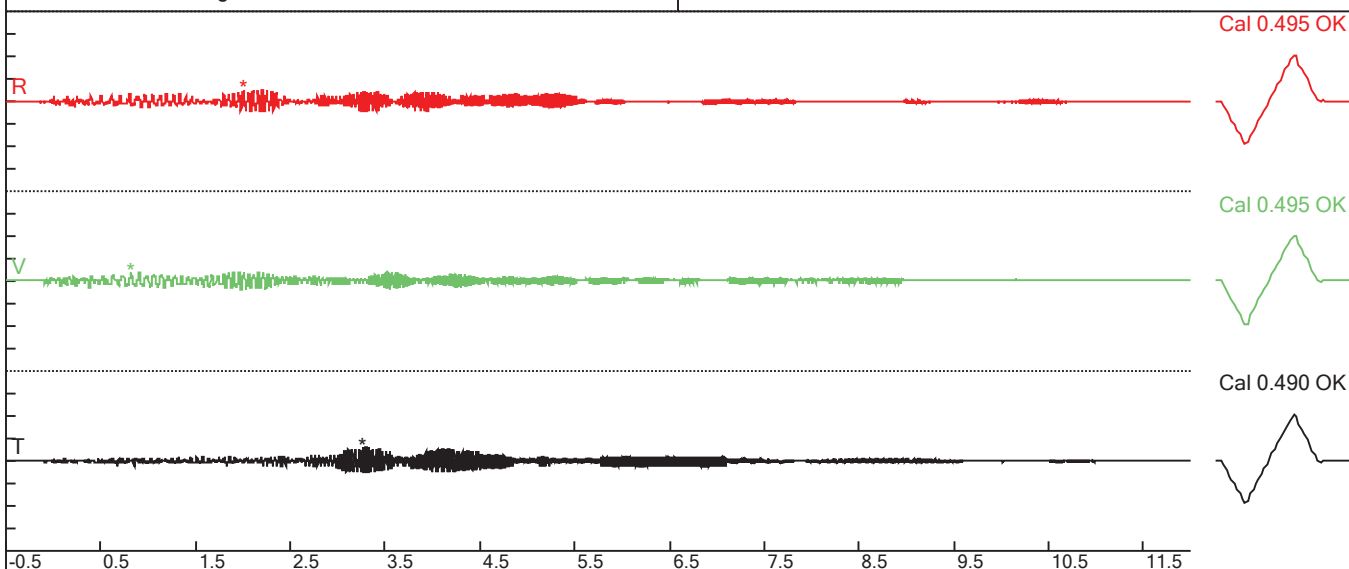
Acceleration: 0.0199 g's

**Graph Information**

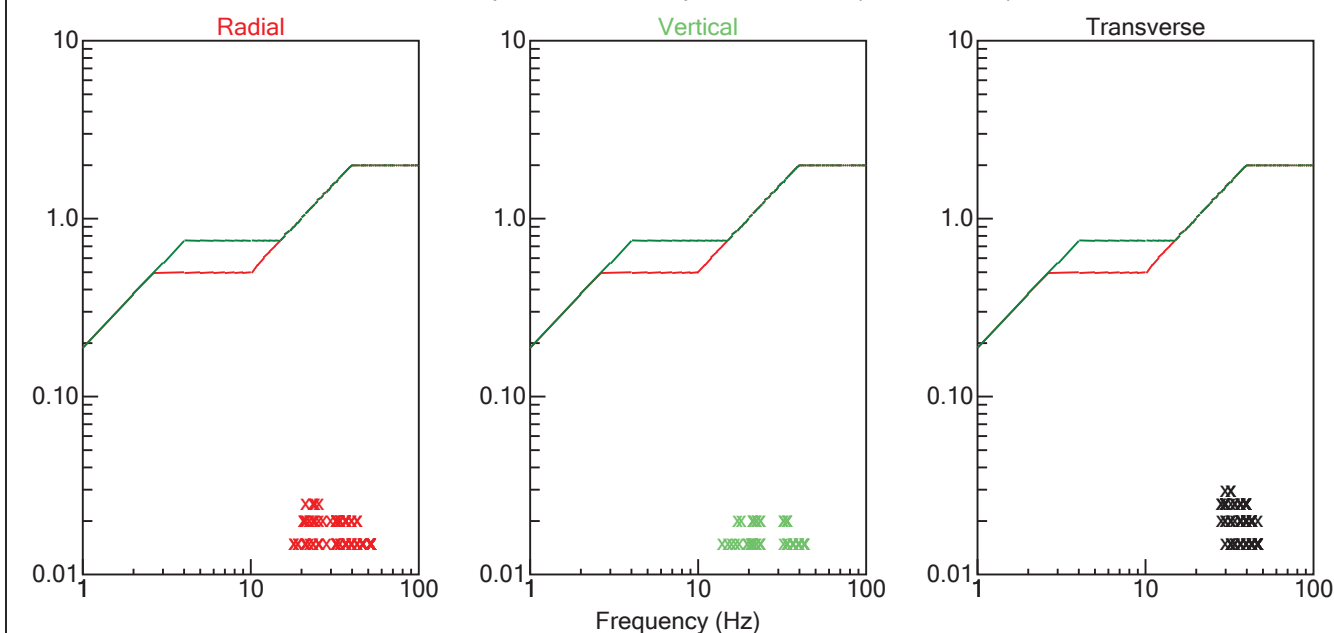
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 300 ft.**

**DRIVE LEVEL: HF 70%**

File: 5134201711231148002.dtb

Number: 002

Date and Time: 11/23/2017 11:48:00 AM

SN: 5134

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.50

**Peaks and Frequencies**

PPV Maximum: 0.0200 in/sec (2.1094 sec)

Radial: 0.0150 in/sec @ 21.3 Hz (1.5029 sec)

Vertical: 0.0200 in/sec @ 21.3 Hz (2.1094 sec)

Transverse: 0.0200 in/sec @ 26.9 Hz (2.9668 sec)

Displacement: 0.0140 in

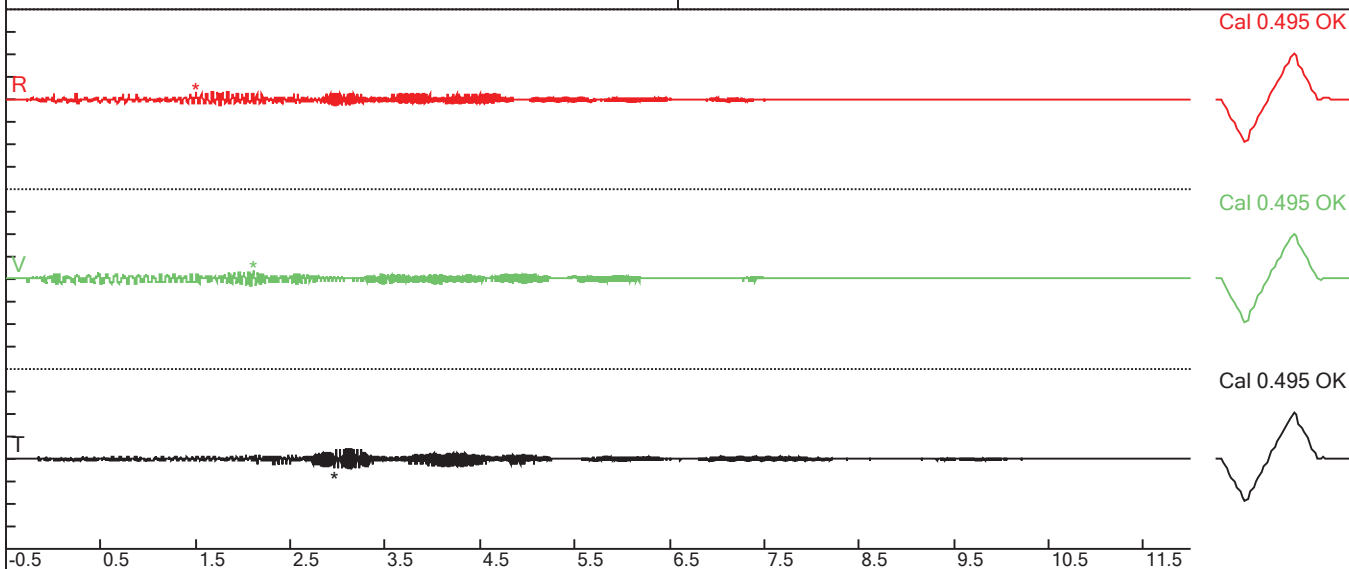
Acceleration: 0.0133 g's

**Graph Information**

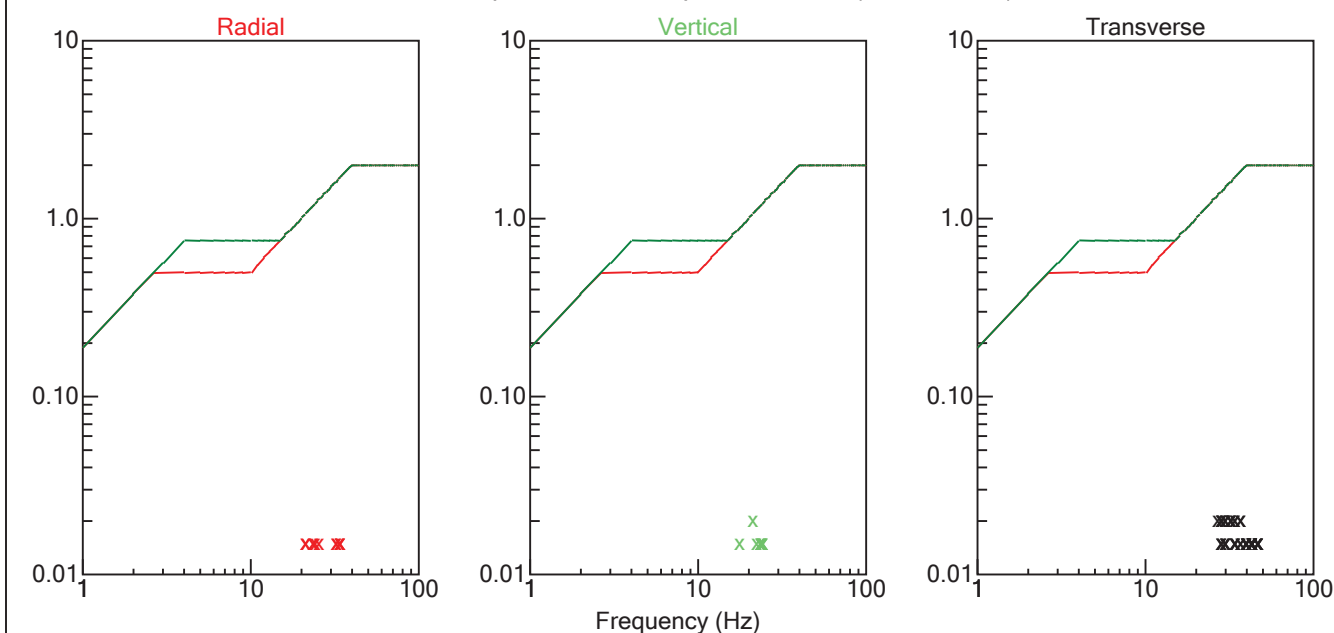
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 350 ft.**

**DRIVE LEVEL: HF 70%**

File: 7013201711231212290011.evt

Number: 0011

Date and Time: 11/23/2017 12:12:29 PM

SN: 7013

Seismic Trigger: 0.0100 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0153 in/sec (2.2188 sec)

Radial: 0.0109 in/sec @ 19.7 Hz (0.8506 sec)

Vertical: 0.0103 in/sec @ 17.1 Hz (-0.5000 sec)

Transverse: 0.0153 in/sec @ 25.6 Hz (2.2188 sec)

Displacement: 0.0100 in

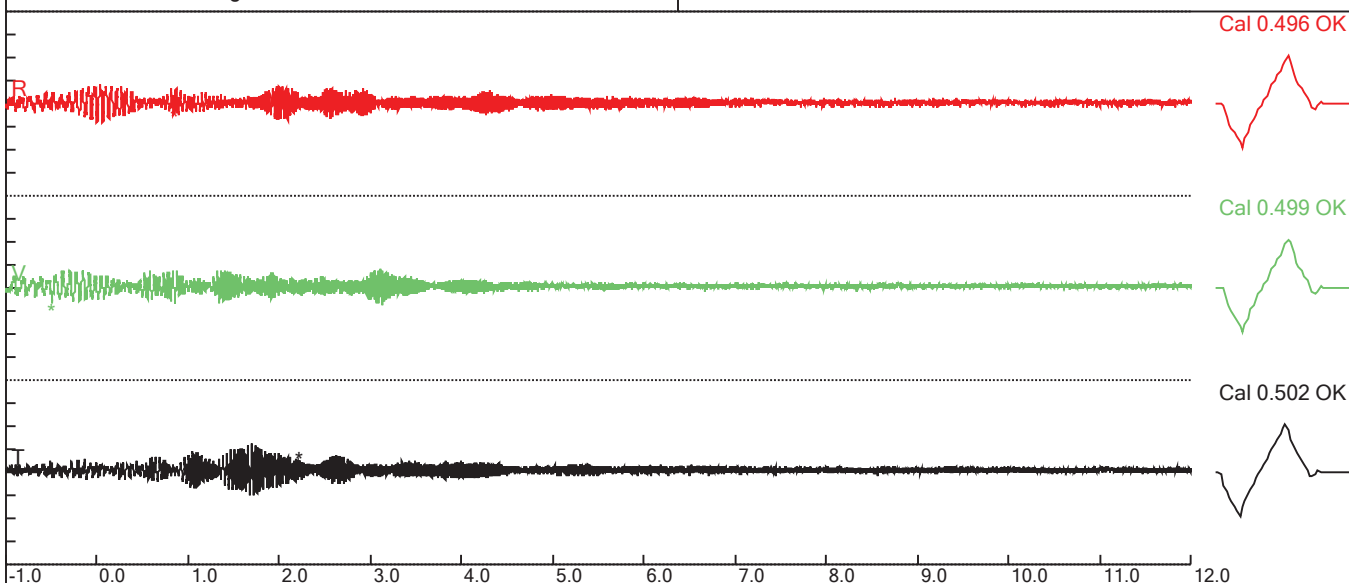
Acceleration: 0.00828 g's

**Graph Information**

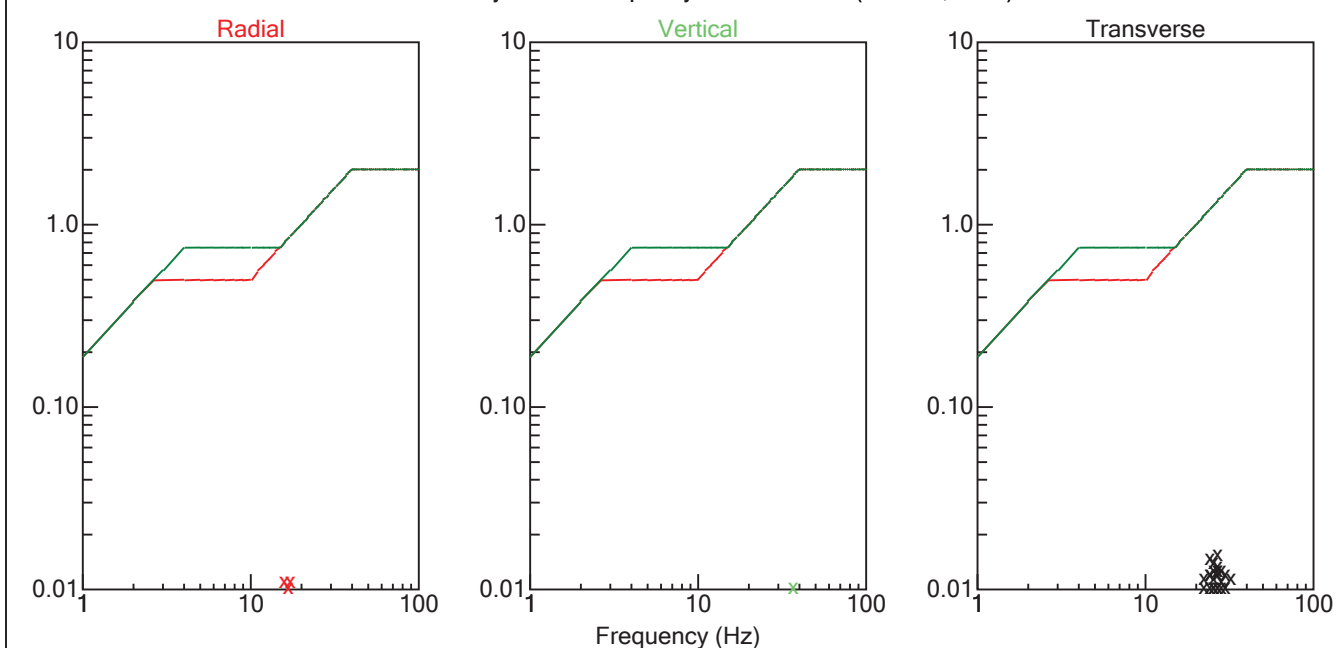
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.0500 in/sec (0.0125 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 400 ft.**

**DRIVE LEVEL: HF 70%**

File: 7121201711231213090011.evt

Number: 0011

Date and Time: 11/23/2017 12:13:09 PM

SN: 7121

Seismic Trigger: 0.0100 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.46

**Peaks and Frequencies**

PPV Maximum: 0.0116 in/sec (0.9873 sec)

Radial: 0.0103 in/sec @ 9.8 Hz (-0.5000 sec)

Vertical: 0.00781 in/sec @ 13.8 Hz (-0.2471 sec)

Transverse: 0.0116 in/sec @ 22.3 Hz (0.9873 sec)

Displacement: 0.00800 in

Acceleration: 0.00663 g's

**Graph Information**

Duration: -1.000 s To: 12.000 s

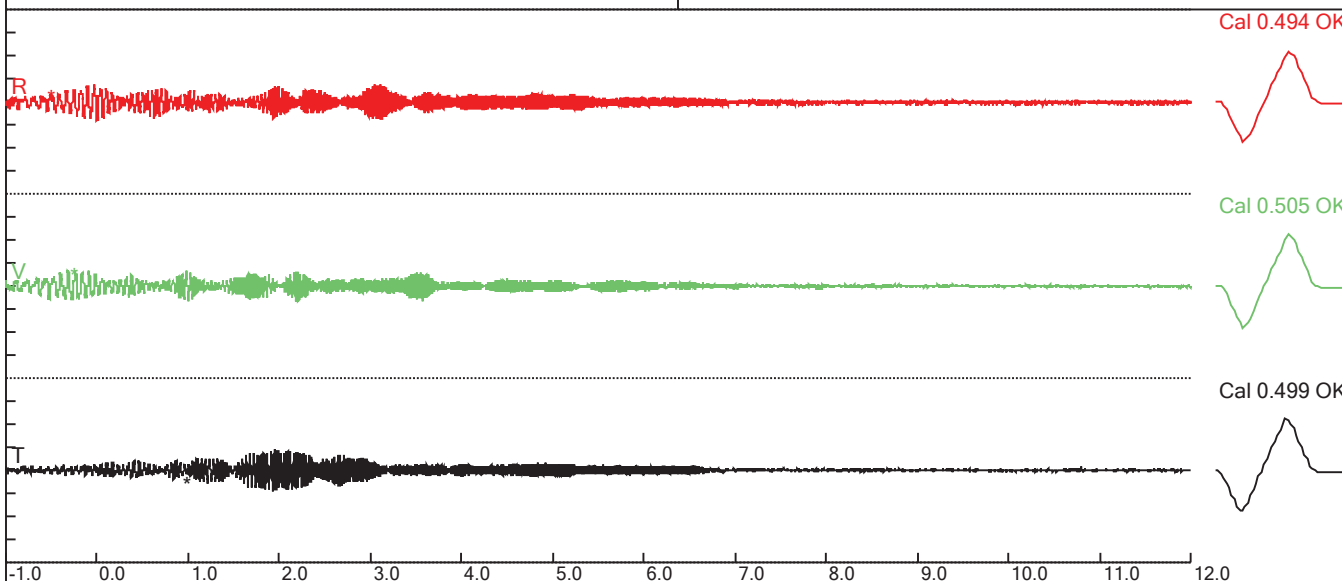
Seismic Scale: 0.0500 in/sec (0.0125 in/sec/div)

Time Intervals: 1.00 sec

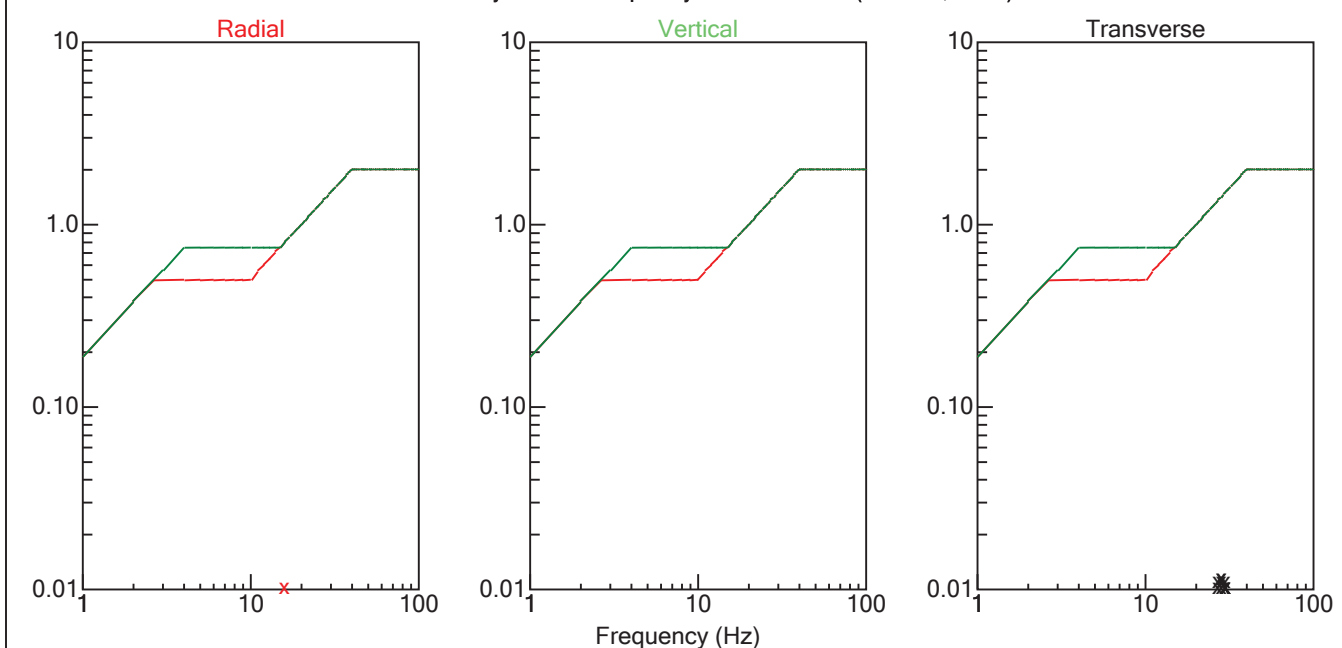
Cal 0.494 OK

Cal 0.505 OK

Cal 0.499 OK



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 450 ft.**

**DRIVE LEVEL: HF 70%**

File: 4355201711231213015.dtb

Number: 015

Date and Time: 11/23/2017 12:13:00 PM

SN: 4355

Seismic Trigger: 0.0100 in/sec

Air Trigger: 146 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 148 dBL

Gain: 2.0x

Voltage: 6.60

**Peaks and Frequencies**

PPV Maximum: 0.0100 in/sec (0.2529 sec)

Radial: 0.0100 in/sec @ 21.3 Hz (0.0000 sec)

Vertical: 0.0100 in/sec @ 23.3 Hz (0.2529 sec)

Transverse: 0.0100 in/sec @ 30.1 Hz (1.4873 sec)

Displacement: 0.00800 in

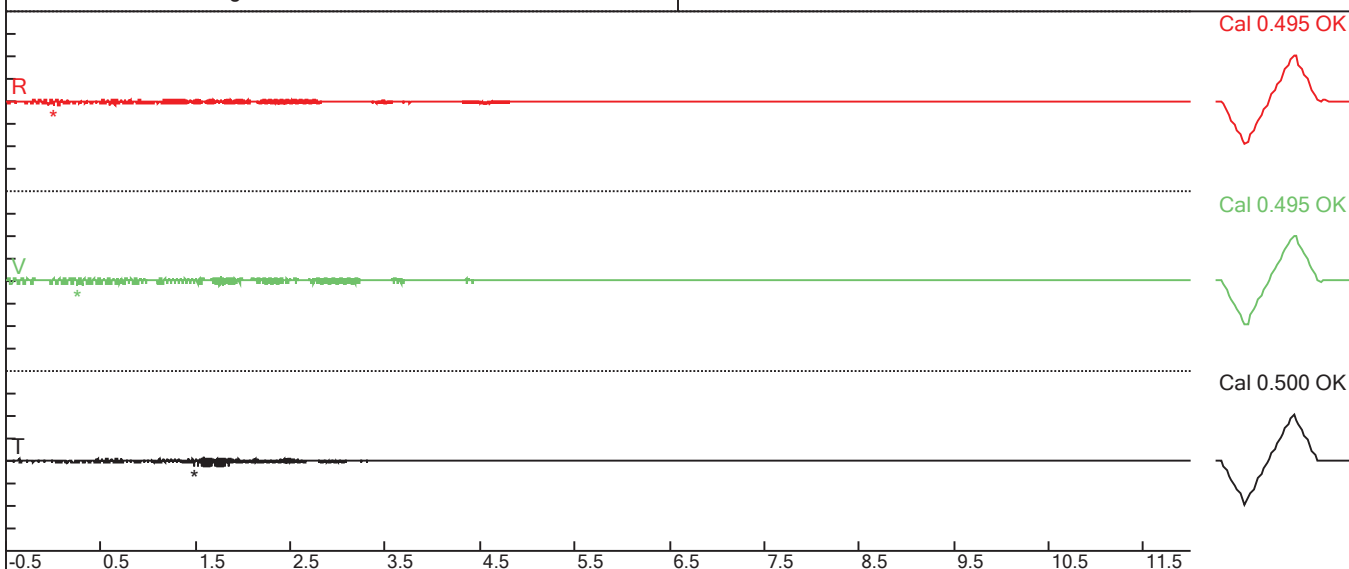
Acceleration: 0.00663 g's

**Graph Information**

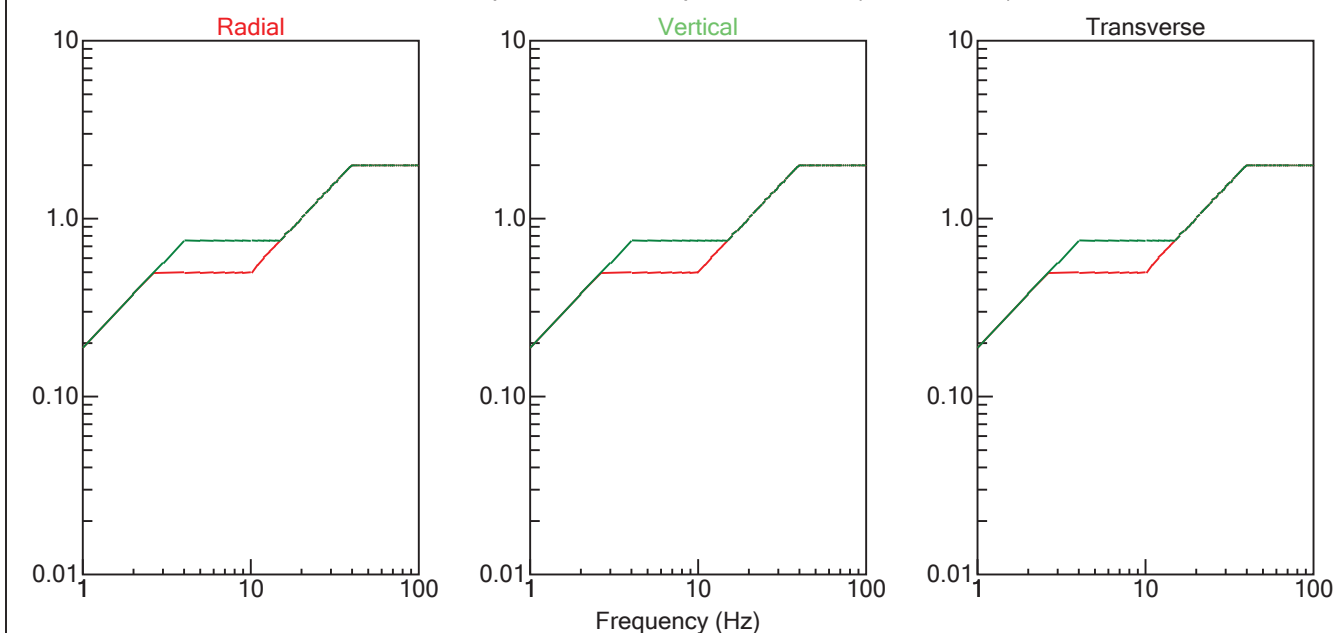
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 500 ft.**

**DRIVE LEVEL: HF 70%**

File: 4955201711231214015.dtb

Number: 015

Date and Time: 11/23/2017 12:14:00 PM

SN: 4955

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0100 in/sec (0.0000 sec)

Radial: 0.0100 in/sec @ 28.4 Hz (2.4199 sec)

Vertical: 0.0100 in/sec @ 11.9 Hz (0.0000 sec)

Transverse: 0.0100 in/sec @ 21.3 Hz (1.4414 sec)

Displacement: 0.00800 in

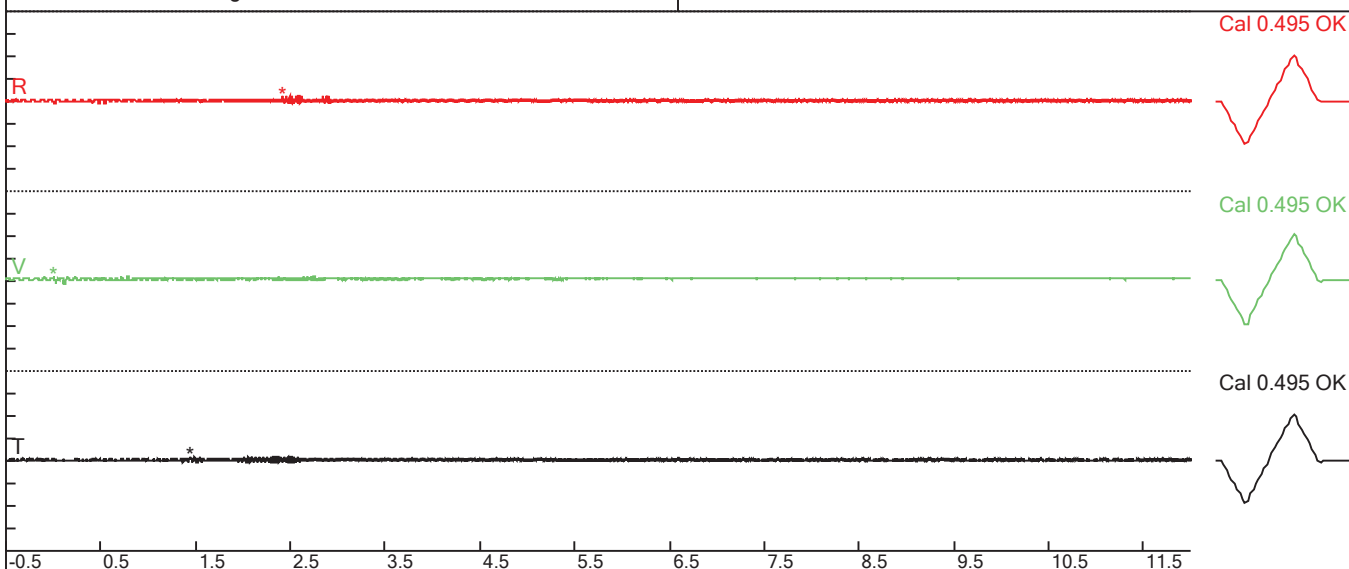
Acceleration: 0.00663 g's

**Graph Information**

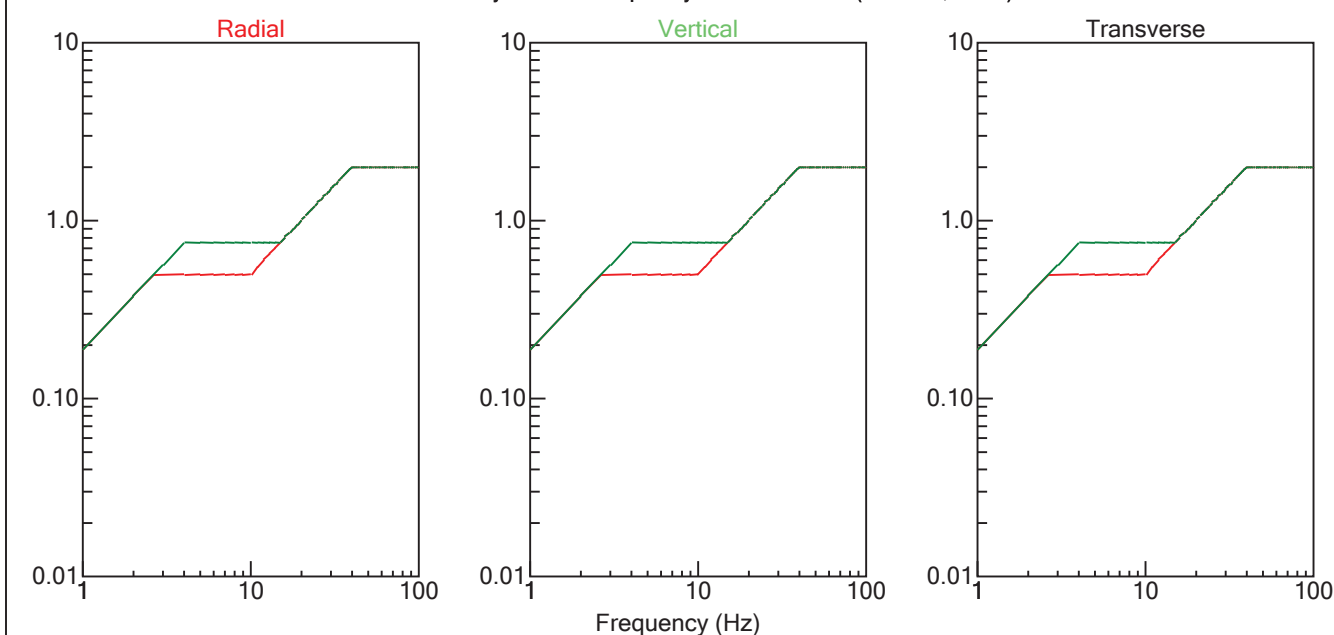
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 2D  
GROUND MOTION STUDY  
PARAGON GEOPHYSICAL  
BEAVER COUNTY UTAH**

| Seq | Drive Level | Sweep Number | Distance | Date       | Time        | PPV   | PPV Hz | Radial | Radial Hz | Vertical | Vertical Hz | Transverse | Transverse Hz | Vector Sum | Voltage | Seismic Trigger | Serial Number | Event Number | Record                     |
|-----|-------------|--------------|----------|------------|-------------|-------|--------|--------|-----------|----------|-------------|------------|---------------|------------|---------|-----------------|---------------|--------------|----------------------------|
| 6   | L.F.        | 1            | 25       | 11/23/2017 | 11:53:38 AM | 0.207 | 24.4   | 0.161  | 25.6      | 0.207    | 24.4        | 0.129      | 23.3          | 0.227      | 6.3     | 0.05            | 7013          | 0006         | 7013201711231153380006.evt |
| 6   | L.F.        | 1            | 50       | 11/23/2017 | 11:54:18 AM | 0.112 | 23.3   | 0.0984 | 39.4      | 0.112    | 23.3        | 0.0384     | 28.4          | 0.119      | 6.5     | 0.05            | 7121          | 0006         | 7121201711231154180006.evt |
| 6   | L.F.        | 1            | 100      | 11/23/2017 | 11:54:00 AM | 0.07  | 22.2   | 0.04   | 32        | 0.07     | 22.2        | 0.03       | 34.1          | 0.07       | 6.6     | 0.015           | 4355          | 008          | 4355201711231154008.dtb    |
| 6   | L.F.        | 1            | 150      | 11/23/2017 | 11:55:00 AM | 0.04  | 23.2   | 0.04   | 23.2      | 0.035    | 24.3        | 0.025      | 24.3          | 0.045      | 6.3     | 0.01            | 4955          | 008          | 4955201711231155008.dtb    |
| 6   | L.F.        | 1            | 200      | 11/23/2017 | 11:55:00 AM | 0.02  | 23.2   | 0.02   | 23.2      | 0.02     | 22.2        | 0.015      | 36.5          | 0.025      | 6.3     | 0.01            | 4956          | 008          | 4956201711231155008.dtb    |
| 6   | L.F.        | 1            | 250      | 11/23/2017 | 11:57:00 AM | 0.02  | 24.3   | 0.015  | 28.4      | 0.02     | 24.3        | 0.015      | 34.1          | 0.02       | 6.5     | 0.01            | 5132          | 008          | 5132201711231157008.dtb    |
| 6   | L.F.        | 1            | 300      | 11/23/2017 | 11:57:00 AM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.015      | 6.4     | 0.01            | 5134          | 008          | 5134201711231157008.dtb    |
| 6   | L.F.        | 1            | 350      | 11/23/2017 | 12:24:33 PM | 0.01  | 24.4   | 0.0059 | 28.4      | 0.00531  | 24.4        | 0.0103     | 24.4          | 0.0105     | 6.3     | 0.01            | 7013          | 0016         | 7013201711231224330016.evt |
| 6   | L.F.        | 1            | 400      | 11/23/2017 | 1:39:07 PM  | 0.016 | 256    | 0.0159 | 256       | 0.0159   | 256         | 0.00719    | 102.4         | 0.0226     | 6.4     | 0.01            | 7121          | 0016         | 7121201711231339070016.evt |
| 7   | L.F.        | 2            | 25       | 11/23/2017 | 11:54:37 AM | 0.212 | 23.3   | 0.157  | 23.3      | 0.212    | 23.3        | 0.122      | 28.4          | 0.223      | 6.3     | 0.05            | 7013          | 0007         | 7013201711231154370007.evt |
| 7   | L.F.        | 2            | 50       | 11/23/2017 | 11:55:17 AM | 0.11  | 22.3   | 0.0972 | 39.4      | 0.11     | 22.3        | 0.0384     | 28.9          | 0.111      | 6.4     | 0.05            | 7121          | 0007         | 7121201711231155170007.evt |
| 7   | L.F.        | 2            | 100      | 11/23/2017 | 11:55:00 AM | 0.05  | 22.2   | 0.035  | 24.3      | 0.05     | 22.2        | 0.03       | 42.6          | 0.06       | 6.6     | 0.015           | 4355          | 009          | 4355201711231155009.dtb    |
| 7   | L.F.        | 2            | 150      | 11/23/2017 | 11:56:00 AM | 0.035 | 21.3   | 0.035  | 21.3      | 0.03     | 23.2        | 0.025      | 30.1          | 0.04       | 6.3     | 0.01            | 4955          | 009          | 4955201711231156009.dtb    |
| 7   | L.F.        | 2            | 200      | 11/23/2017 | 11:56:00 AM | 0.02  | 19.6   | 0.02   | 19.6      | 0.015    | 21.3        | 0.015      | 28.4          | 0.025      | 6.3     | 0.01            | 4956          | 009          | 4956201711231156009.dtb    |
| 7   | L.F.        | 2            | 250      | 11/23/2017 | 11:58:00 AM | 0.015 | 34.1   | 0.015  | 25.6      | 0.015    | 26.9        | 0.015      | 34.1          | 0.02       | 6.5     | 0.01            | 5132          | 009          | 5132201711231158009.dtb    |
| 7   | L.F.        | 2            | 300      | 11/23/2017 | 11:58:00 AM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.015      | 6.4     | 0.01            | 5134          | 009          | 5134201711231158009.dtb    |
| 8   | L.F.        | 3            | 25       | 11/23/2017 | 11:55:31 AM | 0.213 | 23.3   | 0.158  | 23.3      | 0.213    | 23.3        | 0.122      | 28.4          | 0.225      | 6.3     | 0.05            | 7013          | 0008         | 7013201711231155310008.evt |
| 8   | L.F.        | 3            | 50       | 11/23/2017 | 11:56:11 AM | 0.112 | 23.3   | 0.0959 | 39.4      | 0.112    | 23.3        | 0.0384     | 28.4          | 0.113      | 6.4     | 0.05            | 7121          | 0008         | 7121201711231156110008.evt |
| 8   | L.F.        | 3            | 100      | 11/23/2017 | 11:56:00 AM | 0.05  | 22.2   | 0.04   | 25.6      | 0.05     | 22.2        | 0.03       | 42.6          | 0.065      | 6.6     | 0.015           | 4355          | 010          | 4355201711231156010.dtb    |
| 8   | L.F.        | 3            | 150      | 11/23/2017 | 11:57:00 AM | 0.03  | 19.6   | 0.03   | 19.6      | 0.03     | 18.9        | 0.025      | 32            | 0.04       | 6.3     | 0.01            | 4955          | 010          | 4955201711231157010.dtb    |
| 8   | L.F.        | 3            | 200      | 11/23/2017 | 11:57:00 AM | 0.02  | 21.3   | 0.02   | 21.3      | 0.015    | 20.4        | 0.015      | 28.4          | 0.025      | 6.3     | 0.01            | 4956          | 010          | 4956201711231157010.dtb    |
| 8   | L.F.        | 3            | 250      | 11/23/2017 | 11:59:00 AM | 0.015 | 34.1   | 0.015  | 25.6      | 0.015    | 26.9        | 0.015      | 34.1          | 0.02       | 6.5     | 0.01            | 5132          | 010          | 5132201711231159010.dtb    |
| 8   | L.F.        | 3            | 300      | 11/23/2017 | 11:59:00 AM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.015      | 6.4     | 0.01            | 5134          | 010          | 5134201711231159010.dtb    |
| 9   | L.F.        | 4            | 25       | 11/23/2017 | 11:56:40 AM | 0.213 | 23.3   | 0.157  | 23.3      | 0.213    | 23.3        | 0.122      | 28.4          | 0.226      | 6.3     | 0.05            | 7013          | 0009         | 7013201711231156400009.evt |
| 9   | L.F.        | 4            | 50       | 11/23/2017 | 11:57:20 AM | 0.112 | 23.3   | 0.0959 | 39.4      | 0.112    | 23.3        | 0.0384     | 28.4          | 0.113      | 6.4     | 0.05            | 7121          | 0009         | 7121201711231157200009.evt |
| 9   | L.F.        | 4            | 100      | 11/23/2017 | 11:57:00 AM | 0.05  | 21.3   | 0.04   | 25.6      | 0.05     | 21.3        | 0.03       | 42.6          | 0.065      | 6.6     | 0.015           | 4355          | 011          | 4355201711231157011.dtb    |
| 9   | L.F.        | 4            | 150      | 11/23/2017 | 11:58:00 AM | 0.03  | 19.6   | 0.03   | 19.6      | 0.03     | 23.2        | 0.025      | 30.1          | 0.04       | 6.3     | 0.01            | 4955          | 011          | 4955201711231158011.dtb    |
| 9   | L.F.        | 4            | 200      | 11/23/2017 | 11:58:00 AM | 0.02  | 22.2   | 0.02   | 22.2      | 0.015    | 20.4        | 0.015      | 26.9          | 0.025      | 6.3     | 0.01            | 4956          | 011          | 4956201711231158011.dtb    |
| 9   | L.F.        | 4            | 250      | 11/23/2017 | 12:00:00 PM | 0.015 | 36.5   | 0.015  | 25.6      | 0.015    | 24.3        | 0.015      | 36.5          | 0.02       | 6.5     | 0.01            | 5132          | 011          | 5132201711231200011.dtb    |
| 9   | L.F.        | 4            | 300      | 11/23/2017 | 12:00:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.015      | 6.4     | 0.01            | 5134          | 011          | 5134201711231200011.dtb    |
| 10  | L.F.        | 5            | 25       | 11/23/2017 | 11:58:00 AM | 0.208 | 23.3   | 0.158  | 23.3      | 0.208    | 23.3        | 0.123      | 28.4          | 0.225      | 6.3     | 0.05            | 7013          | 0010         | 7013201711231158000010.evt |
| 10  | L.F.        | 5            | 50       | 11/23/2017 | 11:58:40 AM | 0.111 | 22.3   | 0.0959 | 39.4      | 0.111    | 22.3        | 0.0391     | 26.9          | 0.111      | 6.4     | 0.05            | 7121          | 0010         | 7121201711231158400010.evt |
| 10  | L.F.        | 5            | 100      | 11/23/2017 | 11:58:00 AM | 0.05  | 26.9   | 0.04   | 26.9      | 0.05     | 26.9        | 0.03       | 34.1          | 0.065      | 6.6     | 0.015           | 4355          | 012          | 4355201711231158012.dtb    |
| 10  | L.F.        | 5            | 150      | 11/23/2017 | 11:59:00 AM | 0.03  | 19.6   | 0.03   | 19.6      | 0.03     | 23.2        | 0.025      | 30.1          | 0.04       | 6.3     | 0.01            | 4955          | 012          | 4955201711231159012.dtb    |
| 10  | L.F.        | 5            | 200      | 11/23/2017 | 12:00:00 PM | 0.02  | 18.9   | 0.02   | 18.9      | 0.015    | 20.4        | 0.015      | 26.9          | 0.025      | 6.3     | 0.01            | 4956          | 012          | 4956201711231200012.dtb    |
| 10  | L.F.        | 5            | 250      | 11/23/2017 | 12:01:00 PM | 0.015 | 36.5   | 0.015  | 30.1      | 0.015    | 25.6        | 0.015      | 36.5          | 0.02       | 6.5     | 0.01            | 5132          | 012          | 5132201711231201012.dtb    |
| 10  | L.F.        | 5            | 300      | 11/23/2017 | 12:01:00 PM | 0.01  | 0      | 0.01   | 0         | 0.01     | 0           | 0.01       | 0             | 0.015      | 6.4     | 0.01            | 5134          | 012          | 5134201711231201012.dtb    |



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 25 ft.**

**DRIVE LEVEL: LF 40%**

File: 7013201711231153380006.evt

Number: 0006

Date and Time: 11/23/2017 11:53:38 AM

SN: 7013

Seismic Trigger: 0.0500 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.207 in/sec (1.5059 sec)

Radial: 0.161 in/sec @ 18.3 Hz (1.0000 sec)

Vertical: 0.207 in/sec @ 17.7 Hz (1.5059 sec)

Transverse: 0.129 in/sec @ 19.7 Hz (2.2275 sec)

Displacement: 0.100 in

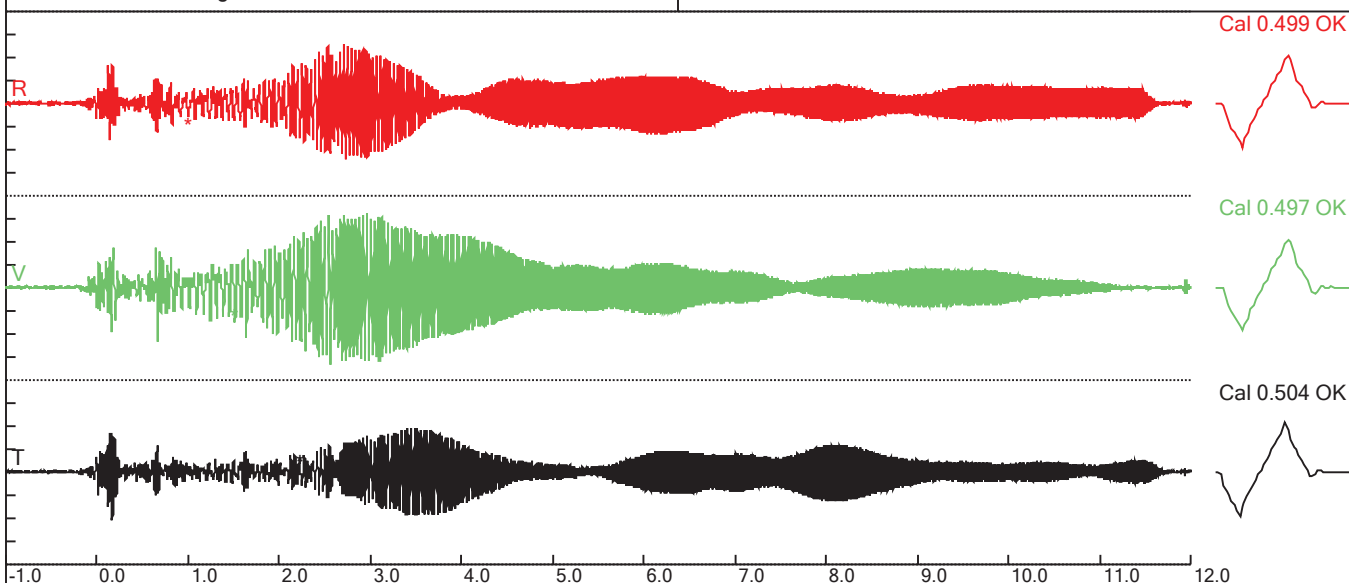
Acceleration: 0.0994 g's

**Graph Information**

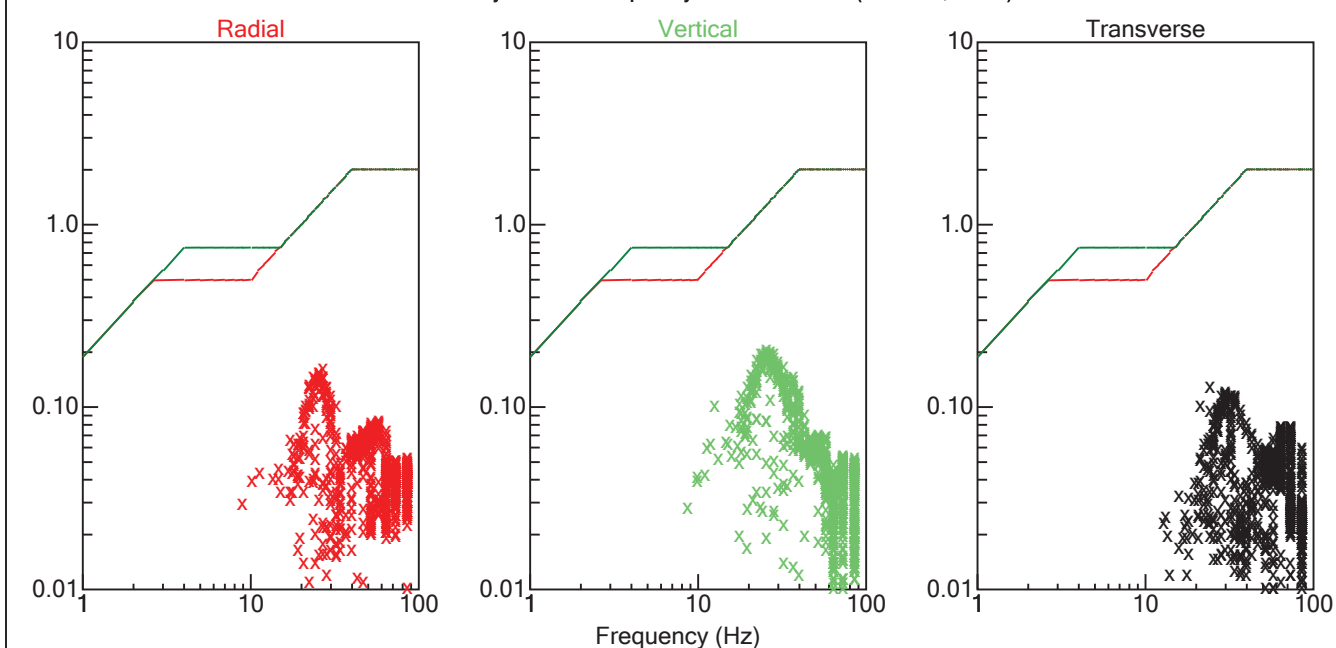
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.250 in/sec (0.0625 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 50 ft.**

**DRIVE LEVEL: LF 40%**

File: 7121201711231154180006.evt

Number: 0006

Date and Time: 11/23/2017 11:54:18 AM

SN: 7121

Seismic Trigger: 0.0500 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.47

**Peaks and Frequencies**

PPV Maximum: 0.112 in/sec (-0.3086 sec)

Radial: 0.0984 in/sec @ 32.0 Hz (-0.4004 sec)

Vertical: 0.112 in/sec @ 46.5 Hz (-0.3086 sec)

Transverse: 0.0384 in/sec @ 28.4 Hz (3.3975 sec)

Displacement: 0.0760 in

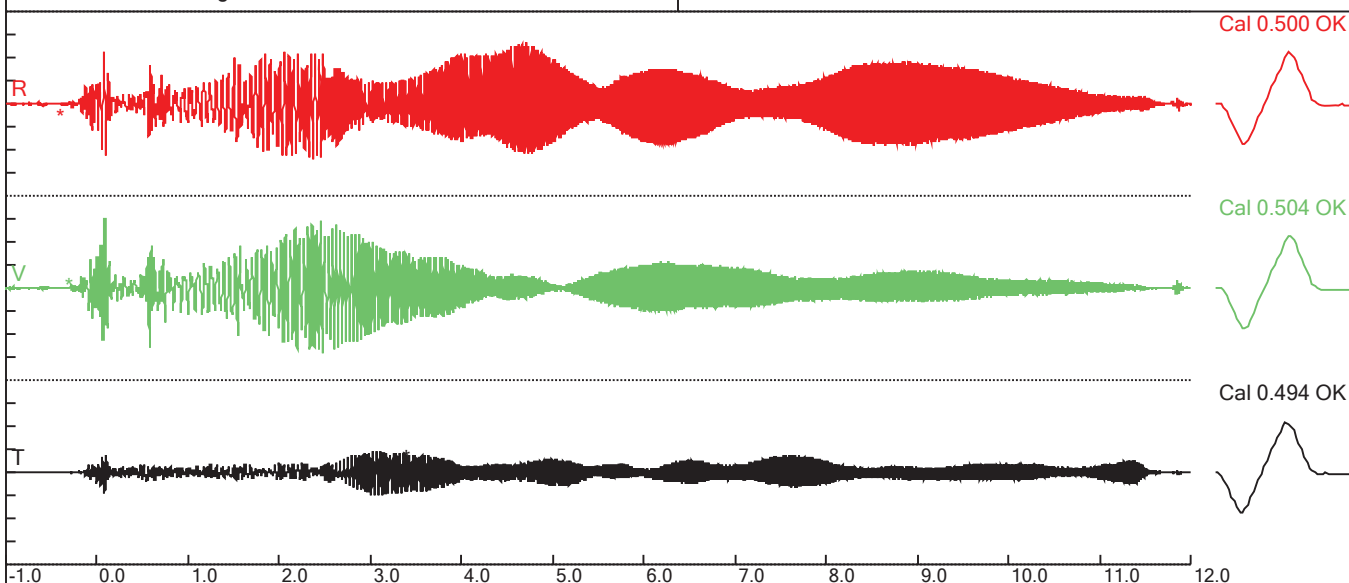
Acceleration: 0.0754 g's

**Graph Information**

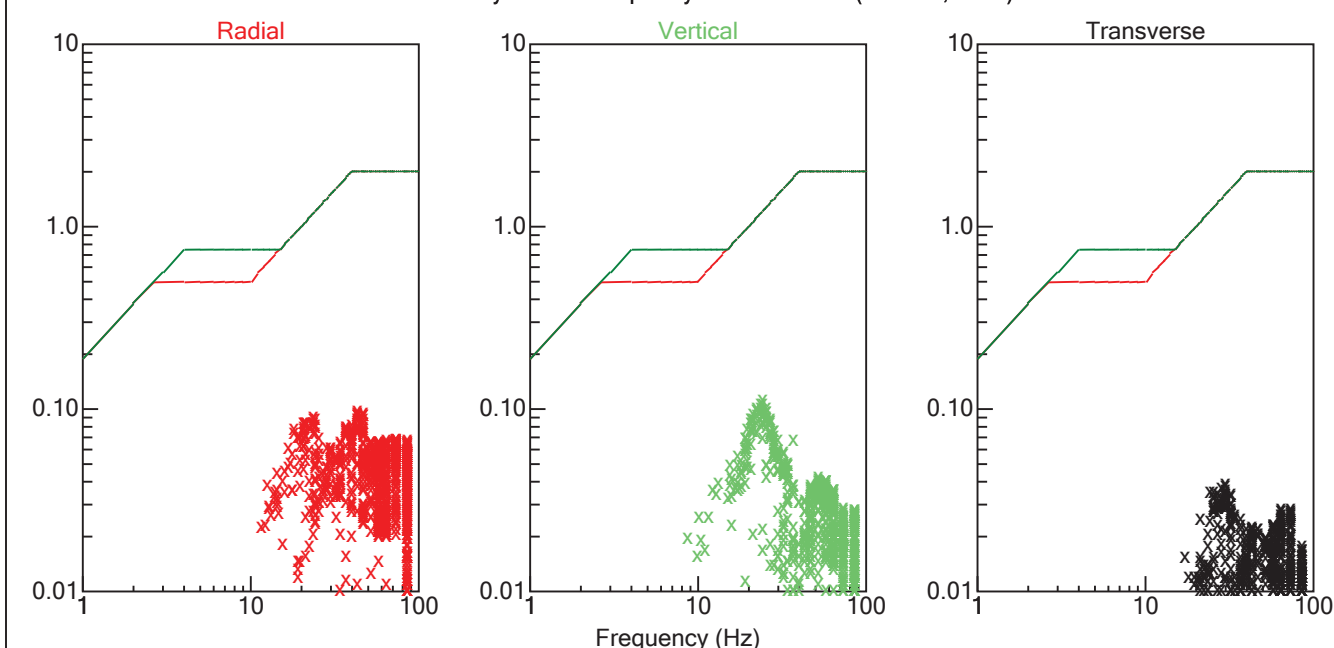
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.150 in/sec (0.0375 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 100 ft.**

**DRIVE LEVEL: LF 40%**

File: 4355201711231154008.dtb

Number: 008

Date and Time: 11/23/2017 11:54:00 AM

SN: 4355

Seismic Trigger: 0.0150 in/sec

Air Trigger: 146 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 148 dBL

Gain: 2.0x

Voltage: 6.60

**Peaks and Frequencies**

PPV Maximum: 0.0700 in/sec (0.1914 sec)

Radial: 0.0400 in/sec @ 32.0 Hz (0.0996 sec)

Vertical: 0.0700 in/sec @ 21.3 Hz (0.1914 sec)

Transverse: 0.0300 in/sec @ 32.0 Hz (3.8975 sec)

Displacement: 0.0280 in

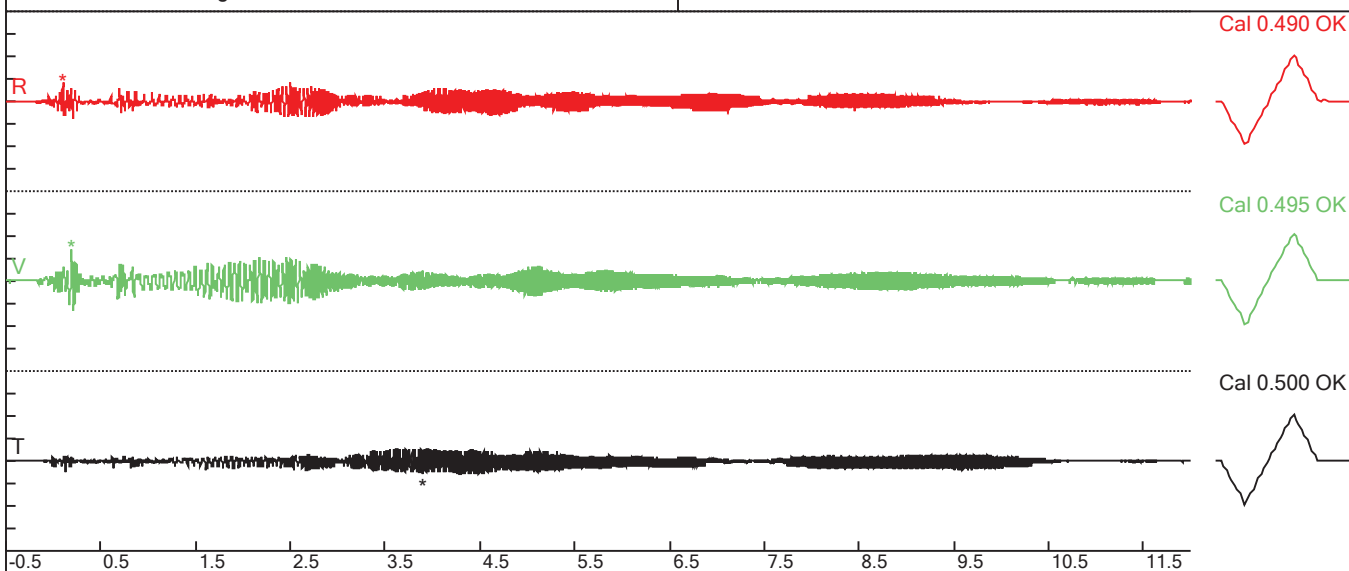
Acceleration: 0.0265 g's

**Graph Information**

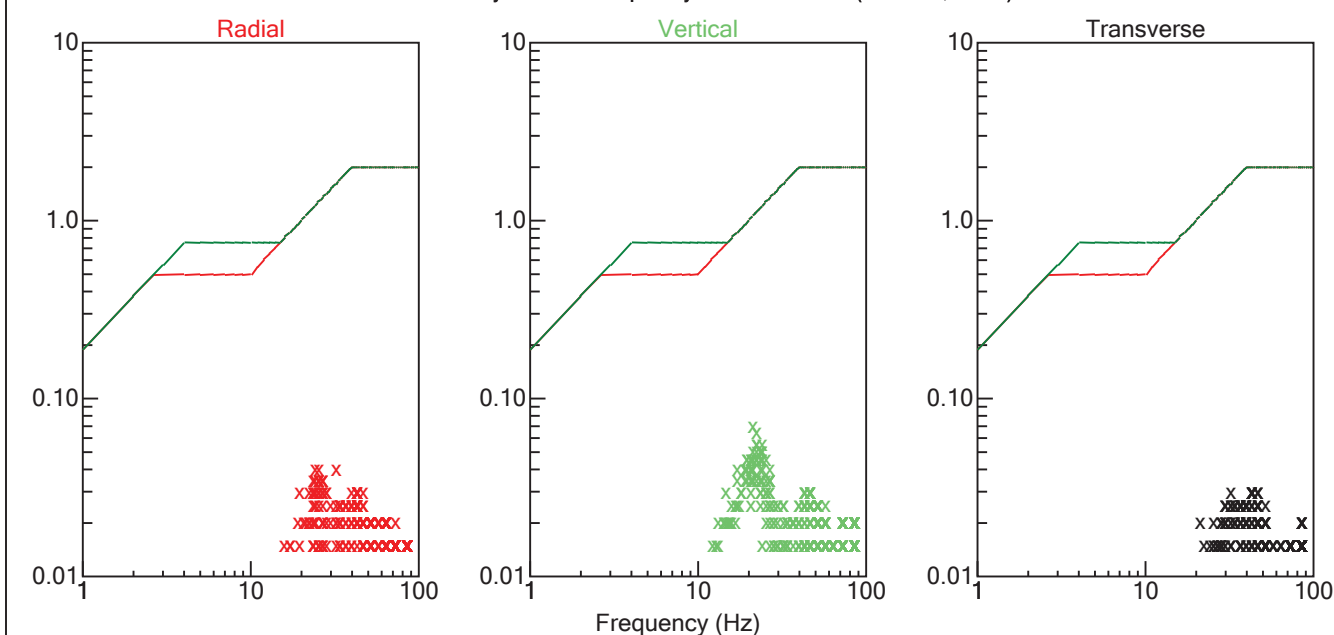
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 150 ft.**

**DRIVE LEVEL: LF 40%**

File: 4955201711231155008.dtb

Number: 008

Date and Time: 11/23/2017 11:55:00 AM

SN: 4955

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0400 in/sec (0.3066 sec)

Radial: 0.0400 in/sec @ 22.3 Hz (0.3066 sec)

Vertical: 0.0350 in/sec @ 21.3 Hz (0.2910 sec)

Transverse: 0.0250 in/sec @ 39.4 Hz (0.1904 sec)

Displacement: 0.0200 in

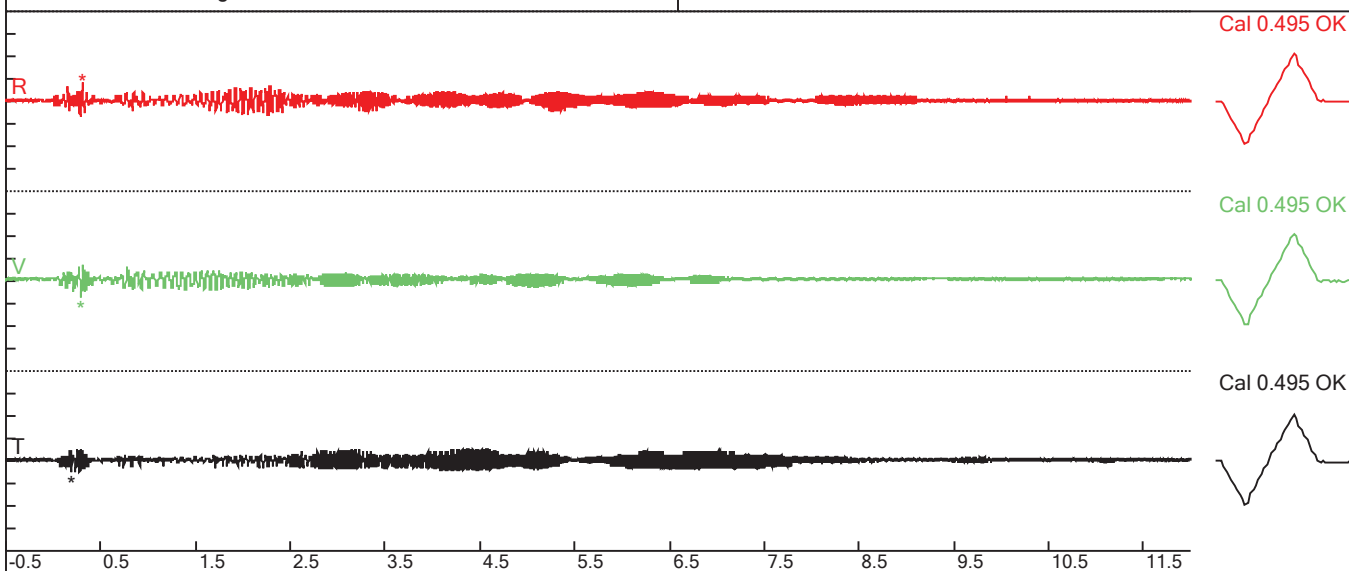
Acceleration: 0.0199 g's

**Graph Information**

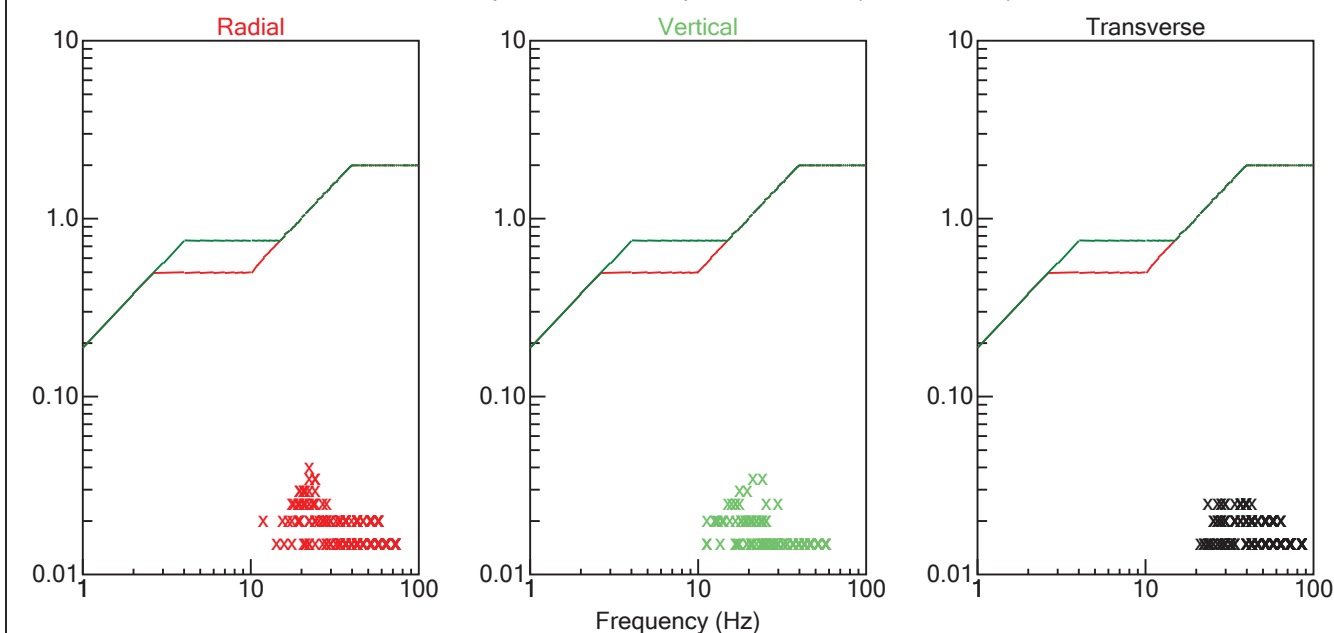
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 200 ft.**

**DRIVE LEVEL: LF 40%**

File: 4956201711231155008.dtb

Number: 008

Date and Time: 11/23/2017 11:55:00 AM

SN: 4956

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0200 in/sec (0.3203 sec)

Radial: 0.0200 in/sec @ 20.5 Hz (0.3057 sec)

Vertical: 0.0200 in/sec @ 20.5 Hz (0.3203 sec)

Transverse: 0.0150 in/sec @ 30.1 Hz (0.2480 sec)

Displacement: 0.0140 in

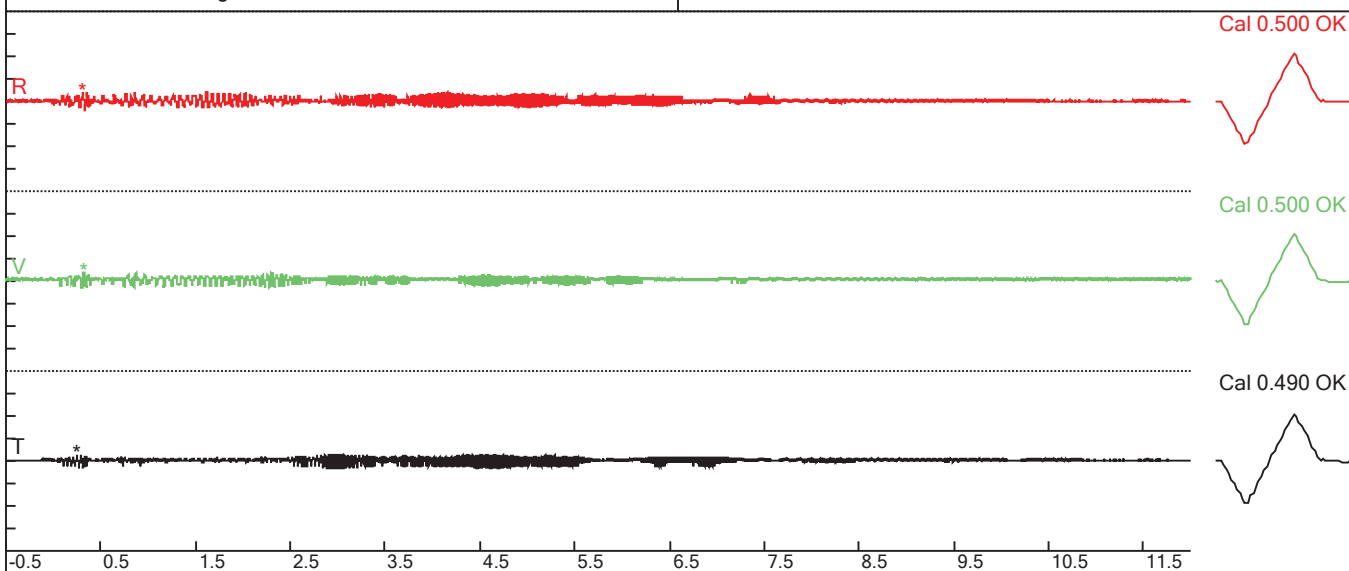
Acceleration: 0.0133 g's

**Graph Information**

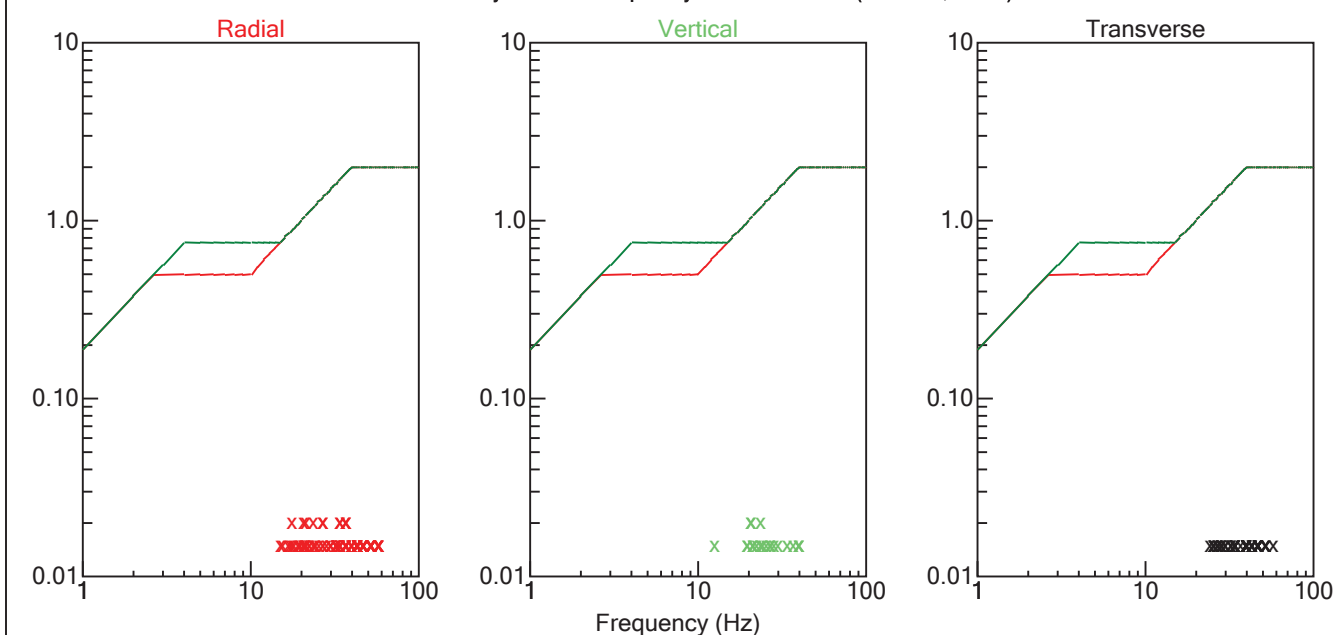
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 300 ft.**

**DRIVE LEVEL: LF 40%**

File: 5134201711231157008.dtb

Number: 008

Date and Time: 11/23/2017 11:57:00 AM

SN: 5134

Seismic Trigger: 0.0100 in/sec

Air Trigger: 142 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 0.5 Second

Seismic Range: 2.50 in/s

Acoustic Range: 142 dBL

Gain: 2.0x

Voltage: 6.40

**Peaks and Frequencies**

PPV Maximum: 0.0100 in/sec (0.0010 sec)

Radial: 0.0100 in/sec @ 22.3 Hz (0.0078 sec)

Vertical: 0.0100 in/sec @ 34.1 Hz (0.0010 sec)

Transverse: 0.0100 in/sec @ 25.6 Hz (0.0000 sec)

Displacement: 0.00800 in

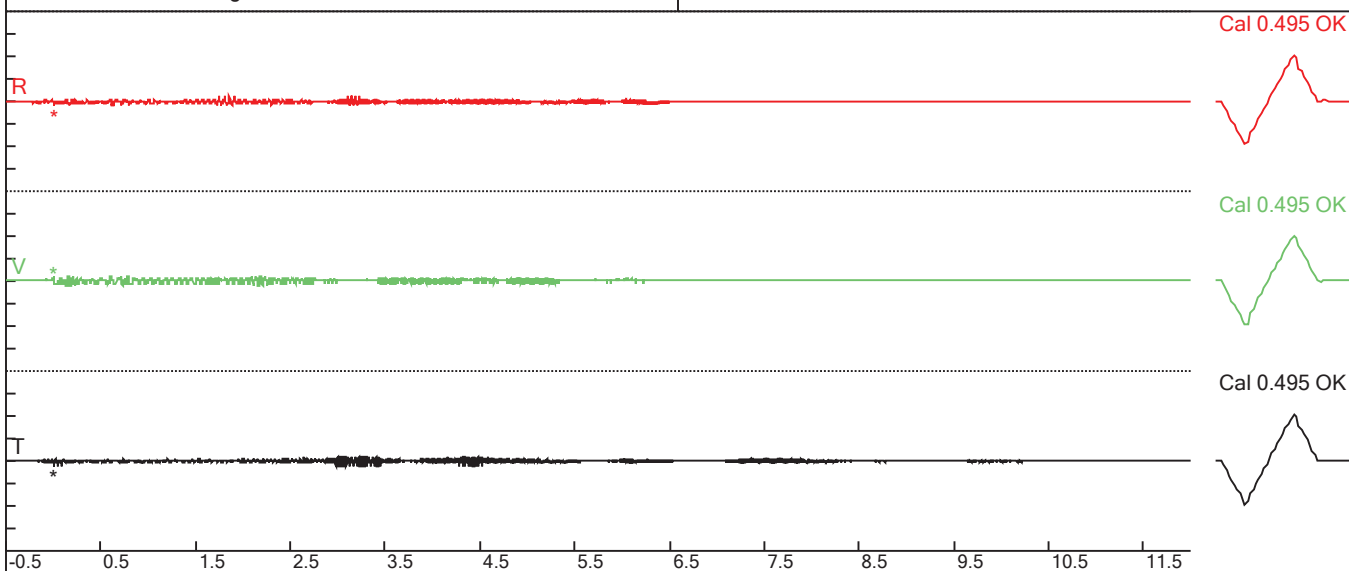
Acceleration: 0.00663 g's

**Graph Information**

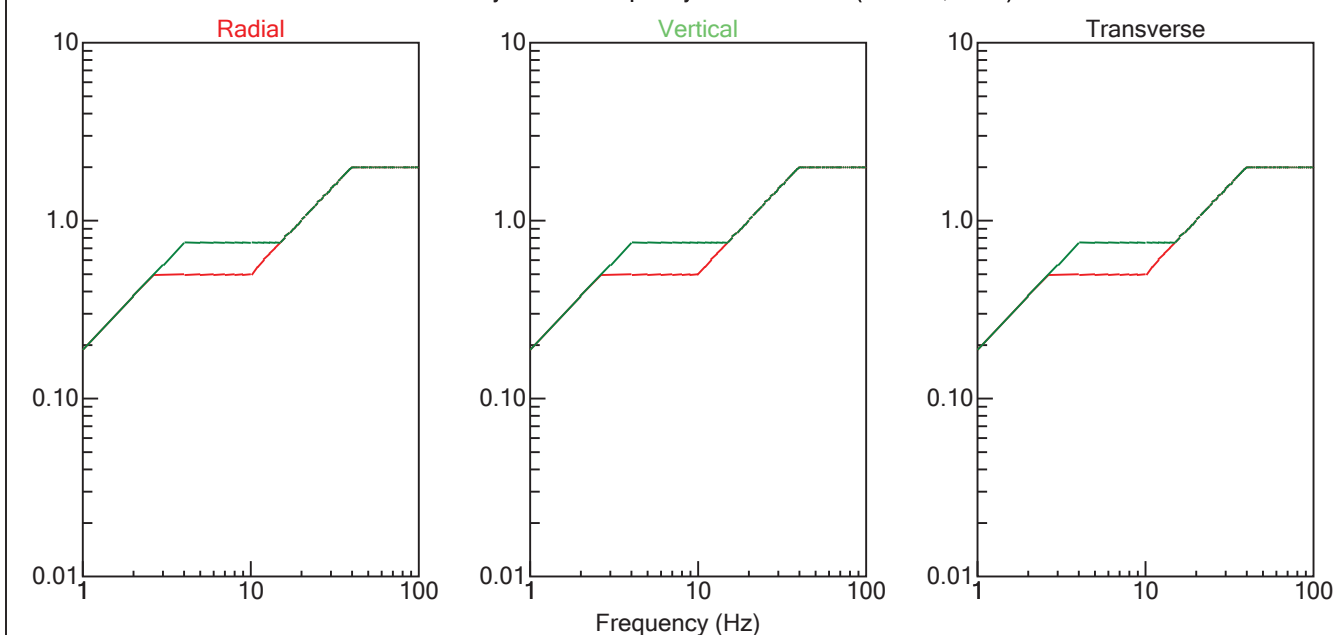
Duration: -0.500 s To: 12.000 s

Seismic Scale: 0.200 in/sec (0.0500 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**





**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 350 ft.**

**DRIVE LEVEL: LF 40%**

File: 7013201711231224330016.evt

Number: 0016

Date and Time: 11/23/2017 12:24:33 PM

SN: 7013

Seismic Trigger: 0.0100 in/sec

Air Trigger: 130.0 dBL

Sample Rate: 1024

Duration: 12 Seconds

Pre-Trigger: 1.0 Second

Seismic Gain: 10.2in/sec

Acoustic Gain: 148.2 dBL

Voltage: 6.30

**Peaks and Frequencies**

PPV Maximum: 0.0103 in/sec (0.9941 sec)

Radial: 0.00594 in/sec @ 512.0 Hz (0.0439 sec)

Vertical: 0.00531 in/sec @ 512.0 Hz (-0.5000 sec)

Transverse: 0.0103 in/sec @ 26.9 Hz (0.9941 sec)

Displacement: 0.00600 in

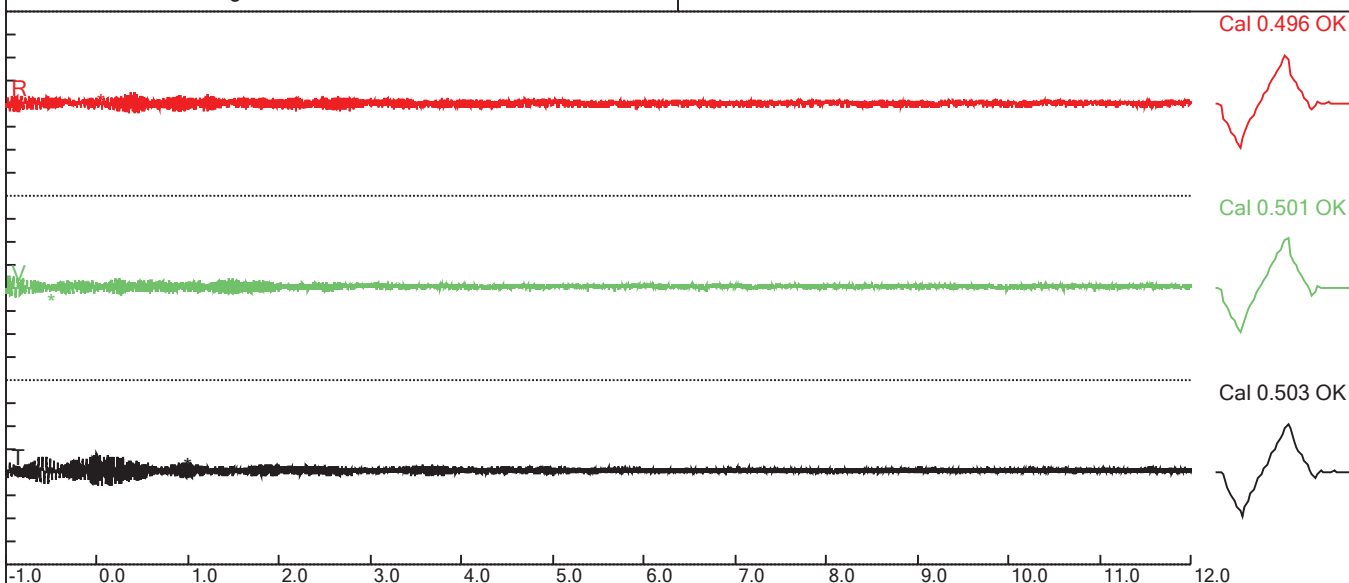
Acceleration: 0.00580 g's

**Graph Information**

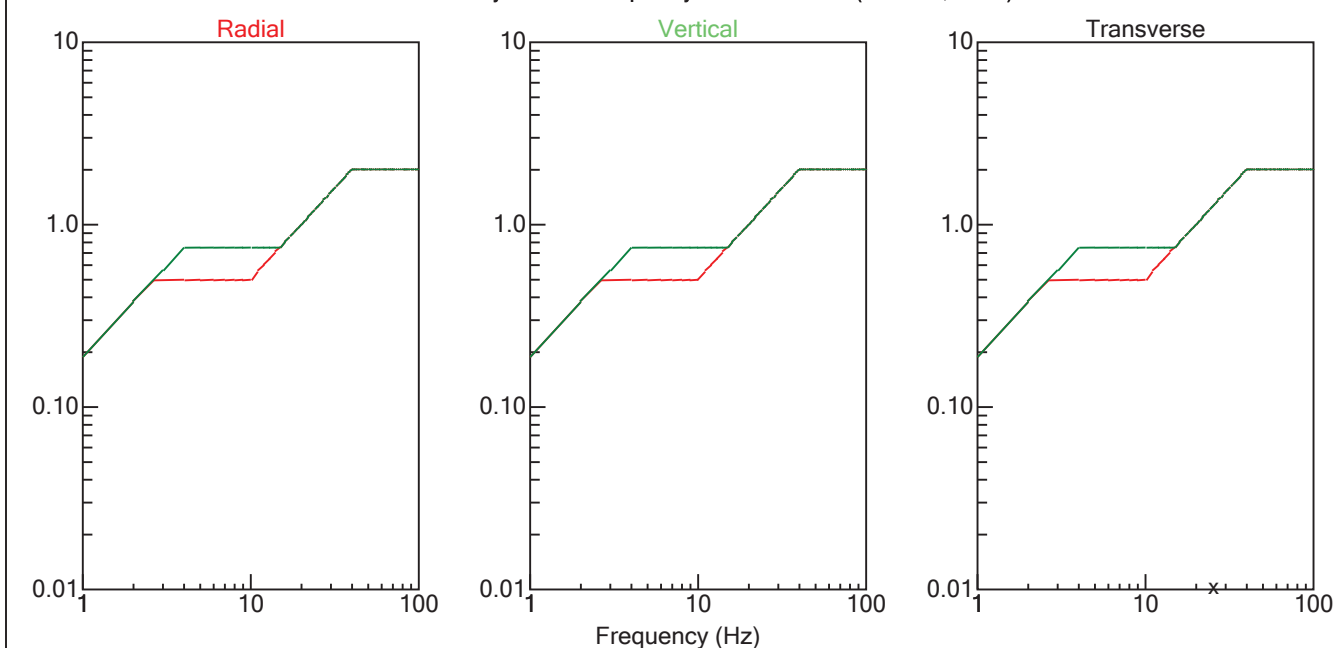
Duration: -1.000 s To: 12.000 s

Seismic Scale: 0.0500 in/sec (0.0125 in/sec/div)

Time Intervals: 1.00 sec



**Particle Velocity Versus Frequency - USBM Limits (RI 8507, 1980)**



**FORGE 3D  
PARAGON GEOPHYSICAL  
GROUND MOTION STUDY**

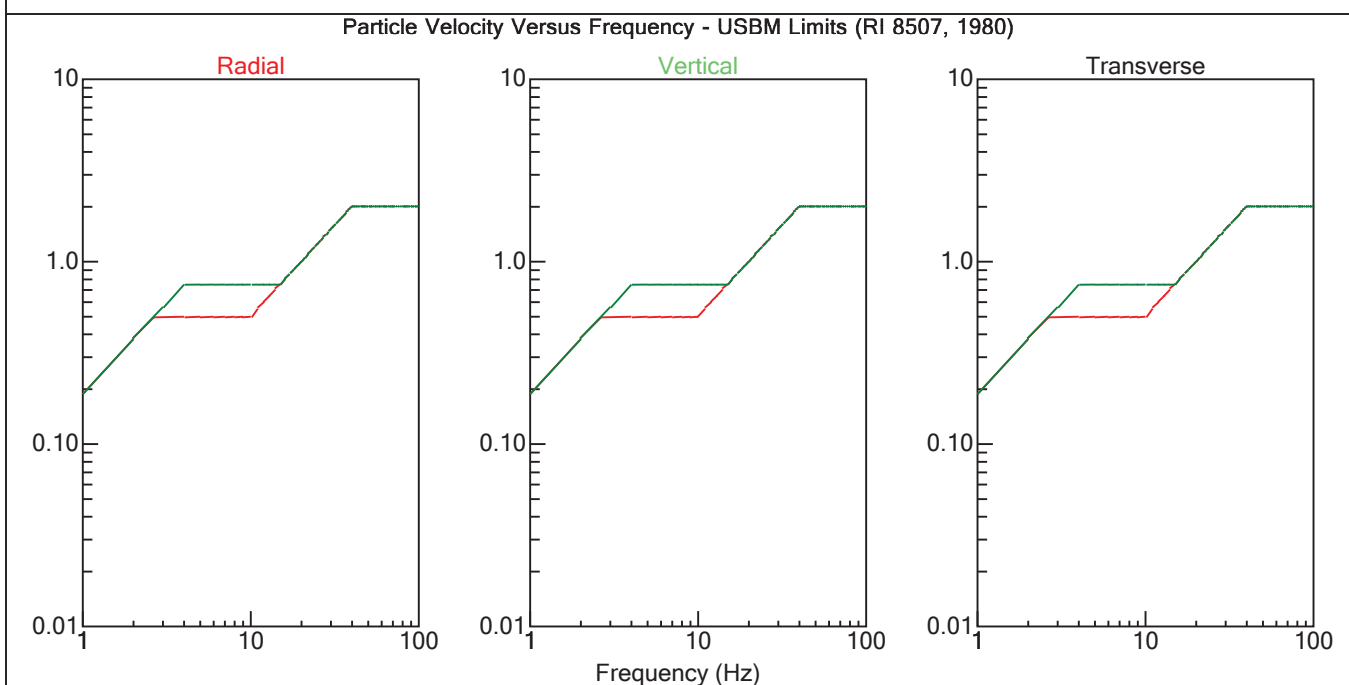
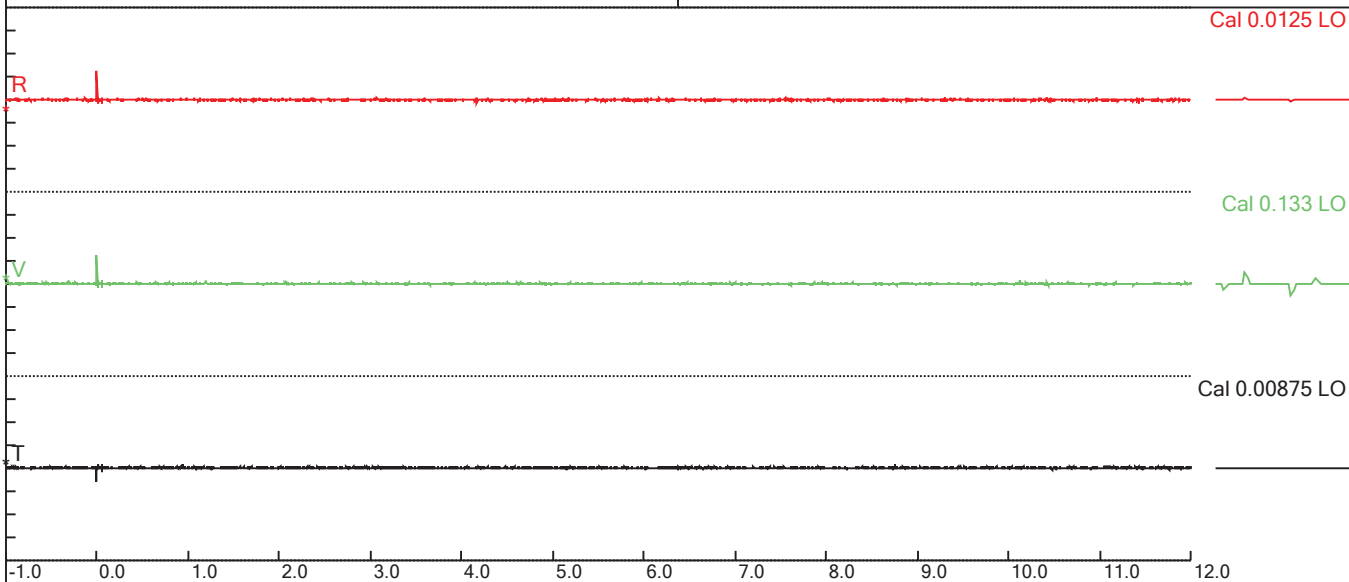
**ENERGY SOURCE: 2 I/O AHV IV 62,000 LB. VIBRATORS**

**SEISMOGRAPH SETUP DISTANCE: 400 ft.**

**DRIVE LEVEL: LF 40%**

File: 7121201711231339070016.evt  
Number: 0016  
Date and Time: 11/23/2017 1:39:07 PM  
SN: 7121  
Seismic Trigger: 0.0100 in/sec  
Air Trigger: 130.0 dBL  
Sample Rate: 1024  
Duration: 12 Seconds  
Pre-Trigger: 1.0 Second  
Seismic Gain: 10.2in/sec  
Acoustic Gain: 148.2 dBL  
Voltage: 6.36

| Peaks and Frequencies                               | Graph Information                                |
|---|--|
| PPV Maximum: 0.0159 in/sec (-1.0000 sec)            | Duration: -1.000 s To: 12.000 s                  |
| Radial: 0.0159 in/sec @ 128.0 Hz (-1.0000 sec)      | Seismic Scale: 0.0500 in/sec (0.0125 in/sec/div) |
| Vertical: 0.0159 in/sec @ 102.4 Hz (-1.0000 sec)    | Time Intervals: 1.00 sec                         |
| Transverse: 0.00719 in/sec @ 128.0 Hz (-1.0000 sec) |  |
| Displacement: 0.0240 in                             |  |
| Acceleration: 0.0224 g's                            |  |





Machine: 7121

Date: 11-23-17

## FORGE 3D

| Source Point | Drive Level | Num of Vibs | Distance and Direction   | P.P.V                                | Sweep Event            | Time                                 |
|--------------|-------------|-------------|--|--------------------------------------|------------------------|--------------------------------------|
| HF           | 2           |             | Set up FOR WALKAWAY TEST<br>3/4 mile NW OF UNIVERSITY OF UTAH<br>GEO THERMAL PLANT NEXT TO 2 TRACK.<br>Soil IS SANDY w/ GRASS & SCARBUSH.<br>w/CATTLE GRAZING ON IT. Test IS being<br>conducted w/ 2 110 AHV IV VIBRATORS. | .205<br>.195<br>.188<br>.196<br>.185 | 1<br>2<br>3<br>4<br>5  | 1149<br>1146<br>1147<br>1148<br>1150 |
| LF           | 2           |             | The Sweep IS 12 seconds w/ START<br>Freq. AT 4 Hz. & End Freq. AT 84 Hz. Vibes<br>weighing IN AT 64,000 lbs each. The vibes<br>ARE SET UP 500' W OF KERN RIVER<br>gas pipeline & 81' E OF RP 503171                        | .112<br>.110<br>.112<br>.112<br>.111 | 6<br>7<br>8<br>9<br>10 | 1154<br>1155<br>1156<br>1157<br>1158 |
| HF           | 2           |             | Moved Seis. 7013, 7121, 4355, 4955 <u>400'</u><br>OUT TO 350, 400, 450, 500  | .011<br>.010<br>.010                 | 11<br>12<br>13         | 1213<br>1215<br>1216                 |
|              |             |             | STARTED TESTING AT 11:45 AM & FINISHED<br>AT 12:26 PM. Met w/ Reas FROM KERN<br>River & University OF UTAH & RANDY<br>SHANNON To go over PRELIMINARY RESULTS   | .010<br>.011                         | 14<br>15               | 1217<br>1218                         |
| LF           | 2           |             | AFTER Test WAS done. I told everybody<br>THAT JAM would do A much more<br>indepth Report & THAT my numbers<br>are  | NT<br>NT<br>NT<br>NT<br>NT           |                        | 1221<br>1223<br>1224<br>1225<br>1226 |
|              |             |             | Seis 7013 AT 25'<br>7121 AT 50'<br>4355 AT 100'<br>4955 AT 150'<br>4956 AT 200'<br>5132 AT 250'<br>5134 AT 300'<br><br>7013 AT 350'<br>7121 AT 400'<br>4355 AT 450'<br>4955 AT 500'  |                                      |                        |                                      |

Technician:

Roger Nagel

|           |      |
|-----------|------|
| total vps |      |
| Pg. /     | Of / |

## **Paragon Geophysical Services, Inc.**

### **Safe Distance Guidelines**

|                       | 5lbs. | 10lbs. | 15lbs. | 20lbs. | Vibroiseis or less than 5 lbs. |
|-----------------------|-------|--------|--------|--------|--------------------------------|
| Prod. Oil/Gas well    | 900'  | 1,000' | 1,100' | 1,200' | 300'                           |
| Pipeline less than 6" | 400'  | 400'   | 400'   | 500'   | 300'                           |
| Pipeline 6" to 12"    | 400'  | 400'   | 500'   | 500'   | 300'                           |
| Water well            | 600'  | 700'   | 800'   | 900'   | 330'                           |
| Building              | 800'  | 900'   | 900'   | 1,000' | 330'                           |



Job # '1524 UT  
FORGE 3D  
University of Utah  
Beaver County Utah

Sweep tests :

CREW CONTACTS

| PARAGON GEOPHYSICAL CREW 215 |                             |
|------------------------------|-----------------------------|
| SUPERVISOR                   | Joe Broussard 405-213-9859  |
| CREW MANAGER                 | Kelly Gautreau 316-293-7907 |
| OBSERVER                     | Richard Gamez 316-293-7331  |
| OBSERVER                     | Armando Garcia 316-706-7478 |
| SURVEY                       | Geo-Nav                     |
| PERMIT Client                | John Miller 303-547-2004    |
| MECHANIC                     | Jeff Trojlin                |

RECORDING SYSTEM

|                 |   |                      |   |         |
|-----------------|---|----------------------|---|---------|
| INSTRUMENT TYPE |   | INOVA Hawk           |   |         |
| SOFTWARE VERS.  |   | 3.2                  |   |         |
| SYSTEM OUTPUT   |   | External Hard Drive  |   |         |
| TAPE TYPE       |   |                      |   |         |
| TAPE FORMAT     |   | SEG Y                |   |         |
| VIB.            |   | DYN.                 |   |         |
| AUX CHANNEL 1   | 1 | System Timing Signal | 1 | Clock   |
| AUX CHANNEL 2   | 2 | Clock TB             | 2 | Conf TB |
| AUX CHANNEL 3   | 3 | True Ref             | 3 | Col UH  |
| AUX CHANNEL 4   | 4 | Wireline Ref         | 4 | UH      |
| AUX CHANNEL 5   | 0 | Radio Ref            | 0 |         |
| AUX CHANNEL 6   | 0 | Vib Out              | 0 |         |
| GEOPHONES       |   |                      |   |         |
| TYPE / MODEL    |   | Oyo CT32             |   |         |
| FREQUENCY       |   | 10Hz                 |   |         |
| PATTERN         |   | 12" Diameter Circle  |   |         |
| PHONES / GROUP  |   | 6                    |   |         |
| WIRED AS        |   | 1 x 6 series         |   |         |

RECORDING PARAMETERS

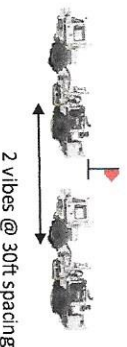
|                       |                         |          |
|-----------------------|-------------------------|----------|
| SAMPLE RATE           | 1                       | ms       |
| LOW CUT FILTER/SLOPE  | off                     | hz       |
| ANTI-ALIAS FRQ./SLOPE | 0                       | hz       |
| PREAMP GAIN           | 24                      | db (G-4) |
| NOISE EDIT            | Diversity Stack         |          |
| DATA TO TAPE TYPE     | Correlated before stack |          |
| RECORD LENGTH         | 4                       | sec      |
| LINE TYPE             | 3D                      |          |
| ACTIVE LINES          | 27                      |          |
| ACTIVE CHAN / LINE    | 1741                    |          |
| MAXIMUM ACTIVE CHAN   | 1741                    |          |
| ROLL ON / OFF         | STATIC                  |          |
| RP / SQUARE MILE      | 101.35sk                |          |
| RCV LINE INTERVAL     | 200m                    |          |
| RCV GROUP INTERVAL    | 50m                     |          |
| TOTAL RCV LINES       | 27                      |          |
| TOTAL RCV GROUPS      | 1741                    | Preplot  |
| RCV ORIENTATION       | n-s                     |          |
| SP / SQUARE MILE      | 57.57sk                 |          |
| SRC LINE INTERVAL     | 375.77m                 |          |
| SRC POINT INTERVAL    | 50m                     |          |
| TOTAL SRC LINES       | 13                      |          |
| TOTAL SRC POINTS      | 1114                    | Preplot  |
| SRC ORIENTATION       | e-w                     |          |
| TOTAL SQUARE MILES    | 17.18sk                 |          |

SOURCE PARAMETERS

| ENERGY SRC TYPE  | Vibroseis            |
|------------------|----------------------|
| VIBRATORS        |                      |
| TYPE / MODEL     | I/O AHV IV 364 & 366 |
| INSTRUMENTS      | Vib Pro              |
| HOLD DOWN WEIGHT | 62,000 lbs           |
| DRIVE LEVEL      | 70 %                 |
| PHASE LOCK       | Ground Force         |
| FORCE CONTROL    | Fundamental Grnd Fo  |
| NUMBER VIBRATORS | one set of two       |
| PATTERN          | centered on stake    |

SWEEP

|              |         |
|--------------|---------|
| NUM. SWEEPS  | 4       |
| MOVE UP      | Stacked |
| START FREQ.  | 4 hz    |
| END FREQ.    | 84 hz   |
| SWEEP LENGTH | 12 sec  |
| LINEARITY    | Lineary |
| START TAPER  | .3 ms   |
| END TAPER    | .3 ms   |



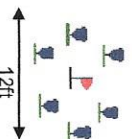
PROCESSING

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CONVERGING POINT, INC.