# SAN RAFAEL ROCK QUARRY VIBRATION REPORT

**Location:** PB-7  
**Max. Charge Weight:** 420  
**Date of Blast:** 8/15/12  
**Northing:** 37°59'12" N  
**Time of Blast:** 11:44  
**Easting:** 122°27'11" W  
**Blast Duration:** 260  
**Blast Number:** 1584

<table>
<thead>
<tr>
<th><strong>Seismograph Model</strong></th>
<th>2000</th>
<th>4550</th>
<th>4560</th>
<th>4570</th>
</tr>
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<tbody>
<tr>
<td><strong>Serial Number</strong></td>
<td>2481</td>
<td>4550</td>
<td>4560</td>
<td>4570</td>
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<tr>
<td><strong>Last Calibration Date</strong></td>
<td>5/17/12</td>
<td>5/17/12</td>
<td>5/17/12</td>
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<table>
<thead>
<tr>
<th><strong>Location</strong></th>
<th>Marin Co.</th>
<th>San Rafael</th>
<th>Marin Co.</th>
<th>Mill Valley Park</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Northing</strong></td>
<td>37°59'19&quot; N</td>
<td>37°59'18&quot; N</td>
<td>37°59'31&quot; W</td>
<td>37°59'30&quot; N</td>
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<tr>
<td><strong>Easting</strong></td>
<td>122°27'22&quot; W</td>
<td>122°47'53&quot; W</td>
<td>122°27'30&quot; W</td>
<td>122°27'16&quot; W</td>
</tr>
</tbody>
</table>

**Distance from Blast**
- 1161
- 3432
- 3234
- 1901

**Scaled Distance**
- 56
- 167
- 123
- 97

**VIBRATION INFORMATION**

| **Longitudinal Peak Particle Velocity (ips)** | 0.7 | 0.7 |
| **Longitudinal Peak Frequency (Hz)** | 9.1 |
| **Transverse Peak Particle Velocity (ips)** | 0.9 |
| **Transverse Peak Frequency (Hz)** | 9.2 |
| **Vertical Peak Particle Velocity (ips)** | 0.9 |
| **Vertical Peak Frequency (Hz)** | 6.0 |
| **Peak Vector Sum (ips)** | 0.7 |
| **Peak Air Overpressure (db)** | 17 |

**Seismograph Operator:** Ben Lopes  
**Signature:** [Signature]

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### GENERAL COMMENTS

[Comments]
### SAN RAFAEL ROCK QUARRY BLAST REPORT

#### DATA:
- **Location:** PB-7
- **Designed Bench Height (ft):** 40
- **Rock Density (t/yard³):** 2.28
- **Relative Rock Hardness:** 7
- **Date:** 8-15-12
- **Time:** 11:44
- **Blast Number:** 1584

#### DESIGN DATA:
- **Number of Holes Shot:** 18
- **Hole Dia. (in):** 2.5
- **Stemming (ft):** 18
- **Loading Time Required (man hrs):** 6
- **Deck Type:**
- **Ave. Hole Depth (ft):** 43
- **Burden (ft):** 15
- ** Lean Type:** 3/4 + 1/2
- **Staggered Pattern (y or n):** Y
- **Length (ft):**
- **Relative Confinement:**
- **Spacing (ft):** 15
- **Subdrill (ft):** 3
- **Number of Lost Holes:** 0
- **Tons Shot:** 13,330

#### EXPLOSIVES DATA:

<table>
<thead>
<tr>
<th>Explosive Type</th>
<th>Weight (lb)</th>
<th>Bootters</th>
<th>Units</th>
<th>Delays</th>
<th>Units</th>
<th>Misc.</th>
<th>Units</th>
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<tbody>
<tr>
<td>Titan 1000</td>
<td>7400</td>
<td>4504</td>
<td>35</td>
<td>5852</td>
<td>18</td>
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<td>7862</td>
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<td></td>
<td></td>
<td>4235</td>
<td>5</td>
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</table>

- **Max. (lb/hole):** 420
- **Blast Duration (sec):** 250ms

#### VIBRATION DATA:
- **Nearest Structure:** 200 yrd
- **Seismograph:**
- **Temperature:**
- **Max. Chg. (lb/ft³):** 420
- **RPPV:** 12

#### PERFORMANCE DATA:
- **Powder Factor (lb/ton):** 5
- **Displacement:**
- **Vibration:**
- **Crushability:**
- **Fines:**
- **Fragmentation:**
- **Digability:**
- **Comments:**

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

Serial Number: 8030
Firmware Version: 08-03-23
Event Date: 08/15/2012 11:43:41 (UTC -07:00)
Event number: 6
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

<table>
<thead>
<tr>
<th>PPV (in/s)</th>
<th>L</th>
<th>T</th>
<th>V</th>
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<tbody>
<tr>
<td></td>
<td>0.055</td>
<td>0.0375</td>
<td>0.0625</td>
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<table>
<thead>
<tr>
<th>FREQ (HZ)</th>
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<tbody>
<tr>
<td>22.7</td>
<td>17.9</td>
<td>41.7</td>
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<table>
<thead>
<tr>
<th>PD (0.01&quot;)</th>
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<tbody>
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<td>0.3775</td>
<td>0.48</td>
<td>0.37</td>
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<table>
<thead>
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<th>PPA (g)</th>
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<tbody>
<tr>
<td>0.05208</td>
<td>0.03255</td>
<td>0.0651</td>
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</table>

Peak Vector Sum: 0.07 in/s
Peak Air Pressure: 111.6 DB 0.001176 psi @ 3.6 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: +/- 0.16 in/s
Sound Scale: +/- 0.0023 psi

Velocity Waveform
SSN: 8030 Event: 6

Printed: August 15, 2012 File: 0000044559_201208.g3k (GeoSonics Inc. PDFGenerator v 1.0)
The seismograph at 114 San Marino Drive (S/N 8021) did not trigger during the shot on August 15, 2012 at approximately 11:43 indicating the ground vibrations produced were below the ground trigger level of 0.030 in/sec.
The seismograph located across the street from 16 Marin Bay Park Court (S/N 8056) did not trigger during the blast on August 15, 2012 at approximately 11:43 indicating the ground vibrations produced were below the ground trigger level of 0.030 in/sec.