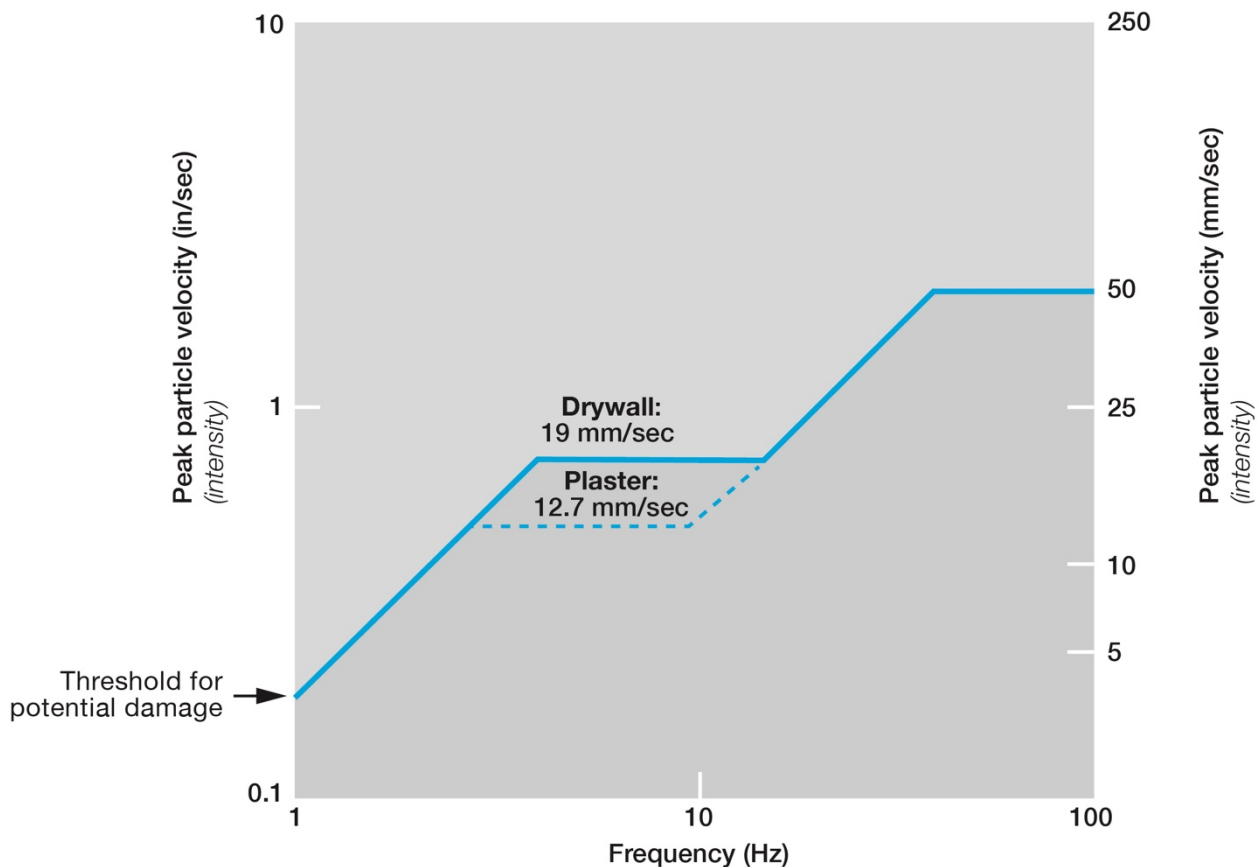


Understanding the Z-Curve

The Z-Curve line establishes a limit above which damage becomes possible, but it is crucial to note that damage does not automatically occur once this limit is breached. Damage would not actually occur in the average residence until ground vibrations reached significantly higher intensities than those outlined by the USBM Z-Curve. If the Z-Curve criteria is exceeded, the probability of damage is merely introduced and will incrementally increase with higher and higher vibration amplitudes.

USBM Z-CURVE (USBM RI 8507)
Threshold damage vibration criteria



Vibrations are occurring around us every day and are highly subjective. Each individual's perception and tolerance will influence the degree to which vibrations are a nuisance or objectionable. Humans and animals are far more sensitive to vibrations than a two-storey timber framed house, bridge or other structures.

Permanent Monitoring Units

| West Calgary Ring Road | | | 92 Cougarstone Manor SW, Calgary, AB | | 9555 2 Avenue SW, Calgary, AB | | 97 Cougar Ridge Close SW, Calgary, AB | | 130 Cougarstone Close SW, Calgary, AB | | 128 Cougarstone Manor SW, Calgary, AB | | 152 Cougarstone Common SW, Calgary, AB | | 135 Cougarstone Common SW, Calgary, AB | |
|------------------------|-----------|-------------|---|------------|----------------------------------|------------|--|------------|--|------------|--|------------|---|------------|---|------------|
| Blast Date: | Blast no. | Blast time: | PPV | AOP | PPV | AOP | PPV | AOP | PPV | AOP | PPV | AOP | PPV | AOP | PPV | AOP |
| 8-Sep-20 | WCRR-153 | 16:02 | 1.78mm/s | 122.1dB(L) | 1.52mm/s | 115.6dB(L) | 7.92mm/s | 121.8dB(L) | 0.51mm/s | 126.8dB(L) | 2.92mm/s | 124.2dB(L) | 1.14mm/s | 115.2dB(L) | 0.76mm/s | 116.7dB(L) |
| 9-Sep-20 | WCRR-154 | 16:04 | 1.02mm/s | 114.6dB(L) | 2.41mm/s | 119.9dB(L) | 2.29mm/s | 115.7dB(L) | 0.51mm/s | 104.2dB(L) | 1.14mm/s | 108.8dB(L) | 0.64mm/s | 107.5dB(L) | 0.64mm/s | 106.5dB(L) |
| 10-Sep-20 | WCRR-155 | 16:10 | 0.76mm/s | 112.6dB(L) | 1.52mm/s | 118.7dB(L) | 1.91mm/s | 112.8dB(L) | 0.51mm/s | 102.8dB(L) | 1.52mm/s | 106.0dB(L) | 0.64mm/s | 106.5dB(L) | 0.51mm/s | 101.9dB(L) |
| 11-Sep-20 | WCRR-156 | 16:06 | 0.76mm/s | 121.7dB(L) | 1.40mm/s | 114.0dB(L) | 2.41mm/s | 109.9dB(L) | 0.38mm/s | 110.6dB(L) | 1.52mm/s | 115.4dB(L) | 0.64mm/s | 104.9dB(L) | 0.64mm/s | 110.2dB(L) |
| | | 16:20 | 0.38mm/s | 115.9dB(L) | 0.89mm/s | 112.6dB(L) | 1.14mm/s | 106.5dB(L) | 0.25mm/s | 121.3dB(L) | 1.02mm/s | 115.6dB(L) | 0.38mm/s | 104.9dB(L) | 0.25mm/s | 110.6dB(L) |
| 12-Sep-20 | WCRR-157 | 16:04 | 2.79mm/s | 123.7dB(L) | 1.27mm/s | 111.8dB(L) | 9.40mm/s | 128.3dB(L) | 0.51mm/s | 109.2dB(L) | 8.76mm/s | 115.9dB(L) | 1.78mm/s | 115.2dB(L) | 1.27mm/s | 111.2dB(L) |

*Click on a highlighted cell to view the seismograph report for the corresponding date and location.

Date/Time Tran At 16:00:59 September 8, 2020
Trigger Source Geo: 5.00 mm/s
Range Geo: 254 mm/s
Sample Rate 5.0 sec. At 1024 Sps
Job Number 8177

Serial Number BE11251 V 10.72-8.17 MiniMate Plus
Battery Level 6.8 Volts
Unit Calibration October 23, 2019 by InstanTel
File Name M2511M19.TN0W

Notes

Location: 97 Cougar Ridge Close SW, Calgary, AB
Client: McCaw's Drilling and Blasting
User Name: Explotech Engineering Ltd.
General: Sandbagged on ground

Post Event Notes

Extended Notes

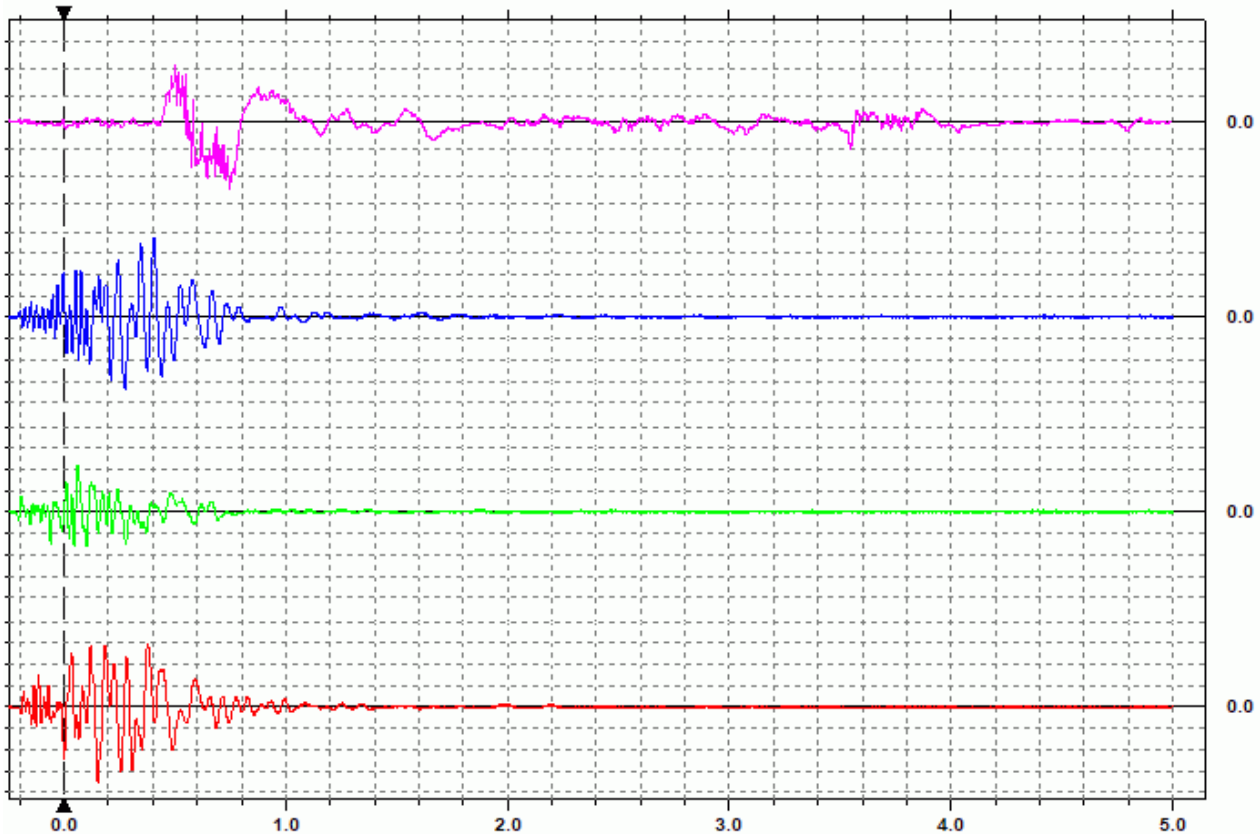
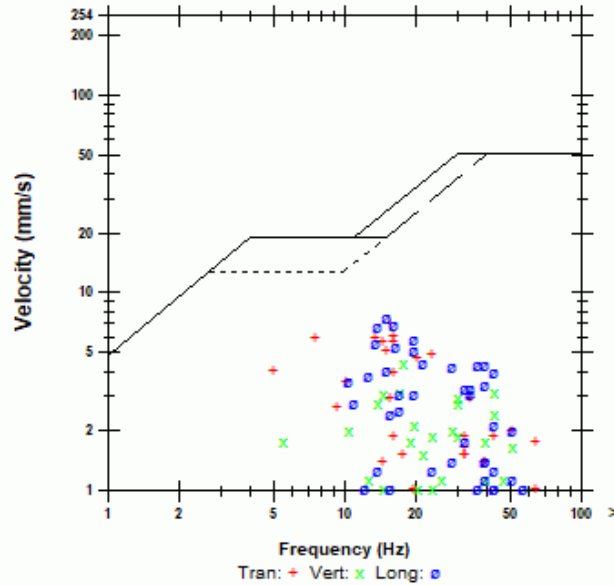
Combo Mode September 8, 2020 05:16:46
 Geophone is sandbagged under the stairs of the backyard deck at 97 Cougar Ridge Close SW adjacent ongoing blasting operations.

Microphone Linear Weighting
PSPL 24.5 pa.(L) at 0.747 sec.
ZC Freq 2.9 Hz.
Channel Test Disabled

| | Tran | Vert | Long | |
|---------------------|----------|----------|----------|------|
| PPV | 7.11 | 4.44 | 7.49 | mm/s |
| ZC Freq | 16 | 18 | 15 | Hz |
| Time (Rel. to Trig) | 0.151 | 0.061 | 0.404 | sec |
| Peak Acceleration | 0.0928 | 0.0795 | 0.106 | g |
| Peak Displacement | 0.101 | 0.0477 | 0.0747 | mm |
| Sensor Check | Disabled | Disabled | Disabled | |

Peak Vector Sum 7.92 mm/s At 0.375 sec.

USBM RI8507 And OSMRE



Time(Seconds) 0.20 sec/div **Amplitude** Geo: 2.00 mm/s/div Mic: 10.00 pa.(L)/div
Trigger =

Date/Time Tran At 16:00:59 September 8, 2020
Trigger Source Geo: 5.00 mm/s
Range Geo: 254 mm/s
Sample Rate 5.0 sec. At 1024 Sps
Job Number 8177

Serial Number BE11251 V 10.72-8.17 MiniMate Plus
Battery Level 6.8 Volts
Unit Calibration October 23, 2019 by InstanTel
File Name M251IM19.TNOW

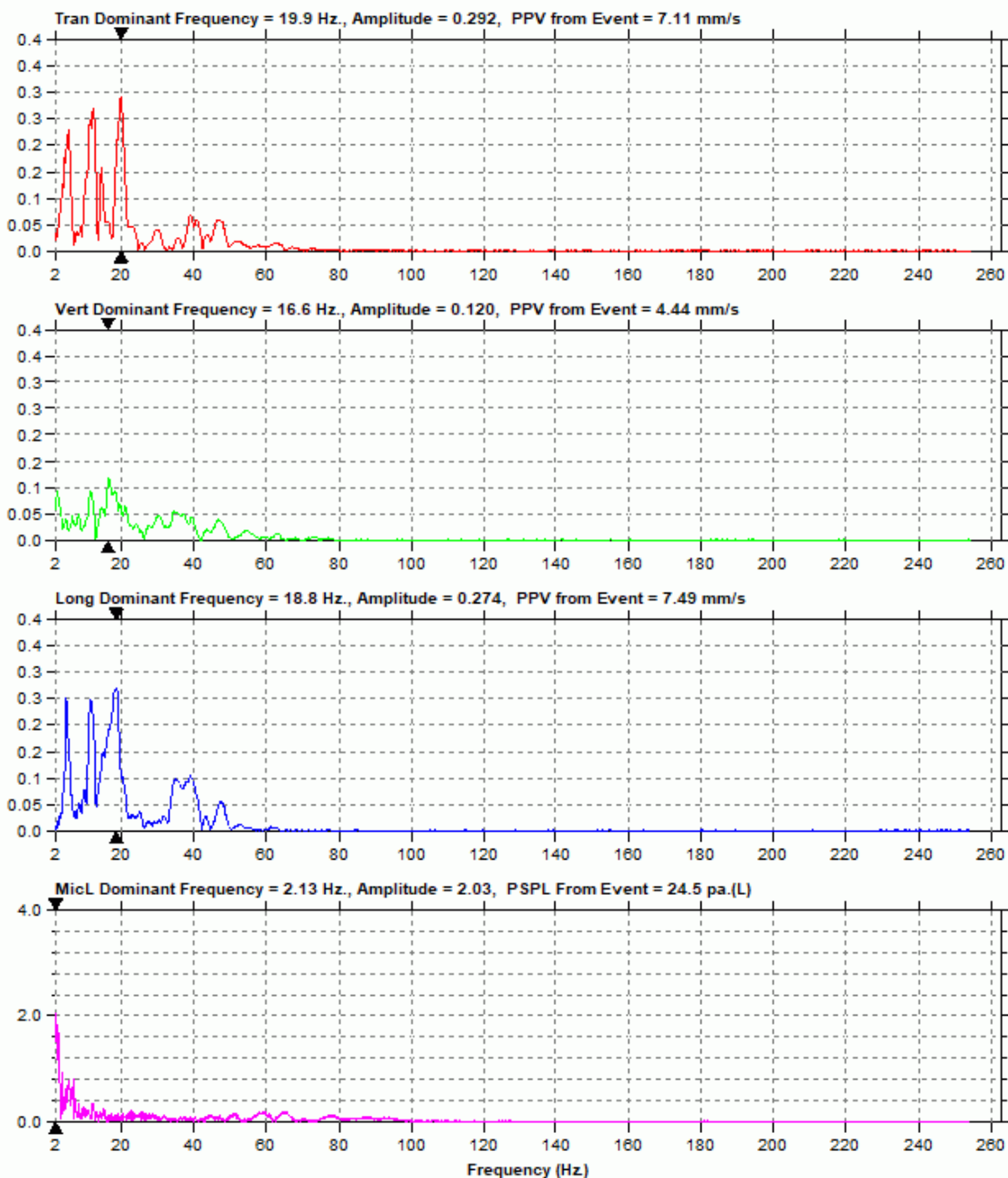
Notes

Location: 97 Cougar Ridge Close SW, Calgary, AB
Client: McCaw's Drilling and Blasting
User Name: Explotech Engineering Ltd.
General: Sandbagged on ground

Extended Notes

Combo Mode September 8, 2020 05:16:46
Geophone is sandbagged under the stairs of the backyard deck at 97 Cougar Ridge Close SW adjacent ongoing blasting operations.

Post Event Notes



Date/Time Tran At 16:02:36 September 12, 2020
 Trigger Source Geo: 5.00 mm/s
 Range Geo: 254 mm/s
 Sample Rate 5.0 sec. At 1024 Sps
 Job Number 8177

Serial Number BE11251 V 10.72-8.17 MiniMate Plus
 Battery Level 6.8 Volts
 Unit Calibration October 23, 2019 by InstanTel
 File Name M251IMPO.KC0W

Notes
 Location: 97 Cougar Ridge Close SW, Calgary, AB
 Client: McCaw's Drilling and Blasting
 User Name: Explotech Engineering Ltd.
 General: Sandbagged on ground

Post Event Notes

Extended Notes

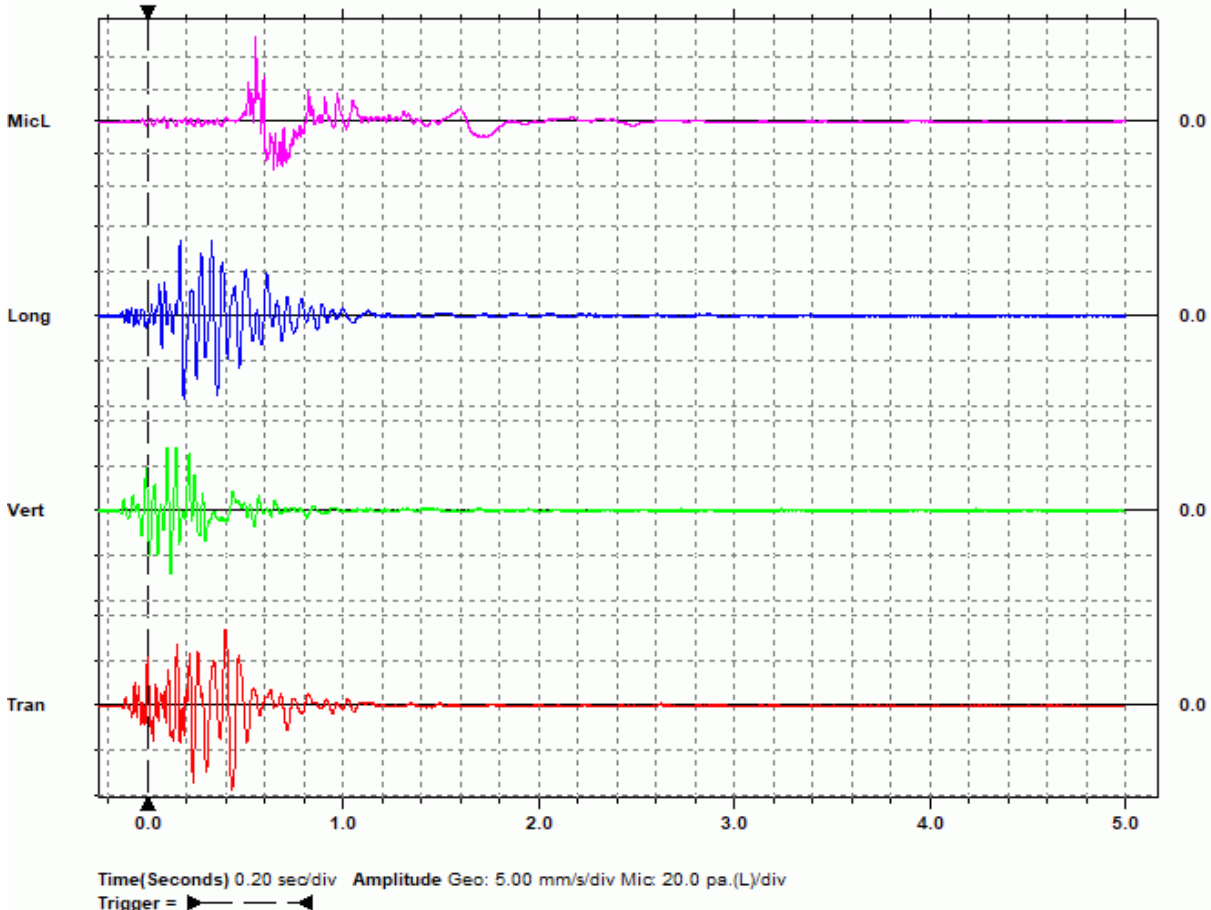
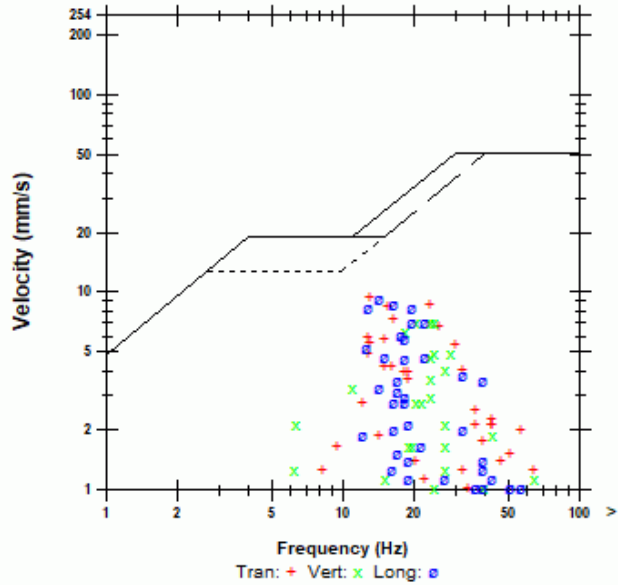
Combo Mode September 12, 2020 05:16:48
 Geophone is sandbagged under the stairs of the backyard deck at 97 Cougar Ridge Close SW adjacent ongoing blasting operations.

Microphone Linear Weighting
 PSPL 51.8 pa.(L) at 0.555 sec.
 ZC Freq 15 Hz.
 Channel Test Disabled

| | Tran | Vert | Long | |
|---------------------|----------|----------|----------|------|
| PPV | 9.40 | 7.11 | 9.27 | mm/s |
| ZC Freq | 13 | 20 | 14 | Hz |
| Time (Rel. to Trig) | 0.433 | 0.148 | 0.187 | sec |
| Peak Acceleration | 0.146 | 0.133 | 0.159 | g |
| Peak Displacement | 0.121 | 0.0495 | 0.0853 | mm |
| Sensor Check | Disabled | Disabled | Disabled | |

Peak Vector Sum 9.84 mm/s At 0.187 sec.

USBM R18507 And OSMRE



Date/Time Tran At 16:02:36 September 12, 2020
Trigger Source Geo: 5.00 mm/s
Range Geo: 254 mm/s
Sample Rate 5.0 sec. At 1024 Sps
Job Number 8177

Serial Number BE11251 V 10.72-8.17 MiniMate Plus
Battery Level 6.8 Volts
Unit Calibration October 23, 2019 by InstanTel
File Name M251IMPO.KC0W

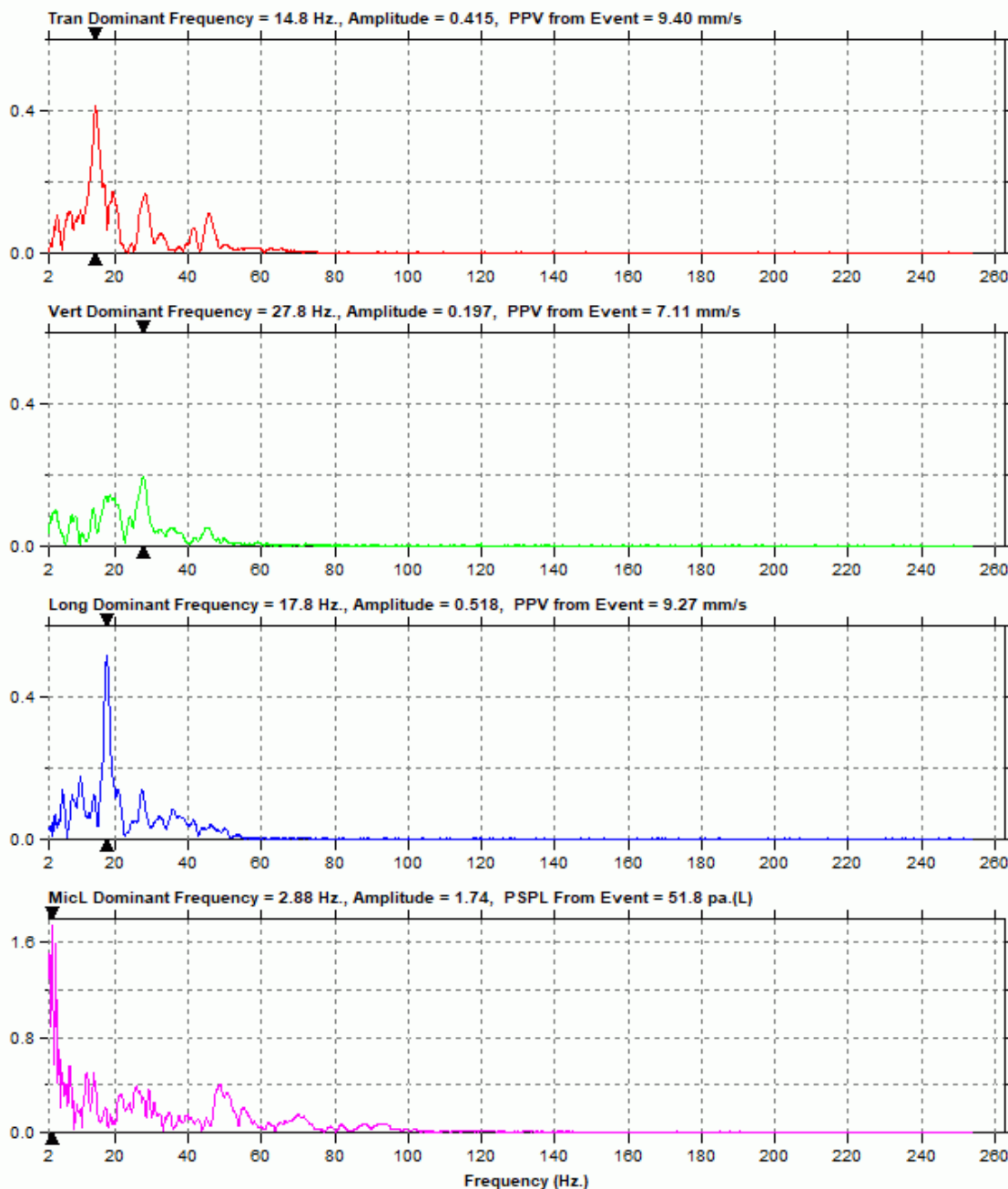
Notes

Location: 97 Cougar Ridge Close SW, Calgary, AB
Client: McCaw's Drilling and Blasting
User Name: Explotech Engineering Ltd.
General: Sandbagged on ground

Extended Notes

Combo Mode September 12, 2020 05:16:46
Geophone is sandbagged under the stairs of the backyard deck at 97 Cougar Ridge Close SW adjacent ongoing blasting operations.

Post Event Notes



Date/Time Vert At 16:03:00 September 12, 2020
 Trigger Source Geo: 5.00 mm/s
 Range Geo: 254 mm/s
 Sample Rate 5.0 sec. At 1024 Sps
 Job Number 8177

Serial Number BE9028 V 10.72-8.17 MiniMate Plus
 Battery Level 6.6 Volts
 Unit Calibration December 10, 2019 by InstanTel
 File Name K028IMPO.L00W

Notes

Location: 128 Cougarstone Manor SW, Calgary, AB
 Client: McCaw's Drilling and Blasting
 User Name: Explotech Engineering Ltd.
 General: Sandbagged on ground

Post Event Notes

Extended Notes

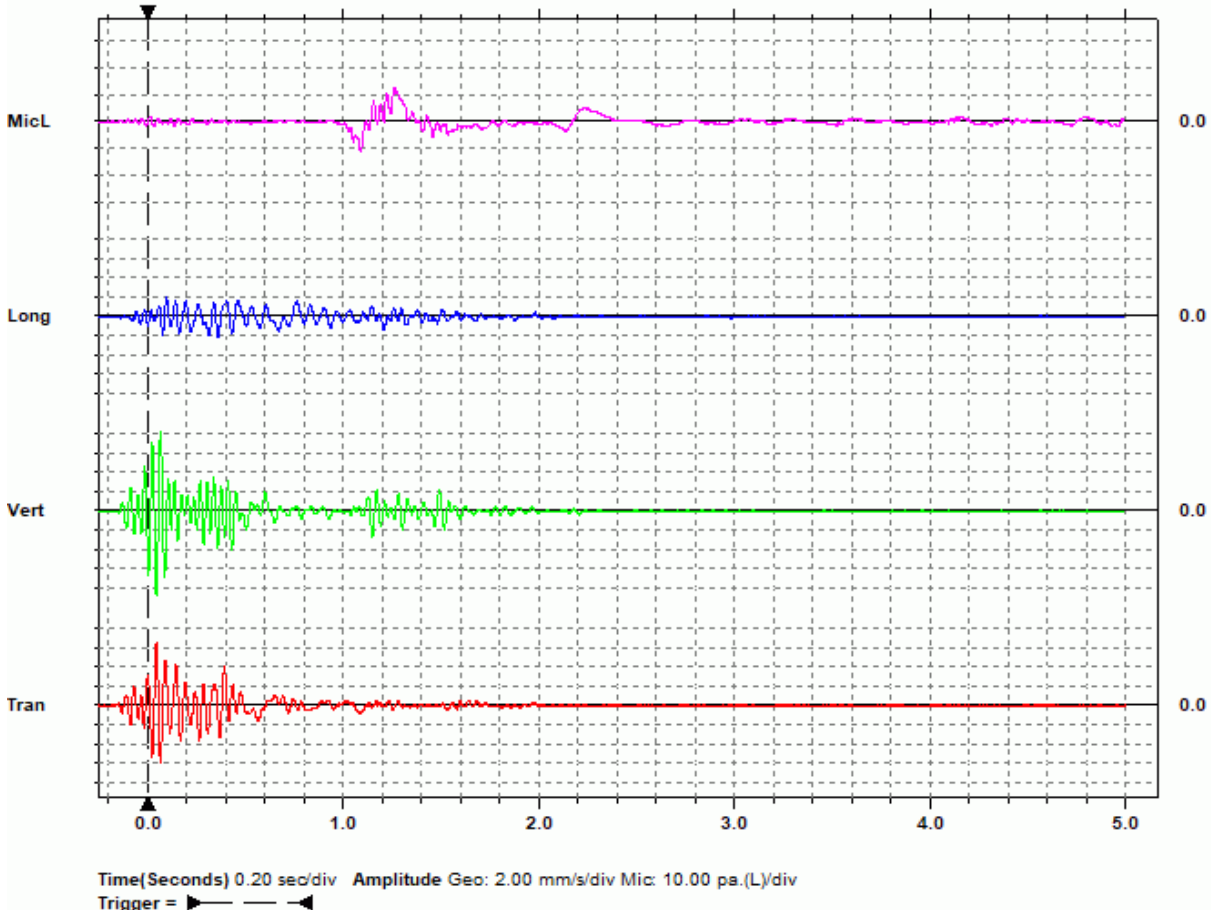
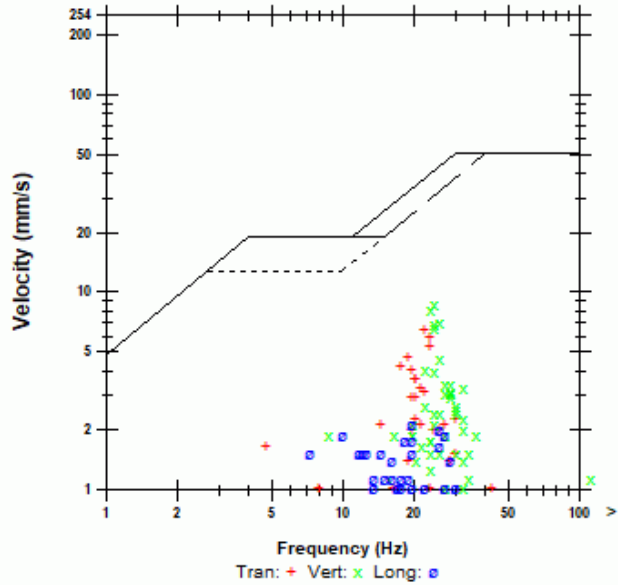
Combo Mode September 12, 2020 05:25:09
 Geophone is sandbagged in the backyard of 128 Cougarstone Manor SW adjacent ongoing blasting operations.

Microphone Linear Weighting
 PSPL 12.5 pa.(L) at 1.262 sec.
 ZC Freq 4.1 Hz.
 Channel Test Disabled

| | Tran | Vert | Long | |
|---------------------|----------|----------|----------|------|
| PPV | 6.48 | 8.76 | 2.16 | mm/s |
| ZC Freq | 22 | 24 | 20 | Hz |
| Time (Rel. to Trig) | 0.044 | 0.044 | 0.358 | sec |
| Peak Acceleration | 0.106 | 0.133 | 0.0398 | g |
| Peak Displacement | 0.0454 | 0.0583 | 0.0272 | mm |
| Sensor Check | Disabled | Disabled | Disabled | |

Peak Vector Sum 10.9 mm/s At 0.044 sec.

USBM RI8507 And OSMRE



Date/Time Vert At 16:03:00 September 12, 2020
Trigger Source Geo: 5.00 mm/s
Range Geo: 254 mm/s
Sample Rate 5.0 sec. At 1024 Sps
Job Number 8177

Serial Number BE9028 V 10.72-8.17 MiniMate Plus
Battery Level 6.6 Volts
Unit Calibration December 10, 2019 by Instantel
File Name K028IMPO.L00W

Notes

Location: 128 Cougarstone Manor SW, Calgary, AB
Client: McCaw's Drilling and Blasting
User Name: Explotech Engineering Ltd.
General: Sandbagged on ground

Extended Notes

Combo Mode September 12, 2020 05:25:09
Geophone is sandbagged in the backyard of 128 Cougarstone Manor SW adjacent ongoing blasting operations.

Post Event Notes

