# SAN RAFAEL ROCK QUARRY VIBRATION REPORT

**Location:** 88-7  
**Northing:** 31°59'11"N  
**Easting:** 122°27'18"W  
**Max. Charge Weight:** 200  
**Date of Blast:** 12.20.11  
**Blast Duration:** 417 ms  
**Time of Blast:** 11:40:56  
**Blast Number:** 1564

<table>
<thead>
<tr>
<th>Seismograph Model</th>
<th>Micro</th>
<th>Micro</th>
<th>Micro</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td>0481</td>
<td>4550</td>
<td>4567</td>
<td>4520</td>
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<tr>
<td>Last Calibration Date</td>
<td>5/31/11</td>
<td>5/26/11</td>
<td>5/26/11</td>
<td>5/26/11</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Location Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location: Marin Ave, VieMarkatele, San Bruno Ave, McKee Ranch</td>
</tr>
<tr>
<td>Northing: 31°59'11&quot;N, 32°59'11&quot;N, 32°59'31&quot;N, 32°59'30&quot;N</td>
</tr>
<tr>
<td>Easting: 122°27'18&quot;W, 122°27'58&quot;W, 122°27'30&quot;W, 122°27'16&quot;W</td>
</tr>
<tr>
<td>Distance from Blast: 950, 2957, 2323, 1984</td>
</tr>
<tr>
<td>Scaled Distance: 67, 209, 169, 138</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Longitudinal Peak Particle Velocity (in/s)</th>
<th>Longitudinal Peak Frequency (Hz)</th>
<th>Transverse Peak Particle Velocity (in/s)</th>
<th>Transverse Peak Frequency (Hz)</th>
<th>Vertical Peak Particle Velocity (in/s)</th>
<th>Vertical Peak Frequency (Hz)</th>
<th>Peak Vector Sum (in/s)</th>
<th>Peak Air Overpressure (db)</th>
</tr>
</thead>
<tbody>
<tr>
<td>950</td>
<td>0.16</td>
<td>0.28</td>
<td>0.12</td>
<td>0.23</td>
<td>0.14</td>
<td>0.23</td>
<td>0.19</td>
<td>109</td>
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<tr>
<td>2957</td>
<td>0.07</td>
<td>0.68</td>
<td>0.08</td>
<td>0.18</td>
<td>0.11</td>
<td>0.18</td>
<td>0.10</td>
<td>10.6</td>
</tr>
<tr>
<td>2323</td>
<td>0.14</td>
<td>0.40</td>
<td>0.08</td>
<td>0.18</td>
<td>0.11</td>
<td>0.18</td>
<td>0.10</td>
<td>10.6</td>
</tr>
<tr>
<td>1984</td>
<td>0.10</td>
<td>0.60</td>
<td>0.06</td>
<td>0.18</td>
<td>0.11</td>
<td>0.18</td>
<td>0.10</td>
<td>10.6</td>
</tr>
</tbody>
</table>

**Seismograph Operator:** Pedo Lopes  
**Signature:** [Signature]
**BASE DATA:**
- Location: PB-7
- Northing: 37°59'11.1N
- Easting: 122°22'27.6W
- Designed Bench Height (ft): 40
- Rock Density (yd³/ft³): 2.23
- Relative Rock Hardness: 7
- Date: 12.20.11
- Time: 11:40
- Blast Number: 1564

**DESIGN DATA:**
- Number of Holes Shot: 18
- Hole Dia. (in.): 6.3/4
- Stemming (ft): 15
- Loading Time Required (man hrs): 7
- Ave. Hole Depth (ft): 43
- Burden (ft): 15
- Stem Type: 3/4" dia.
- Deck Type: 3/4" dia.
- Staggered Pattern (y or n): N
- Length (ft):
- Relative confinement: Spacing (ft): 15
- Subdrill (ft): 4
- Number of Lost Holes: 0
- Tons Shot: 13,380

**EXPLOSIVES DATA:**
<table>
<thead>
<tr>
<th>Bulk Explosive</th>
<th>Weight</th>
<th>Boosters</th>
<th>Units</th>
<th>Delays</th>
<th>Units</th>
<th>Misc.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titan 1000 lb</td>
<td>6,360</td>
<td>450 dyn.</td>
<td>36</td>
<td>90 cfs</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50 cfs</td>
<td>18</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>42 cfs</td>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Max (lb/hole): 340
Blast Duration (sec): 417

**VIBRATION DATA:**
- Nearest Structure:                                           Seismograph Loc.:         Temperature: 54°F
- Northing: 21°13'11.6N
- Easting: 122°22'27.6W
- Sky Condition: Cloudy
- RPPV: 11
- Wind Direction: 310°
- Frequency:        

**PERFORMANCE DATA:**
- Powder Factor (lb/ton): 1.02
- Lb/yard³: 4.5
- Fragmentation: 4100
- Displacement: 480 cts
- Wind Speed: 1-5 mph
- Airblast: 10°
- Crushability:
- Fines:
- Dig ability:

Comments: 2-30° Angle holes with no subdrill jack loaded

Blaster in Charge: [Signature]
Seismic Analysis
Velocity Waveform Analysis

Serial No: 9856 v3.23
Date: 12/20/2011 11.42.01 (UTC-8)
Event No: 10
Record Time: 5.0 s
Client: COUNTY MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: ON QUARRY PROPERTY
Distance:
Operator: VIBRA-TECH GSM
Comment:
Seismic Trigger: 0.030 in/s

Summary Data

<table>
<thead>
<tr>
<th></th>
<th>L</th>
<th>T</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPV (in/s)</td>
<td>0.045</td>
<td>0.035</td>
<td>0.045</td>
</tr>
<tr>
<td>FREQ (Hz)</td>
<td>15.2</td>
<td>17.9</td>
<td>45.5</td>
</tr>
<tr>
<td>PD (.001&quot;)</td>
<td>0.42</td>
<td>0.31</td>
<td>0.36</td>
</tr>
<tr>
<td>PPA (g)</td>
<td>0.033</td>
<td>0.026</td>
<td>0.046</td>
</tr>
<tr>
<td>Peak Vector Sum</td>
<td>0.053 in/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak Air Pressure</td>
<td>104 dB</td>
<td>0.00052 PSI @ 2.1 Hz</td>
<td></td>
</tr>
</tbody>
</table>

Additional Info:
j-GEO-01253
N37 59 481, W122 27 256

ShakeTable Calibrated: 01/27/2011
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40299 U.S.A.
TEL: 502.240.9900  FAX: 502.240.9902

Velocity Waveform Graph Scale
Time Scale: 0.100 s
Seismic Scale: +/- 0.160 in/s
Sound Scale: +/- 0.0023 PSI

Printed: December 20, 2011  File: 1782652512.g3k (GeoSonic Inc. AnalysisNET v8.1.35)
Seismic Analysis
Velocity Waveform Analysis

Serial No: 7155 v3.23
Date: 12/20/2011 11:41:59 (UTC-8)
Event No: 11
Record Time: 5.0 s
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: 16 MARIN BAY PARK CT
Distance:
Operator: VIBRA-TECH GSM
Comment: WILLIAM HOSKEN RESIDENC
Seismic Trigger: 0.030 in/s

Summary Data

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.038</td>
<td>0.025</td>
<td>0.040</td>
</tr>
<tr>
<td>21.7</td>
<td>41.7</td>
<td>20.0</td>
</tr>
<tr>
<td>0.29</td>
<td>0.24</td>
<td>0.26</td>
</tr>
<tr>
<td>0.020</td>
<td>0.020</td>
<td>0.033</td>
</tr>
<tr>
<td>0.045 in/s</td>
<td>0.00036 PSI @ 3.0 Hz</td>
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</tr>
<tr>
<td>101 db</td>
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Additional Info:

j-GEO-01252
N37 59.324, W122 27.373

Shakeable Calibrated: 01/26/2011
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40299 U.S.A.
TEL. 502.240.9900  FAX. 502.240.9902

Velocity Waveform Graph Scale
Time Scale: 0.100 s
Seismic Scale: +/- 0.160 in/s
Sound Scale: +/- 0.0023 PSI

USBM Safe Blasting Levels
SN: 7155 Event: 11

Velocity Waveform
SN: 7155 Event: 11

Printed: December 20, 2011  File: 134028922 g3k (GeoSonics Inc AnalysisNET v8.1.35)
The seismograph at 114 San Marino Drive (S/N 9669) did not trigger during the shot on December 20, 2011 at approximately 11:42 indicating the ground vibrations produced were below the ground trigger level of 0.030 in/sec.