# SAN RAFAEL ROCK QUARRY VIBRATION REPORT

- **Location:** PB-8
- **Max Charge Weight:** 500
- **Date of Blast:** 9/36/12
- **Time of Blast:** 11:32
- **Blast Number:** 1587

## Seismograph Information

<table>
<thead>
<tr>
<th>Seismograph Model</th>
<th>Micro</th>
<th>Micro</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td>4181</td>
<td>4650</td>
<td>4547</td>
</tr>
<tr>
<td>Last Calibration Date</td>
<td>5/12/12</td>
<td>5/17/12</td>
<td>5/17/12</td>
</tr>
</tbody>
</table>

## Location Information

<table>
<thead>
<tr>
<th>Location</th>
<th>Micro</th>
<th>Micro</th>
<th>Micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northing</td>
<td>37°59'10&quot;N</td>
<td>37°59'10&quot;N</td>
<td>37°59'10&quot;N</td>
</tr>
<tr>
<td>Easting</td>
<td>122°47'11&quot;W</td>
<td>122°47'11&quot;W</td>
<td>122°47'11&quot;W</td>
</tr>
</tbody>
</table>

## Distance from Blast

<table>
<thead>
<tr>
<th>Distance from Blast</th>
<th>127</th>
<th>103</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scaled Distance</td>
<td>92</td>
<td>87</td>
</tr>
</tbody>
</table>

## Vibration Information

<table>
<thead>
<tr>
<th>Longitudinal Peak Particle Velocity (ips)</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longitudinal Peak Frequency (Hz)</td>
<td>.08</td>
</tr>
<tr>
<td>Transverse Peak Particle Velocity (ips)</td>
<td>39</td>
</tr>
<tr>
<td>Transverse Peak Frequency (Hz)</td>
<td>.07</td>
</tr>
<tr>
<td>Vertical Peak Particle Velocity (ips)</td>
<td>29</td>
</tr>
<tr>
<td>Vertical Peak Frequency (Hz)</td>
<td>.03</td>
</tr>
<tr>
<td>Peak Vector Sum (ips)</td>
<td>34</td>
</tr>
<tr>
<td>Peak Air Overpressure (db)</td>
<td>130</td>
</tr>
</tbody>
</table>

## Seismograph Operator

*Veron Lopez*
**BASE DATA:**

Location: PB 8  
Northing: 37°54′10″ N  
Easting: 172°27′19″ W  
Designed Bench Height (ft): 45  
Rock Density (t/yd³): 2.22  
Relative Rock Hardness: 7  
Date: 9/26/12  
Time: 11:32  
Blast Number: 1587

**DESIGN DATA:**

Number of Holes Shot: 9  
Hole Dia. (in.): 6  
Stemming (ft): 18  
Loading Time Required (man hrs):  
Ave. Hole Depth (ft): 48  
Burden (ft): 15  
Rock Type:  
Staggered Pattern (y or n):  
Relative Confinement:  
Spacing (ft): 16  
Drill Type:  
Sundrill (ft): 3  
Number of Lost Holes: 0  
Tons Shot: 1694.8

**EXPLOSIVES DATA:**

<table>
<thead>
<tr>
<th>Explosive</th>
<th>Weight</th>
<th>Boosters</th>
<th>Delays</th>
<th>Misc.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titan 1000C</td>
<td>8360</td>
<td>450 goe</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Max (lb/hole): 520</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Blast Duration (sec): 219</td>
</tr>
</tbody>
</table>

**VIBRATION DATA:**

Nearest Structure:  
Seismograph:  
Temperature:  
Max. Chrg. (lb/8ms): 50  
Northing:  
Easting:  
Sky Condition:  
RPPV:  
Distance Away:  
Wind Speed:  
Airblast: 6.5

**PERFORMANCE DATA:**

Powder Factor (lb/ton): 5  
Displacement:  
Crushability:  
Fines:  
Fragmentation:  
Dig ability:  
Comments:  
Blaster in Charge:  
1 lb/yard³: 1.25  
Vibration:  
Frequency:  
Wind Direction:  
Distance Away:  
Wind Speed:  
Airblast: 6.5

Total Charge Wt.: $898
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Seismic Analysis
Velocity Waveform Analysis

Serial Number: 8056
Firmware Version: 08-03.23
Event Date: 09/26/2012 11:31:58 (UTC -07:00)
Event number: 6
Recording Time: 5 s
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: 16 MARIN BAY PARK CT.
Distance:
Operator: VIBRA-TECH GSM
Comment: WILLIAM HOSKEN RES.
Seismic Trigger: 0.03 in/s
Sound Trigger: 75.9 DB

Additional Info:
j-GEO-01252
N37 59.524, W122 27.373

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>0.0725</td>
<td>0.055</td>
<td>0.6925</td>
</tr>
<tr>
<td>FREQ (HZ):</td>
<td>33.3</td>
<td>45.5</td>
<td>45.5</td>
</tr>
<tr>
<td>PD (.001&quot;)</td>
<td>0.36</td>
<td>0.3</td>
<td>0.2425</td>
</tr>
<tr>
<td>PPA (g):</td>
<td>0.04557</td>
<td>0.04557</td>
<td>0.07812</td>
</tr>
</tbody>
</table>

Peak Vector Sum: 0.1 in/s
Peak Air Pressure: 112.8 DB, 0.001372 psi @ 2.1 HZ

Shaketable Calibrated
On: 05/16/2012 (UTC -07:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.

Waveform Graph Scale
Time Scale: 0.1 s
Seismic Scale: +/- 0.185 in/s
Sound Scale: +/- 0.0023 psi

Velocity Waveform
SSN: 8056 Event: 6

Printed: September 26, 2012 File: 0000074032_201209.g3k (GeoSonics Inc. PDFGenerator v 1.0)
Seismic Analysis
Velocity Waveform Analysis

Serial Number: 8021
Firmware Version: 08-03.23
Event Date: 09/26/2012 11:31:59 (UTC -07:00)
Event number: 16
Recording Time: 5 s
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: 114 SAN MARINO DRIVE
Distance: 
Operator: VIBRA-TECH GSM
Comment: VERONIQUE RASKIN*
Seismic Trigger: 0.03 in/s
Sound Trigger: 75.9 DB
Additional Info: *RESIDENCE
j-GEO-01254
N37 59.395, W122 27.700

Summary Data

<table>
<thead>
<tr>
<th>PPV (in/s)</th>
<th>L</th>
<th>T</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.025</td>
<td></td>
<td></td>
<td>0.0275</td>
</tr>
<tr>
<td>0.0375</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0275</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FREQ (Hz)</th>
<th>45.5</th>
<th>29.4</th>
<th>31.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD (.001&quot;)</td>
<td>0.1825</td>
<td>0.2125</td>
<td>0.1875</td>
</tr>
<tr>
<td>PPA (g)</td>
<td>0.02604</td>
<td>0.01953</td>
<td>0.02604</td>
</tr>
</tbody>
</table>

Peak Vector Sum: 0.0425 in/s
Peak Air Pressure: 111.2 DB
0.001105 psi @ 3 HZ

Shaketable Calibrated
On: 05/11/2012 (UTC -07:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.

USBM Safe Blasting Levels
SSN: 8021 Event: 16

Velocity Waveform
SSN: 8021 Event: 16
Seismic Analysis
Velocity Waveform Analysis

Serial Number: 8030
Firmware Version: 08-03-23
Event Date: 09/26/2012 11:31:58 (UTC -07:00)
Event number: 8
Recording Time: 5 s
Client: COUNTY OF MARIN
Operation: SAN RAFAEL ROCK QUARRY
Location: ON QUARRY PROPERTY
Distance: 
Operator: VIBRA-TECH GSM
Comment: Seismic Trigger: 0.03 in/s
Sound Trigger: 75.9 DB

Additional Info:
j-GEO-01253
N37 59.481, W122 27.256

Summary Data

PPV (in/s):
L 0.0875
T 0.0625
V 0.1

FREQ (HZ):
71.4
55.6
62.5

PD (.001°):
0.3175
0.385
0.4125

PPA (g):
0.09766
0.0651
0.09115

Peak Vector Sum: 0.125 in/s
Peak Air Pressure: 114 DB
0.001568 psi @ 2.1 HZ

Shaketable Calibrated
On: 05/14/2012 (UTC -07:00)
By: Vibra-Tech, Inc.
2700 Holloway Road - Suite 113
Louisville, KY 40203 U.S.A.

Waveform Graph Scale
Time Scale: 0.1 s
Seismic Scale: +/- 0.2 in/s
Sound Scale: +/- 0.0023 psi

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