An Evaluation of Measured Ground Motions at the Port Access Bridge
Outline

- Introduction
- Port Access Bridge Description
- PGA Evaluation
- Intensity Measures
- Analysis
- Conclusions
NSMP Station 8043 – Port Access Bridge

- Instrumented Bridge with adjacent ground station
- Bridge constructed in 1975 and operated by Alaska DOT&PF
- Numerous studies
  - Yang et al. (2007), Xiong and Yang (2007), URS PSHA (2012), and others.
- In the Ship Creek Drainage
- Closest station at same elevation as the Port of Alaska
- South end of bridge at 4th Avenue Slide (1964)

- PGA recorded was 1.7 times higher than the nearest 4 stations
Port Access Bridge Instrumentation

NSMP Station 8043
(3 components)

36 Structural Sensors
Subsurface Soils – Ship Creek Basin
PGA Comparisons

- NSMP Station 8043 (Port Access Bridge)
- Station AK 223 (Government Hill)
- NSMP Station 8038 (Fire Station 1)

<table>
<thead>
<tr>
<th>Event</th>
<th>8043 PGA</th>
<th>AK 223 PGA</th>
<th>8038 PGA</th>
<th>8043/223</th>
<th>8043/8038</th>
</tr>
</thead>
<tbody>
<tr>
<td>M7.1</td>
<td>0.440g</td>
<td>0.269g</td>
<td>0.293g</td>
<td>1.6</td>
<td>1.5</td>
</tr>
</tbody>
</table>

- Using the main earthquake and 10 aftershocks
  - 8043/AK223 = 2.3
  - 8043/8038 = 2.1
Intensity Measures

- Peak Ground Acceleration
  - Pervasive but generally a poor predictor of overall energy

- Arias Intensity ($I_a$)
  - $I_a = \frac{\pi}{2g} \int_0^{t_{max}} [a(t)]^2 dt$
  - Arias (1970)

- Cumulative Absolute Velocity ($CAV$)
  - $CAV = \int_0^{t_{max}} [a(t)] dt$
  - EPRI (1988)
Station Comparisons – Intensity Measures

<table>
<thead>
<tr>
<th>IM</th>
<th>8043 HNE</th>
<th>AK 223 HNE</th>
<th>8038 HNE</th>
<th>8043/223</th>
<th>8043/8038</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGA</td>
<td>0.440g</td>
<td>0.269g</td>
<td>0.293g</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Arias Intensity (m/sec)</td>
<td>3.52</td>
<td>1.37</td>
<td>1.41</td>
<td>2.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Cumulative Absolute Velocity (cm/sec)</td>
<td>2113</td>
<td>1427</td>
<td>1427</td>
<td>1.48</td>
<td>1.48</td>
</tr>
</tbody>
</table>
Arias Intensity for 3 Stations (E-W)
Conclusions

- Port Access Bridge ground motions appear to be higher than nearby stations.
- Is this because of site environment?
  - Nearby structure response?
  - Subsurface conditions?
- Port of Alaska
  - Using nearby stations may not be appropriate
  - Significant structures
  - Variability in subsurface conditions