#### **Supplemental Data**



Figure S-1 Box-and-whisker plot showing the distribution of LSN and LPI values of 44 Christhcurch liquefaction case histories computed using Boulanger & Idriss (2016) CPT procedure with P L = 50% and C FC = 0.13. The Port Island data is excluded to maintain consistency using CPT data.

#### Note:

This supplemental document summarizes the CPT-based liquefaction triggering analysis of all 44 Christchurch liquefaction case histories considered in this paper.

The analysis is performed using Boulanger and Idriss (2016) CPT-based Liquefaction Triggering Procedure with parameters and assumption described below:

-  $C_{FC} = 0.13$  (Maurer et al. 2019 recommendation for Christchurch soil)

-  $P_L = 50\%$  (This value is usually used to back-analyze a liquefaction case histories)

- Peak ground acceleration values for each scenario are estimated using New Zealand specific ground motion prediction equation (Bradley, 2013)

- LPI and LSN are computed for each scenarios and the results is summarized in FIgure S-1

#### Reference:

1. Boulanger, R. W. and Idriss, I. (2016). CPT-based liquefaction triggering procedure. J. Geotech. Geoenviron. Eng., ASCE, 142(2), 04015065.

2. Maurer, B., Green, R., van Ballegooy, S., and Wotherspoon, L. (2019). Development of regionspecific soil behavior type index correlations for evaluating liquefaction hazard in Christchurch, New Zealand. SDEE, Elsevier, 117, 96–105.

3. Bradley, B. A. (2013). A New Zealand-specific pseudospectra acceleration ground-motion prediction equation for active shallow crustal earthquakes based on foreign models. B. Seismo. Soc. America, 103(3), 1801–1822.

Scenario #: 1 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.29 g Site: St. Teresa ; CPT#: 57345 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 2 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.36 g Site: St. Teresa ; CPT#: 57345 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 3 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.17 g Site: St. Teresa ; CPT#: 57345 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 4 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.2511 g Site: 200 Cashmere ; CPT#: 36421 ; G.W.L: 0.8 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 5 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.1883 g Site: 200 Cashmere ; CPT#: 36421 ; G.W.L: 0.8 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 6 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4622 g Site: 200 Cashmere ; CPT#: 36421 ; G.W.L: 0.8 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014) & Tor

Scenario #: 7 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.3163 g Site: Caulfield ; CPT#: 36419 ; G.W.L: 0.2 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 8 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.306 g Site: Caulfield ; CPT#: 36419 ; G.W.L: 0.2 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 9 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.1347 g Site: Caulfield ; CPT#: 36419 ; G.W.L: 0.6 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\*  $FS_{Liq}^{*}$ LSN\*\* Tip Resistance SBT Index q<sub>t</sub> (MPa)  $I_c$ 30 2 2 10 20 30 40 50 0 10 20 1 3 4 0 1 0 0 8 15 40 0 1 Depth below ground surface (m)  $\epsilon$ None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction (2) Minor liquefaction (1) No liquefaction 5  $\mathfrak{S}$ (4) (5)LSN: 6.7 LPI: 0.1 6

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 10 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.2462 g Site: Gainsborough ; CPT#: 36417 ; G.W.L: 0.6 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 11 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.1842 g Site: Gainsborough ; CPT#: 36417 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\* Tip Resistance SBT Index  $FS_{Lig}^{*}$ LSN\*\* q<sub>t</sub> (MPa)  $I_c$ 30 10 20 30 40 50 0 20 2 3 0 1 2 0 0 8 15 10 1 4 0.0 -9. W.I 2.5 5.0 Depth below ground surface (m) 7.5 10.0 2.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5  $\mathfrak{S}$ (4)(2)20.0 LSN: 19.3 LPI: 3.9

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019)

\*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

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Scenario #: 12 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4264 g Site: Gainsborough ; CPT#: 36417 ; G.W.L: 1.2 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 13 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.2473 g Site: Hillsborough ; CPT#: 57365 ; G.W.L: 0.8 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 14 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.3643 g Site: Hillsborough ; CPT#: 57365 ; G.W.L: 0.4 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 15 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.6338 g Site: Hillsborough ; CPT#: 57365 ; G.W.L: 0.8 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



<sup>\*</sup> Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 16 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.222 g Site: Paeroa ; CPT#: 36418 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 17 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.173 g Site: Paeroa ; CPT#: 36418 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\* FS<sub>Liq</sub>\* LSN\*\* Tip Resistance SBT Index q<sub>t</sub> (MPa)  $I_c$ 20 30 2 2 10 20 30 40 50 0 10 3 4 0 1 0 0 8 15 40 1 0 G.W.L 2 6 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction (2) Minor liquefaction 8 (1) No liquefaction 10 3 (4) (2)LSN: 15.5 LPI: 2.2

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Depth below ground surface (m)

By: DH UC Berkeley, 2017

Scenario #: 18 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.2271 g Site: Barrington ; CPT#: 37818 ; G.W.L: 1.6 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\* FS<sub>Liq</sub>\* Tip Resistance SBT Index LSN\*\* q<sub>t</sub> (MPa)  $I_c$ 30 10 20 30 40 50 0 20 2 3 0 1 2 0 0 8 15 40 10 1 4 0.0 + . . . . . . . . . . . . . . . . . . 2.5 5.0 Depth below ground surface (m) 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5 (C) (4)(2)20.0 LSN: 15.3 LPI: 4.0

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 19 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.2016 g Site: Barrington ; CPT#: 37818 ; G.W.L: 1.6 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\*  $FS_{Liq}^{*}$ Tip Resistance SBT Index LSN\*\* q<sub>t</sub> (MPa)  $I_c$ 30 10 20 30 40 50 0 20 2 3 0 1 2 0 0 8 15 40 10 1 4 0.0 + . . . . . . . . . . . . . . . . . . 2.5 5.0 Depth below ground surface (m) 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5 (C) (4) (2)20.0 LSN: 7.5 LPI: 0.8

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

By: DH UC Berkeley, 2017

Scenario #: 20 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.1918 g Site: Shirley ; CPT#: 57366 ; G.W.L: 2.8 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\* FS<sub>Liq</sub>\* LSN\*\* Tip Resistance SBT Index q<sub>t</sub> (MPa)  $I_c$ 30 2 10 20 30 40 50 0 10 20 1 3 4 0 1 2 0 0 8 15 40 0.0 2.5 G.W.L 5.0 Depth below ground surface (m) 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5 (C) (4) (2)20.0 LSN: 2.3 LPI: 0.0

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

By: DH UC Berkeley, 2017

Scenario #: 21 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.6768 g Site: Palinurus 1; CPT#: 57360; G.W.L: 1.4 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 22 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4178 g Site: Palinurus 1; CPT#: 57360; G.W.L: 1.4 m Observed Ejecta Severity: None ; Site Condition: Free-field flat LPI\*\*\*  $FS_{Liq}^{*}$ LSN\*\* Tip Resistance SBT Index q<sub>t</sub> (MPa)  $I_c$ 30 10 20 30 40 50 8 0 10 20 2 3 0 1 2 0 0 15 40 1 4 0.0 G.W.I 2.5 5.0 Depth below ground surface (m) 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5  $\mathfrak{S}$ (4)(2)20.0 LSN: 29.1 LPI: 14.3

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 23 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.45 g Site: CMHS ; CPT#: 72541 ; G.W.L: 2 m Observed Ejecta Severity: None ; Site Condition: Near Building LPI\*\*\* FS<sub>Liq</sub>\* LSN\*\* Tip Resistance SBT Index q<sub>t</sub> (MPa)  $I_c$ 20 30 2 2 10 20 30 40 50 0 10 1 3 4 0 1 0 0 8 15 40 0 2 4 Depth below ground surface (m) 6 8 None to mino<del>r liquofactio</del> Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 10 (2) Minor liquefaction (1) No liquefaction 12 3 (4)(2)LSN: 11.8 LPI: 6.2 14

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 24 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.3379 g Site: Paeroa ; CPT#: 36418 ; G.W.L: 1 m Observed Ejecta Severity: None ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 25 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4641 g Site: Carisbrooke ; CPT#: 57347 ; G.W.L: 2.6 m Observed Ejecta Severity: Minor ; Site Condition: Free-field flat FS<sub>Liq</sub>\* SBT Index LSN\*\* Tip Resistance q<sub>t</sub> (MPa)  $I_c$ 20 30 2 10 20 30 40 50 0 10 1 3 4 0 1 2 0 0 8 0.0 G.W.L 2.5 5.0 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5 (C) (4) (2)20.0 LSN: 7.6

LPI: 2.8 By: DH UC Berkeley, 2017

Severe liquefaction

Moderate liquefaction

LPI\*\*\*

40

15

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Depth below ground surface (m)

Scenario #: 26 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4568 g Site: Brougham St. ; CPT#: 57355 ; G.W.L: 1.4 m Observed Ejecta Severity: Minor ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 27 ; Event: DAR ; M<sub>w</sub>: 7.1 ; a<sub>max</sub>: 0.245 g Site: Rydal ; CPT#: 57344 ; G.W.L: 1.6 m Observed Ejecta Severity: Minor ; Site Condition: Free-field flat LPI\*\*\*  $FS_{Liq}^{*}$ SBT Index LSN\*\* Tip Resistance q<sub>t</sub> (MPa)  $I_c$ 30 2 10 20 30 40 50 0 10 20 3 4 0 1 2 0 0 8 15 40 1 0 2 4 Depth below ground surface (m) 6 8 10 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction (2) Minor liquefaction 12 (1) No liquefaction 14  $\mathfrak{S}$ (4)(2)LSN: 10.4 LPI: 2.3 16

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 28 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.258 g Site: Avondale PG ; CPT#: 57354 ; G.W.L: 2 m Observed Ejecta Severity: Moderate ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 30 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4213 g Site: Barrington ; CPT#: 37818 ; G.W.L: 1.6 m Observed Ejecta Severity: Moderate ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 31 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.3959 g Site: Avondale PG ; CPT#: 57354 ; G.W.L: 2 m Observed Ejecta Severity: Moderate ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 32 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.3435 g Site: Sabina ; CPT#: 57346 ; G.W.L: 1.2 m Observed Ejecta Severity: Moderate ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 33 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.2531 g Site: Avondale Park ; CPT#: 57342 ; G.W.L: 1.2 m Observed Ejecta Severity: Moderate ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 34 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.6768 g Site: Palinurus 2; CPT#: 62761; G.W.L: 1.4 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 35 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.434 g Site: Ti Rakau ; CPT#: 57341 ; G.W.L: 1.2 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 36 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4178 g Site: Palinurus 2; CPT#: 62761; G.W.L: 1.4 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 37 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.25 g Site: Shirley ; CPT#: 57366 ; G.W.L: 2.2 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat LPI\*\*\* SBT Index LSN\*\* Tip Resistance  $FS_{Liq}^{*}$ q<sub>t</sub> (MPa)  $I_c$ 30 2 10 20 30 40 50 40 0 10 20 1 3 4 0 1 2 0 0 8 15 0.0 G.W.L 2.5 5.0 Depth below ground surface (m) 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5 (C) (4) (2)20.0 LSN: 5.5 LPI: 0.6

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

By: DH UC Berkeley, 2017

Scenario #: 38 ; Event: JUN ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.219 g Site: Sabina ; CPT#: 57346 ; G.W.L: 1 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 39 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.371 g Site: Avondale Park ; CPT#: 57342 ; G.W.L: 1.8 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat



\*\*\*: Based on Maurer et al (2014)

Scenario #: 40 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.6811 g Site: Ti Rakau ; CPT#: 57341 ; G.W.L: 1.6 m Observed Ejecta Severity: Moderate ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 41 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.5498 g Site: Cresselly ; CPT#: 57353 ; G.W.L: 1.8 m Observed Ejecta Severity: Severe ; Site Condition: Near Building LPI\*\*\* FS<sub>Liq</sub>\* SBT Index LSN\*\* Tip Resistance q<sub>t</sub> (MPa)  $I_c$ 30 2 2 10 20 30 40 50 0 8 15 40 0 10 20 3 4 0 1 0 1 0.0 + G.V 2.5 5.0 Depth below ground surface (m) 7.5 0.0 2.5 None to minor liquetact Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction (2) Minor liquefaction (1) No liquefaction 15.0  $\mathfrak{S}$ (4)(2)17.5 LSN: 43.3 LPI: 33.7

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

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Scenario #: 42 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.4386 g Site: Rydal ; CPT#: 57344 ; G.W.L: 1.6 m Observed Ejecta Severity: Severe ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 43 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.45 g Site: Cashmere SW ; CPT#: 33758 ; G.W.L: 2.6 m Observed Ejecta Severity: Extreme ; Site Condition: Free-field flat



\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

Scenario #: 45 ; Event: CHC ; M<sub>w</sub>: 6.2 ; a<sub>max</sub>: 0.38 g Site: Shirley ; CPT#: 57366 ; G.W.L: 2.6 m Observed Ejecta Severity: Extreme ; Site Condition: Free-field flat LPI\*\*\*  $FS_{Liq}^{*}$ SBT Index LSN\*\* Tip Resistance q<sub>t</sub> (MPa)  $I_c$ 30 2 10 20 30 40 50 40 0 10 20 1 3 4 0 1 2 0 0 8 15 0.0 G.W.L 2.5 5.0 Depth below ground surface (m) 7.5 10.0 12.5 None to minor liquefaction Moderate liquefaction Moderate liquefaction Extreme liquefaction Severe liquefaction Severe liquefaction 15.0 (2) Minor liquefaction (1) No liquefaction 17.5  $\mathfrak{S}$ (4)(2)20.0 LSN: 14.3 LPI: 5.7

\* Using Boulanger & Idriss (2016):  $I_{c-cut}$ =2.6,  $P_L$ =50%, and  $C_{FC}$ =0.13 (Maurer et al. 2019) \*\*: Based on van Ballegooy et al. (2014) & Tonkin+Taylor (2013)

\*\*\*: Based on Maurer et al (2014)

By: DH UC Berkeley, 2017