Nevada ShakeZoning Model of the 5/22/15 Caliente M5.3 Event

- 136 km from Las Vegas I15-I515 interchange
- Two overpasses suffered joint-fill damage – MMI V?
- Traffic impeded for hours
- Mostly MMI 2-3 reports in Las Vegas Val.
- MMIs above prediction at all distances

Steve Marcus, Las Vegas Sun

Intensity vs. Distance Plot (ID nn00495477)

USGS Community Internet Intensity Map
NEVADA
May 22 2015 11:47:42 AM local 37.3829N 114.6046W MH 5.8 Depth: 4 km ID nn00495477

Soma Logic Laboratory
Nevada ShakeZoning Model of the 5/22/15 Caliente M5.3 Event

- Many geological basins between event, Las Vegas
- NSZ uses 3D basins & Clark Co. Parcel Map
- Modeled shaking up to 0.2 Hz in a few hours of physics-based computation

Basin Map from USGS

Geotech Vs Map with 10,000 Clark County Parcel Map measurements
Nevada ShakeZoning Model of the 5/22/15 Caliente M5.3 Event

Basin waveguides channel, amplify, and prolong earthquake shaking

Geotech heterogeneity shown by Parcel Map traps more shaking

3D NSZ PGVs (cm/s, blue) show 5x to 10x basin amplification

3D NSZ matches recorded PGVs (cm/s, red) to factor of two
Nevada ShakeZoning Model of the 5/22/15 Caliente M5.3 Event

3D NSZ PGVs (cm/s, blue) show 5x to 10x basin amplification

3D NSZ matches recorded PGVs (cm/s, red) to factor of two

- Deep LV basin amplified and extended low-frequency shaking to MMI IV, damaging bridge joints
Nevada ShakeZoning Model of the 5/22/15 Caliente M5.3 Event, MMI Colors

3D NSZ PGVs (cm/s, blue) show blue-green MMI IV in Las Vegas Val.

Basin trapping gives 1/3 the shaking in bedrock areas, purple MMI II

<table>
<thead>
<tr>
<th>PERCEIVED SHAKING</th>
<th>Not felt</th>
<th>Weak</th>
<th>Light</th>
<th>Moderate</th>
<th>Strong</th>
<th>Very strong</th>
<th>Severe</th>
<th>Violent</th>
<th>Extreme</th>
</tr>
</thead>
<tbody>
<tr>
<td>POTENTIAL DAMAGE</td>
<td>none</td>
<td>none</td>
<td>none</td>
<td>Very light</td>
<td>Light</td>
<td>Moderate</td>
<td>Mod./Heavy</td>
<td>Heavy</td>
<td>Very Heavy</td>
</tr>
<tr>
<td>PEAK ACC. (%g)</td>
<td>&lt;0.05</td>
<td>0.3</td>
<td>2.8</td>
<td>6.2</td>
<td>12</td>
<td>22</td>
<td>40</td>
<td>75</td>
<td>&gt;139</td>
</tr>
<tr>
<td>PEAK VEL (cm/s)</td>
<td>&lt;0.02</td>
<td>0.1</td>
<td>1.4</td>
<td>4.7</td>
<td>9.6</td>
<td>20</td>
<td>41</td>
<td>86</td>
<td>&gt;178</td>
</tr>
<tr>
<td>INSTRUMENTAL INTENSITY</td>
<td>I</td>
<td>II–III</td>
<td>IV</td>
<td>V</td>
<td>VI</td>
<td>VII</td>
<td>VIII</td>
<td>IX</td>
<td>X+</td>
</tr>
</tbody>
</table>

Scale based upon Worden et al. (2012)