SEISMIC SOIL LIQUEFACTION TRIGGERING
SPT LEGACY CASE HISTORY SITES

NGL: NEXT GENERATION LIQUEFACTION DATABASE DEVELOPMENT AND IMPLICATIONS FOR ENGINEERING MODELS

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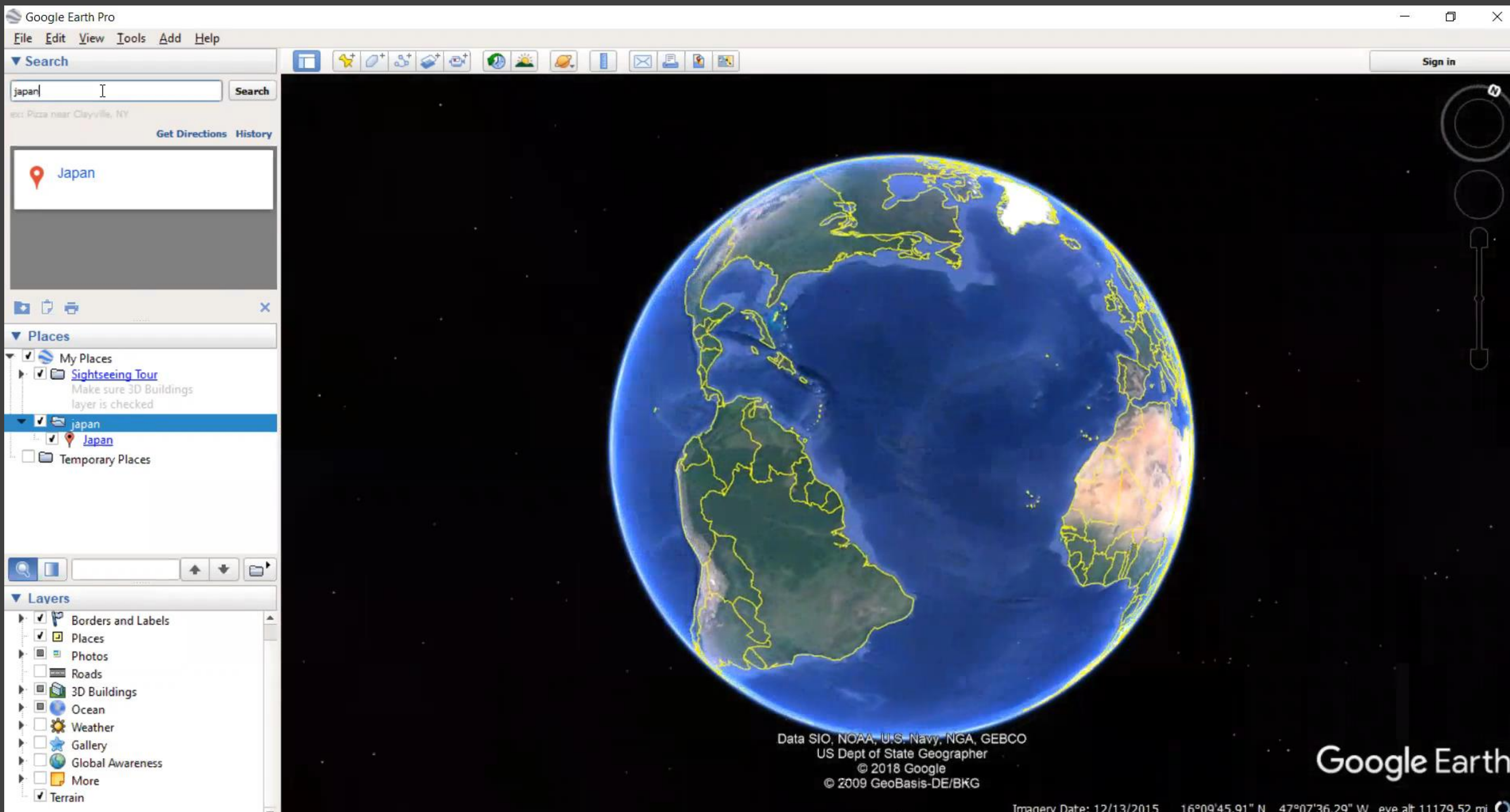
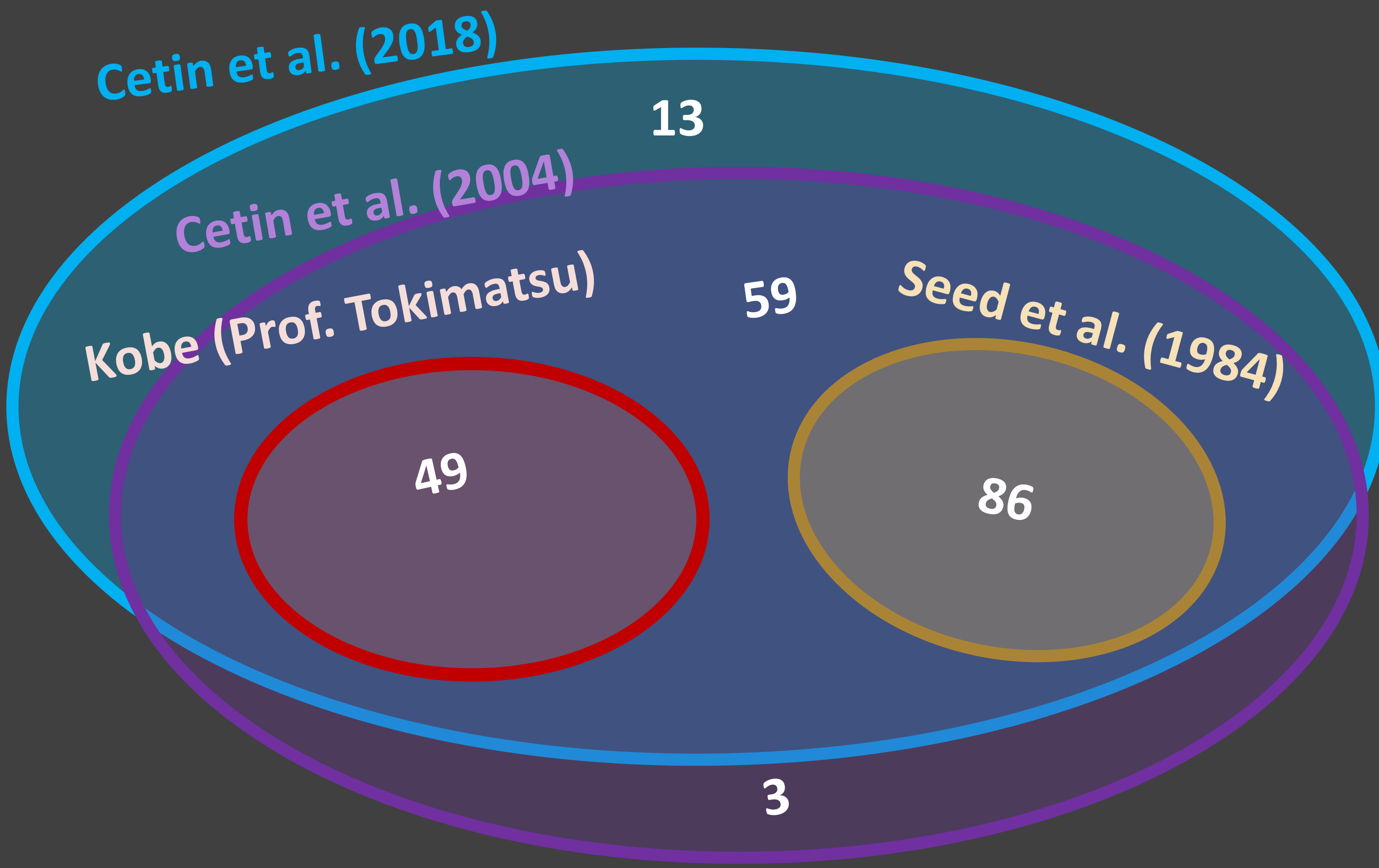
SPT Legacy Case Histories



SPT Case History Dataset



Data in Brief: Cetin et al. (2018)

Data in Brief 20 (2018) 544–548

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Data Article

Dataset on SPT-based seismic soil liquefaction

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A B S T R A C T

This data article provides a summary of seismic soil liquefaction triggering and non-triggering case histories, which were compiled, screened for data completeness and quality, and then processed for the development of triggering relationships proposed in "SPT-based probabilistic and deterministic assessment of seismic soil liquefaction triggering hazard" [1]. The database is composed of 113 liquefaction, 95 non-liquefaction, and 2 marginal liquefaction case histories, from seismic events with moment magnitude M_w values varying in the range of 5.9 to 8.3. A spreadsheet summary of these case histories are included along with a separate spreadsheet, by which maximum likelihood assessment was performed. These data transparently enable researchers to access case history input parameters and processing details, and to compare the case history processing protocols with the ones of different researchers (e.g.: "The influence of SPT procedures in soil liquefaction resistance evaluations." [2], "SPT-based liquefaction triggering procedures." [3]).

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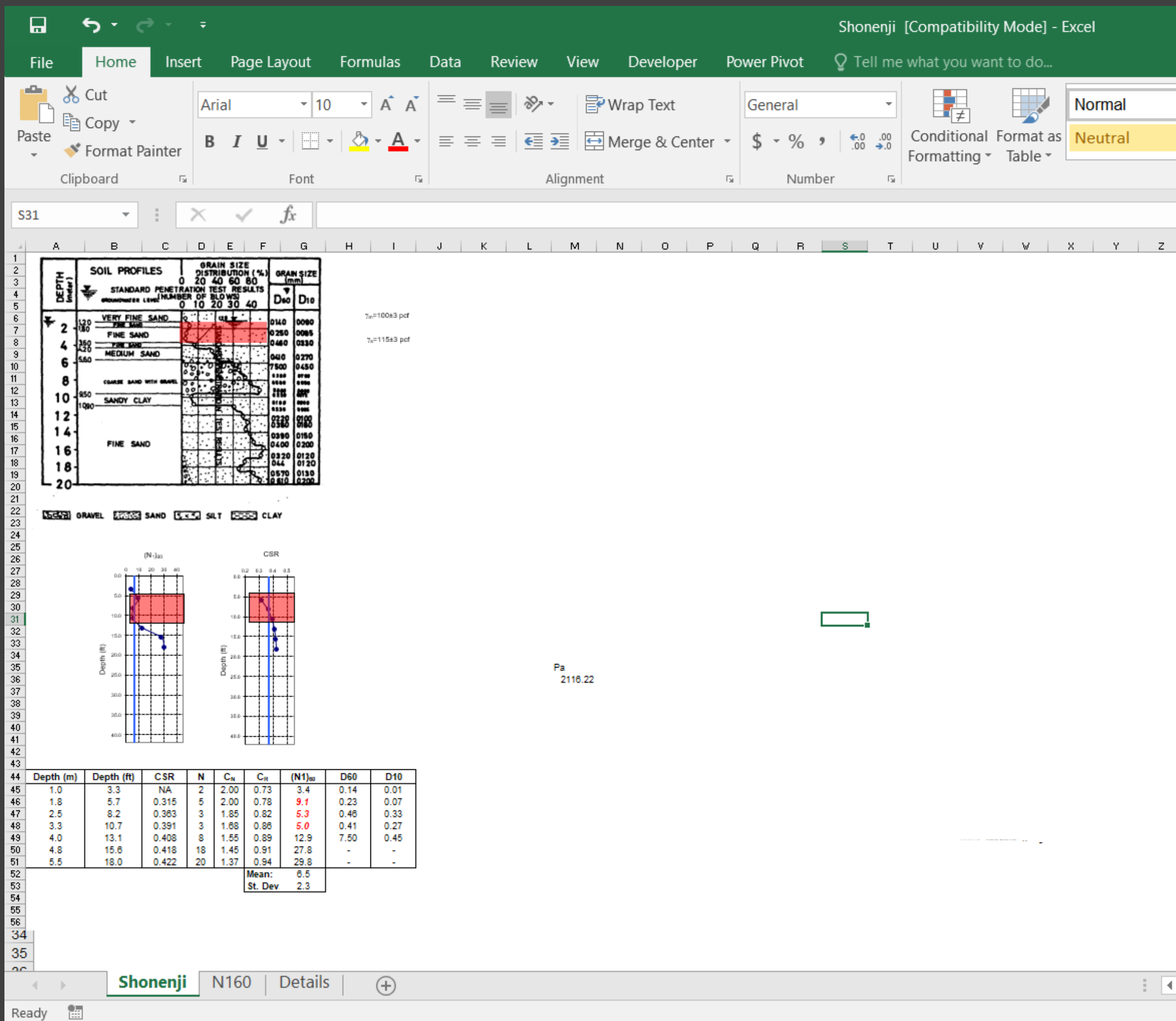
Cetin KO, Seed RB, Kayen RE, Moss RES, Bilge HT, Ilgac M, Chowdhury K. Dataset on SPT-based seismic soil liquefaction, Data in Brief, Elsevier, Vol. 20, 544-548, October 2018.

Cetin et al. (2018) Database

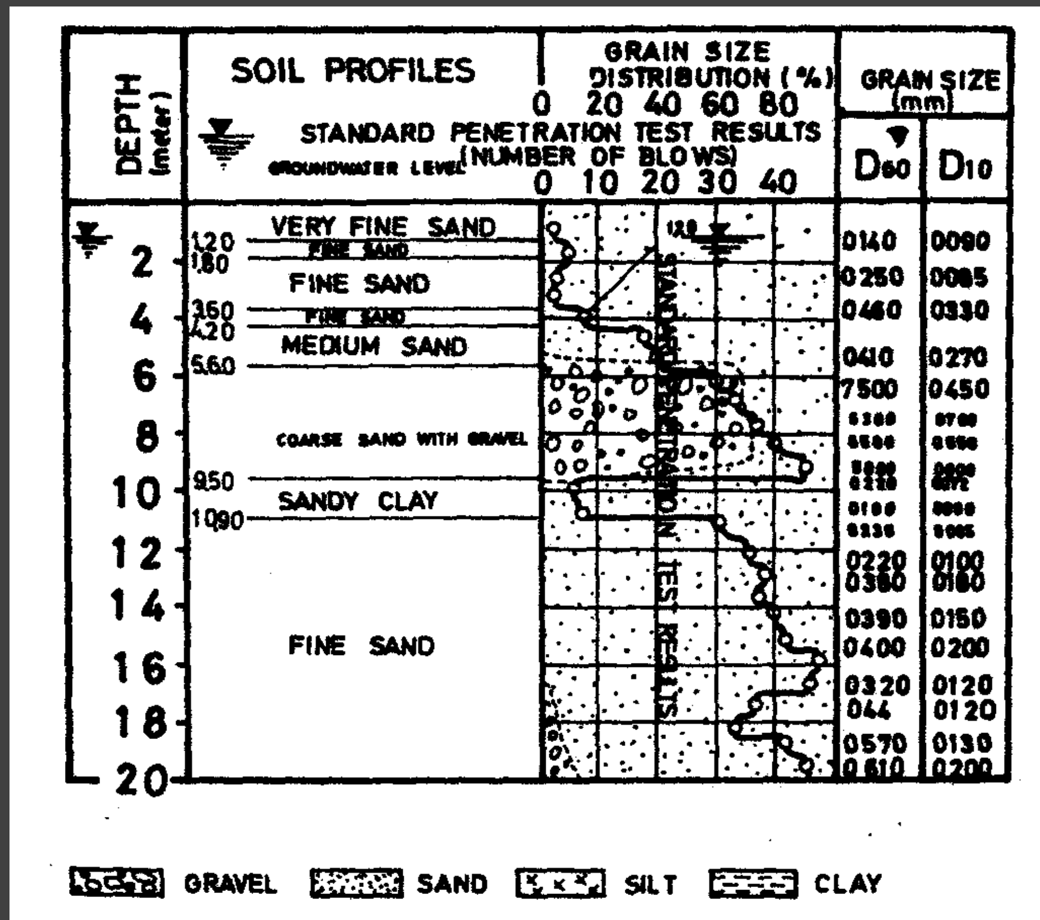


Depth (m)	Depth (ft)	CSR	N	C_N	C_R	$(N1)_{60}$	D60	D10
1.0	3.3	NA	2	2.00	0.73	3.4	0.14	0.01
1.8	5.7	0.315	5	2.00	0.78	*9.1*	0.23	0.07
2.5	8.2	0.363	3	1.85	0.82	*5.3*	0.46	0.33
3.3	10.7	0.391	3	1.68	0.86	*5.0*	0.41	0.27
4.0	13.1	0.408	8	1.55	0.89	12.9	7.50	0.45
4.8	15.6	0.418	18	1.45	0.91	27.8	-	-
5.5	18.0	0.422	20	1.37	0.94	29.8	-	-
					Mean:	6.5		
					St. Dev	2.3		

A Summary of Seismic Soil Liquefaction Field Case History Data

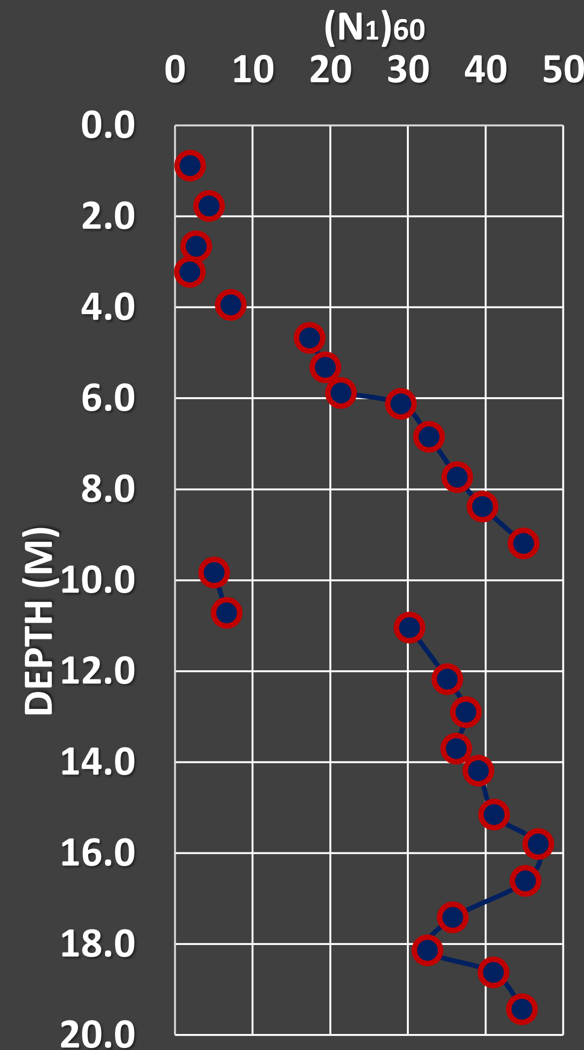
Earthquake:	1948 Fukui
Magnitude:	7.0 (Mw) USGS Centennial Earthquake Catalog
Location:	Shonenji Temple
References:	Kishida (1969) Hamada et al (1989)
Nature of Failure:	"… eruption of water and sand volcanoes were quite promonent, and the main building of the temple settled 0.30 m"
Comments:	The epicenter of the earthquake is located 5 kms east of Fukui City. The seismic intensity of shaking was estimated as JMAIS V-VI. A PGA value of 0.4 g was adopted by Seed et al (84) Shonenji Temple and Agricultural Union sites are 500 m apart. Kishida (1969) predicted the critical zone to be from 1-4 m based on: Effective overburden pressure<2.0 kg/cm2 D_r<75% Saturated coarse grained soil with U_c<10 and 0.074mm<D_{50}<2.0 mm SPT energy was estimated as 70 % by Seed et al. (84)

A Summary of Seismic Soil Liquefaction Field Case History Data



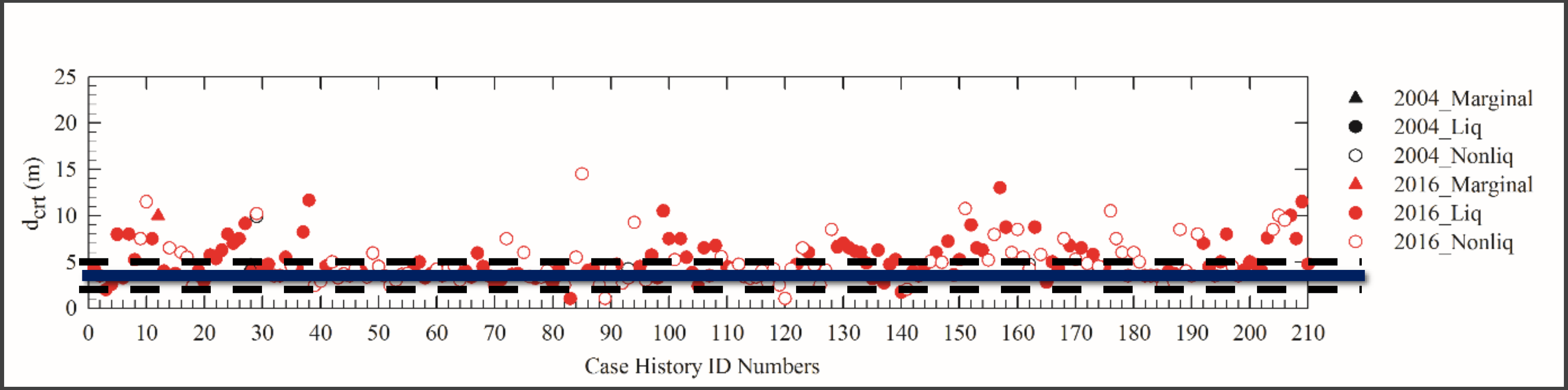
A Summary of Seismic Soil Liquefaction Field Case History Data

Depth (m)	Soil Profile	Depth (m)	N
0.0	Very Fine Sand		
1.4		0.9	2.0
	Fine Sand	1.8	4.4
1.9			
	Fine Sand	2.7	2.8
		3.2	2.0
3.7			
	Fine Sand	4.0	7.2
4.3			
	Medium Sand	4.7	17.4
		5.3	19.4
5.6			
	Coarse Sand with Gravel	5.9	21.4
		6.1	29.1
		6.9	32.8
		7.7	36.4
		8.4	39.7
		9.2	44.9
9.6			
	Sandy Clay	9.8	5.1
		10.7	6.7
10.9			
	Fine Sand	11.0	30.3
		12.2	35.1
		12.9	37.5
		13.7	36.3
		14.2	39.1
		15.2	41.2
		15.8	46.8
		16.6	45.2
		17.4	35.8
		18.1	32.6
		18.6	41.1
		19.4	44.7
20.0			



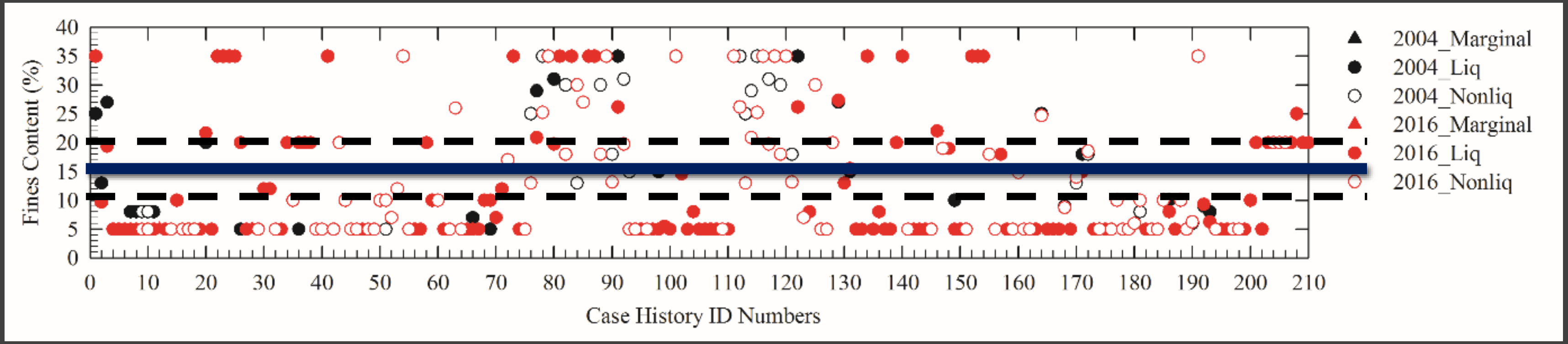
Cetin et al. (2018) Database Statistics

$d_{crt} = 4.9 \pm 0.6$ m



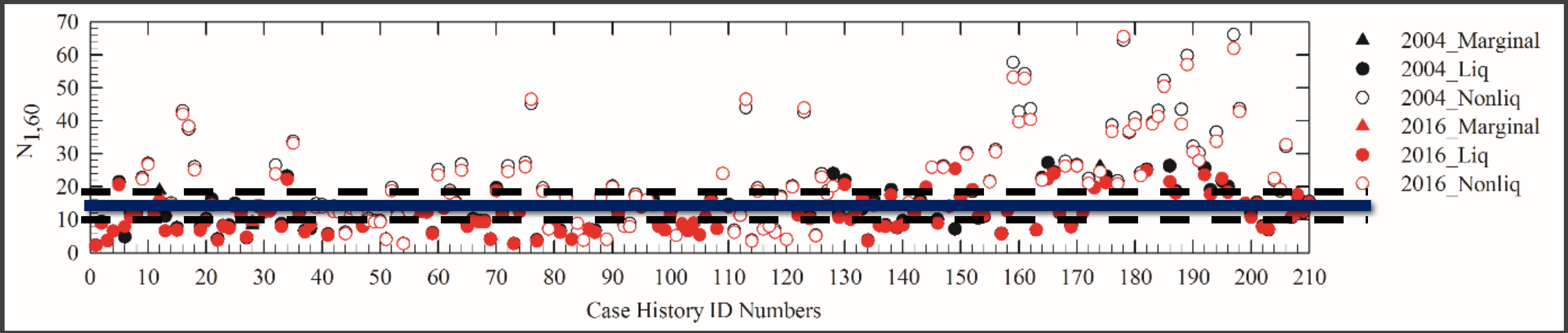
Cetin et al. (2018) Database Statistics

FC= 16.6 ± 4.2



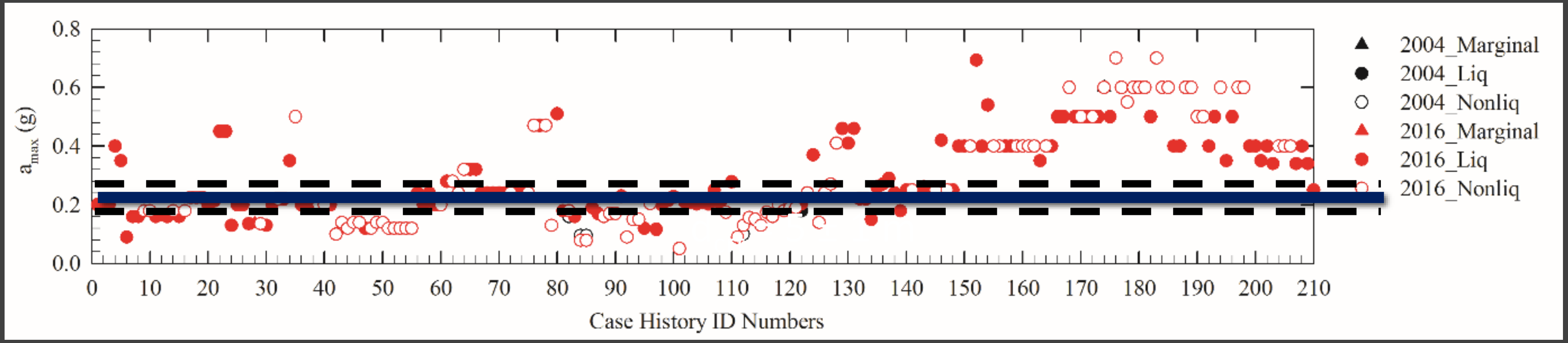
Cetin et al. (2018) Database Statistics

$N_{1,60}$= 15.1 ± 3.1



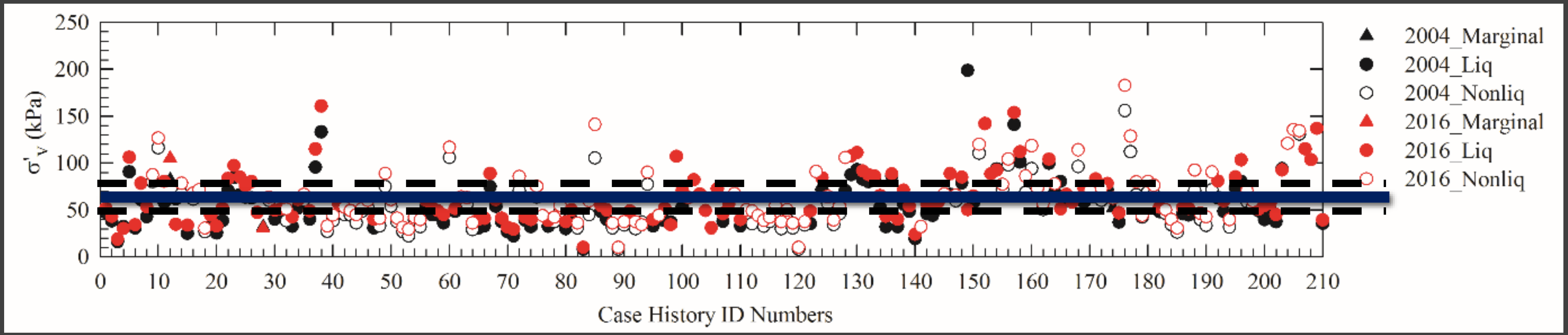
Cetin et al. (2018) Database Statistics

$a_{max} = 0.24 \pm 0.05$



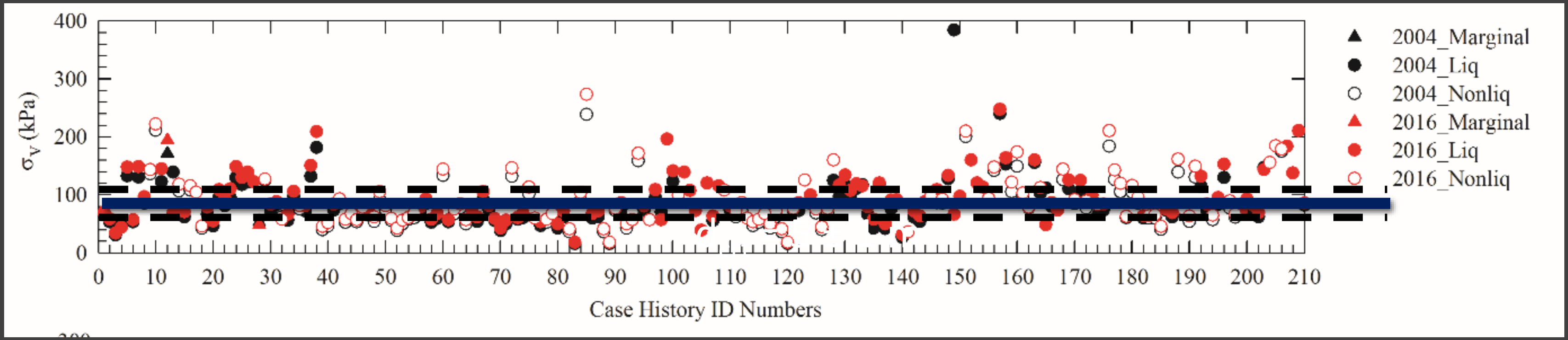
Cetin et al. (2018) Database Statistics

σ'_v= 60.6 ± 5.6 kPa



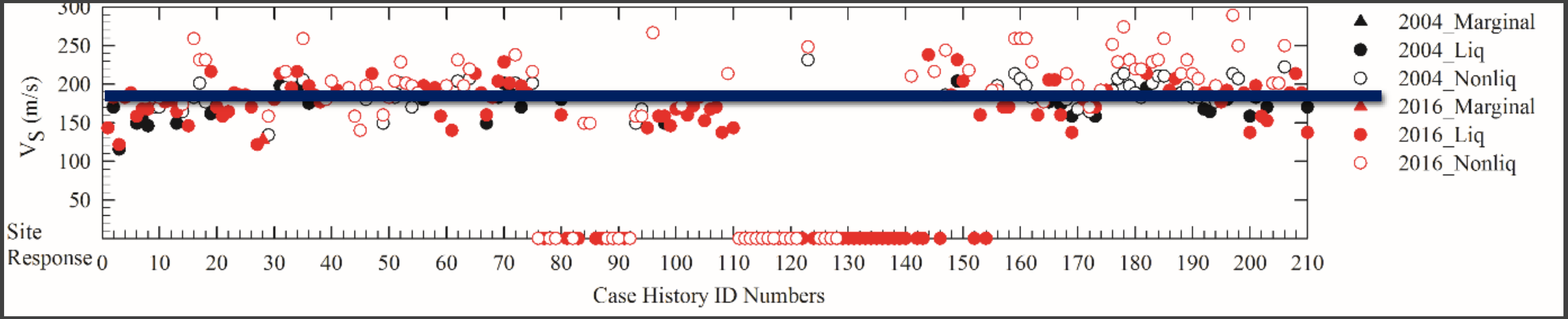
Cetin et al. (2018) Database Statistics

σ_v= 89.7 ± 10.6 kPa



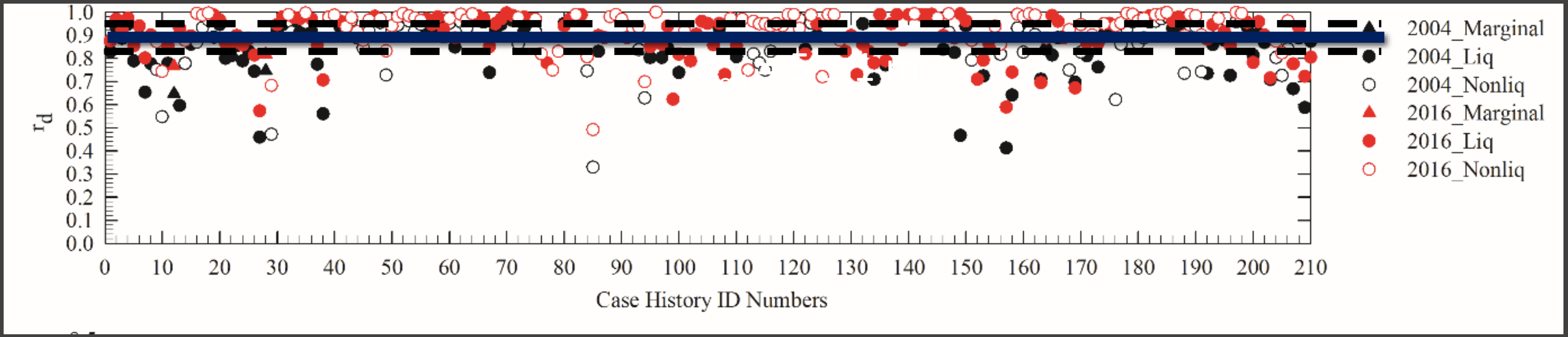
Cetin et al. (2018) Database Statistics

V_s = 191 m/s



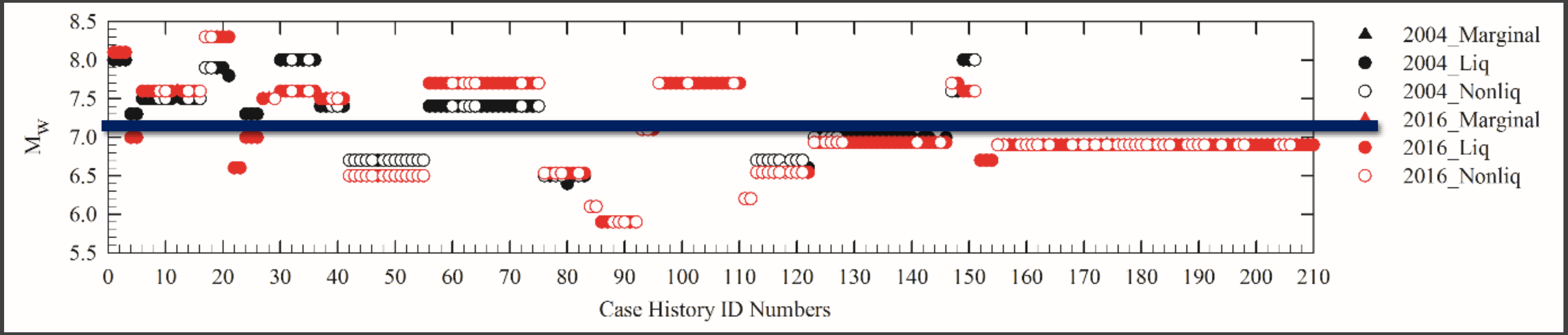
Cetin et al. (2018) Database Statistics

$r_d = 0.91 \pm 0.06$



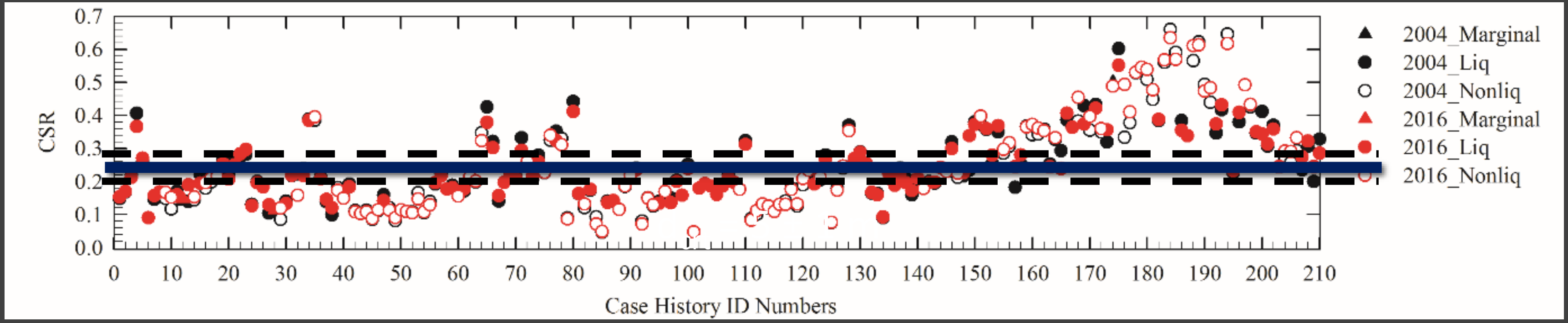
Cetin et al. (2018) Database Statistics

$M_w = 7.09$



Cetin et al. (2018) Database Statistics

CSR = 0.208 ± 0.05



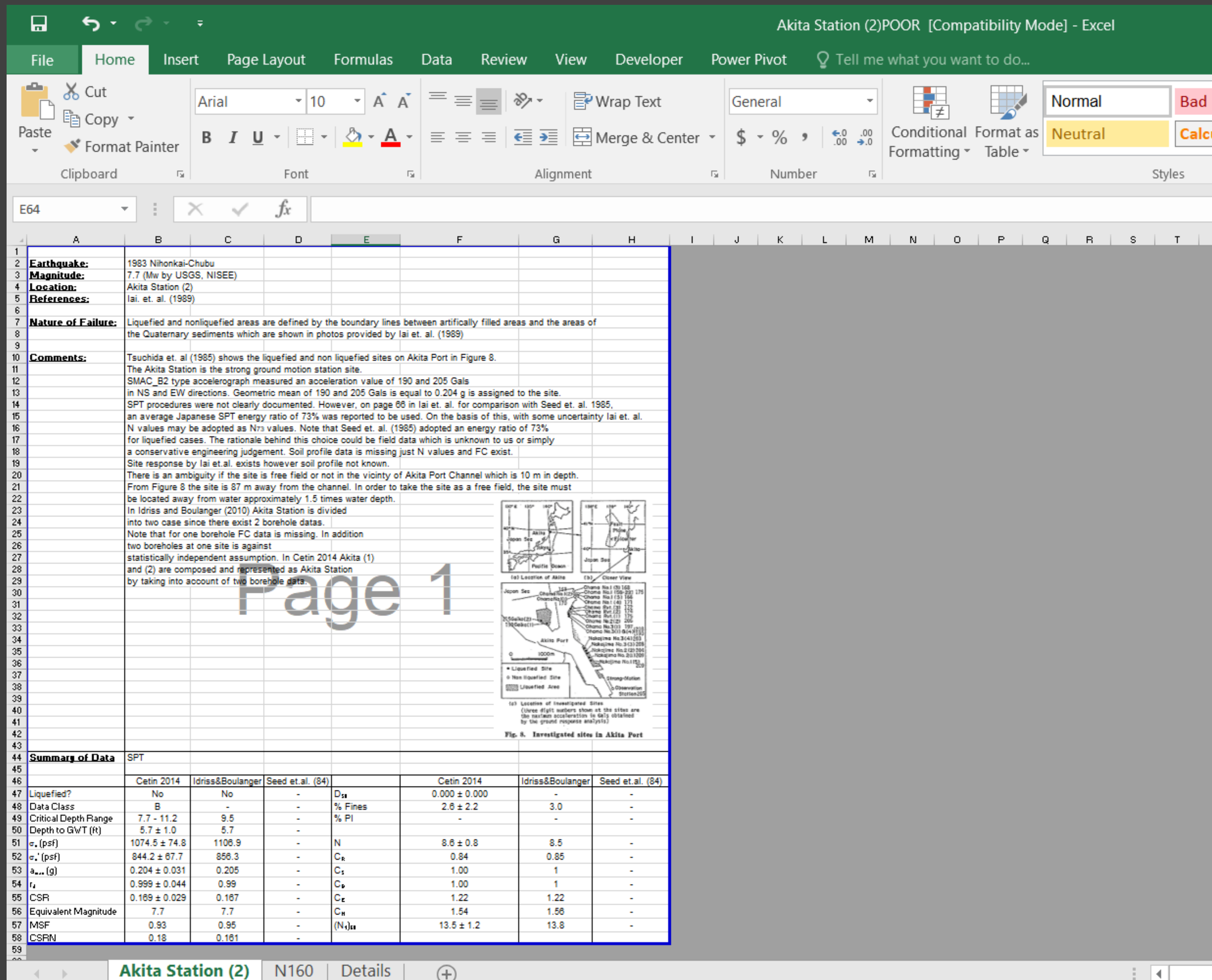
Cetin et al. (2018) Database Excluded

1. *Akita Station (2)POOR*
2. *Aomori PortPOOR*
3. *Hososhima_Agust7POOR*
4. *Hososhima_April1POOR*
5. *Ohama No. 1 (1)POOR*
6. *Ohama No. 1 (2)POOR*
7. *Ohama No. 1 (3)POOR*
8. *Ohama No. 1 (4)POOR*
9. *Ohama No. 1 (5)POOR*
10. *Ohama No. 1 (58-22)POOR*
11. *Ohama No. 3 (1)POOR*
12. *Ohama No. 3 (3)&(4)POOR*
13. *Ohama No. 3 (3)POOR*
14. *Ohama No. 3 (4)POOR*
15. *Ohama No. Rvt. (2)POOR*
16. *Ohama No. Rvt. (3)POOR*
17. *TokachiPOOR*
18. *General OhsakiPOOR*
19. *Kawagishi-choPOOR*
20. *Balboa Blv Unit DPoor*
21. *Malden Street Unit D_Excluded*
22. *POOR_Agricultural Union*
23. *POOR_Takaya 2*
24. *Poor_Shuang Tai Zi R.*
25. *POOR_Ashiyama A (Mountain Sand 2)*
26. *WildlifeB_Excluded*
27. *Pier ANoBL*
28. *Reservation PointNoBL*
29. *Ogaki*
30. *Hiyori-5Poor*
31. *Lake MercedPOOR*
32. *Vail-A_POOR*
33. *CaraballedaPOOR*

Cetin et al. (2018) Database Excluded

Name	Date modified	Type	Size
Akita Station (2)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	402 KB
Aomori PortPOOR	11/14/2014 12:46	Microsoft Excel 97...	418 KB
Hososhima_Agust7POOR	6/22/2017 4:33 AM	Microsoft Excel 97...	682 KB
Hososhima_April1POOR	11/15/2014 9:07 A	Microsoft Excel 97...	675 KB
Ohama No. 1 (1)POOR	2/2/2016 12:32 AM	Microsoft Excel 97...	715 KB
Ohama No. 1 (2)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	720 KB
Ohama No. 1 (3)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	729 KB
Ohama No. 1 (4)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	731 KB
Ohama No. 1 (5)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	729 KB
Ohama No. 1 (58-22)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	731 KB
Ohama No. 3 (1)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	512 KB
Ohama No. 3 (3)&(4)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	556 KB
Ohama No. 3 (3)POOR	9/29/2014 1:59 AM	Microsoft Excel 97...	456 KB
Ohama No. 3 (4)POOR	9/29/2014 2:00 AM	Microsoft Excel 97...	527 KB
Ohama No. Rvt. (2)POOR	2/4/2016 3:03 AM	Microsoft Excel 97...	405 KB
Ohama No. Rvt. (3)POOR	7/10/2017 1:41 AM	Microsoft Excel 97...	415 KB
TokachiPOOR	12/16/2015 5:56 A	Microsoft Excel 97...	354 KB

Cetin et al. (2018) Database Excluded



Earthquake: 1983 Nihonkai-Chubu
Magnitude: 7.7 (Mw by USGS, NISEE)
Location: Akita Station (2)
References: Iai. et. al. (1989)

Nature of Failure: Liquefied and nonliquefied areas are defined by the boundary lines between artifically filled areas and the areas of the Quaternary sediments which are shown in photos provided by Iai et. al. (1989)

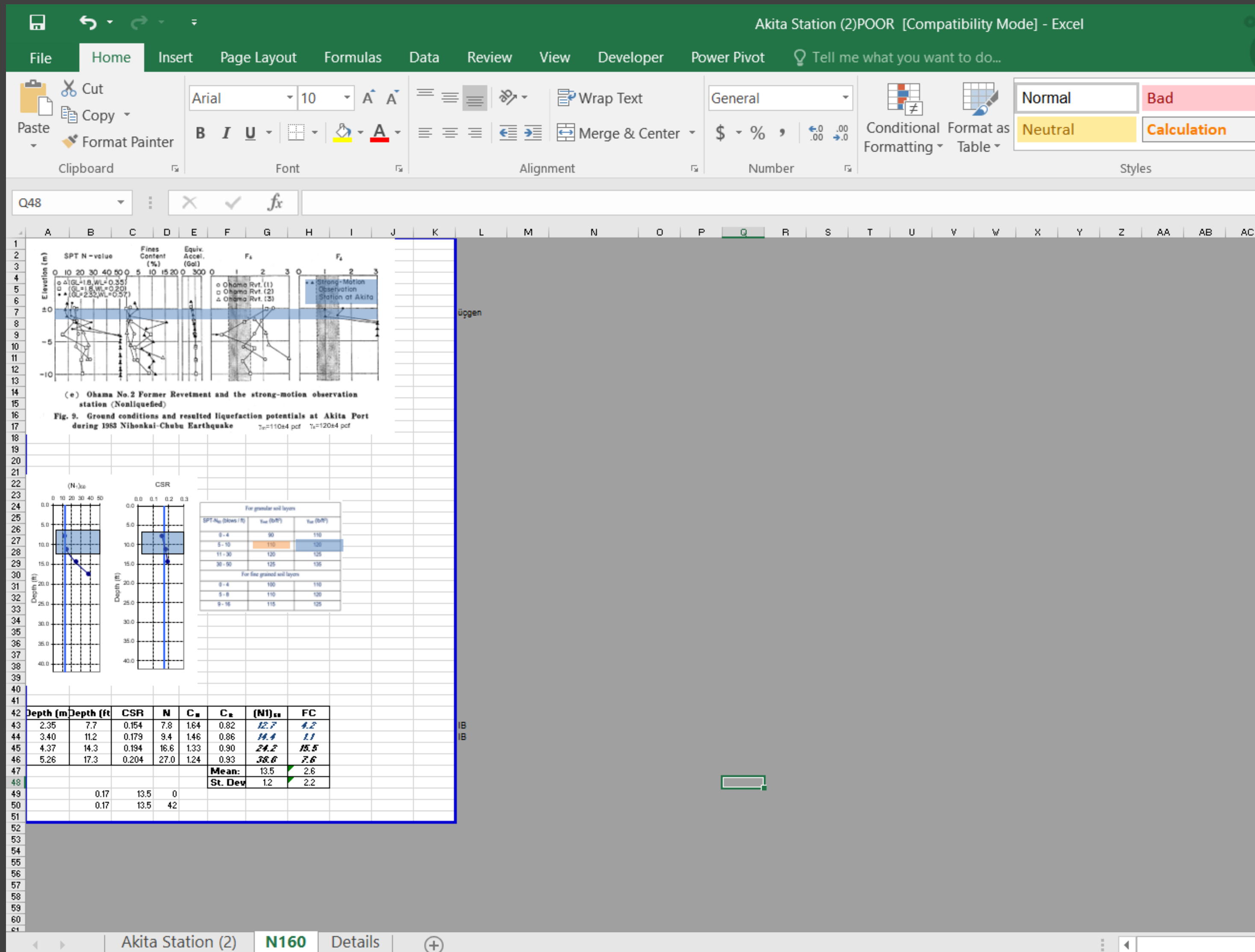
Comments: Tsuchida et. al (1985) shows the liquefied and non liquefied sites on Akita Port in Figure 8.
The Akita Station is the strong ground motion station site.
SMAC_B2 type accelerograph measured an acceleration value of 190 and 205 Gals
in NS and EW directions. Geometric mean of 190 and 205 Gals is equal to 0.204 g is assigned to the site.
SPT procedures were not clearly documented. However, on page 66 in Iai et. al. for comparison with Seed et. al. 1985,
an average Japanese SPT energy ratio of 73% was reported to be used. On the basis of this, with some uncertainty Iai et. al.
N values may be adopted as N_{73} values. Note that Seed et. al. (1985) adopted an energy ratio of 73%
for liquefied cases. The rationale behind this choice could be field data which is unknown to us or simply
a conservative engineering judgement. Soil profile data is missing just N values and FC exist.
Site response by Iai et.al. exists however soil profile not known.
There is an ambiguity if the site is free field or not in the vicinty of Akita Port Channel which is 10 m in depth.
From Figure 8 the site is 87 m away from the channel. In order to take the site as a free field, the site must
be located away from water approximately 1.5 times water depth.
In Idriss and Boulanger (2010) Akita Station is divided
into two case since there exist 2 borehole datas.
Note that for one borehole FC data is missing. In addition
two boreholes at one site is against
statistically independent assumption. In Cetin 2014 Akita (1)
and (2) are composed and represented as Akita Station
by taking into account of two borehole data.

Page 1

Summary of Data SPT

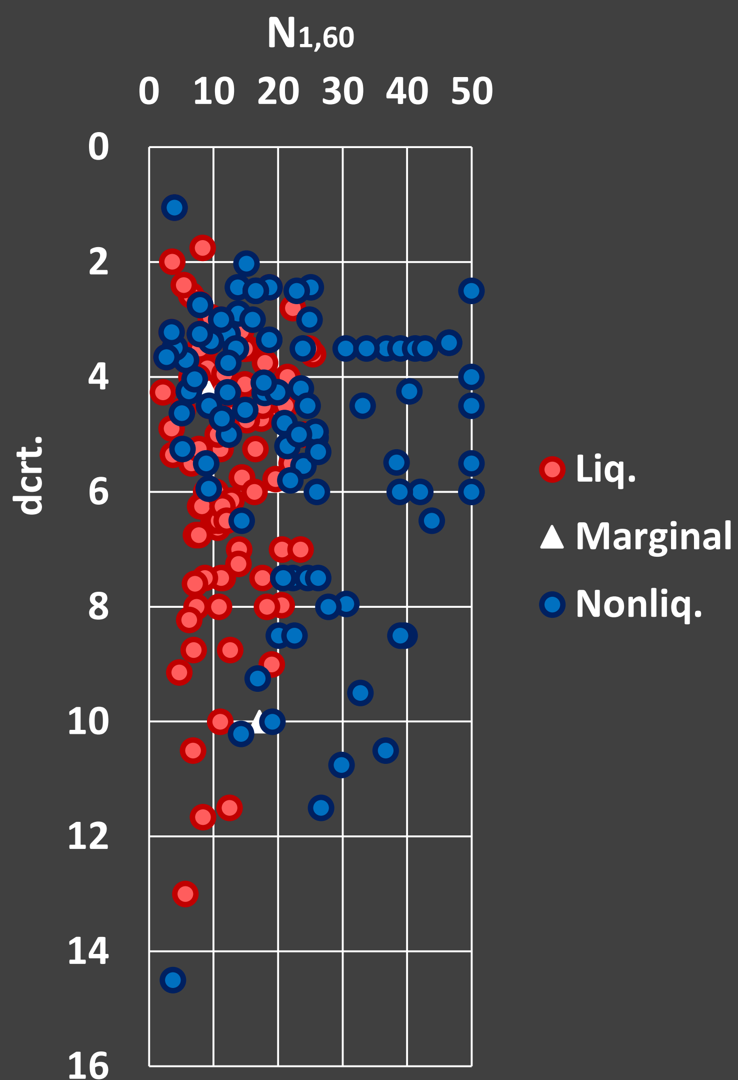
	Cetin 2014	Idriss&Boulanger	Seed et.al. (84)		Cetin 2014	Idriss&Boulanger	Seed et.al. (84)
Liquefied?	No	No	-	D_{50}	0.000 ± 0.000	-	-
Data Class	B	-	-	% Fines	2.6 ± 2.2	3.0	-
Critical Depth Range	7.7 - 11.2	9.5	-	% PI	-	-	-
Depth to GWT (ft)	5.7 ± 1.0	5.7	-				
σ_v (psf)	1074.5 ± 74.8	1106.9	-	N	8.6 ± 0.8	8.5	-
σ_v' (psf)	844.2 ± 67.7	856.3	-	C_R	0.84	0.85	-
a_{max} (g)	0.204 ± 0.031	0.205	-	C_S	1.00	1	-
r_d	0.999 ± 0.044	0.99	-	C_B	1.00	1	-
CSR	0.169 ± 0.029	0.167	-	C_E	1.22	1.22	-
Equivalent Magnitude	7.7	7.7	-	C_N	1.54	1.56	-
MSF	0.93	0.95	-	$(N_1)_{60}$	13.5 ± 1.2	13.8	-
CSRN	0.18	0.161	-				

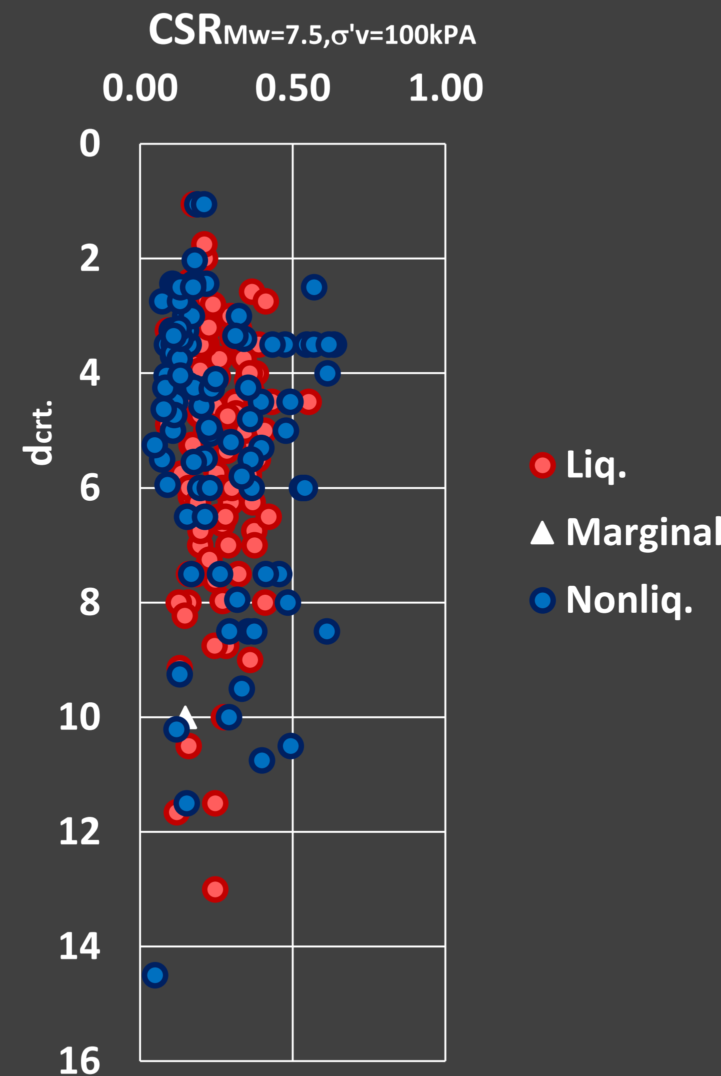
Cetin et al. (2018) Database Excluded



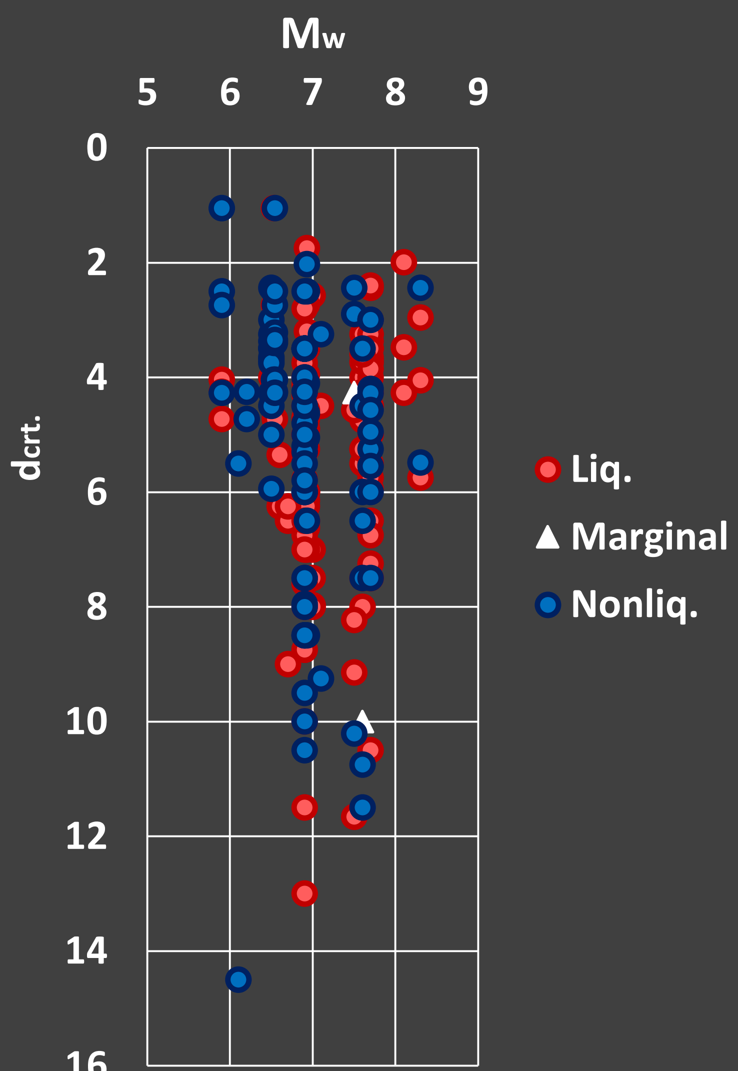
Depth (m	Depth (ft	CSR	N	C_N	C_E	$(N1)_{60}$	FC
2.35	7.7	0.154	7.8	1.64	0.82	12.7	4.2
3.40	11.2	0.179	9.4	1.46	0.86	14.4	1.1
4.37	14.3	0.194	16.6	1.33	0.90	24.2	15.5
5.26	17.3	0.204	27.0	1.24	0.93	38.6	7.6
					Mean:	13.5	2.6
					St. Dev	1.2	2.2
	0.17	13.5	0				
	0.17	13.5	42				

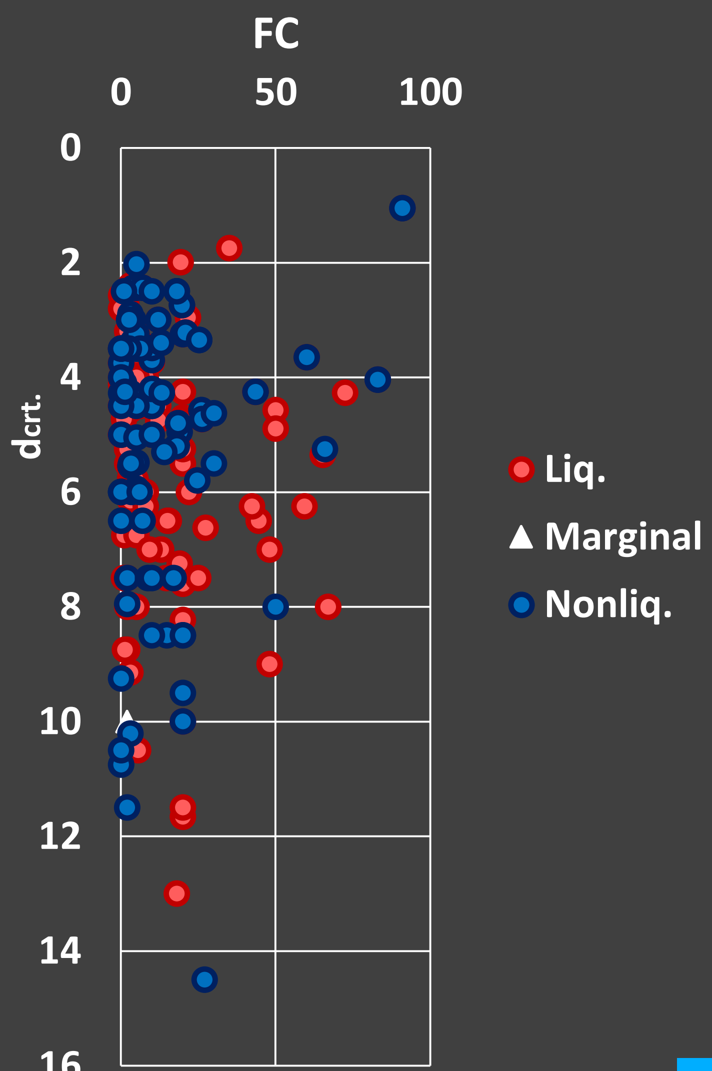
Existing Database of Cetin et al. (2018)





Existing Database of Cetin et al. (2018)





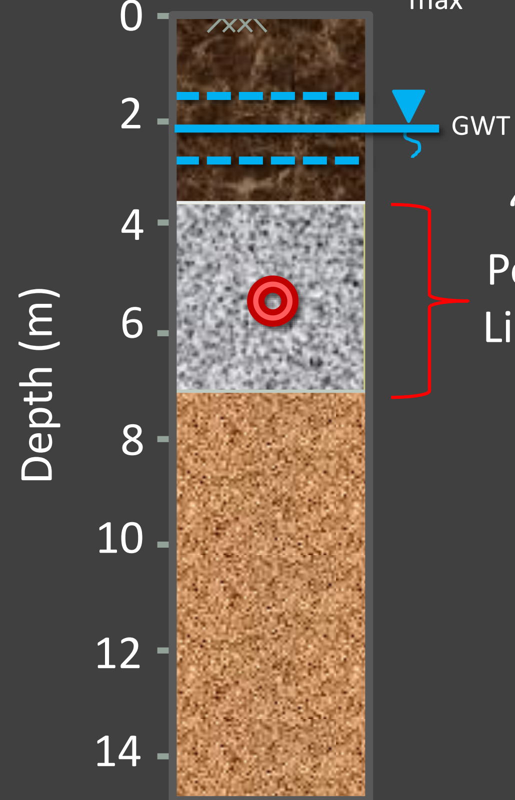
Summary and comparison of overall case history weighted average input parameters

Parameter	Seed et al. [10] 125 case history		CEA2004 200 case history		Cetin et al. [4, 9] 210 case history		IB2010 230 case history	
	Mean	Mean Std. Dev.	Mean	Mean Std. Dev.	Mean	Mean Std. Dev.	Mean	Mean Std. Dev.
γ_{moist} (kN/m^3)	-	-	15.2	0.67	16.77	0.47	-	-
$\gamma_{saturated}$(kN/m^3)	-	-	16.91	0.69	18.91	0.47	-	-
Critical Depth: d_{cr} (m)	5.80	-	5.08	0.53	4.93	0.55	5.02	-
$N_{1,60}$	13.51	-	15.83	3.15	15.13	3.09	15.02	-
FC (%)	14.72	-	18.89	3.02	16.57	4.16	16.24	-
$\Delta N_{1,60}$	-	-	1.61	*	1.52	*	1.94	-
$N_{1,60,CS}$	-	-	17.44	*	16.65	*	16.96	-
a_{max} (g)	0.22	-	0.25	0.04	0.24	0.05	0.25	-
σ_v (kPa)	105.58	-	83.87	9.52	89.70	10.60	91.78	-
σ'_v (kPa)	67.45	-	53.48	5.83	60.62	5.62	61.29	-
$V_{s,12m}$ (m/s)	-	-	178.92	-	190.87	-	-	-
r_d	0.953	-	0.859	0.058	0.911	0.057	0.949	-
CSR_{σ_v',M_w}	0.210	-	0.211	0.04	0.208	0.05	0.225	-
M_w	7.12	-	7.06	-	7.09	-	7.13	-
K_{Mw}	-	-	1.17	-	1.17	-	1.12	-
K_σ	-	-	1.23	-	1.25	-	1.06	-
$CSR_{\sigma_v'=1atm.,M_w=7.5}$	0.197	-	0.158	-	0.156	-	0.196	-

*Functions of regressed likelihood model coefficients, as presented later in this manuscript.

A Typical SPT Case History Site From Cetin et al. (2018) Database

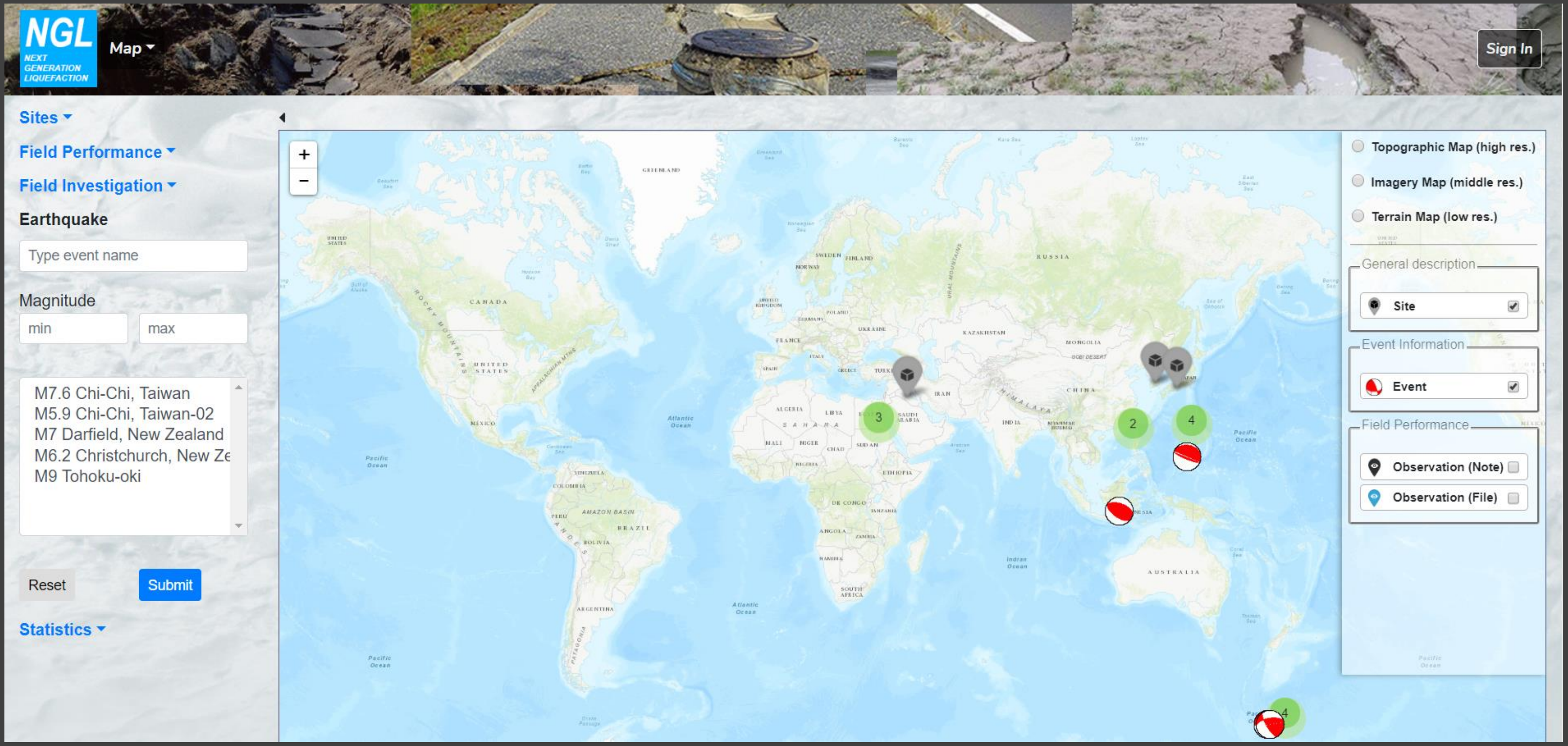
M_w=7.0
a_{max}=0.24 ± 0.05 g



"Typical" Potentially Liquefiable Layer

$N_{1,60}$ =15 ± 3
FC= 17 ± 4 %
σ_v= 90 ± 11 kPa
σ'_v= 61 ± 6 kPa
r_d=0.9 ± 0.06
CSR=0.208 ± 0.05

NGL: Next Generation Liquefaction Database Development and Implications for Engineering Models



NGL: Next Generation Liquefaction Database Development and Implications for Engineering Models

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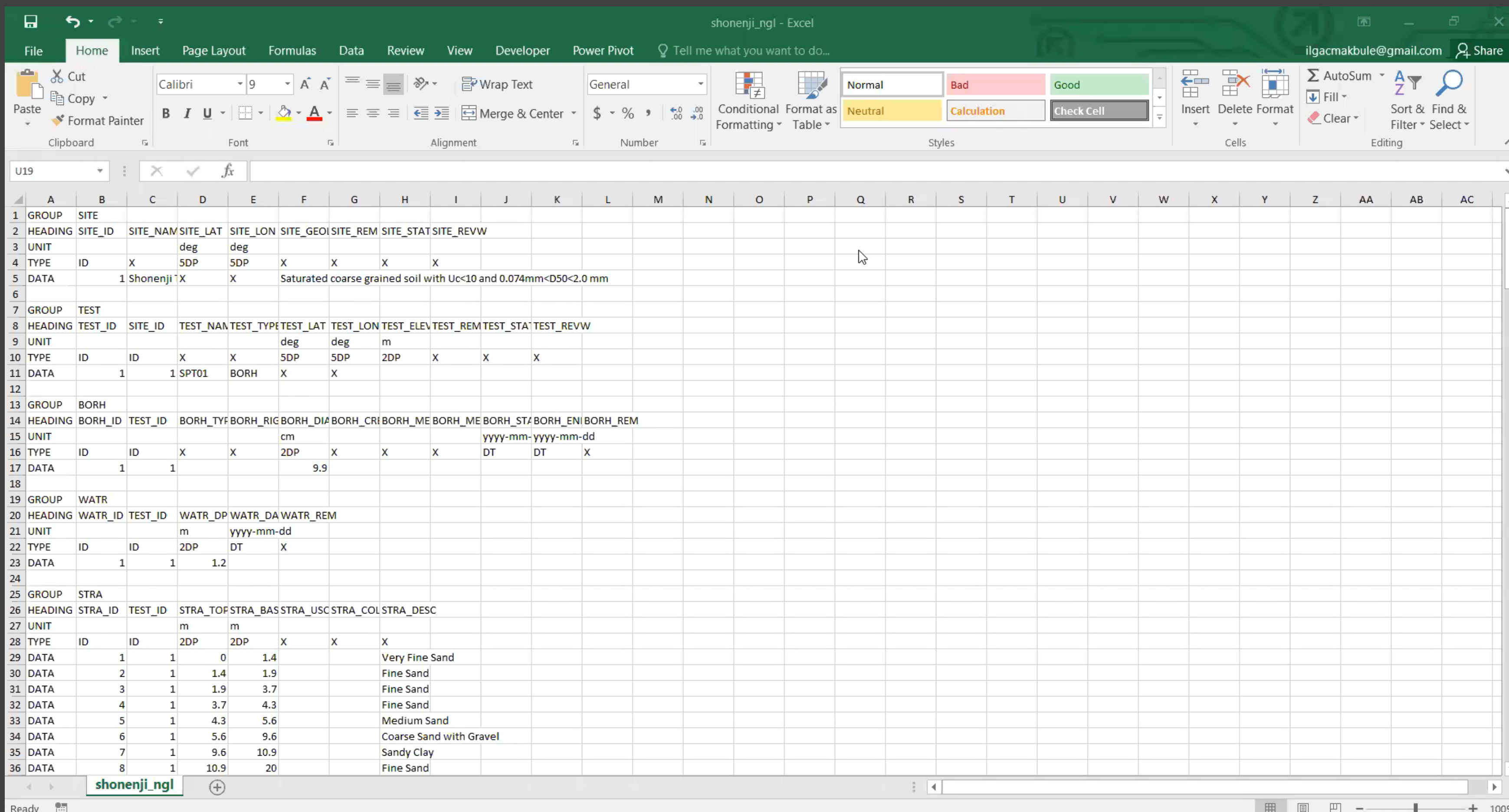
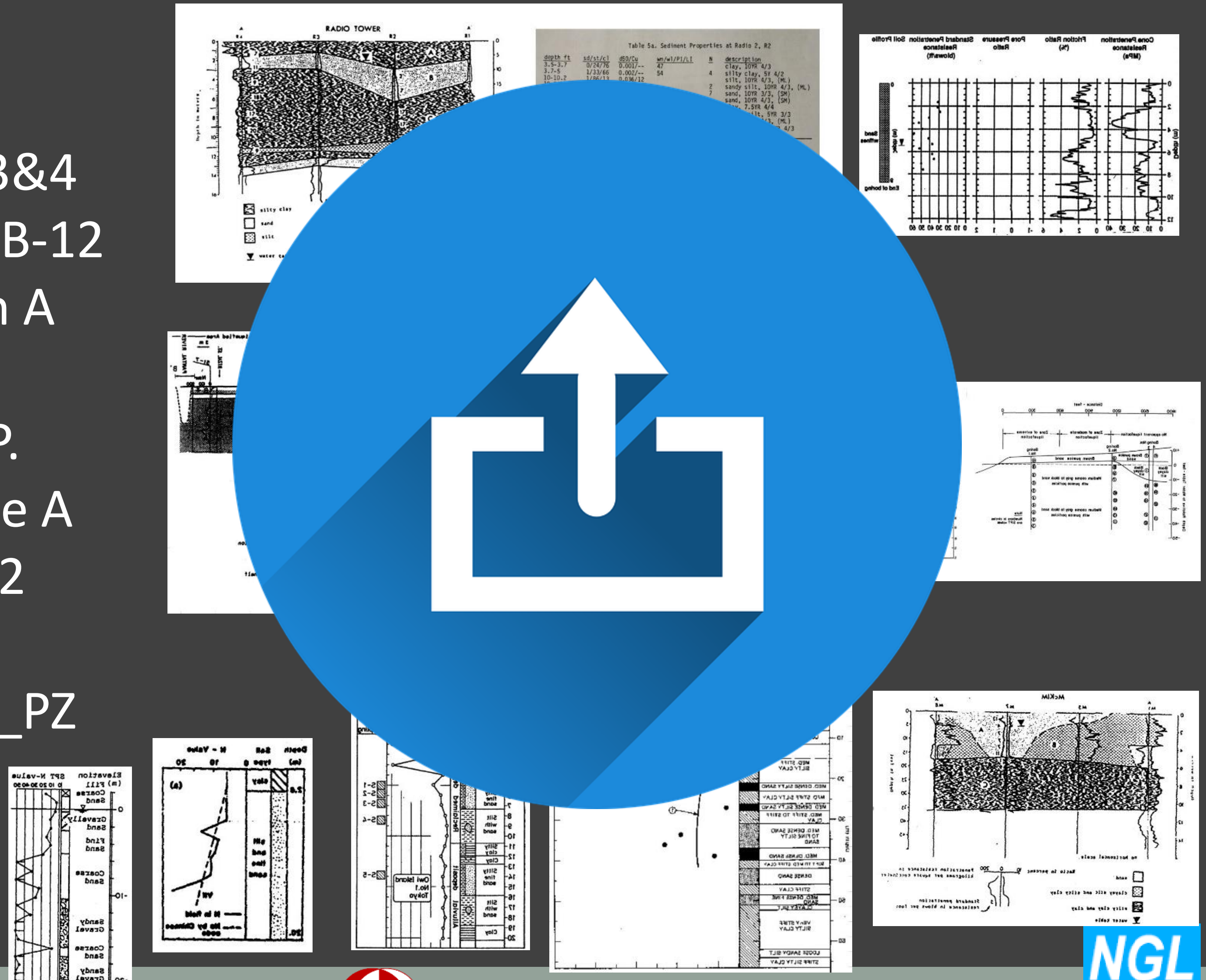


	A	B	C	D	E	F	G	H	I	J	K	L
1	GROUP	SITE										
2	HEADING	SITE_ID	SITE_NAM	SITE_LAT	SITE_LON	SITE_GEOI	SITE_REM	SITE_STAT	SITE_REVW			
3	UNIT			deg	deg							
4	TYPE	ID	X	5DP	5DP	X	X	X	X			
5	DATA	1	Shonenji '	X	X	Saturated coarse grained soil with Uc<10 and 0.074mm<D50<2.0 mm						
6												
7	GROUP	TEST										
8	HEADING	TEST_ID	SITE_ID	TEST_NAM	TEST_TYPE	TEST_LAT	TEST_LON	TEST_ELEV	TEST_REM	TEST_STA	TEST_REVW	
9	UNIT					deg	deg	m				
10	TYPE	ID	ID	X	X	5DP	5DP	2DP	X	X	X	
11	DATA	1	1	SPT01	BORH	X	X					
12												
13	GROUP	BORH										
14	HEADING	BORH_ID	TEST_ID	BORH_TYF	BORH_RIG	BORH_DIA	BORH_CRI	BORH_ME	BORH_ME	BORH_STA	BORH_ENI	BORH_REM
15	UNIT					cm				yyyy-mm-	yyyy-mm-dd	
16	TYPE	ID	ID	X	X	2DP	X	X	X	DT	DT	X
17	DATA	1	1			9.9						
18												
19	GROUP	WATR										
20	HEADING	WATR_ID	TEST_ID	WATR_DP	WATR_DA	WATR_REM						
21	UNIT			m	yyyy-mm-dd							
22	TYPE	ID	ID	2DP	DT	X						
23	DATA	1	1	1.2								
24												
25	GROUP	STRA										
26	HEADING	STRA_ID	TEST_ID	STRA_TOF	STRA_BAS	STRA_USC	STRA_COL	STRA_DESC				
27	UNIT			m	m							
28	TYPE	ID	ID	2DP	2DP	X	X	X				
29	DATA	1	1	0	1.4			Very Fine Sand				
30	DATA	2	1	1.4	1.9			Fine Sand				
31	DATA	3	1	1.9	3.7			Fine Sand				
32	DATA	4	1	3.7	4.3			Fine Sand				
33	DATA	5	1	4.3	5.6			Medium Sand				
34	DATA	6	1	5.6	9.6			Coarse Sand with Gravel				
35	DATA	7	1	9.6	10.9			Sandy Clay				
36	DATA	8	1	10.9	20			Fine Sand				

NGL: Next Generation Liquefaction Database Development and Implications for Engineering Models

- AlamedaDike
- Amatitlan B-3&4
- Careenan St. B-12
- McKim Ranch A
- Owi Island
- Panjin Ch. F. P.
- Quay Wall Site A
- RadioTowerB2
- San Juan B-1
- Shonenji_ngl_PZ



NGL: Next Generation Liquefaction Database Development and Implications for Engineering Models

Case Number	Earthquake	Site
1	1944 Tohnankai M=8.0	Ienaga
2	1944 Tohnankai M=8.0	Komei
3	1944 Tohnankai M=8.0	Meiko
4	1948 Fukui M=7.3	Shonenji Temple
5	1948 Fukui M=7.3	Takaya 45
6	1964 Niigata M=7.5	Arayamotomachi
7	1964 Niigata M=7.5	Cc17-1
8	1964 Niigata M=7.5	Cc17-2
9	1964 Niigata M=7.5	Old Town -1
10	1964 Niigata M=7.5	Old Town -2
11	1964 Niigata M=7.5	Rail Road-1
12	1964 Niigata M=7.5	Rail Road-2
13	1964 Niigata M=7.5	River Site
14	1964 Niigata M=7.5	Road Site
15	1964 Niigata M=7.5	Showa Br 2
16	1964 Niigata M=7.5	Showa Br 4
17	1968 Tokachioki M=7.9	Hachinohe - 2
18	1968 Tokachioki M=7.9	Hachinohe - 4
19	1968 Tokachioki M=7.9	Hachinohe-6
20	1968 Tokachioki M=7.9	Nanaehama1-
21	1968 Tokachi-Oki M=7.9	Aomori Stati
22	1971 San Fernando Mw=6.6	Juvenile H
23	1971 San Fernando Mw=6.6	Van Nor
24	1975 Haicheng Ms=7.3	Panjin
25	1975 Haicheng Ms=7.3	Ying
26	1975 Haicheng Ms=7.3	Ying
27	1976 Guatemala M=7.5	Am
28	1976 Guatemala M=7.5	A
29	1976 Guatemala M=7.5	
30	1976 Tangshan Ms=7.8	
31	1976 Tangshan Ms=7.8	
32	1976 Tangshan Ms=7.8	
33	1976 Tangshan Ms=7.8	
34	1976 Tangshan Ms=7.8	
35	1976 Tangshan Ms=7.8	
36	1976 Tangshan Ms=7.8	
37	1977 Argentina M=7.4	
38	1977 Argentina M=7.4	
39	1977 Argentina M=7.4	
40	1977 Argentina M=7.4	
41	1977 Argentina M=7.4	
42	1978 Miyagiken-Oki M=6.7	
43	1978 Miyagiken-Oki M=6.7	
44	1978 Miyagiken-Oki M=6.7	
45	1978 Miyagiken-Oki M=6.7	
46	1978 Miyagiken-Oki M=6.7	N
47	1978 Miyagiken-Oki M=6.7	Na
48	1978 Miyagiken-Oki M=6.7	Nak
49	1978 Miyagiken-Oki M=6.7	Oiiri-
50	1978 Miyagiken-Oki M=6.7	Shiom
51	1978 Miyagiken-Oki M=6.7	Yuriage
52	1978 Miyagiken-Oki M=6.7	Yuriage Br
53	1978 Miyagiken-Oki M=6.7	Yuriage Br-3
54	1978 Miyagiken-Oki M=6.7	Yuriagekami-1
55	1978 Miyagiken-Oki M=6.7	Yuriagekami-2
56	1978 Miyagiken-Oki M=7.4	Nakajima-18
57	1978 Miyagiken-Oki M=7.4	Arahama
58	1978 Miyagiken-Oki M=7.4	Hiyori-18
59	1978 Miyagiken-Oki M=7.4	Ishinomaki-2
60	1978 Miyagiken-Oki M=7.4	Ishinomaki-4
61	1978 Miyagiken-Oki M=7.4	Kitawabuchi-2
62	1978 Miyagiken-Oki M=7.4	Kitawabuchi-3
63	1978 Miyagiken-Oki M=7.4	Nakajima-2
64	1978 Miyagiken-Oki M=7.4	Nakamura 1
65	1978 Miyagiken-Oki M=7.4	Nakamura 4
66	1978 Miyagiken-Oki M=7.4	Nakamura 5
67	1978 Miyagiken-Oki M=7.4	Oiiri-1
68	1978 Miyagiken-Oki M=7.4	Shiomi-6
69	1978 Miyagiken-Oki M=7.4	Yuriage Br-1
70	1978 Miyagiken-Oki M=7.4	Yuriage Br-2
71	1978 Miyagiken-Oki M=7.4	Yuriage Br-3
72	1978 Miyagiken-Oki M=7.4	Yuriage Br-5
73	1978 Miyagiken-Oki M=7.4	Yuriagekami-1
74	1978 Miyagiken-Oki M=7.4	Yuriagekami-2
75	1978 Miyagiken-Oki M=7.4	Yuriagekami-3
76	1979 Imperial Valley ML=6.6	Heber Road A1
77	1979 Imperial Valley ML=6.6	Heber Road A2
78	1979 Imperial Valley ML=6.6	Heber Road A3
79	1979 Imperial Valley ML=6.6	Kornbloom B
	1979 Imperial Valley ML=6.6	McKim Ranch A
	1979 Imperial Valley ML=6.6	Radio Tower B1
82	1979 Imperial Valley ML=6.6	Radio Tower B2
83	1979 Imperial Valley ML=6.6	River Park A
84	1980 Mid-Chiba M=6.1	Owi-1
85	1980 Mid-Chiba M	
86	1981	
87		
88		
89		
90		
91		
92		
131		
132		
133		
134		
135		
136	1989 L	
137	1989 Loma Prieta Mw=7	State Beach UC-B1
138	1989 Loma Prieta Mw=7	State Beach UC-B2
139	1989 Loma Prieta Mw=7	Treasure Island
140	1989 Loma Prieta Mw=7	WoodMarine UC-B4
141	1989 Loma Prieta Mw=7	General Fish
142	1989 Loma Prieta Mw=7	Marine Laboratory UC-B1
143	1989 Loma Prieta Mw=7	Marine Laboratory UC-B2
144	1989 Loma Prieta Mw=7	Marine Laboratory_F1-F7
145	1989 Loma Prieta Mw=7	MBARI N0.4-B4B5EB2EB3
146	1989 Loma Prieta Mw=7	Miller Farm
147	1990 Luzon Mw=7.6	Cereenan St. B-12
148	1990 Luzon Mw=7.6	Perez Blv. B-11
149	1993 Kushiro-Oki Mw=8	Kushiro Port Seismo St.
150	1993 Kushiro-Oki Mw=8	Kushiro Port Site A
151	1993 Kushiro-Oki Mw=8	Kushiro Port Site D
	1994 Northridge Mw=6.7	Balboa Blv. Unit C
	1994 Northridge Mw=6.7	Potrero Canyon C1
	1994 Northridge Mw=6.7	Wynne Ave. Unit C1
	1995 Hyogoken-Nambu ML=7.2	Ashiyama A (Mountain Sand 1)
	1995 Hyogoken-Nambu ML=7.2	Ashiyama A (Marine Sand)
	1995 Hyogoken-Nambu ML=7.2	Ashiyama C-D-E (Mountain Sand 2)
	1995 Hyogoken-Nambu ML=7.2	Ashiyama C-D-E (Marine Sand)
	1995 Hyogoken-Nambu ML=7.2	Kobe No 1
	1995 Hyogoken-Nambu ML=7.2	Kobe No 2
	1995 Hyogoken-Nambu ML=7.2	Kobe No 3
	995 Hyogoken-Nambu ML=7.2	Kobe No 4
	5 Hyogoken-Nambu ML=7.2	Kobe No 5
	Hyogoken-Nambu ML=7.2	Kobe No 6
	yogoken-Nambu ML=7.2	Kobe No 7
	ogoken-Nambu ML=7.2	Kobe No 8
	ogoken-Nambu ML=7.2	Kobe No 9
	goken-Nambu ML=7.2	Kobe No 10
	oken-Nambu ML=7.2	Kobe No 11
	oken-Nambu ML=7.2	Kobe No 12
	ken-Nambu ML=7.2	Kobe No 13
	ken-Nambu ML=7.2	Kobe No 14
	ken-Nambu ML=7.2	Kobe No 15
	ken-Nambu ML=7.2	Kobe No 16
	ken-Nambu ML=7.2	Kobe No 17
	ken-Nambu ML=7.2	Kobe No 18
	oken-Nambu ML=7.2	Kobe No 19
	oken-Nambu ML=7.2	Kobe No 20
	goken-Nambu ML=7.2	Kobe No 21
	goken-Nambu ML=7.2	Kobe No 22
	ogoken-Nambu ML=7.2	Kobe No 23
	yogoken-Nambu ML=7.2	Kobe No 24
	Hyogoken-Nambu ML=7.2	Kobe No 25
	Hyogoken-Nambu ML=7.2	Kobe No 26
	95 Hyogoken-Nambu ML=7.2	Kobe No 27
	995 Hyogoken-Nambu ML=7.2	Kobe No 28
	1995 Hyogoken-Nambu ML=7.2	Kobe No 29
	1995 Hyogoken-Nambu ML=7.2	Kobe No 30
	1995 Hyogoken-Nambu ML=7.2	Kobe No 31
	1995 Hyogoken-Nambu ML=7.2	Kobe No 32
	1995 Hyogoken-Nambu ML=7.2	Kobe No 33
	1995 Hyogoken-Nambu ML=7.2	Kobe No 34
	1995 Hyogoken-Nambu ML=7.2	Kobe No 35
	1995 Hyogoken-Nambu ML=7.2	Kobe No 36
	1995 Hyogoken-Nambu ML=7.2	Kobe No 37
	1995 Hyogoken-Nambu ML=7.2	Kobe No 38
197	1995 Hyogoken-Nambu ML=7.2	Kobe No 39
198	1995 Hyogoken-Nambu ML=7.2	Kobe No 40
199	1995 Hyogoken-Nambu ML=7.2	Kobe No 41
200	1995 Hyogoken-Nambu ML=7.2	Kobe No 42
201	1995 Hyogoken-Nambu ML=7.2	Kobe No 43
202	1995 Hyogoken-Nambu ML=7.2	Kobe No 44
203	1995 Hyogoken-Nambu ML=7.2	Port Island Borehole Array Station
204	1995 Hyogoken-Nambu ML=7.2	Port Island Improved Site (Ikegaya)
205	1995 Hyogoken-Nambu ML=7.2	Port Island Improved Site (Tanahashi)
206	1995 Hyogoken-Nambu ML=7.2	Port Island Improved Site (Watanabe)
207	1995 Hyogoken-Nambu ML=7.2	Port Island Site I
208	1995 Hyogoken-Nambu ML=7.2	Rokko Island Building D
209	1995 Hyogoken-Nambu ML=7.2	Rokko Island Site G
210	1995 Hyogoken-Nambu ML=7.2	Torishima Dike

210 Case History

Issues (Mostly Difficulties) Specific to SPT & Legacy Sites

SPT	*LEGACY*
Digitize Soil Profile & Borelog Data	*Seismic Events Not Part of NGA Database*
SPT Procedures	*Global Coordinates Not Available*
Laboratory Test Data (Grain size distribution, Consistency limits)	*Non standard lab test data (Chinese vs. ASTM)*

REVIEW OF UPLOADED CASE HISTORIES VERY IMPORTANT...

THANKS TO THE PROJECT TEAM CASE SPECIFIC SOLUTIONS DEVELOPED...

Issues (Mostly Difficulties) Specific to SPT Legancy Sites

SPT	*LEGACY*
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Thank you...