



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Oxidized Brenna Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: 8/5/2011 Date: 12/5/2012

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
OX Brenna, R-bar, B31-2, 3, 1, FM Bridge	B31-2	23.0	0.0	3	1	OX Brenna	R-bar	CH	FM Bridge	1.00	0.37		
OX Brenna, R-bar, B31-2, 3, 2, FM Bridge	B31-2	23.0	0.0	3	2	OX Brenna	R-bar	CH	FM Bridge	1.47	0.45		
OX Brenna, R-bar, B31-2, 3, 3, FM Bridge	B31-2	23.0	0.0	3	3	OX Brenna	R-bar	CH	FM Bridge	2.42	0.60		
OX Brenna, R-bar, B29-1, 1, 1, FM Bridge	B29-1	14.5	0.0	1	1	OX Brenna	R-bar	CH	FM Bridge	0.74	0.26		
OX Brenna, R-bar, B29-1, 1, 2, FM Bridge	B29-1	14.5	0.0	1	2	OX Brenna	R-bar	CH	FM Bridge	1.32	0.41		
OX Brenna, R-bar, B29-1, 1, 3, FM Bridge	B29-1	14.5	0.0	1	3	OX Brenna	R-bar	CH	FM Bridge	2.34	0.65		
OX Brenna, R-bar, B29-7, 3, 1, FM Bridge	B29-7	19.5	0.0	3	1	OX Brenna	R-bar	CH	FM Bridge	0.66	0.38		
OX Brenna, R-bar, B29-7, 3, 2, FM Bridge	B29-7	19.5	0.0	3	2	OX Brenna	R-bar	CH	FM Bridge	0.57	0.39		
OX Brenna, R-bar, B29-7, 3, 3, FM Bridge	B29-7	19.5	0.0	3	3	OX Brenna	R-bar	CH	FM Bridge	3.42	1.65		
OX Brenna, R-bar, B22-4, 2, 1, FM Bridge	B22-4	14.5	0.0	2	1	OX Brenna	R-bar	CH	FM Bridge	0.61	0.24		
OX Brenna, R-bar, B22-4, 2, 2, FM Bridge	B22-4	14.5	0.0	2	2	OX Brenna	R-bar	CH	FM Bridge	0.80	0.31		
OX Brenna, R-bar, B22-4, 2, 3, FM Bridge	B22-4	14.5	0.0	2	3	OX Brenna	R-bar	CH	FM Bridge	1.67	0.48		
OX Brenna, R-bar, 84-2M, 1, 1, WF	84-2M	10.8	893.8	1	1	OX Brenna	R-bar	CH	WF	0.92	0.37		
OX Brenna, R-bar, 84-2M, 1, 2, WF	84-2M	10.8	893.8	1	2	OX Brenna	R-bar	CH	WF	1.77	0.71		
OX Brenna, R-bar, 84-2M, 1, 3, WF	84-2M	10.8	893.8	1	3	OX Brenna	R-bar	CH	WF	3.37	1.25		
OX Brenna, R-bar, 85-4M, 1, 1, WF	85-4M	9.0	904.2	1	1	OX Brenna	R-bar	CH	WF	0.56	0.24		
OX Brenna, R-bar, 85-4M, 1, 2, WF	85-4M	9.0	904.2	1	2	OX Brenna	R-bar	CH	WF	1.04	0.51		
OX Brenna, R-bar, 85-4M, 1, 3, WF	85-4M	9.0	904.2	1	3	OX Brenna	R-bar	CH	WF	1.87	0.51		
OX Brenna, R-bar, 85-4M, 1, 4, WF	85-4M	9.0	904.2	1	4	OX Brenna	R-bar	CH	WF	0.27	0.10		
OX Brenna, R-bar, 85-6M, 1, 1, WF	85-6M	8.0	894.2	1	1	OX Brenna	R-bar	CH	WF	0.53	0.18		
OX Brenna, R-bar, 85-6M, 1, 2, WF	85-6M	8.0	894.2	1	2	OX Brenna	R-bar	CH	WF	0.90	0.32		
OX Brenna, R-bar, 85-6M, 1, 3, WF	85-6M	8.0	894.2	1	3	OX Brenna	R-bar	CH	WF	1.76	0.47		
OX Brenna, R-bar, 85-6M, 1, 4, WF	85-6M	8.0	894.2	1	4	OX Brenna	R-bar	CH	WF	0.83	0.59		
OX Brenna, R-bar, 85-7M, 1, 1, WF	85-7M	5.9	895.7	1	1	OX Brenna	R-bar	CH	WF	0.72	0.29		
OX Brenna, R-bar, 85-7M, 1, 2, WF	85-7M	5.9	895.7	1	2	OX Brenna	R-bar	CH	WF	0.47	0.46		
OX Brenna, R-bar, 85-7M, 1, 3, WF	85-7M	5.9	895.7	1	3	OX Brenna	R-bar	CH	WF	1.75	0.62		
OX Brenna, R-bar, 85-7M, 2, 1, WF	85-7M	15.0	886.6	2	1	OX Brenna	R-bar	CH	WF	0.48	0.22		
OX Brenna, R-bar, 85-7M, 2, 2, WF	85-7M	15.0	886.6	2	2	OX Brenna	R-bar	CH	WF	0.83	0.27		
OX Brenna, R-bar, 85-7M, 2, 3, WF	85-7M	15.0	886.6	2	3	OX Brenna	R-bar	CH	WF	1.64	0.40		
OX Brenna, R-bar, 85-7M, 2, 4, WF	85-7M	15.0	886.6	2	4	OX Brenna	R-bar	CH	WF	0.34	0.13		
OX Brenna, R-bar, 85-11M, 1, 1, WF	85-11M	16.0	883.5	1	1	OX Brenna	R-bar	CH	WF	0.64	0.22		
OX Brenna, R-bar, 85-11M, 1, 2, WF	85-11M	16.0	883.5	1	2	OX Brenna	R-bar	CH	WF	0.96	0.34		
OX Brenna, R-bar, 85-11M, 1, 3, WF	85-11M	16.0	883.5	1	3	OX Brenna	R-bar	CH	WF	1.68	0.35		
OX Brenna, R-bar, 85-12M, 2, 1, WF	85-12M	16.0	8957.0	2	1	OX Brenna	R-bar	CH	WF	1.03	0.56		
OX Brenna, R-bar, 85-12M, 2, 2, WF	85-12M	16.0	8957.0	2	2	OX Brenna	R-bar	CH	WF	1.43	0.91		
OX Brenna, R-bar, 85-12M, 2, 3, WF	85-12M	16.0	8957.0	2	3	OX Brenna	R-bar	CH	WF	1.99	1.00		
OX Brenna, R-bar, 86-28M, 1, 1, WF	86-28M	11.0	906.6	1	1	OX Brenna	R-bar	CH	WF	0.86	0.38		
OX Brenna, R-bar, 86-28M, 1, 2, WF	86-28M	11.0	906.6	1	2	OX Brenna	R-bar	CH	WF	1.07	0.39		
OX Brenna, R-bar, 86-28M, 1, 3, WF	86-28M	11.0	906.6	1	3	OX Brenna	R-bar	CH	WF	1.95	0.58		



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										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
OX Brenna, R-bar, 86-28M, 2, 1, WF	86-28M	21.0	896.6	2	1	OX Brenna	R-bar	CH	WF	0.97	0.32		
OX Brenna, R-bar, 86-28M, 2, 2, WF	86-28M	21.0	896.6	2	2	OX Brenna	R-bar	CH	WF	1.66	0.48		
OX Brenna, R-bar, 86-28M, 2, 3, WF	86-28M	21.0	896.6	2	3	OX Brenna	R-bar	CH	WF	2.94	0.63		
OX Brenna, R-bar, 85-11M, 1, 1, WF	85-11M	16.0	883.5	1	1	OX Brenna	R-bar	CH	WF	0.64	0.22		
OX Brenna, R-bar, 85-11M, 1, 2, WF	85-11M	16.0	883.5	1	2	OX Brenna	R-bar	CH	WF	0.96	0.34		
OX Brenna, R-bar, 85-11M, 1, 3, WF	85-11M	16.0	883.5	1	3	OX Brenna	R-bar	CH	WF	1.68	0.35		



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										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, R-bar, Moor 09-11MU, 2, 1, FM	Moor 09-11MU	31.0	856.6	2	1	Brenna	R-bar	CH	FM	0.95	0.32		
Brenna, R-bar, Moor 09-11MU, 2, 2, FM	Moor 09-11MU	31.0	856.6	2	2	Brenna	R-bar	CH	FM	1.67	0.45		
Brenna, R-bar, Moor 09-11MU, 2, 3, FM	Moor 09-11MU	31.0	856.6	2	3	Brenna	R-bar	CH	FM	2.71	0.68		
Brenna, R-bar, Moor 09-11MU, 3, 1, FM	Moor 09-11MU	41.0	846.6	3	1	Brenna	R-bar	CH	FM	1.08	0.48		
Brenna, R-bar, Moor 09-11MU, 3, 2, FM	Moor 09-11MU	41.0	846.6	3	2	Brenna	R-bar	CH	FM	1.49	0.51		
Brenna, R-bar, Moor 09-11MU, 3, 3, FM	Moor 09-11MU	41.0	846.6	3	3	Brenna	R-bar	CH	FM	2.27	0.63		
Brenna, R-bar, Moor 09-14MU, 2, 1, FM	Moor 09-14MU	16.0	897.1	2	1	Brenna	R-bar	CH	FM	0.46	0.20		
Brenna, R-bar, Moor 09-14MU, 2, 2, FM	Moor 09-14MU	16.0	897.1	2	2	Brenna	R-bar	CH	FM	0.76	0.26		
Brenna, R-bar, Moor 09-14MU, 2, 3, FM	Moor 09-14MU	16.0	897.1	2	3	Brenna	R-bar	CH	FM	1.30	0.37		
Brenna, R-bar, Moor 09-25MU, 4, 1, FM	Moor 09-25MU	39.0	859.7	4	1	Brenna	R-bar	CH	FM	0.64	0.23		
Brenna, R-bar, Moor 09-25MU, 4, 2, FM	Moor 09-25MU	39.0	859.7	4	2	Brenna	R-bar	CH	FM	0.74	0.35		
Brenna, R-bar, Moor 09-25MU, 4, 3, FM	Moor 09-25MU	39.0	859.7	4	3	Brenna	R-bar	CH	FM	1.88	0.55		
Brenna, R-bar, Moor 09-53MU, 2, 1, FM	Moor 09-53MU	29.0	871.5	2	1	Brenna	R-bar	CH	FM	0.84	0.29		
Brenna, R-bar, Moor 09-53MU, 2, 2, FM	Moor 09-53MU	29.0	871.5	2	2	Brenna	R-bar	CH	FM	1.48	0.45		
Brenna, R-bar, Moor 09-53MU, 2, 3, FM	Moor 09-53MU	29.0	871.5	2	3	Brenna	R-bar	CH	FM	2.48	0.59		
Brenna, R-bar, Far 09-25MU, 4, 1, FM	Far 09-25MU	51.0	842.4	4	1	Brenna	R-bar	CH	FM	0.80	0.26		
Brenna, R-bar, Far 09-25MU, 4, 2, FM	Far 09-25MU	51.0	842.4	4	2	Brenna	R-bar	CH	FM	1.31	0.45		
Brenna, R-bar, Far 09-25MU, 4, 3, FM	Far 09-25MU	51.0	842.4	4	3	Brenna	R-bar	CH	FM	2.13	0.51		
Brenna, R-bar, Far 09-26MU, 3, 1, FM	Far 09-26MU	29.0	874.5	3	1	Brenna	R-bar	CH	FM	0.82	0.32		
Brenna, R-bar, Far 09-26MU, 3, 2, FM	Far 09-26MU	29.0	874.5	3	2	Brenna	R-bar	CH	FM	1.49	0.50		
Brenna, R-bar, Far 09-26MU, 3, 3, FM	Far 09-26MU	29.0	874.5	3	3	Brenna	R-bar	CH	FM	2.44	0.67		
Brenna, R-bar, Far 09-27MU, 3, 1, FM	Far 09-27MU	33.0	870.1	3	1	Brenna	R-bar	CH	FM	0.91	0.26		
Brenna, R-bar, Far 09-27MU, 3, 2, FM	Far 09-27MU	33.0	870.1	3	2	Brenna	R-bar	CH	FM	1.35	0.40		
Brenna, R-bar, Far 09-27MU, 3, 3, FM	Far 09-27MU	33.0	870.1	3	3	Brenna	R-bar	CH	FM	2.25	0.53		
Brenna, R-bar, Far 10-80MU, 2, 1, FM	Far 10-80MU	36.0	885.1	2	1	Brenna	R-bar	CH	FM	1.16	0.56		
Brenna, R-bar, Far 10-80MU, 2, 2, FM	Far 10-80MU	36.0	885.1	2	2	Brenna	R-bar	CH	FM	1.57	0.48		
Brenna, R-bar, Far 10-80MU, 2, 3, FM	Far 10-80MU	36.0	885.1	2	3	Brenna	R-bar	CH	FM	3.05	0.61		
Brenna, R-bar, Far 10-78MU, 2, 1, FM	Far 10-78MU	26.0	879.7	2	1	Brenna	R-bar	CH	FM	1.07	0.46		
Brenna, R-bar, Far 10-78MU, 2, 2, FM	Far 10-78MU	26.0	879.7	2	2	Brenna	R-bar	CH	FM	1.61	0.64		
Brenna, R-bar, Far 10-78MU, 2, 3, FM	Far 10-78MU	26.0	879.7	2	3	Brenna	R-bar	CH	FM	2.71	0.69		
Brenna, R-bar, Far 10-105MU, 2, 1, FM	Far 10-105MU	26.0	871.0	2	1	Brenna	R-bar	CH	FM	0.67	0.25		
Brenna, R-bar, Far 10-105MU, 2, 2, FM	Far 10-105MU	26.0	871.0	2	2	Brenna	R-bar	CH	FM	0.95	0.44		
Brenna, R-bar, Far 10-105MU, 2, 3, FM	Far 10-105MU	26.0	871.0	2	3	Brenna	R-bar	CH	FM	1.59	0.51		
Brenna, R-bar, Far 10-105MU, 3, 1, FM	Far 10-105MU	36.0	861.0	3	1	Brenna	R-bar	CH	FM	0.61	0.24		
Brenna, R-bar, Far 10-105MU, 3, 2, FM	Far 10-105MU	36.0	861.0	3	2	Brenna	R-bar	CH	FM	0.97	0.28		
Brenna, R-bar, Far 10-105MU, 3, 3, FM	Far 10-105MU	36.0	861.0	3	3	Brenna	R-bar	CH	FM	1.55	0.47		
Brenna, R-bar, Moor 11-107MU, 1, 1, FM	Moor 11-107MU	21.0	893.2	1	1	Brenna	R-bar	CH	FM	0.97	0.34		
Brenna, R-bar, Moor 11-107MU, 1, 2, FM	Moor 11-107MU	21.0	893.2	1	2	Brenna	R-bar	CH	FM	1.18	0.41		
Brenna, R-bar, Moor 11-107MU, 1, 3, FM	Moor 11-107MU	21.0	893.2	1	3	Brenna	R-bar	CH	FM	2.41	0.63		



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										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, R-bar, Moor 11-107MU, 2, 1, FM	Moor 11-107MU	31.0	883.2	2	1	Brenna	R-bar	CH	FM	0.97	0.54		
Brenna, R-bar, Moor 11-107MU, 2, 2, FM	Moor 11-107MU	31.0	883.2	2	2	Brenna	R-bar	CH	FM	1.17	0.57		
Brenna, R-bar, Moor 11-107MU, 2, 3, FM	Moor 11-107MU	31.0	883.2	2	3	Brenna	R-bar	CH	FM	1.67	0.70		
Brenna, R-bar, Far 11-110MU, 2, 1, FM	Far 11-110MU	36.0	881.6	2	1	Brenna	R-bar	CH	FM	0.51	0.26		
Brenna, R-bar, Far 11-110MU, 2, 2, FM	Far 11-110MU	36.0	881.6	2	2	Brenna	R-bar	CH	FM	1.21	0.52		
Brenna, R-bar, Far 11-110MU, 2, 3, FM	Far 11-110MU	36.0	881.6	2	3	Brenna	R-bar	CH	FM	1.68	0.63		
Brenna, R-bar, Far 11-110MU, 3, 1, FM	Far 11-110MU	49.0	868.6	3	1	Brenna	R-bar	CH	FM	0.74	0.31		
Brenna, R-bar, Far 11-110MU, 3, 2, FM	Far 11-110MU	49.0	868.6	3	2	Brenna	R-bar	CH	FM	1.22	0.45		
Brenna, R-bar, Far 11-110MU, 3, 3, FM	Far 11-110MU	49.0	868.6	3	3	Brenna	R-bar	CH	FM	1.78	0.54		
Brenna, R-bar, Far 11-118MU, 2, 1, FM	Far 11-118MU	34.0	878.7	2	1	Brenna	R-bar	CH	FM	0.71	0.34		
Brenna, R-bar, Far 11-118MU, 2, 2, FM	Far 11-118MU	34.0	878.7	2	2	Brenna	R-bar	CH	FM	1.09	0.48		
Brenna, R-bar, Far 11-118MU, 2, 3, FM	Far 11-118MU	34.0	878.7	2	3	Brenna	R-bar	CH	FM	1.51	0.56		
Brenna, R-bar, Far 11-119MU, 1, 1, FM	Far 11-119MU	31.0	876.1	1	1	Brenna	R-bar	CH	FM	0.62	0.29		
Brenna, R-bar, Far 11-119MU, 1, 2, FM	Far 11-119MU	31.0	876.1	1	2	Brenna	R-bar	CH	FM	0.92	0.42		
Brenna, R-bar, Far 11-119MU, 1, 3, FM	Far 11-119MU	31.0	876.1	1	3	Brenna	R-bar	CH	FM	1.29	0.52		
Brenna, R-bar, Moor 11-111MU, 2, 1, FM PED	Moor 11-111MU	22.0	893.1	2	1	Brenna	R-bar	CH	FM PED	0.70	0.42		
Brenna, R-bar, Moor 11-111MU, 2, 2, FM PED	Moor 11-111MU	22.0	893.1	2	2	Brenna	R-bar	CH	FM PED	0.83	0.42		
Brenna, R-bar, Moor 11-111MU, 2, 3, FM PED	Moor 11-111MU	22.0	893.1	2	3	Brenna	R-bar	CH	FM PED	1.31	0.61		
Brenna, R-bar, Moor 11-111MU, 3, 1, FM PED	Moor 11-111MU	27.0	888.1	3	1	Brenna	R-bar	CH	FM PED	0.72	0.36		
Brenna, R-bar, Moor 11-111MU, 3, 2, FM PED	Moor 11-111MU	27.0	888.1	3	2	Brenna	R-bar	CH	FM PED	0.88	0.41		
Brenna, R-bar, Moor 11-111MU, 3, 3, FM PED	Moor 11-111MU	27.0	888.1	3	3	Brenna	R-bar	CH	FM PED	1.47	0.62		
Brenna, R-bar, Far 11-127MU, 3, 1, FM PED	Far 11-127MU	39.0	841.2	3	1	Brenna	R-bar	CH	FM PED	1.15	0.36		
Brenna, R-bar, Far 11-127MU, 3, 2, FM PED	Far 11-127MU	39.0	841.2	3	2	Brenna	R-bar	CH	FM PED	1.76	0.50		
Brenna, R-bar, Far 11-127MU, 3, 3, FM PED	Far 11-127MU	39.0	841.2	3	3	Brenna	R-bar	CH	FM PED	2.57	0.72		
Brenna, R-bar, Far 12-162MU, 3, 1, FM PED	Far 12-162MU	23.9	869.5	3	1	Brenna	R-bar	CH	FM PED	0.79	0.31		
Brenna, R-bar, Far 12-162MU, 3, 2, FM PED	Far 12-162MU	23.9	869.5	3	2	Brenna	R-bar	CH	FM PED	1.16	0.41		
Brenna, R-bar, Far 12-162MU, 3, 3, FM PED	Far 12-162MU	23.9	869.5	3	3	Brenna	R-bar	CH	FM PED	1.58	0.51		
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Brenna, DS, Moor 09-14MU, 3, 1, FM	Moor 09-14MU	39.0	874.1	3	1	Brenna	DS	CH	FM			0.51	0.15
Brenna, DS, Moor 09-14MU, 3, 2, FM	Moor 09-14MU	39.0	874.1	3	2	Brenna	DS	CH	FM			1.01	0.29
Brenna, DS, Moor 09-14MU, 3, 3, FM	Moor 09-14MU	39.0	874.1	3	3	Brenna	DS	CH	FM			3.18	0.92
Brenna, DS, Far 09-23MU, 5, 1, FM	Far 09-23MU	39.0	858.0	5	1	Brenna	DS	CH	FM			0.51	0.14
Brenna, DS, Far 09-23MU, 5, 2, FM	Far 09-23MU	39.0	858.0	5	2	Brenna	DS	CH	FM			1.01	0.24
Brenna, DS, Far 09-23MU, 5, 3, FM	Far 09-23MU	39.0	858.0	5	3	Brenna	DS	CH	FM			3.18	0.65



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Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, DS, Far 09-23MU, 6, 1, FM	Far 09-23MU	81.0	816.0	6	1	Brenna	DS	CH	FM			1.01	0.39
Brenna, DS, Far 09-23MU, 6, 2, FM	Far 09-23MU	81.0	816.0	6	2	Brenna	DS	CH	FM			1.93	0.55
Brenna, DS, Far 09-23MU, 6, 3, FM	Far 09-23MU	81.0	816.0	6	3	Brenna	DS	CH	FM			4.08	1.02
Brenna, DS, Far 09-25MU, 4, 1, FM	Far 09-25MU	51.0	842.4	4	1	Brenna	DS	CH	FM			1.01	0.23
Brenna, DS, Far 09-25MU, 4, 2, FM	Far 09-25MU	51.0	842.4	4	2	Brenna	DS	CH	FM			2.00	0.43
Brenna, DS, Far 09-25MU, 4, 3, FM	Far 09-25MU	51.0	842.4	4	3	Brenna	DS	CH	FM			4.08	0.83
Brenna, DS, Moor 09-26MU, 3, 1, FM	Moor 09-26MU	29.0	882.5	3	1	Brenna	DS	CH	FM			1.01	0.24
Brenna, DS, Moor 09-26MU, 3, 2, FM	Moor 09-26MU	29.0	882.5	3	2	Brenna	DS	CH	FM			2.00	0.43
Brenna, DS, Moor 09-26MU, 3, 3, FM	Moor 09-26MU	29.0	882.5	3	3	Brenna	DS	CH	FM			4.08	0.88
Brenna, DS, Far 09-27MU, 3, 1, FM	Far 09-27MU	33.0	870.1	3	1	Brenna	DS	CH	FM			1.01	0.23
Brenna, DS, Far 09-27MU, 3, 2, FM	Far 09-27MU	33.0	870.1	3	2	Brenna	DS	CH	FM			2.00	0.45
Brenna, DS, Far 09-27MU, 3, 3, FM	Far 09-27MU	33.0	870.1	3	3	Brenna	DS	CH	FM			4.08	0.85
Brenna, DS, Far 09-27MU, 4, 1, FM	Far 09-27MU	65.0	838.1	4	1	Brenna	DS	CH	FM			1.01	0.30
Brenna, DS, Far 09-27MU, 4, 2, FM	Far 09-27MU	65.0	838.1	4	2	Brenna	DS	CH	FM			2.00	0.56
Brenna, DS, Far 09-27MU, 4, 3, FM	Far 09-27MU	65.0	838.1	4	3	Brenna	DS	CH	FM			4.08	1.11
Brenna, DS, Moor 09-34MU, 3, 1, FM	Moor 09-34MU	29.0	878.9	3	1	Brenna	DS	CH	FM			1.01	0.31
Brenna, DS, Moor 09-34MU, 3, 2, FM	Moor 09-34MU	29.0	878.9	3	2	Brenna	DS	CH	FM			2.00	0.41
Brenna, DS, Moor 09-34MU, 3, 3, FM	Moor 09-34MU	29.0	878.9	3	3	Brenna	DS	CH	FM			4.08	0.85
Brenna, DS, Far 09-60MU, 3, 1, FM	Far 09-60MU	36.0	847.3	3	1	Brenna	DS	CH	FM			1.01	0.29
Brenna, DS, Far 09-60MU, 3, 2, FM	Far 09-60MU	36.0	847.3	3	2	Brenna	DS	CH	FM			2.00	0.40
Brenna, DS, Far 09-60MU, 3, 3, FM	Far 09-60MU	36.0	847.3	3	3	Brenna	DS	CH	FM			4.08	0.82
Brenna, DS, Far 10-80MU, 2, 1, FM	Far 10-80MU	36.0	885.1	2	1	Brenna	DS	CH	FM			1.00	0.45
Brenna, DS, Far 10-80MU, 2, 2, FM	Far 10-80MU	36.0	885.1	2	2	Brenna	DS	CH	FM			2.00	0.71
Brenna, DS, Far 10-80MU, 2, 3, FM	Far 10-80MU	36.0	885.1	2	3	Brenna	DS	CH	FM			4.00	1.48
Brenna, DS, Far 11-122MU, 3, 1, FM PED	Far 11-122MU	43.0	850.8	3	1	Brenna	DS	CH	FM PED			0.51	0.21
Brenna, DS, Far 11-122MU, 3, 2, FM PED	Far 11-122MU	43.0	850.8	3	2	Brenna	DS	CH	FM PED			1.01	0.34
Brenna, DS, Far 11-122MU, 3, 3, FM PED	Far 11-122MU	43.0	850.8	3	3	Brenna	DS	CH	FM PED			1.93	0.54
Brenna, DS, Moor 11-111MU, 4, 1, FM PED	Moor 11-111MU	43.0	872.1	4	1	Brenna	DS	CH	FM PED			0.76	0.34
Brenna, DS, Moor 11-111MU, 4, 2, FM PED	Moor 11-111MU	43.0	872.1	4	2	Brenna	DS	CH	FM PED			1.51	0.62
Brenna, DS, Moor 11-111MU, 4, 3, FM PED	Moor 11-111MU	43.0	872.1	4	3	Brenna	DS	CH	FM PED			3.18	0.98
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Brenna, R-bar, B31-1, 4, 1, FM Bridge	B31-1	35.0	0.0	4	1	Brenna	R-bar	CH	FM Bridge	1.14	0.40		
Brenna, R-bar, B31-1, 4, 2, FM Bridge	B31-1	35.0	0.0	4	2	Brenna	R-bar	CH	FM Bridge	1.42	0.48		
Brenna, R-bar, B31-1, 4, 3, FM Bridge	B31-1	35.0	0.0	4	3	Brenna	R-bar	CH	FM Bridge	2.63	0.64		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Subject: Brenna Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: 8/5/2011 Date: 12/5/2012

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, R-bar, B31-2, 4, 1, FM Bridge	B31-2	44.5	0.0	4	1	Brenna	R-bar	CH	FM Bridge	1.12	0.41		
Brenna, R-bar, B31-2, 4, 2, FM Bridge	B31-2	44.5	0.0	4	2	Brenna	R-bar	CH	FM Bridge	1.68	0.55		
Brenna, R-bar, B31-2, 4, 3, FM Bridge	B31-2	44.5	0.0	4	3	Brenna	R-bar	CH	FM Bridge	2.60	0.73		
Brenna, R-bar, B31-6, 5, 1, FM Bridge	B31-6	59.5	0.0	5	1	Brenna	R-bar	CH	FM Bridge	0.89	0.36		
Brenna, R-bar, B31-6, 5, 2, FM Bridge	B31-6	59.5	0.0	5	2	Brenna	R-bar	CH	FM Bridge	1.60	0.41		
Brenna, R-bar, B31-6, 5, 3, FM Bridge	B31-6	59.5	0.0	5	3	Brenna	R-bar	CH	FM Bridge	2.66	0.69		
Brenna, R-bar, B81-3, 3, 1, FM Bridge	B81-3	24.5	0.0	3	1	Brenna	R-bar	CH	FM Bridge	0.79	0.35		
Brenna, R-bar, B81-3, 3, 2, FM Bridge	B81-3	24.5	0.0	3	2	Brenna	R-bar	CH	FM Bridge	1.19	0.46		
Brenna, R-bar, B81-3, 3, 3, FM Bridge	B81-3	24.5	0.0	3	3	Brenna	R-bar	CH	FM Bridge	1.51	0.49		
Brenna, R-bar, B81-5, 4, 1, FM Bridge	B81-5	35.5	0.0	4	1	Brenna	R-bar	CH	FM Bridge	0.91	0.33		
Brenna, R-bar, B81-5, 4, 2, FM Bridge	B81-5	35.5	0.0	4	2	Brenna	R-bar	CH	FM Bridge	1.49	0.40		
Brenna, R-bar, B81-5, 4, 3, FM Bridge	B81-5	35.5	0.0	4	3	Brenna	R-bar	CH	FM Bridge	2.53	0.60		
Brenna, R-bar, B81-6, 4, 1, FM Bridge	B81-6	49.5	0.0	4	1	Brenna	R-bar	CH	FM Bridge	0.91	0.30		
Brenna, R-bar, B81-6, 4, 2, FM Bridge	B81-6	49.5	0.0	4	2	Brenna	R-bar	CH	FM Bridge	1.50	0.42		
Brenna, R-bar, B81-6, 4, 3, FM Bridge	B81-6	49.5	0.0	4	3	Brenna	R-bar	CH	FM Bridge	2.51	0.60		
Brenna, R-bar, B29-3, 4, 1, FM Bridge	B29-3	35.0	0.0	4	1	Brenna	R-bar	CH	FM Bridge	0.84	0.34		
Brenna, R-bar, B29-3, 4, 2, FM Bridge	B29-3	35.0	0.0	4	2	Brenna	R-bar	CH	FM Bridge	1.40	0.42		
Brenna, R-bar, B29-3, 4, 3, FM Bridge	B29-3	35.0	0.0	4	3	Brenna	R-bar	CH	FM Bridge	2.46	0.73		
Brenna, R-bar, B29-4, 4, 1, FM Bridge	B29-4	49.5	0.0	4	1	Brenna	R-bar	CH	FM Bridge	0.96	0.31		
Brenna, R-bar, B29-4, 4, 2, FM Bridge	B29-4	49.5	0.0	4	2	Brenna	R-bar	CH	FM Bridge	-1.36	0.42		
Brenna, R-bar, B29-4, 4, 3, FM Bridge	B29-4	49.5	0.0	4	3	Brenna	R-bar	CH	FM Bridge	2.61	0.64		
Brenna, R-bar, B29-5, 3, 1, FM Bridge	B29-5	24.5	0.0	3	1	Brenna	R-bar	CH	FM Bridge	0.79	0.31		
Brenna, R-bar, B29-5, 3, 2, FM Bridge	B29-5	24.5	0.0	3	2	Brenna	R-bar	CH	FM Bridge	1.11	0.36		
Brenna, R-bar, B29-5, 3, 3, FM Bridge	B29-5	24.5	0.0	3	3	Brenna	R-bar	CH	FM Bridge	2.82	0.74		
Brenna, R-bar, B29-6, 5, 1, FM Bridge	B29-6	49.5	0.0	5	1	Brenna	R-bar	CH	FM Bridge	1.02	0.26		
Brenna, R-bar, B29-6, 5, 2, FM Bridge	B29-6	49.5	0.0	5	2	Brenna	R-bar	CH	FM Bridge	1.77	0.40		
Brenna, R-bar, B29-6, 5, 3, FM Bridge	B29-6	49.5	0.0	5	3	Brenna	R-bar	CH	FM Bridge	2.65	0.64		
Brenna, R-bar, B32-3, 3, 1, FM Bridge	B32-3	34.5	0.0	3	1	Brenna	R-bar	CH	FM Bridge	0.89	0.28		
Brenna, R-bar, B32-3, 3, 2, FM Bridge	B32-3	34.5	0.0	3	2	Brenna	R-bar	CH	FM Bridge	1.33	0.42		
Brenna, R-bar, B32-3, 3, 3, FM Bridge	B32-3	34.5	0.0	3	3	Brenna	R-bar	CH	FM Bridge	2.31	0.71		
Brenna, R-bar, B32-3, 5, 1, FM Bridge	B32-3	54.5	0.0	5	1	Brenna	R-bar	CH	FM Bridge	-5.22	0.35		
Brenna, R-bar, B32-3, 5, 2, FM Bridge	B32-3	54.5	0.0	5	2	Brenna	R-bar	CH	FM Bridge	1.39	0.49		
Brenna, R-bar, B32-3, 5, 3, FM Bridge	B32-3	54.5	0.0	5	3	Brenna	R-bar	CH	FM Bridge	2.00	0.70		
Brenna, R-bar, B32-4, 3, 1, FM Bridge	B32-4	17.0	0.0	3	1	Brenna	R-bar	CH	FM Bridge	0.65	0.29		
Brenna, R-bar, B32-4, 3, 2, FM Bridge	B32-4	17.0	0.0	3	2	Brenna	R-bar	CH	FM Bridge	0.93	0.36		
Brenna, R-bar, B32-4, 3, 3, FM Bridge	B32-4	17.0	0.0	3	3	Brenna	R-bar	CH	FM Bridge	1.50	0.47		
Brenna, R-bar, B22-1, 3, 1, FM Bridge	B22-1	29.5	0.0	3	1	Brenna	R-bar	CH	FM Bridge	0.56	0.29		
Brenna, R-bar, B22-1, 3, 2, FM Bridge	B22-1	29.5	0.0	3	2	Brenna	R-bar	CH	FM Bridge	1.15	0.37		
Brenna, R-bar, B22-1, 3, 3, FM Bridge	B22-1	29.5	0.0	3	3	Brenna	R-bar	CH	FM Bridge	2.02	0.50		



Project: Fargo-Moorhead Metro Flood Risk Management Project
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Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, R-bar, 01-5MU, 2, 1, FRW	01-5MU	49.0	852.7	2	1	Brenna	R-bar	CH	FRW	0.95	0.25		
Brenna, R-bar, 01-5MU, 2, 2, FRW	01-5MU	49.0	852.7	2	2	Brenna	R-bar	CH	FRW	1.34	0.29		
Brenna, R-bar, 01-5MU, 2, 3, FRW	01-5MU	49.0	852.7	2	3	Brenna	R-bar	CH	FRW	2.57	0.46		
Brenna, R-bar, 01-12MU, 2, 1, FRW	01-12MU	31.0	853.0	2	1	Brenna	R-bar	CH	FRW	0.93	0.22		
Brenna, R-bar, 01-12MU, 2, 2, FRW	01-12MU	31.0	853.0	2	2	Brenna	R-bar	CH	FRW	1.61	0.36		
Brenna, R-bar, 01-12MU, 2, 3, FRW	01-12MU	31.0	853.0	2	3	Brenna	R-bar	CH	FRW	2.75	0.69		
Brenna, DS, 06-18MU, 2, 1, FRW	06-18MU	52.0	837.7	2	1	Brenna	DS	CH	FRW			1.00	0.31
Brenna, DS, 06-18MU, 2, 2, FRW	06-18MU	52.0	837.7	2	2	Brenna	DS	CH	FRW			2.00	0.52
Brenna, DS, 06-18MU, 2, 3, FRW	06-18MU	52.0	837.7	2	3	Brenna	DS	CH	FRW			4.00	0.61
Brenna, R-bar, 99-1M, 5, 1, Oakport	99-1M	35.0	0.0	5	1	Brenna	R-bar	CH	Oakport	0.46	0.29		
Brenna, R-bar, 99-1M, 5, 2, Oakport	99-1M	35.0	0.0	5	2	Brenna	R-bar	CH	Oakport	0.61	0.20		
Brenna, R-bar, 99-1M, 5, 3, Oakport	99-1M	35.0	0.0	5	3	Brenna	R-bar	CH	Oakport	0.97	0.33		
Brenna, R-bar, 84-1M, 3, 1, WF	84-1M	19.0	877.1	3	1	Brenna	R-bar	MH	WF	0.80	0.18		
Brenna, R-bar, 84-1M, 3, 2, WF	84-1M	19.0	877.1	3	2	Brenna	R-bar	MH	WF	1.37	0.29		
Brenna, R-bar, 84-1M, 3, 3, WF	84-1M	19.0	877.1	3	3	Brenna	R-bar	MH	WF	2.43	0.40		
Brenna, R-bar, 84-1M, 4, 1, WF	84-1M	29.0	867.1	4	1	Brenna	R-bar	CH	WF	0.94	0.25		
Brenna, R-bar, 84-1M, 4, 2, WF	84-1M	29.0	867.1	4	2	Brenna	R-bar	CH	WF	1.46	0.24		
Brenna, R-bar, 84-1M, 4, 3, WF	84-1M	29.0	867.1	4	3	Brenna	R-bar	CH	WF	2.23	0.48		
Brenna, R-bar, 84-2M, 3, 1, WF	84-2M	21.0	883.6	3	1	Brenna	R-bar	CH	WF	0.78	0.27		
Brenna, R-bar, 84-2M, 3, 2, WF	84-2M	21.0	883.6	3	2	Brenna	R-bar	CH	WF	1.52	0.37		
Brenna, R-bar, 84-2M, 3, 3, WF	84-2M	21.0	883.6	3	3	Brenna	R-bar	CH	WF	2.76	0.63		
Brenna, R-bar, 85-4M, 3, 1, WF	85-4M	25.0	888.2	3	1	Brenna	R-bar	CH	WF	0.51	0.21		
Brenna, R-bar, 85-4M, 3, 2, WF	85-4M	25.0	888.2	3	2	Brenna	R-bar	CH	WF	0.88	0.28		
Brenna, R-bar, 85-4M, 3, 3, WF	85-4M	25.0	888.2	3	3	Brenna	R-bar	CH	WF	1.54	0.41		
Brenna, R-bar, 85-4M, 4, 1, WF	85-4M	30.8	882.4	4	1	Brenna	R-bar	CH	WF	0.81	0.28		
Brenna, R-bar, 85-4M, 4, 2, WF	85-4M	30.8	882.4	4	2	Brenna	R-bar	CH	WF	1.43	0.34		
Brenna, R-bar, 85-4M, 4, 3, WF	85-4M	30.8	882.4	4	3	Brenna	R-bar	CH	WF	2.04	0.69		
Brenna, R-bar, 85-4M, 6, 1, WF	85-4M	48.0	865.2	6	1	Brenna	R-bar	CH	WF	0.89	0.30		
Brenna, R-bar, 85-4M, 6, 2, WF	85-4M	48.0	865.2	6	2	Brenna	R-bar	CH	WF	1.43	0.42		
Brenna, R-bar, 85-4M, 6, 3, WF	85-4M	48.0	865.2	6	3	Brenna	R-bar	CH	WF	2.07	0.83		



Project: Fargo-Moorhead Metro Flood Risk Management Project
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Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, R-bar, 85-6M, 2, 1, WF	85-6M	18.0	884.2	2	1	Brenna	R-bar	CH	WF	1.00	0.18		
Brenna, R-bar, 85-6M, 2, 2, WF	85-6M	18.0	884.2	2	2	Brenna	R-bar	CH	WF	1.05	0.32		
Brenna, R-bar, 85-6M, 2, 3, WF	85-6M	18.0	884.2	2	3	Brenna	R-bar	CH	WF	1.72	0.40		
Brenna, R-bar, 85-6M, 2, 4, WF	85-6M	18.0	884.2	2	4	Brenna	R-bar	CH	WF	0.43	0.19		
Brenna, R-bar, 85-6M, 2, 5, WF	85-6M	18.0	884.2	2	5	Brenna	R-bar	CH	WF	0.26	0.39		
Brenna, R-bar, 85-6M, 2, 6, WF	85-6M	18.0	884.2	2	6	Brenna	R-bar	CH	WF	0.44	0.50		
Brenna, R-bar, 85-6M, 2, 7, WF	85-6M	18.0	884.2	2	7	Brenna	R-bar	CH	WF	1.36	0.89		
Brenna, R-bar, 85-6M, 2, 8, WF	85-6M	18.0	884.2	2	8	Brenna	R-bar	CH	WF	0.53	0.19		
Brenna, R-bar, 85-6M, 3, 1, WF	85-6M	31.0	871.2	3	1	Brenna	R-bar	CH	WF	1.01	0.35		
Brenna, R-bar, 85-6M, 3, 2, WF	85-6M	31.0	871.2	3	2	Brenna	R-bar	CH	WF	1.52	0.38		
Brenna, R-bar, 85-6M, 3, 3, WF	85-6M	31.0	871.2	3	3	Brenna	R-bar	CH	WF	2.33	0.40		
Brenna, R-bar, 85-7M, 3, 1, WF	85-7M	22.0	879.6	3	1	Brenna	R-bar	CH	WF	0.51	0.20		
Brenna, R-bar, 85-7M, 3, 2, WF	85-7M	22.0	879.6	3	2	Brenna	R-bar	CH	WF	0.85	0.30		
Brenna, R-bar, 85-7M, 3, 3, WF	85-7M	22.0	879.6	3	3	Brenna	R-bar	CH	WF	1.20	0.31		
Brenna, R-bar, 85-10M, 1, 1, WF	85-10M	16.0	880.1	1	1	Brenna	R-bar	CH	WF	0.51	0.16		
Brenna, R-bar, 85-10M, 1, 2, WF	85-10M	16.0	880.1	1	2	Brenna	R-bar	CH	WF	0.79	0.21		
Brenna, R-bar, 85-10M, 1, 3, WF	85-10M	16.0	880.1	1	3	Brenna	R-bar	CH	WF	1.48	0.35		
Brenna, R-bar, 85-10M, 3, 1, WF	85-10M	26.0	870.1	3	1	Brenna	R-bar	CH	WF	0.46	0.16		
Brenna, R-bar, 85-10M, 3, 2, WF	85-10M	26.0	870.1	3	2	Brenna	R-bar	CH	WF	0.72	0.18		
Brenna, R-bar, 85-10M, 3, 3, WF	85-10M	26.0	870.1	3	3	Brenna	R-bar	CH	WF	1.20	0.31		
Brenna, R-bar, 85-10M, 4, 1, WF	85-10M	37.0	859.1	4	1	Brenna	R-bar	CH	WF	0.87	0.27		
Brenna, R-bar, 85-10M, 4, 2, WF	85-10M	37.0	859.1	4	2	Brenna	R-bar	CH	WF	1.38	0.31		
Brenna, R-bar, 85-10M, 4, 3, WF	85-10M	37.0	859.1	4	3	Brenna	R-bar	CH	WF	2.40	0.65		
Brenna, R-bar, 85-11M, 4, 1, WF	85-11M	31.0	868.5	4	1	Brenna	R-bar	CH	WF	0.97	0.20		
Brenna, R-bar, 85-11M, 4, 2, WF	85-11M	31.0	868.5	4	2	Brenna	R-bar	CH	WF	1.67	0.38		
Brenna, R-bar, 85-11M, 4, 3, WF	85-11M	31.0	868.5	4	3	Brenna	R-bar	CH	WF	2.62	0.46		
Brenna, R-bar, 85-12M, 4, 1, WF	85-12M	26.0	871.3	4	1	Brenna	R-bar	CH	WF	0.59	0.18		
Brenna, R-bar, 85-12M, 4, 2, WF	85-12M	26.0	871.3	4	2	Brenna	R-bar	CH	WF	0.86	0.27		
Brenna, R-bar, 85-12M, 4, 3, WF	85-12M	26.0	871.3	4	3	Brenna	R-bar	CH	WF	1.58	0.45		
Brenna, R-bar, 86-6M, 6, 1, WF	86-6M	14.1	888.1	6	1	Brenna	R-bar	CH	WF	1.13	0.28		
Brenna, R-bar, 86-6M, 6, 2, WF	86-6M	14.1	888.1	6	2	Brenna	R-bar	CH	WF	1.88	0.49		
Brenna, R-bar, 86-6M, 6, 3, WF	86-6M	14.1	888.1	6	3	Brenna	R-bar	CH	WF	3.38	0.61		
Brenna, R-bar, 86-6M, 7, 1, WF	86-6M	26.1	876.1	7	1	Brenna	R-bar	CH	WF	1.08	0.38		
Brenna, R-bar, 86-6M, 7, 2, WF	86-6M	26.1	876.1	7	2	Brenna	R-bar	CH	WF	1.80	0.53		
Brenna, R-bar, 86-6M, 7, 3, WF	86-6M	26.1	876.1	7	3	Brenna	R-bar	CH	WF	3.21	0.50		
Brenna, R-bar, 86-9M, 2, 1, WF	86-9M	30.1	866.0	2	1	Brenna	R-bar	CH	WF	0.69	0.25		
Brenna, R-bar, 86-9M, 2, 2, WF	86-9M	30.1	866.0	2	2	Brenna	R-bar	CH	WF	1.42	0.38		
Brenna, R-bar, 86-9M, 2, 3, WF	86-9M	30.1	866.0	2	3	Brenna	R-bar	CH	WF	2.61	0.41		
Brenna, R-bar, 86-29M, 5, 1, WF	86-29M	39.1	864.9	5	1	Brenna	R-bar	CH	WF	0.89	0.27		
Brenna, R-bar, 86-29M, 5, 2, WF	86-29M	39.1	864.9	5	2	Brenna	R-bar	CH	WF	1.34	0.38		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Subject: Brenna Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: 8/5/2011 Date: 12/5/2012

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Brenna, R-bar, 86-29M, 5, 3, WF	86-29M	39.1	864.9	5	3	Brenna	R-bar	CH	WF	2.64	0.51		
Brenna, R-bar, 86-31M, 3, 1, WF	86-31M	31.1	862.2	3	1	Brenna	R-bar	CH	WF	0.72	0.24		
Brenna, R-bar, 86-31M, 3, 2, WF	86-31M	31.1	862.2	3	2	Brenna	R-bar	CH	WF	1.44	0.35		
Brenna, R-bar, 86-31M, 3, 3, WF	86-31M	31.1	862.2	3	3	Brenna	R-bar	CH	WF	1.95	0.62		
Brenna, R-bar, 86-31M, 4, 1, WF	86-31M	41.1	852.2	4	1	Brenna	R-bar	CH	WF	0.82	0.24		
Brenna, R-bar, 86-31M, 4, 2, WF	86-31M	41.1	852.2	4	2	Brenna	R-bar	CH	WF	1.33	0.22		
Brenna, R-bar, 86-31M, 4, 3, WF	86-31M	41.1	852.2	4	3	Brenna	R-bar	CH	WF	2.04	0.44		
Brenna, R-bar, 86-32M, 2, 1, WF	86-32M	21.1	866.7	2	1	Brenna	R-bar	CH	WF	0.67	0.16		
Brenna, R-bar, 86-32M, 2, 2, WF	86-32M	21.1	866.7	2	2	Brenna	R-bar	CH	WF	0.93	0.32		
Brenna, R-bar, 86-32M, 2, 3, WF	86-32M	21.1	866.7	2	3	Brenna	R-bar	CH	WF	2.02	0.54		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Argusville Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: 8/5/2011 Date: 12/5/2012

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Argusville, R-bar, Far 10-79MU, 2, 1, FM	Far 10-79MU	41.0	864.7	2	1	Argusville	R-bar	CH	FM	0.81	0.43		
Argusville, R-bar, Far 10-79MU, 2, 2, FM	Far 10-79MU	41.0	864.7	2	2	Argusville	R-bar	CH	FM	1.26	0.54		
Argusville, R-bar, Far 10-79MU, 2, 3, FM	Far 10-79MU	41.0	864.7	2	3	Argusville	R-bar	CH	FM	1.70	0.69		
Argusville, R-bar, Far 10-80MU, 3, 1, FM	Far 10-80MU	56.0	865.1	3	1	Argusville	R-bar	CH	FM	0.94	0.30		
Argusville, R-bar, Far 10-80MU, 3, 2, FM	Far 10-80MU	56.0	865.1	3	2	Argusville	R-bar	CH	FM	1.48	0.34		
Argusville, R-bar, Far 10-80MU, 3, 3, FM	Far 10-80MU	56.0	865.1	3	3	Argusville	R-bar	CH	FM	2.70	0.48		
Argusville, R-bar, Far 10-105MU, 4, 1, FM	Far 10-105MU	46.0	851.0	4	1	Argusville	R-bar	CH	FM	0.66	0.25		
Argusville, R-bar, Far 10-105MU, 4, 2, FM	Far 10-105MU	46.0	851.0	4	2	Argusville	R-bar	CH	FM	1.15	0.32		
Argusville, R-bar, Far 10-105MU, 4, 3, FM	Far 10-105MU	46.0	851.0	4	3	Argusville	R-bar	CH	FM	1.71	0.47		
Argusville, R-bar, Far 10-105MU, 5, 1, FM	Far 10-105MU	56.0	841.0	5	1	Argusville	R-bar	CH	FM	0.86	0.27		
Argusville, R-bar, Far 10-105MU, 5, 2, FM	Far 10-105MU	56.0	841.0	5	2	Argusville	R-bar	CH	FM	1.36	0.37		
Argusville, R-bar, Far 10-105MU, 5, 3, FM	Far 10-105MU	56.0	841.0	5	3	Argusville	R-bar	CH	FM	2.18	0.56		
Argusville, R-bar, Moor 11-107MU, 3, 1, FM	Moor 11-107MU	41.0	873.2	3	1	Argusville	R-bar	CH	FM	1.23	0.60		
Argusville, R-bar, Moor 11-107MU, 3, 2, FM	Moor 11-107MU	41.0	873.2	3	2	Argusville	R-bar	CH	FM	1.60	0.61		
Argusville, R-bar, Moor 11-107MU, 3, 3, FM	Moor 11-107MU	41.0	873.2	3	3	Argusville	R-bar	CH	FM	2.34	0.82		
Argusville, R-bar, Moor 11-107MU, 4, 1, FM	Moor 11-107MU	51.0	863.2	4	1	Argusville	R-bar	CH	FM	1.42	0.78		
Argusville, R-bar, Moor 11-107MU, 4, 2, FM	Moor 11-107MU	51.0	863.2	4	2	Argusville	R-bar	CH	FM	1.95	0.95		
Argusville, R-bar, Moor 11-107MU, 4, 3, FM	Moor 11-107MU	51.0	863.2	4	3	Argusville	R-bar	CH	FM	2.54	1.27		
Argusville, R-bar, Far 11-110MU, 4, 1, FM	Far 11-110MU	56.0	861.6	4	1	Argusville	R-bar	CH	FM	0.74	0.29		
Argusville, R-bar, Far 11-110MU, 4, 2, FM	Far 11-110MU	56.0	861.6	4	2	Argusville	R-bar	CH	FM	1.19	0.42		
Argusville, R-bar, Far 11-110MU, 4, 3, FM	Far 11-110MU	56.0	861.6	4	3	Argusville	R-bar	CH	FM	1.69	0.63		
Argusville, R-bar, Far 11-110MU, 5, 1, FM	Far 11-110MU	61.0	856.6	5	1	Argusville	R-bar	CH	FM	1.05	0.52		
Argusville, R-bar, Far 11-110MU, 5, 2, FM	Far 11-110MU	61.0	856.6	5	2	Argusville	R-bar	CH	FM	1.34	0.69		
Argusville, R-bar, Far 11-110MU, 5, 3, FM	Far 11-110MU	61.0	856.6	5	3	Argusville	R-bar	CH	FM	1.93	0.87		
Argusville, R-bar, Far 11-118MU, 3, 1, FM	Far 11-118MU	46.0	866.7	3	1	Argusville	R-bar	CH	FM	0.76	0.32		
Argusville, R-bar, Far 11-118MU, 3, 2, FM	Far 11-118MU	46.0	866.7	3	2	Argusville	R-bar	CH	FM	1.18	0.47		
Argusville, R-bar, Far 11-118MU, 3, 3, FM	Far 11-118MU	46.0	866.7	3	3	Argusville	R-bar	CH	FM	1.85	0.57		
Argusville, R-bar, Far 11-118MU, 4, 1, FM	Far 11-118MU	56.0	856.7	4	1	Argusville	R-bar	CH	FM	1.07	0.46		
Argusville, R-bar, Far 11-118MU, 4, 2, FM	Far 11-118MU	56.0	856.7	4	2	Argusville	R-bar	CH	FM	1.56	0.60		
Argusville, R-bar, Far 11-118MU, 4, 3, FM	Far 11-118MU	56.0	856.7	4	3	Argusville	R-bar	CH	FM	2.19	0.82		
Argusville, R-bar, Far 11-118MU, 5, 1, FM	Far 11-118MU	66.0	846.7	5	1	Argusville	R-bar	CH	FM	1.16	0.58		
Argusville, R-bar, Far 11-118MU, 5, 2, FM	Far 11-118MU	66.0	846.7	5	2	Argusville	R-bar	CH	FM	1.45	0.72		
Argusville, R-bar, Far 11-118MU, 5, 3, FM	Far 11-118MU	66.0	846.7	5	3	Argusville	R-bar	CH	FM	1.95	0.96		
Argusville, R-bar, Far 11-119MU, 2, 1, FM	Far 11-119MU	41.0	866.1	2	1	Argusville	R-bar	CH	FM	0.89	0.43		
Argusville, R-bar, Far 11-119MU, 2, 2, FM	Far 11-119MU	41.0	866.1	2	2	Argusville	R-bar	CH	FM	1.18	0.61		
Argusville, R-bar, Far 11-119MU, 2, 3, FM	Far 11-119MU	41.0	866.1	2	3	Argusville	R-bar	CH	FM	1.62	0.74		
Argusville, R-bar, Far 11-119MU, 3, 1, FM	Far 11-119MU	51.0	856.1	3	1	Argusville	R-bar	CH	FM	0.82	0.43		
Argusville, R-bar, Far 11-119MU, 3, 2, FM	Far 11-119MU	51.0	856.1	3	2	Argusville	R-bar	CH	FM	1.08	0.52		
Argusville, R-bar, Far 11-119MU, 3, 3, FM	Far 11-119MU	51.0	856.1	3	3	Argusville	R-bar	CH	FM	1.47	0.66		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Argusville Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: 8/5/2011 Date: 12/5/2012

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
? A, DS, Moor 11-111MU, 5, 1, FM PED	Moor 11-111MU	53.0	862.1	5	1	? A	DS	CH	FM PED			0.76	0.34
? A, DS, Moor 11-111MU, 5, 2, FM PED	Moor 11-111MU	53.0	862.1	5	2	? A	DS	CH	FM PED			1.51	0.55
? A, DS, Moor 11-111MU, 5, 3, FM PED	Moor 11-111MU	53.0	862.1	5	3	? A	DS	CH	FM PED			3.18	1.07
Argusville, R-bar, B22-1, 5, 1, FM Bridge	B22-1	59.5	0.0	5	1	Argusville	R-bar	CL	FM Bridge	1.35	0.69		
Argusville, R-bar, B22-1, 5, 2, FM Bridge	B22-1	59.5	0.0	5	2	Argusville	R-bar	CL	FM Bridge	1.36	0.97		
Argusville, R-bar, B22-1, 5, 3, FM Bridge	B22-1	59.5	0.0	5	3	Argusville	R-bar	CL	FM Bridge	1.90	1.04		
Argusville, R-bar, 01-5MU, 4, 1, FRW	01-5MU	78.0	823.7	4	1	Argusville	R-bar	CH	FRW	1.22	0.29		
Argusville, R-bar, 01-5MU, 4, 2, FRW	01-5MU	78.0	823.7	4	2	Argusville	R-bar	CH	FRW	2.49	0.46		
Argusville, R-bar, 01-5MU, 4, 3, FRW	01-5MU	78.0	823.7	4	3	Argusville	R-bar	CH	FRW	4.80	0.69		
Argusville, R-bar, 01-12MU, 3, 1, FRW	01-12MU	64.0	820.0	3	1	Argusville	R-bar	CH	FRW	0.98	0.25		
Argusville, R-bar, 01-12MU, 3, 2, FRW	01-12MU	64.0	820.0	3	2	Argusville	R-bar	CH	FRW	1.56	0.71		
Argusville, R-bar, 01-12MU, 3, 3, FRW	01-12MU	64.0	820.0	3	3	Argusville	R-bar	CH	FRW	3.59	0.84		
Argusville, DS, 06-16MU, 2, 1, FRW	06-16MU	46.0	832.6	2	1	Argusville	DS	CH	FRW			1.00	0.28
Argusville, DS, 06-16MU, 2, 2, FRW	06-16MU	46.0	832.6	2	2	Argusville	DS	CH	FRW			2.00	0.53
Argusville, DS, 06-16MU, 2, 3, FRW	06-16MU	46.0	832.6	2	3	Argusville	DS	CH	FRW			4.00	0.64
Argusville, DS, 06-16MU, 3, 1, FRW	06-16MU	57.0	821.6	3	1	Argusville	DS	CH	FRW			1.00	0.38
Argusville, DS, 06-16MU, 3, 2, FRW	06-16MU	57.0	821.6	3	2	Argusville	DS	CH	FRW			2.00	0.60
Argusville, DS, 06-16MU, 3, 3, FRW	06-16MU	57.0	821.6	3	3	Argusville	DS	CH	FRW			4.00	0.97
Argusville, DS, 06-18MU, 3, 1, FRW	06-18MU	73.0	816.7	3	1	Argusville	DS	CH	FRW			1.00	0.36
Argusville, DS, 06-18MU, 3, 2, FRW	06-18MU	73.0	816.7	3	2	Argusville	DS	CH	FRW			2.00	0.63
Argusville, DS, 06-18MU, 3, 3, FRW	06-18MU	73.0	816.7	3	3	Argusville	DS	CH	FRW			4.00	1.11
Argusville, R-bar, 84-2M, 6, 1, WF	84-2M	61.0	843.6	6	1	Argusville	R-bar	CH	WF	0.86	0.31		
Argusville, R-bar, 84-2M, 6, 2, WF	84-2M	61.0	843.6	6	2	Argusville	R-bar	CH	WF	1.15	0.44		
Argusville, R-bar, 84-2M, 6, 3, WF	84-2M	61.0	843.6	6	3	Argusville	R-bar	CH	WF	1.96	0.63		
Argusville, R-bar, 85-6M, 4, 1, WF	85-6M	44.0	858.2	4	1	Argusville	R-bar	CH	WF	0.79	0.23		
Argusville, R-bar, 85-6M, 4, 2, WF	85-6M	44.0	858.2	4	2	Argusville	R-bar	CH	WF	1.32	0.38		
Argusville, R-bar, 85-6M, 4, 3, WF	85-6M	44.0	858.2	4	3	Argusville	R-bar	CH	WF	2.00	0.52		
Argusville, R-bar, 85-6M, 5, 1, WF	85-6M	54.0	848.2	5	1	Argusville	R-bar	CH	WF	0.91	0.33		
Argusville, R-bar, 85-6M, 5, 2, WF	85-6M	54.0	848.2	5	2	Argusville	R-bar	CH	WF	1.35	0.46		
Argusville, R-bar, 85-6M, 5, 3, WF	85-6M	54.0	848.2	5	3	Argusville	R-bar	CH	WF	4.11	0.58		
Argusville, R-bar, 85-7M, 5, 1, WF	85-7M	46.0	855.6	5	1	Argusville	R-bar	CH	WF	0.82	0.34		
Argusville, R-bar, 85-7M, 5, 2, WF	85-7M	46.0	855.6	5	2	Argusville	R-bar	CH	WF	1.09	0.47		
Argusville, R-bar, 85-7M, 5, 3, WF	85-7M	46.0	855.6	5	3	Argusville	R-bar	CH	WF	1.94	0.73		
Argusville, R-bar, 85-12M, 7, 1, WF	85-12M	49.0	848.3	7	1	Argusville	R-bar	CH	WF	0.80	0.23		
Argusville, R-bar, 85-12M, 7, 2, WF	85-12M	49.0	848.3	7	2	Argusville	R-bar	CH	WF	1.21	0.29		
Argusville, R-bar, 85-12M, 7, 3, WF	85-12M	49.0	848.3	7	3	Argusville	R-bar	CH	WF	2.68	0.56		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Argusville Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: 8/5/2011 Date: 12/5/2012

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Argusville, R-bar, 84-3M, 6, 1, WF	84-3M	63.0	839.2	6	1	Argusville	R-bar	CH	WF	0.89	0.29		
Argusville, R-bar, 84-3M, 6, 2, WF	84-3M	63.0	839.2	6	2	Argusville	R-bar	CH	WF	1.34	0.36		
Argusville, R-bar, 84-3M, 6, 3, WF	84-3M	63.0	839.2	6	3	Argusville	R-bar	CH	WF	1.82	0.55		
B/A Trans, R-bar, Moor 09-25MU, 5, 1, FM	Moor 09-25MU	69.0	829.7	5	1	B/A Trans	R-bar	CH	FM	0.80	0.26		
B/A Trans, R-bar, Moor 09-25MU, 5, 2, FM	Moor 09-25MU	69.0	829.7	5	2	B/A Trans	R-bar	CH	FM	1.49	0.41		
B/A Trans, R-bar, Moor 09-25MU, 5, 3, FM	Moor 09-25MU	69.0	829.7	5	3	B/A Trans	R-bar	CH	FM	2.18	0.61		
B/A Trans, R-bar, Far 09-27MU, 4, 1, FM	Far 09-27MU	65.0	838.1	4	1	B/A Trans	R-bar	CH	FM	0.83	0.37		
B/A Trans, R-bar, Far 09-27MU, 4, 2, FM	Far 09-27MU	65.0	838.1	4	2	B/A Trans	R-bar	CH	FM	1.16	0.51		
B/A Trans, R-bar, Far 09-27MU, 4, 3, FM	Far 09-27MU	65.0	838.1	4	3	B/A Trans	R-bar	CH	FM	1.91	0.74		
B/A Trans, DS, Far 09-59MU, 3, 1, FM	Far 09-59MU	36.0	880.2	3	1	B/A Trans	DS	CH	FM			1.01	0.45
B/A Trans, DS, Far 09-59MU, 3, 2, FM	Far 09-59MU	36.0	880.2	3	2	B/A Trans	DS	CH	FM			2.00	0.85
B/A Trans, DS, Far 09-59MU, 3, 3, FM	Far 09-59MU	36.0	880.2	3	3	B/A Trans	DS	CH	FM			4.08	1.63
B/A Transition, R-bar, Far 12-124MU, 1, 1, FM PED	Far 12-124MU	69.4	810.7	1	1	B/A Transition	R-bar	CH	FM PED	0.83	0.36		
B/A Transition, R-bar, Far 12-124MU, 1, 2, FM PED	Far 12-124MU	69.4	810.7	1	2	B/A Transition	R-bar	CH	FM PED	1.24	0.46		
B/A Transition, R-bar, Far 12-124MU, 1, 3, FM PED	Far 12-124MU	69.4	810.7	1	3	B/A Transition	R-bar	CH	FM PED	1.90	0.60		
B/A Transition, R-bar, Far 12-124MU, 2, 1, FM PED	Far 12-124MU	73.0	807.1	2	1	B/A Transition	R-bar	CH	FM PED	1.07	0.47		
B/A Transition, R-bar, Far 12-124MU, 2, 2, FM PED	Far 12-124MU	73.0	807.1	2	2	B/A Transition	R-bar	CH	FM PED	1.33	0.51		
B/A Transition, R-bar, Far 12-124MU, 2, 3, FM PED	Far 12-124MU	73.0	807.1	2	3	B/A Transition	R-bar	CH	FM PED	1.90	0.74		
B/A Transition, R-bar, Far 12-131MU, 1, 1, FM PED	Far 12-131MU	67.0	811.9	1	1	B/A Transition	R-bar	CH	FM PED	0.57	0.26		
B/A Transition, R-bar, Far 12-131MU, 1, 2, FM PED	Far 12-131MU	67.0	811.9	1	2	B/A Transition	R-bar	CH	FM PED	1.20	0.39		
B/A Transition, R-bar, Far 12-131MU, 1, 3, FM PED	Far 12-131MU	67.0	811.9	1	3	B/A Transition	R-bar	CH	FM PED	2.14	0.51		
B/A Transition, R-bar, Far 12-131MU, 2, 1, FM PED	Far 12-131MU	69.9	809.1	2	1	B/A Transition	R-bar	CH	FM PED	0.71	0.33		
B/A Transition, R-bar, Far 12-131MU, 2, 2, FM PED	Far 12-131MU	69.9	809.1	2	2	B/A Transition	R-bar	CH	FM PED	1.27	0.39		
B/A Transition, R-bar, Far 12-131MU, 2, 3, FM PED	Far 12-131MU	69.9	809.1	2	3	B/A Transition	R-bar	CH	FM PED	2.24	0.65		
B/A Transition, R-bar, Far 12-162MU, 4, 1, FM PED	Far 12-162MU	46.1	847.3	4	1	B/A Transition	R-bar	CH	FM PED	0.70	0.30		
B/A Transition, R-bar, Far 12-162MU, 4, 2, FM PED	Far 12-162MU	46.1	847.3	4	2	B/A Transition	R-bar	CH	FM PED	1.16	0.37		
B/A Transition, R-bar, Far 12-162MU, 4, 3, FM PED	Far 12-162MU	46.1	847.3	4	3	B/A Transition	R-bar	CH	FM PED	1.76	0.52		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Unit "A" Till Formation Effective Shear Strength Data from Borings
 Compiled By: KAH Revised By:
 Date: 8/5/2011 Date: 8/5/2011

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	FORMATION	TEST	USCS SOIL TYPE	PROJECT	R-bar, Ultimate		DS, Ultimate	
										σ_{ff} (tsf)	τ_{ff} (tsf)	σ_{ff} (tsf)	τ_{ff} (tsf)
Unit "A" Till, R-bar, Far 10-78MU, 4, 1, FM	Far 10-78MU	70.6	835.1	4	1	Unit "A" Till	R-bar	SC	FM	5.86	4.15		
Unit "A" Till, R-bar, Far 10-78MU, 4, 2, FM	Far 10-78MU	70.6	835.1	4	2	Unit "A" Till	R-bar	SC	FM	5.26	3.39		
Unit "A" Till, R-bar, Far 10-105MU, 6, 1, FM	Far 10-105MU	68.0	829.0	6	1	Unit "A" Till	R-bar	CH	FM	1.46	1.06		
Unit "A" Till, R-bar, Far 10-105MU, 6, 2, FM	Far 10-105MU	68.0	829.0	6	2	Unit "A" Till	R-bar	CH	FM	3.86	2.35		
Unit "A" Till, R-bar, Far 11-110MU, 6, 1, FM	Far 11-110MU	66.0	851.6	6	1	Unit "A" Till	R-bar	CH	FM	1.19	0.65		
Unit "A" Till, R-bar, Far 11-110MU, 6, 2, FM	Far 11-110MU	66.0	851.6	6	2	Unit "A" Till	R-bar	CH	FM	1.62	0.75		
Unit "A" Till, R-bar, Far 11-110MU, 6, 3, FM	Far 11-110MU	66.0	851.6	6	3	Unit "A" Till	R-bar	CH	FM	2.28	0.97		
Unit "A" Till, R-bar, Far 11-119MU, 4, 1, FM	Far 11-119MU	62.5	844.6	4	1	Unit "A" Till	R-bar	CH	FM	0.67	0.38		
Unit "A" Till, R-bar, Far 11-119MU, 4, 2, FM	Far 11-119MU	62.5	844.6	4	2	Unit "A" Till	R-bar	CH	FM	1.09	0.53		
Unit "A" Till, R-bar, Far 11-119MU, 4, 3, FM	Far 11-119MU	62.5	844.6	4	3	Unit "A" Till	R-bar	CH	FM	2.26	0.97		



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Undrained Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: OCT 09 Date: 12/5/2012

TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION
							Ultimate Stress Values				Peak Stress Values						
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)			
1	2	3	4	5	6	17	38	39	40	41	42	43	46	47	48		
Soft Alluvium, UU, Far 12-194MU, 1, 1, FM PED	Far 12-194MU	13.0	866.0	1	1	0.5	0.38	0.19	375	0.69	0.40	0.20	395	0.70	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 12-194MU, 1, 2, FM PED	Far 12-194MU	13.0	866.0	1	2	1.0	0.37	0.18	365	1.18	0.39	0.19	385	1.19	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 12-194MU, 2, 1, FM PED	Far 12-194MU	15.0	864.0	2	1	0.5	0.37	0.19	370	0.69	0.37	0.19	370	0.69	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 12-194MU, 2, 2, FM PED	Far 12-194MU	15.0	864.0	2	2	0.5	0.82	0.41	820	0.91	1.00	0.50	1000	1.00	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 12-194MU, 2, 3, FM PED	Far 12-194MU	15.0	864.0	2	3	0.5	1.50	0.75	1500	1.25	1.55	0.78	1550	1.28	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 1, 1, FM PED	Far 13-200MU	9.0	869.5	1	1	0.3	1.03	0.52	1030	0.77	1.03	0.52	1030	0.77	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 1, 2, FM PED	Far 13-200MU	9.0	869.5	1	2	0.5	0.88	0.44	880	0.94	0.99	0.50	990	1.00	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 1, 3, FM PED	Far 13-200MU	9.0	869.5	1	3	0.1	1.28	0.64	1280	0.74	1.30	0.65	1300	0.75	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 2, 1, FM PED	Far 13-200MU	11.0	867.5	2	1	0.3	0.97	0.49	970	0.74	0.99	0.50	990	0.75	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 2, 2, FM PED	Far 13-200MU	11.0	867.5	2	2	0.5	1.03	0.52	1030	1.02	1.05	0.53	1050	1.03	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 2, 3, FM PED	Far 13-200MU	11.0	867.5	2	3	1.0	0.81	0.41	810	1.41	0.87	0.44	870	1.44	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 3, 1, FM PED	Far 13-200MU	13.0	865.5	3	1	0.3	0.34	0.17	340	0.42	0.42	0.21	420	0.46	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 3, 2, FM PED	Far 13-200MU	13.0	865.5	3	2	0.5	0.33	0.17	330	0.67	0.39	0.20	390	0.70	CH	UU	Soft Alluvium
Soft Alluvium, UU, Far 13-200MU, 3, 3, FM PED	Far 13-200MU	13.0	865.5	3	3	1.0	0.48	0.24	480	1.24	0.49	0.25	490	1.25	CH	UU	Soft Alluvium
Alluvium, UU, Far 10-79MU, 1, 1, FM	Far 10-79MU	21.0	884.7	1	1	1.0	2.16	1.08	2160	2.08	2.21	1.11	2210	2.11	CH	UU	Alluvium
Alluvium, UU, Far 10-79MU, 1, 2, FM	Far 10-79MU	21.0	884.7	1	2	2.0	2.45	1.23	2450	3.23	2.45	1.23	2450	3.23	CH	UU	Alluvium
Alluvium, UU, Far 10-79MU, 1, 3, FM	Far 10-79MU	21.0	884.7	1	3	4.0	2.72	1.36	2720	5.36	2.73	1.37	2730	5.37	CH	UU	Alluvium
Alluvium, UU, Far 10-80MU, 1, 1, FM	Far 10-80MU	24.0	897.1	1	1	1.0	1.03	0.52	1030	1.52	1.09	0.55	1090	1.55	CL-ML	UU	Alluvium
Alluvium, UU, Far 10-80MU, 1, 2, FM	Far 10-80MU	24.0	897.1	1	2	2.0	1.40	0.70	1400	2.70	1.47	0.74	1470	2.74	CL-ML	UU	Alluvium
Alluvium, UU, Far 10-80MU, 1, 3, FM	Far 10-80MU	24.0	897.1	1	3	4.0	1.67	0.84	1670	4.84	1.85	0.93	1850	4.93	CL-ML	UU	Alluvium
Sherack, UU, Far 09-23MU, 2, 1, FM	Far 09-23MU	11.0	886.0	2	1	0.5	0.95	0.48	950	0.98	1.22	0.61	1220	1.11	CH	UU	Sherack
Sherack, UU, Far 09-23MU, 2, 2, FM	Far 09-23MU	11.0	886.0	2	2	1.0	1.04	0.52	1040	1.52	1.27	0.64	1270	1.64	CH	UU	Sherack
Sherack, UU, Far 09-23MU, 2, 3, FM	Far 09-23MU	11.0	886.0	2	3	2.0	0.49	0.25	490	2.25	1.61	0.81	1610	2.81	CH	UU	Sherack
Sherack, UU, Moor 09-25MU, 1, 1, FM	Moor 09-25MU	9.0	889.7	1	1	0.5	0.99	0.50	990	1.00	1.53	0.77	1530	1.27	CH	UU	Sherack
Sherack, UU, Moor 09-25MU, 1, 2, FM	Moor 09-25MU	9.0	889.7	1	2	1.0	0.60	0.30	600	1.30	1.70	0.85	1700	1.85	CH	UU	Sherack
Sherack, UU, Moor 09-25MU, 1, 3, FM	Moor 09-25MU	9.0	889.7	1	3	2.0	1.66	0.83	1660	2.83	2.12	1.06	2120	3.06	CH	UU	Sherack
Sherack, UU, Moor 11-111MU, 1, 1, FM PED	Moor 11-111MU	9.0	906.1	1	1	0.5	0.51	0.26	510	0.77	1.00	0.50	1000	1.01	CH	UU	Sherack
Sherack, UU, Moor 11-111MU, 1, 2, FM PED	Moor 11-111MU	9.0	906.1	1	2	1.0	0.61	0.31	610	1.32	1.21	0.61	1210	1.62	CH	UU	Sherack
Sherack, UU, Moor 11-111MU, 1, 3, FM PED	Moor 11-111MU	9.0	906.1	1	3	2.0	0.46	0.23	460	2.21	1.27	0.64	1270	2.62	CH	UU	Sherack
Sherack, UU, Far 11-122MU, 1, 1, FM PED	Far 11-122MU	9.0	884.8	1	1	0.5	1.27	0.64	1270	1.15	1.30	0.65	1300	1.16	CH	UU	Sherack
Sherack, UU, Far 11-122MU, 1, 2, FM PED	Far 11-122MU	9.0	884.8	1	2	1.0	1.35	0.68	1350	1.69	1.35	0.68	1350	1.69	CH	UU	Sherack
Sherack, UU, Far 11-122MU, 1, 3, FM PED	Far 11-122MU	9.0	884.8	1	3	2.0	1.40	0.70	1400	2.71	1.43	0.72	1430	2.73	CH	UU	Sherack
Sherack, UU, Far 11-127MU, 1, 1, FM PED	Far 11-127MU	13.0	867.2	1	1	0.5	1.02	0.51	1020	1.02	1.51	0.76	1510	1.27	CH	UU	Sherack
Sherack, UU, Far 11-127MU, 1, 2, FM PED	Far 11-127MU	13.0	867.2	1	2	1.0	1.05	0.53	1050	1.54	1.71	0.86	1710	1.87	CH	UU	Sherack
Sherack, UU, Far 11-127MU, 1, 3, FM PED	Far 11-127MU	13.0	867.2	1	3	2.0	0.92	0.46	920	2.48	1.58	0.79	1580	2.81	CH	UU	Sherack
Sherack, UU, Far 12-162MU, 1, 1, FM PED	Far 12-162MU	9.0	884.4	1	1	0.5	0.65	0.33	654	0.84	1.39	0.70	1390	1.21	CH	UU	Sherack
Sherack, UU, Far 12-162MU, 1, 2, FM PED	Far 12-162MU	9.0	884.4	1	2	1.0	1.16	0.58	1155	1.59	1.34	0.67	1341	1.68	CH	UU	Sherack
Sherack, UU, Far 12-162MU, 1, 3, FM PED	Far 12-162MU	9.0	884.4	1	3	2.0	0.94	0.47	935	2.47	1.28	0.64	1282	2.64	CH	UU	Sherack



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Undrained Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: OCT 09 Date: 12/5/2012

TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION	
							Ultimate Stress Values				Peak Stress Values							
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)				
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Sherack, UU, 01-4MU, 1, 1, FRW	01-4MU	18.0	881.2	1	1	1.0	1.84	0.92	1840	1.92	1.99	1.00	1990	2.00	CH/CL	UU	Sherack	
Sherack, UU, 01-4MU, 2, 2, FRW	01-4MU	18.0	881.2	2	2	2.0	2.53	1.27	2530	3.27	2.53	1.27	2530	3.27	CH/CL	UU	Sherack	
Sherack, UU, 01-4MU, 3, 3, FRW	01-4MU	18.0	881.2	3	3	4.0	3.19	1.60	3190	5.60	3.19	1.60	3190	5.60	CH/CL	UU	Sherack	
Sherack, UU, 84-1M, 1, 1, WF	84-1M	5.7	890.4	1	1	1.0	0.87	0.44	873	1.44	1.09	0.55	1090	1.55	MH	UU	Sherack	
Sherack, UU, 84-1M, 1, 2, WF	84-1M	5.7	890.4	1	2	2.0	1.29	0.65	1290	2.65	1.32	0.66	1320	2.66	MH	UU	Sherack	
Sherack, UU, 84-1M, 1, 3, WF	84-1M	5.7	890.4	1	3	4.0	0.16	0.08	156	4.08	1.40	0.70	1400	4.70	MH	UU	Sherack	
Sherack, UU, 85-12M, 1, 1, WF	85-12M	6.0	891.3	1	1	0.5	4.01	2.01	4010	2.51	7.05	3.53	7050	4.03	CH	UU	Sherack	
Sherack, UU, 85-12M, 1, 2, WF	85-12M	6.0	891.3	1	2	1.0	5.36	2.68	5360	3.68	7.29	3.65	7290	4.65	CH	UU	Sherack	
Sherack, UU, 85-12M, 1, 3, WF	85-12M	6.0	891.3	1	3	2.0	8.55	4.28	8550	6.28	8.69	4.35	8690	6.35	CH	UU	Sherack	
Sherack, UU, 99-1M, 1, 1, Oakport	99-1M	7.3		1	1	0.3	1.10	0.55	1100	0.80	1.53	0.77	1530	1.02	CH	UU	Sherack	
Sherack, UU, 99-1M, 1, 2, Oakport	99-1M	7.3		1	2	0.5	1.30	0.65	1300	1.15	1.67	0.84	1670	1.34	CH	UU	Sherack	
Sherack, UU, 99-1M, 1, 3, Oakport	99-1M	7.3		1	3	1.0	1.22	0.61	1220	1.61	2.49	1.25	2490	2.25	CH	UU	Sherack	
Poplar River, UU, 01-10MU, 1, 1, FRW	01-10MU	20.0	861.0	1	1	1.0	1.68	0.84	1680	1.84	1.70	0.85	1700	1.85	CH	UU	Poplar River	
Poplar River, UU, 01-10MU, 1, 2, FRW	01-10MU	20.0	861.0	1	2	2.0	1.73	0.87	1730	2.87	1.79	0.90	1790	2.90	CH	UU	Poplar River	
Poplar River, UU, 01-10MU, 1, 3, FRW	01-10MU	20.0	861.0	1	3	4.0	1.81	0.91	1810	4.91	1.88	0.94	1880	4.94	CH	UU	Poplar River	
PR - WF, UU, Far 09-23MU, 3, 1, FM	Far 09-23MU	21.0	876.0	3	1	0.5	1.53	0.77	1530	1.26	1.86	0.93	1860	1.42	ML	UU	PR - WF	
PR - WF, UU, Far 09-23MU, 3, 2, FM	Far 09-23MU	21.0	876.0	3	2	1.0	3.33	1.67	3330	2.70	3.52	1.76	3520	2.79	ML	UU	PR - WF	
PR - WF, UU, Far 09-23MU, 3, 3, FM	Far 09-23MU	21.0	876.0	3	3	2.0	5.08	2.54	5080	4.53	5.14	2.57	5140	4.56	ML	UU	PR - WF	
PR - WF, UU, Moor 09-25MU, 2, 1, FM	Moor 09-25MU	22.0	876.7	2	1	5.0	2.12	1.06	2120	6.06	2.48	1.24	2480	6.24	ML	UU	PR - WF	
PR - WF, UU, Moor 09-25MU, 2, 2, FM	Moor 09-25MU	22.0	876.7	2	2	1.0	3.43	1.72	3430	2.72	3.98	1.99	3980	2.99	ML	UU	PR - WF	
PR - WF, UU, Moor 09-25MU, 2, 3, FM	Moor 09-25MU	22.0	876.7	2	3	2.0	5.78	2.89	5780	4.89	6.30	3.15	6300	5.15	ML	UU	PR - WF	
PR - Harwood, UU, Far 09-23MU, 4, 1, FM	Far 09-23MU	29.0	868.0	4	1	0.5	1.32	0.66	1320	1.16	1.47	0.74	1470	1.24	CH	UU	PR - Harwood	
PR - Harwood, UU, Far 09-23MU, 4, 2, FM	Far 09-23MU	29.0	868.0	4	2	1.0	1.18	0.59	1180	1.59	1.43	0.72	1430	1.72	CH	UU	PR - Harwood	
PR - Harwood, UU, Far 09-23MU, 4, 3, FM	Far 09-23MU	29.0	868.0	4	3	2.0	0.46	0.23	460	2.23	1.51	0.76	1510	2.76	CH	UU	PR - Harwood	
PR - Harwood, UU, Moor 09-25MU, 3, 1, FM	Moor 09-25MU	26.0	872.7	3	1	0.5	1.36	0.68	1360	1.18	1.46	0.73	1460	1.23	CH	UU	PR - Harwood	
PR - Harwood, UU, Moor 09-25MU, 3, 2, FM	Moor 09-25MU	26.0	872.7	3	2	1.0	1.42	0.71	1420	1.71	1.61	0.81	1610	1.81	CH	UU	PR - Harwood	
PR - Harwood, UU, Moor 09-25MU, 3, 3, FM	Moor 09-25MU	26.0	872.7	3	3	2.0	1.70	0.85	1700	2.85	1.86	0.93	1860	2.93	CH	UU	PR - Harwood	



Project: Fargo-Moorhead Metro Flood Risk Management Project
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TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION
							Ultimate Stress Values				Peak Stress Values						
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)			
OX Brenna, UU, Far 09-59MU, 1, 1, FM	Far 09-59MU	11.0	905.2	1	1	0.8	1.29	0.65	1290	1.40	1.35	0.68	1350	1.43	CH	UU	OX Brenna
OX Brenna, UU, Far 09-59MU, 1, 2, FM	Far 09-59MU	11.0	905.2	1	2	1.5	1.25	0.63	1250	2.13	1.37	0.69	1370	2.19	CH	UU	OX Brenna
OX Brenna, UU, Far 09-59MU, 1, 3, FM	Far 09-59MU	11.0	905.2	1	3	3.0	1.39	0.70	1390	3.70	1.47	0.74	1470	3.74	CH	UU	OX Brenna
OX Brenna, UU, Far 09-59MU, 2, 1, FM	Far 09-59MU	21.0	895.2	2	1	1.0	0.96	0.48	960	1.48	1.15	0.58	1150	1.58	CH	UU	OX Brenna
OX Brenna, UU, Far 09-59MU, 2, 2, FM	Far 09-59MU	21.0	895.2	2	2	2.0	0.99	0.50	990	2.50	1.19	0.60	1190	2.60	CH	UU	OX Brenna
OX Brenna, UU, Far 09-59MU, 2, 3, FM	Far 09-59MU	21.0	895.2	2	3	4.0	1.01	0.51	1010	4.51	1.05	0.53	1050	4.53	CH	UU	OX Brenna
OX Brenna, UU, Far 09-60MU, 1, 1, FM	Far 09-60MU	16.0	867.3	1	1	0.8	0.72	0.36	720	1.11	0.86	0.43	860	1.18	CH	UU	OX Brenna
OX Brenna, UU, Far 09-60MU, 1, 2, FM	Far 09-60MU	16.0	867.3	1	2	1.5	0.80	0.40	800	1.90	0.98	0.49	980	1.99	CH	UU	OX Brenna
OX Brenna, UU, Far 09-60MU, 1, 3, FM	Far 09-60MU	16.0	867.3	1	3	3.0	0.80	0.40	800	3.40	1.06	0.53	1060	3.53	CH	UU	OX Brenna
OX Brenna, UU, Far 09-60MU, 2, 1, FM	Far 09-60MU	26.0	857.3	2	1	1.0	1.09	0.55	1090	1.55	1.19	0.60	1190	1.60	CH	UU	OX Brenna
OX Brenna, UU, Far 09-60MU, 2, 2, FM	Far 09-60MU	26.0	857.3	2	2	2.0	0.73	0.37	730	2.37	0.82	0.41	820	2.41	CH	UU	OX Brenna
OX Brenna, UU, Far 09-60MU, 2, 3, FM	Far 09-60MU	26.0	857.3	2	3	4.0	0.85	0.43	850	4.43	0.86	0.43	860	4.43	CH	UU	OX Brenna
OX Brenna, UU, Far 10-105MU, 1, 1, FM	Far 10-105MU	16.0	881.0	1	1	0.5	1.20	0.60	1200	1.10	1.31	0.66	1310	1.16	CH	UU	OX Brenna
OX Brenna, UU, Far 10-105MU, 1, 2, FM	Far 10-105MU	16.0	881.0	1	2	1.0	1.35	0.68	1350	1.68	1.41	0.71	1410	1.71	CH	UU	OX Brenna
OX Brenna, UU, Far 10-105MU, 1, 3, FM	Far 10-105MU	16.0	881.0	1	3	2.0	1.17	0.59	1170	2.59	1.30	0.65	1300	2.65	CH	UU	OX Brenna
OX Brenna, UU, Far 11-110MU, 1, 1, FM	Far 11-110MU	26.0	891.6	1	1	0.5	1.06	0.53	1060	1.04	1.07	0.54	1070	1.05	CH	UU	OX Brenna
OX Brenna, UU, Far 11-110MU, 1, 2, FM	Far 11-110MU	26.0	891.6	1	2	1.0	1.13	0.57	1130	1.57	1.31	0.66	1310	1.66	CH	UU	OX Brenna
OX Brenna, UU, Far 11-110MU, 1, 3, FM	Far 11-110MU	26.0	891.6	1	3	2.0	1.08	0.54	1080	2.56	1.26	0.63	1260	2.65	CH	UU	OX Brenna
OX Brenna, UU, Far 11-118MU, 1, 1, FM	Far 11-118MU	20.5	892.2	1	1	0.8	0.56	0.28	560	1.03	0.60	0.30	600	1.05	CH	UU	OX Brenna
OX Brenna, UU, Far 11-118MU, 1, 2, FM	Far 11-118MU	20.5	892.2	1	2	1.5	0.82	0.41	820	1.91	0.87	0.44	870	1.94	CH	UU	OX Brenna
OX Brenna, UU, Far 11-118MU, 1, 3, FM	Far 11-118MU	20.5	892.2	1	3	3.0	0.95	0.48	950	3.48	1.18	0.59	1180	3.59	CH	UU	OX Brenna
? OX B, UU, Far 11-122MU, 2, 1, FM PED	Far 11-122MU	19.0	874.8	2	1	0.8	0.56	0.28	560	1.03	1.10	0.55	1100	1.30	CH	UU	? OX B
? OX B, UU, Far 11-122MU, 2, 2, FM PED	Far 11-122MU	19.0	874.8	2	2	1.5	0.56	0.28	560	1.79	0.99	0.50	990	2.01	CH	UU	? OX B
? OX B, UU, Far 11-122MU, 2, 3, FM PED	Far 11-122MU	19.0	874.8	2	3	3.0	0.66	0.33	660	3.33	0.98	0.49	980	3.49	CH	UU	? OX B



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Undrained Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: OCT 09 Date: 12/5/2012

TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION
							Ultimate Stress Values				Peak Stress Values						
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)			
OX Brenna, UU, Far 12-162MU, 2, 1, FM PED	Far 12-162MU	15.0	878.4	2	1	0.8	0.51	0.25	506	1.01	1.00	0.50	1002	1.26	CH	UU	OX Brenna
OX Brenna, UU, Far 12-162MU, 2, 2, FM PED	Far 12-162MU	15.0	878.4	2	2	1.5	0.56	0.28	564	1.79	0.88	0.44	881	1.95	CH	UU	OX Brenna
OX Brenna, UU, Far 12-162MU, 2, 3, FM PED	Far 12-162MU	15.0	878.4	2	3	3.0	0.67	0.34	672	3.34	1.04	0.52	1040	3.52	CH	UU	OX Brenna
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
OX Brenna, UU, 84-2M, 1, 1, WF	84-2M	10.8	893.8	1	1	1.0	1.08	0.54	1080	1.54	1.11	0.56	1110	1.56	CH	UU	OX Brenna
OX Brenna, UU, 84-2M, 1, 2, WF	84-2M	10.8	893.8	1	2	2.0	1.27	0.64	1270	2.64	1.27	0.64	1270	2.64	CH	UU	OX Brenna
OX Brenna, UU, 84-2M, 1, 3, WF	84-2M	10.8	893.8	1	3	4.0	1.10	0.55	1100	4.55	1.14	0.57	1140	4.57	CH	UU	OX Brenna
OX Brenna, UU, 85-4M, 1, 1, WF	85-4M	9.0	904.2	1	1	0.5	0.78	0.39	776	0.89	0.81	0.40	808	0.90	CH	UU	OX Brenna
OX Brenna, UU, 85-4M, 1, 2, WF	85-4M	9.0	904.2	1	2	1.0	0.91	0.45	906	1.45	0.93	0.46	929	1.46	CH	UU	OX Brenna
OX Brenna, UU, 85-4M, 1, 3, WF	85-4M	9.0	904.2	1	3	2.0	0.75	0.37	748	2.37	0.86	0.43	862	2.43	CH	UU	OX Brenna
OX Brenna, UU, 85-6M, 1, 1, WF	85-6M	8.0	894.2	1	1	0.5	0.70	0.35	701	0.85	0.72	0.36	718	0.86	CH	UU	OX Brenna
OX Brenna, UU, 85-6M, 1, 2, WF	85-6M	8.0	894.2	1	2	1.0	0.95	0.48	950	1.48	1.03	0.52	1030	1.52	CH	UU	OX Brenna
OX Brenna, UU, 85-6M, 1, 3, WF	85-6M	8.0	894.2	1	3	2.0	0.74	0.37	741	2.37	0.74	0.37	741	2.37	CH	UU	OX Brenna
OX Brenna, UU, 85-7M, 1, 1, WF	85-7M	5.9	895.7	1	1	0.5	1.16	0.58	1160	1.08	1.25	0.63	1250	1.13	CH	UU	OX Brenna
OX Brenna, UU, 85-7M, 1, 2, WF	85-7M	5.9	895.7	1	2	1.0	1.55	0.78	1550	1.78	1.60	0.80	1600	1.80	CH	UU	OX Brenna
OX Brenna, UU, 85-7M, 1, 3, WF	85-7M	5.9	895.7	1	3	2.0	1.44	0.72	1440	2.72	1.62	0.81	1620	2.81	CH	UU	OX Brenna
OX Brenna, UU, 85-12M, 2, 1, WF	85-12M	16.0	881.3	2	1	0.5	2.02	1.01	2020	1.51	2.04	1.02	2040	1.52	CH	UU	OX Brenna
OX Brenna, UU, 85-12M, 2, 2, WF	85-12M	16.0	881.3	2	2	1.0	2.40	1.20	2400	2.20	2.40	1.20	2400	2.20	CH	UU	OX Brenna
OX Brenna, UU, 85-12M, 2, 3, WF	85-12M	16.0	881.3	2	3	2.0	2.28	1.14	2280	3.14	2.28	1.14	2280	3.14	CH	UU	OX Brenna
OX Brenna, UU, 86-28M, 2, 1, WF	86-28M	21.0	896.6	2	1	1.0	1.31	0.66	1310	1.66	1.74	0.87	1740	1.87	CH	UU	OX Brenna
OX Brenna, UU, 86-28M, 2, 2, WF	86-28M	21.0	896.6	2	2	2.0	1.39	0.70	1390	2.70	1.58	0.79	1580	2.79	CH	UU	OX Brenna
OX Brenna, UU, 86-28M, 2, 3, WF	86-28M	21.0	896.6	2	3	4.0	1.59	0.80	1590	4.80	2.36	1.18	2360	5.18	CH	UU	OX Brenna
Brenna, UU, Far 09-23MU, 5, 1, FM	Far 09-23MU	39.0	858.0	5	1	0.8	0.65	0.33	650	1.08	0.79	0.40	790	1.15	CH	UU	Brenna
Brenna, UU, Far 09-23MU, 5, 2, FM	Far 09-23MU	39.0	858.0	5	2	1.5	0.59	0.30	590	1.80	0.82	0.41	820	1.91	CH	UU	Brenna
Brenna, UU, Far 09-23MU, 5, 3, FM	Far 09-23MU	39.0	858.0	5	3	3.0	0.73	0.37	730	3.37	0.83	0.42	830	3.42	CH	UU	Brenna
Brenna, UU, Far 09-23MU, 6, 1, FM	Far 09-23MU	81.0	816.0	6	1	1.0	0.76	0.38	760	1.38	0.86	0.43	860	1.43	CH	UU	Brenna
Brenna, UU, Far 09-23MU, 6, 2, FM	Far 09-23MU	81.0	816.0	6	2	2.0	0.63	0.32	630	2.32	0.76	0.38	760	2.38	CH	UU	Brenna
Brenna, UU, Far 09-23MU, 6, 3, FM	Far 09-23MU	81.0	816.0	6	3	4.0	0.71	0.36	710	4.36	0.71	0.36	710	4.36	CH	UU	Brenna
Brenna, UU, Far 09-26MU, 3, 1, FM	Far 09-26MU	29.0	874.5	3	1	1.0	0.43	0.22	430	1.22	1.29	0.65	1290	1.65	CH	UU	Brenna
Brenna, UU, Far 09-26MU, 3, 2, FM	Far 09-26MU	29.0	874.5	3	2	2.0	0.88	0.44	880	2.44	1.32	0.66	1320	2.66	CH	UU	Brenna
Brenna, UU, Far 09-26MU, 3, 3, FM	Far 09-26MU	29.0	874.5	3	3	4.0	0.81	0.41	810	4.41	0.94	0.47	940	4.47	CH	UU	Brenna
Brenna, UU, Far 09-27MU, 4, 1, FM	Far 09-27MU	65.0	838.1	4	1	1.0	0.68	0.34	680	1.34	0.79	0.40	790	1.40	CH	UU	Brenna
Brenna, UU, Far 09-27MU, 4, 2, FM	Far 09-27MU	65.0	838.1	4	2	2.0	0.75	0.38	750	2.38	0.86	0.43	860	2.43	CH	UU	Brenna
Brenna, UU, Far 09-27MU, 4, 3, FM	Far 09-27MU	65.0	838.1	4	3	4.0	0.82	0.41	820	4.41	0.84	0.42	840	4.42	CH	UU	Brenna
Brenna, UU, Far 09-60MU, 3, 1, FM	Far 09-60MU	36.0	847.3	3	1	1.0	0.87	0.44	870	1.44	1.19	0.60	1190	1.60	CH	UU	Brenna
Brenna, UU, Far 09-60MU, 3, 2, FM	Far 09-60MU	36.0	847.3	3	2	2.0	1.03	0.52	1030	2.52	1.42	0.71	1420	2.71	CH	UU	Brenna
Brenna, UU, Far 09-60MU, 3, 3, FM	Far 09-60MU	36.0	847.3	3	3	4.0	1.03	0.52	1030	4.52	1.36	0.68	1360	4.68	CH	UU	Brenna



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Undrained Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: OCT 09 Date: 12/5/2012

TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION
							Ultimate Stress Values				Peak Stress Values						
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)			
Brenna, UU, Far 10-78MU, 2, 1, FM	Far 10-78MU	26.0	879.7	2	1	1.0	0.71	0.36	710	1.36	0.97	0.49	970	1.49	CH	UU	Brenna
Brenna, UU, Far 10-78MU, 2, 2, FM	Far 10-78MU	26.0	879.7	2	2	2.0	0.97	0.49	970	2.49	1.14	0.57	1140	2.57	CH	UU	Brenna
Brenna, UU, Far 10-78MU, 2, 3, FM	Far 10-78MU	26.0	879.7	2	3	4.0	1.14	0.57	1140	4.57	1.47	0.74	1470	4.74	CH	UU	Brenna
Brenna, UU, Far 10-80MU, 2, 1, FM	Far 10-80MU	36.0	885.1	2	1	1.0	0.88	0.44	880	1.44	0.93	0.47	930	1.47	CH	UU	Brenna
Brenna, UU, Far 10-80MU, 2, 2, FM	Far 10-80MU	36.0	885.1	2	2	2.0	0.92	0.46	920	2.46	1.09	0.55	1090	2.55	CH	UU	Brenna
Brenna, UU, Far 10-80MU, 2, 3, FM	Far 10-80MU	36.0	885.1	2	3	4.0	1.14	0.57	1140	4.57	1.41	0.71	1410	4.71	CH	UU	Brenna
Brenna, UU, Far 10-105MU, 2, 1, FM	Far 10-105MU	26.0	871.0	2	1	0.5	0.97	0.49	970	0.99	1.18	0.59	1180	1.09	CH	UU	Brenna
Brenna, UU, Far 10-105MU, 2, 2, FM	Far 10-105MU	26.0	871.0	2	2	1.0	1.05	0.53	1050	1.53	1.33	0.67	1330	1.67	CH	UU	Brenna
Brenna, UU, Far 10-105MU, 2, 3, FM	Far 10-105MU	26.0	871.0	2	3	2.0	0.93	0.47	930	2.47	1.06	0.53	1060	2.53	CH	UU	Brenna
Brenna, UU, Far 10-105MU, 3, 1, FM	Far 10-105MU	36.0	861.0	3	1	0.5	0.72	0.36	720	0.86	1.01	0.51	1010	1.01	CH	UU	Brenna
Brenna, UU, Far 10-105MU, 3, 2, FM	Far 10-105MU	36.0	861.0	3	2	1.0	0.69	0.35	690	1.35	0.76	0.38	760	1.38	CH	UU	Brenna
Brenna, UU, Far 10-105MU, 3, 3, FM	Far 10-105MU	36.0	861.0	3	3	2.0	0.67	0.34	670	2.34	0.75	0.38	750	2.38	CH	UU	Brenna
Brenna, UU, Moor 11-107MU, 1, 1, FM	loor 11-107M	21.0	893.2	1	1	0.8	1.48	0.74	1480	1.49	2.25	1.13	2250	1.88	CH	UU	Brenna
Brenna, UU, Moor 11-107MU, 1, 2, FM	loor 11-107M	21.0	893.2	1	2	1.5	2.02	1.01	2020	2.51	2.25	1.13	2250	2.63	CH	UU	Brenna
Brenna, UU, Moor 11-107MU, 1, 3, FM	loor 11-107M	21.0	893.2	1	3	3.0	2.08	1.04	2080	4.04	2.31	1.16	2310	4.16	CH	UU	Brenna
Brenna, UU, Moor 11-107MU, 2, 1, FM	loor 11-107M	31.0	883.2	2	1	0.5	1.96	0.98	1960	1.48	2.56	1.28	2560	1.78	CH	UU	Brenna
Brenna, UU, Moor 11-107MU, 2, 2, FM	loor 11-107M	31.0	883.2	2	2	1.0	1.75	0.88	1750	1.88	1.99	1.00	1990	2.00	CH	UU	Brenna
Brenna, UU, Moor 11-107MU, 2, 3, FM	loor 11-107M	31.0	883.2	2	3	2.0	1.77	0.89	1770	2.89	2.13	1.07	2130	3.07	CH	UU	Brenna
Brenna, UU, Far 11-110MU, 2, 1, FM	Far 11-110MU	36.0	881.6	2	1	0.5	0.86	0.43	860	0.94	1.11	0.56	1110	1.07	CH	UU	Brenna
Brenna, UU, Far 11-110MU, 2, 2, FM	Far 11-110MU	36.0	881.6	2	2	1.0	1.02	0.51	1020	1.51	1.13	0.57	1130	1.57	CH	UU	Brenna
Brenna, UU, Far 11-110MU, 2, 3, FM	Far 11-110MU	36.0	881.6	2	3	2.0	0.87	0.44	870	2.45	1.27	0.64	1270	2.65	CH	UU	Brenna
Brenna, UU, Far 11-110MU, 3, 1, FM	Far 11-110MU	49.0	868.6	3	1	0.8	1.72	0.86	1720	1.62	2.07	1.04	2070	1.80	CH	UU	Brenna
Brenna, UU, Far 11-110MU, 3, 2, FM	Far 11-110MU	49.0	868.6	3	2	1.5	0.78	0.39	780	1.90	1.50	0.75	1500	2.26	CH	UU	Brenna
Brenna, UU, Far 11-110MU, 3, 3, FM	Far 11-110MU	49.0	868.6	3	3	3.0	0.95	0.48	950	3.50	1.34	0.67	1340	3.69	CH	UU	Brenna
Brenna, UU, Far 11-118MU, 2, 1, FM	Far 11-118MU	34.0	878.7	2	1	0.5	1.17	0.59	1170	1.09	1.17	0.59	1170	1.09	CH	UU	Brenna
Brenna, UU, Far 11-118MU, 2, 2, FM	Far 11-118MU	34.0	878.7	2	2	1.0	0.83	0.42	830	1.42	1.30	0.65	1300	1.65	CH	UU	Brenna
Brenna, UU, Far 11-118MU, 2, 3, FM	Far 11-118MU	34.0	878.7	2	3	2.0	1.19	0.60	1190	2.60	1.25	0.63	1250	2.63	CH	UU	Brenna
Brenna, UU, Far 11-119MU, 1, 1, FM	Far 11-119MU	31.0	876.1	1	1	0.5	1.10	0.55	1100	1.05	1.10	0.55	1100	1.05	CH	UU	Brenna
Brenna, UU, Far 11-119MU, 1, 2, FM	Far 11-119MU	31.0	876.1	1	2	1.0	0.95	0.48	950	1.48	1.08	0.54	1080	1.54	CH	UU	Brenna
Brenna, UU, Far 11-119MU, 1, 3, FM	Far 11-119MU	31.0	876.1	1	3	2.0	0.70	0.35	700	2.35	0.75	0.38	750	2.38	CH	UU	Brenna
Brenna, UU, Moor 09-25MU, 4, 1, FM	Moor 09-25MU	39.0	859.7	4	1	0.8	0.66	0.33	660	1.08	0.66	0.33	660	1.08	CH	UU	Brenna
Brenna, UU, Moor 09-25MU, 4, 2, FM	Moor 09-25MU	39.0	859.7	4	2	1.5	0.67	0.34	670	1.84	0.67	0.34	670	1.84	CH	UU	Brenna
Brenna, UU, Moor 09-25MU, 4, 3, FM	Moor 09-25MU	39.0	859.7	4	3	3.0	0.67	0.34	670	3.34	0.79	0.40	790	3.40	CH	UU	Brenna
Brenna, UU, Moor 11-111MU, 2, 1, FM PED	loor 11-111M	22.0	893.1	2	1	0.5	0.57	0.29	570	0.79	0.60	0.30	600	0.80	CH	UU	Brenna
Brenna, UU, Moor 11-111MU, 2, 2, FM PED	loor 11-111M	22.0	893.1	2	2	1.0	0.82	0.41	820	1.41	1.14	0.57	1140	1.57	CH	UU	Brenna
Brenna, UU, Moor 11-111MU, 2, 3, FM PED	loor 11-111M	22.0	893.1	2	3	2.0	0.72	0.36	720	2.38	0.76	0.38	760	2.40	CH	UU	Brenna
Brenna, UU, Moor 11-111MU, 3, 1, FM PED	loor 11-111M	27.0	888.1	3	1	0.5	0.98	0.49	980	1.00	0.98	0.49	980	1.00	CH	UU	Brenna
Brenna, UU, Moor 11-111MU, 3, 2, FM PED	loor 11-111M	27.0	888.1	3	2	1.0	0.61	0.31	610	1.31	0.61	0.31	610	1.31	CH	UU	Brenna
Brenna, UU, Moor 11-111MU, 3, 3, FM PED	loor 11-111M	27.0	888.1	3	3	2.0	1.13	0.57	1130	2.57	1.32	0.66	1320	2.66	CH	UU	Brenna
Brenna, UU, Far 11-122MU, 3, 1, FM PED	Far 11-122MU	43.0	850.8	3	1	0.5	0.61	0.31	610	0.81	1.23	0.62	1230	1.12	CH	UU	Brenna
Brenna, UU, Far 11-122MU, 3, 2, FM PED	Far 11-122MU	43.0	850.8	3	2	1.0	0.72	0.36	720	1.35	1.29	0.65	1290	1.64	CH	UU	Brenna
Brenna, UU, Far 11-122MU, 3, 3, FM PED	Far 11-122MU	43.0	850.8	3	3	2.0	0.58	0.29	580	2.26	0.78	0.39	780	2.36	CH	UU	Brenna



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Undrained Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: OCT 09 Date: 12/5/2012

TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION
							Ultimate Stress Values				Peak Stress Values						
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)			
Brenna, UU, Far 11-127MU, 3, 1, FM PED	Far 11-127MU	39.0	841.2	3	1	1.0	0.76	0.38	760	1.39	1.85	0.93	1850	1.94	CH	UU	Brenna
Brenna, UU, Far 11-127MU, 3, 2, FM PED	Far 11-127MU	39.0	841.2	3	2	2.0	1.20	0.60	1200	2.60	1.83	0.92	1830	2.92	CH	UU	Brenna
Brenna, UU, Far 11-127MU, 3, 3, FM PED	Far 11-127MU	39.0	841.2	3	3	4.0	0.89	0.45	890	4.46	1.03	0.52	1030	4.53	CH	UU	Brenna
? B, UU, Moor 11-111MU, 4, 1, FM PED	loor 11-111M	43.0	872.1	4	1	0.8	1.08	0.54	1080	1.30	1.55	0.78	1550	1.54	CH	UU	? B
? B, UU, Moor 11-111MU, 4, 2, FM PED	loor 11-111M	43.0	872.1	4	2	1.5	0.90	0.45	900	1.96	1.64	0.82	1640	2.33	CH	UU	? B
? B, UU, Moor 11-111MU, 4, 3, FM PED	loor 11-111M	43.0	872.1	4	3	3.0	1.00	0.50	1000	3.50	1.45	0.73	1450	3.73	CH	UU	? B
Brenna, UU, Far 12-162MU, 3, 1, FM PED	Far 12-162MU	23.9	869.5	3	1	0.8	0.59	0.29	586	1.05	1.16	0.58	1164	1.34	CH	UU	Brenna
Brenna, UU, Far 12-162MU, 3, 2, FM PED	Far 12-162MU	23.9	869.5	3	2	1.5	0.65	0.32	646	1.82	0.97	0.49	973	1.99	CH	UU	Brenna
Brenna, UU, Far 12-162MU, 3, 3, FM PED	Far 12-162MU	23.9	869.5	3	3	3.0	0.90	0.45	900	3.46	1.37	0.69	1372	3.70	CH	UU	Brenna
Brenna, UU, 01-12MU, 2, 1, FRW	01-12MU	30.0	854.0	2	1	1.0	0.36	0.18	360	1.18	0.53	0.27	530	1.27	CH	UU	Brenna
Brenna, UU, 01-12MU, 2, 2, FRW	01-12MU	30.0	854.0	2	2	2.0	0.45	0.23	450	2.23	0.60	0.30	600	2.30	CH	UU	Brenna
Brenna, UU, 01-12MU, 2, 3, FRW	01-12MU	30.0	854.0	2	3	4.0	0.49	0.25	490	4.25	0.61	0.31	610	4.31	CH	UU	Brenna
Brenna, UU, 06-18MU, 2, 1, FRW	06-18MU	52.0	837.7	2	1	1.0	0.69	0.35	690	1.35	1.24	0.62	1240	1.62	CH	UU	Brenna
Brenna, UU, 06-18MU, 2, 2, FRW	06-18MU	52.0	837.7	2	2	2.0	0.62	0.31	620	2.31	1.20	0.60	1200	2.60	CH	UU	Brenna
Brenna, UU, 06-18MU, 2, 3, FRW	06-18MU	52.0	837.7	2	3	4.0	0.59	0.30	590	4.30	1.31	0.66	1310	4.66	CH	UU	Brenna
Brenna, UU, 84-1M, 3, 1, WF	84-1M	19.0	877.1	3	1	1.0	0.42	0.21	417	1.21	0.55	0.28	551	1.28	CH	UU	Brenna
Brenna, UU, 84-1M, 3, 2, WF	84-1M	19.0	877.1	3	2	2.0	0.41	0.21	414	2.21	0.62	0.31	623	2.31	CH	UU	Brenna
Brenna, UU, 84-1M, 3, 3, WF	84-1M	19.0	877.1	3	3	4.0	0.46	0.23	458	4.23	0.58	0.29	577	4.29	CH	UU	Brenna
Brenna, UU, 84-1M, 4, 1, WF	84-1M	29.0	867.4	4	1	1.0	0.55	0.27	549	1.27	0.84	0.42	839	1.42	CH	UU	Brenna
Brenna, UU, 84-1M, 4, 2, WF	84-1M	29.0	867.4	4	2	2.0	0.55	0.27	548	2.27	0.73	0.37	731	2.37	CH	UU	Brenna
Brenna, UU, 84-1M, 4, 3, WF	84-1M	29.0	867.4	4	3	4.0	0.48	0.24	479	4.24	0.78	0.39	777	4.39	CH	UU	Brenna
Brenna, UU, 84-2M, 3, 1, WF	84-2M	21.0	883.6	3	1	1.0	0.70	0.35	703	1.35	0.77	0.38	768	1.38	CH	UU	Brenna
Brenna, UU, 84-2M, 3, 2, WF	84-2M	21.0	883.6	3	2	2.0	0.74	0.37	738	2.37	0.89	0.44	889	2.44	CH	UU	Brenna
Brenna, UU, 84-2M, 3, 3, WF	84-2M	21.0	883.6	3	3	4.0	0.73	0.37	731	4.37	0.90	0.45	902	4.45	CH	UU	Brenna
Brenna, UU, 85-4M, 6, 1, WF	85-4M	48.0	865.2	6	1	1.0	0.83	0.42	831	1.42	1.33	0.67	1330	1.67	CH	UU	Brenna
Brenna, UU, 85-4M, 6, 2, WF	85-4M	48.0	865.2	6	2	2.0	0.81	0.41	811	2.41	1.11	0.56	1110	2.56	CH	UU	Brenna
Brenna, UU, 85-4M, 6, 3, WF	85-4M	48.0	865.2	6	3	4.0	0.86	0.43	864	4.43	1.23	0.62	1230	4.62	CH	UU	Brenna
Brenna, UU, 85-6M, 3, 1, WF	85-6M	31.0	871.2	3	1	1.0	0.64	0.32	637	1.32	0.78	0.39	784	1.39	CH	UU	Brenna
Brenna, UU, 85-6M, 3, 2, WF	85-6M	31.0	871.2	3	2	2.0	0.71	0.35	708	2.35	0.98	0.49	981	2.49	CH	UU	Brenna
Brenna, UU, 85-6M, 3, 3, WF	85-6M	31.0	871.2	3	3	4.0	0.73	0.36	728	4.36	0.97	0.48	966	4.48	CH	UU	Brenna
Brenna, UU, 85-7M, 3, 1, WF	85-7M	22.0	879.6	3	1	0.5	0.20	0.10	203	0.60	0.44	0.22	435	0.72	CH	UU	Brenna
Brenna, UU, 85-7M, 3, 2, WF	85-7M	22.0	879.6	3	2	1.0	0.53	0.26	526	1.26	0.62	0.31	615	1.31	CH	UU	Brenna
Brenna, UU, 85-7M, 3, 3, WF	85-7M	22.0	879.6	3	3	2.0	0.41	0.20	409	2.20	0.66	0.33	664	2.33	CH	UU	Brenna
Brenna, UU, 85-10M, 1, 1, WF	85-10M	16.0	880.1	1	1	0.5	0.37	0.19	373	0.69	0.49	0.24	485	0.74	CH	UU	Brenna
Brenna, UU, 85-10M, 1, 2, WF	85-10M	16.0	880.1	1	2	1.0	0.54	0.27	538	1.27	0.63	0.32	633	1.32	CH	UU	Brenna
Brenna, UU, 85-10M, 1, 3, WF	85-10M	16.0	880.1	1	3	2.0	0.49	0.24	489	2.24	0.47	0.24	470	2.24	CH	UU	Brenna
Brenna, UU, 85-10M, 3, 1, WF	85-10M	26.0	870.1	3	1	0.5	0.40	0.20	395	0.70	0.48	0.24	484	0.74	CH	UU	Brenna
Brenna, UU, 85-10M, 3, 2, WF	85-10M	26.0	870.1	3	2	1.0	0.38	0.19	382	1.19	0.47	0.24	472	1.24	CH	UU	Brenna
Brenna, UU, 85-10M, 3, 3, WF	85-10M	26.0	870.1	3	3	2.0	0.42	0.21	421	2.21	0.56	0.28	562	2.28	CH	UU	Brenna



Project: Fargo-Moorhead Metro Flood Risk Management Project
 Subject: Undrained Shear Strength Data from Borings
 Compiled By: KAH Revised By: GSW
 Date: OCT 09 Date: 12/5/2012

TEST NO.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	σ_c (tsf)	Q Strengths								USCS SOIL TYPE	TEST	FORMATION	
							Ultimate Stress Values				Peak Stress Values							
							σ_d (tsf)	q (tsf)	q (psf)	p (tsf)	σ_d (tsf)	q (tsf)	q (psf)	p (tsf)				
Argusville, UU, SB-3, , 1, SS-40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Argusville, UU, SB-3, , 2, SS-40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Argusville, UU, SB-3, , 3, SS-40	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Argusville, UU, ST-1, 1B, 1, SS-MP	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Argusville, UU, ST-8, 8A, 1, SS-MP	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Unit "A" Till, UU, Far 10-105MU, 6, 1, FM	Far 10-105MU	68.0	829.0	6	1	2.0	1.23	0.62	1230	2.62	1.24	0.62	1240	2.62	CH	UU	Unit "A" Till	
Unit "A" Till, UU, Far 10-105MU, 6, 2, FM	Far 10-105MU	68.0	829.0	6	2	4.0	2.40	1.20	2400	5.20	2.41	1.21	2410	5.21	CH	UU	Unit "A" Till	
Unit "A" Till, UU, Far 11-110MU, 6, 1, FM	Far 11-110MU	66.0	851.6	6	1	1.0	1.96	0.98	1960	1.99	2.43	1.22	2430	2.23	CH	UU	Unit "A" Till	
Unit "A" Till, UU, Far 11-110MU, 6, 2, FM	Far 11-110MU	66.0	851.6	6	2	2.0	2.20	1.10	2200	3.11	2.56	1.28	2560	3.29	CH	UU	Unit "A" Till	
Unit "A" Till, UU, Far 11-110MU, 6, 3, FM	Far 11-110MU	66.0	851.6	6	3	4.0	2.31	1.16	2310	5.17	2.58	1.29	2580	5.30	CH	UU	Unit "A" Till	



Project: Fargo-Moorhead Metro Flood Risk Management Project

Subject: Residual Direct Shear Strength Data from Borings

Compiled By: KAH
Date: 2 DEC 09

Revised By: KAH
Date: 10/29/2010

Project, Formation, Test, Boring, Sample No., Specimen No.	BORING NO.	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SPEC. NO.	LL (%)	MC (%)	PL (%)	PI (%)	LI	G _s	e	γ _d (pcf)	γ _m (pcf)	γ _{sat} (pcf)	Residual Stress Values		USCS SOIL TYPE	TEST	FORMATION	PROJECT	PROJECT #
																σ _{ff} (tsf)	τ _{ff} (tsf)					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	45	44	46	47	48	49	50
Alluvium, Res DS, Far 09-25MU, 1, 1, FM	Far 09-25MU	15.0	878.4	1	1		31.6				2.75	0.95	88.2	116.1	118.5	1.511	0.550	CH	Res DS	Alluvium	FM	
Alluvium, Res DS, Far 09-27MU, 1, 1, FM	Far 09-27MU	7.0	896.1	1	1	75	29.7	18	57	0.21	2.71	0.85	91.6	118.8	120.2	1.511	0.277	CH	Res DS	Alluvium	FM	
Sherack, Res DS, Far 09-26MU, 1, 1, FM	Far 09-26MU	9.0	894.5	1	1		34.8				2.74	0.98	86.3	116.3	117.2	1.511	0.339	CH	Res DS	Sherack	FM	
Sherack, Res DS, Moor 09-34MU, 1, 1, FM	Moor 09-34MU	9.0	898.9	1	1		40.5				2.75	1.17	79.2	111.3	112.8	1.511	0.339	CH	Res DS	Sherack	FM	
Sherack, Res DS, Moor 09-53MU, 1, 1, FM	Moor 09-53MU	19.0	881.5	1	1	55	40.3	21	34	0.57	2.75	1.13	80.4	112.8	113.6	1.511	0.726	CH	Res DS	Sherack	FM	
Sherack, Res DS, 01-12MU, 1, 1, FRW	01-12MU	19.0	865.0	1	1	53	97.2	21	32	2.38	2.68	0.72	97.2	191.7	123.3	2.000	0.850	CH	Res DS	Sherack	FRW	
PL Sherack, Res DS, 01-05MU, 1, 1, FRW	01-05MU	16.0	885.7	1	1	78	35.5	28	50	0.15	2.71	1.04	82.9	112.3	114.7	2.000	0.240	CH	Res DS	PL Sherack	FRW	
OX Brenna, Res DS, Moor 09-34MU, 2, 1, FM	Moor 09-34MU	15.0	883.0	2	1	114	62.5	24	90	0.43	2.70	1.69	62.7	101.9	101.9	2.000	0.195	CH	Res DS	OX Brenna	FM	
Poplar River, Res DS, 01-10MU, 1, 1, FRW	01-10MU	21.0	860.0	1	1	61	30.3	24	37	0.17	2.73	0.85	92.3	120.3	120.8	2.000	0.900	CH	Res DS	Poplar River	FRW	
Brenna, Res DS, Far 09-25MU, 4, 1, FM	Far 09-25MU	51.0	842.4	4	1	108	57.7	22	86	0.42	2.75	1.60	66.0	104.1	104.4	2.000	0.355	CH	Res DS	Brenna	FM	
Brenna, Res DS, Far 09-26MU, 3, 1, FM	Far 09-26MU	29.0	874.5	3	1	110	52.1	24	86	0.33	2.75	1.45	70.0	106.5	106.9	1.511	0.303	CH	Res DS	Brenna	FM	
Brenna, Res DS, Far 09-26MU, 3, 2, FM	Far 09-26MU	29.0	874.5	3	2	110	52.2	24	86	0.33	2.75	1.44	70.3	107.0	107.1	1.511	0.276	CH	Res DS	Brenna	FM	
Brenna, Res DS, Far 09-27MU, 3, 1, FM	Far 09-27MU	33.0	870.1	3	1	117	65.0	25	92	0.43	2.75	1.83	60.7	100.2	101.0	2.000	0.301	CH	Res DS	Brenna	FM	
Brenna, Res DS, 01-12MU, 2, 1, FRW	01-12MU	31.0	853.0	2	1	118	67.7	33	85	0.41	2.74	1.92	58.5	98.1	99.6	2.000	0.290	CH	Res DS	Brenna	FRW	
B/A Trans, Res DS, Far 09-27MU, 4, 1, FM	Far 09-27MU	65.0	838.1	4	1	111	52.2	25	86	0.32	2.70	1.43	69.5	105.8	106.2	2.000	0.378	CH	Res DS	B/A Trans	FM	
B/A Trans, Res DS, Far 09-27MU, 4, 2, FM	Far 09-27MU	66.0	837.1	4	2	111	49.8	25	86	0.29	2.70	1.35	71.9	107.7	107.7	2.000	0.463	CH	Res DS	B/A Trans	FM	
Argusville, Res DS, Far 09-25MU, 5, 1, FM	Far 09-25MU	67.0	826.4	5	1	81	52.1	20	61	0.53	2.71	1.41	70.2	106.8	106.7	2.000	0.400	CH	Res DS	Argusville	FM	
Argusville, Res DS, Moor 09-34MU, 4, 1, FM	Moor 09-34MU	57.0	841.0	4	1	79	48.5	21	58	0.47	2.75	1.37	72.6	107.8	108.6	2.000	0.500	CH	Res DS	Argusville	FM	
Argusville, Res DS, 01-05MU, 4, 1, FRW	01-05MU	78.0	823.7	4	1	99	58.1	28	71	0.42	2.77	1.66	64.9	102.6	103.9	2.000	0.320	CH	Res DS	Argusville	FRW	

Project: Fargo-Moorhead Metro Flood Risk Management Project

Subject: Summary of Consolidated Parameters

Computed By: KAH

Date: 8/6/2012

Formation	OCR					C _r					C _c					e _o				
	Average	Max	Min	σ	Avg - 1σ	Average	Max	Min	σ	Avg + 1σ	Average	Max	Min	σ	Avg + 1σ	Average	Max	Min	σ	Avg - 1σ
Alluvium	3.77	4.75	2.2	1.11	2.7	0.034	0.08	0.012	0.031	0.065	0.24	0.3	0.14	0.07	0.31	0.84	0.93	0.75	0.07	0.77
Sherack	3.62	4.44	2.8	1.47	2.2	0.051	0.072	0.042	0.018	0.069	0.22	0.2	0.17	0.06	0.28	0.79	0.91	0.67	0.14	0.65
Ox. Brenna	4.2	5.44	2.34	1.00	3.2	0.154	0.22	0.091	0.04	0.194	0.59	0.8	0.38	0.13	0.72	1.41	1.66	1.2	0.14	1.27
Brenna	3.08	4.73	1.51	1.03	2.1	0.141	0.25	0.022	0.073	0.214	0.77	1.28	0.29	0.29	1.06	1.47	1.99	0.97	0.3	1.17
Argusville	2.17	2.86	1.13	1.11	1.1	0.113	0.225	0.033	0.057	0.17	0.75	1.26	0.38	0.24	0.99	1.36	1.8	0.97	0.25	1.11

Case 1 - Mean			
OCR	C _r	C _c	e _o
3.8	0.034	0.24	0.84
3.6	0.051	0.22	0.79
4.2	0.154	0.59	1.41
3.1	0.141	0.77	1.47
2.2	0.113	0.75	1.36

Case 2 - Mean + St dev			
OCR	C _r	C _c	e _o
2.7	0.065	0.31	0.77
2.2	0.069	0.28	0.65
3.2	0.194	0.72	1.27
2.1	0.214	1.06	1.17
1.1	0.17	0.99	1.11

Project, Formation, Boring, Sample No., Specimen No.	BORING NO.	TOP BORING ELEV. (feet)	Depth to GWT (feet)	Water Table Elevation (feet)	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SP EC	LL (%)	MC (%)	PL (%)	PI (%)	LI	G _s	e	γ _d (pcf)	γ _m (pcf)	γ _{sat} (pcf)	COE p _c (tsf)	Lab p _c (tsf)	p _o (tsf)	OCR	COE Cc	Lab Cc	COE Cr	Lab Cr	USCS SOIL TYPE	FORMATION	PROJECT	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
PR - WF, Moor 09-25MU, 2, FM	Moor 09-25MU	898.7	8.8	889.9	22.0	876.7	2		30	28.3	24	6	0.72	2.75	0.78	96.6	123.9	123.8	1.6		0.93	1.72	0.05		0.01		ML	PR - WF	FM	
PR - Harwood, Moor 09-25MU, 3, FM	Moor 09-25MU	898.7	8.8	889.9	26.0	872.7	3		80	36.3	21	59	0.26	2.75	1.03	84.7	115.4	116.3	3.4		1.04	3.27	0.29		0.07		CH	PR - Harwood	FM	
Brenna, Moor 09-25MU, 4, FM	Moor 09-25MU	898.7	8.8	889.9	39.0	859.7	4		116	70.5	25	91	0.50	2.75	1.99	57.3	97.7	98.9	2.9		1.34	2.15	1.28		0.24		CH	Brenna	FM	
B-A Trans, Moor 09-25MU, 5, FM	Moor 09-25MU	898.7	8.8	889.9	69.0	829.7	5		87	55.0	22	65	0.51	2.75	1.49	69.0	107.0	106.3	2.8		1.95	1.44	0.80		0.13		CH	B-A Trans	FM	
Brenna, Far 09-25MU, 4, FM	Far 09-25MU	893.4	9.0	884.4	51.0	842.4	4		108	62.8	22	86	0.47	2.75	1.77	62.0	100.9	101.9	2.8		1.70	1.62	1.10		0.23		CH	Brenna	FM	
Sherack, Far 09-26MU, 1, FM	Far 09-26MU	903.5	7.9	895.6	9.0	894.5	1		67	32.4	17	50	0.31	2.74	0.91	89.5	118.5	119.2	1.4		0.51	2.80	0.20		0.07		CH	Sherack	FM	
Brenna, Far 09-26MU, 3, FM	Far 09-26MU	903.5	7.9	895.6	29.0	874.5	3		110	54.2	24	86	0.35	2.75	1.51	65.5	101.0	106.0	3.7		1.04	3.56	0.81		0.19		CH	Brenna	FM	
Alluvium, Far 09-27MU, 1, FM	Far 09-27MU	903.1	7.9	895.2	7.0	896.1	1		75	29.7	18	57	0.21	2.71	0.84	92.1	119.5	120.5	1.6		0.42	3.81	0.23		0.08		CH	Alluvium	FM	
Brenna, Far 09-27MU, 4, FM	Far 09-27MU	903.1	7.9	895.2	65.0	838.1	4		89	55.4	20	69	0.51	2.70	1.52	67.0	104.1	104.6	2.8		1.82	1.51	0.87		0.16		CH	Brenna	FM	
OX Brenna, Moor 09-34MU, 2, FM	Moor 09-34MU	907.9	9.8	898.1	17.0	890.9	2		114	60.7	24	90	0.41	2.70	1.66	63.5	102.0	102.4	3.8		0.80	4.75	0.80		0.22		CH	OX Brenna	FM	
OX Brenna, Far 09-59MU, 2, FM	Far 09-59MU	916.2	14.4	901.8	21.0	895.2	2		92	53.3	19	73	0.47	2.75	1.50	68.6	105.2	106.1	3.5	3.0	0.95	3.68	0.59	0.65	0.09	0.17	CH	OX Brenna	FM	
B-A Trans, Far 09-59MU, 3, FM	Far 09-59MU	916.2	14.4	901.8	36.0	880.2	3		64	38.3	17	47	0.45	2.75	1.08	82.6	114.2	114.9	2.7	2.8	1.30	2.08	0.36	0.41	0.04	0.08	CH	B-A Trans	FM	
OX Brenna, Far 09-60MU, 2, FM	Far 09-60MU	887.3	8.0	879.3	26.0	861.3	2		106	49.1	24	82	0.31	2.70	1.42	69.8	104.1	106.3	4.9	5.6	0.90	5.44	0.64	0.65	0.06	0.12	CH	OX Brenna	FM	
Brenna, Far 09-60MU, 3, FM	Far 09-60MU	887.3	8.0	879.3	36.0	851.3	3		111	57.5	26	85	0.37	2.70	1.55	66.0	104.0	103.9	5.2	4.7	1.10	4.73	0.82	1.06	0.04	0.17	CH	Brenna	FM	
Alluvium, Far 10-78MU, 1, FM	Far 10-78MU	905.7	6.7	899.0	14.0	891.7	1								0.93	89.5	116.2		2.9	3.0	0.61	4.75	0.29	0.28	0.0040	0.03	CH	Alluvium	FM	
Brenna, Far 10-78MU, 2, FM	Far 10-78MU	905.7	6.7	899.0	26.0	879.7	2								1.17	79.6	113.2		3.6	4.0	0.90	4.00	0.51	0.54	0.0043	0.04	CH	Brenna	FM	
Argusville, Far 10-78MU, 3, FM	Far 10-78MU	905.7	6.7	899.0	56.0	849.7	3								1.34	73.8	108.9		4.5	5.3	1.60	2.81	0.68	0.82	0.02	0.05	CH	Argusville	FM	
Alluvium, Far 10-79MU, 1, FM	Far 10-79MU	905.7	10.7	895.0	21.0	884.7	1								0.84	91.7	119.5		4.0	4.0	0.93	4.30	0.30	0.31	0.01	0.05	CH	Alluvium	FM	
Argusville, Far 10-79MU, 2, FM	Far 10-79MU	905.7	10.7	895.0	41.0	864.7	2								1.34	72.7	108.5		4.0	3.9	1.40	2.86	0.63	0.69	0.01	0.05	CH	Argusville	FM	
Alluvium, Far 10-80MU, 1, FM	Far 10-80MU	921.1	9.6	911.5	24.0	897.1	1		28	28.7	17	11	1.06	2.67	0.75	95.3	122.7	122.0	2.2	2.0	1.00	2.20	0.14	0.14	0.01	0.02	CL & SM	Alluvium	FM	
Brenna, Far 10-80MU, 2, FM	Far 10-80MU	921.1	9.6	911.5	36.0	885.1	2								1.31	75.3	110.0		5.1	5.0	1.30	3.88	0.63	0.63	0.02	0.04	CH	Brenna	FM	
Argusville, Far 10-80MU, 3, FM	Far 10-80MU	921.1	9.6	911.5	56.0	865.1	3								1.45	70.8	107.5		4.7	4.4	1.70	2.76	0.73	0.73	0.01	0.09	CH	Argusville	FM	
OX Brenna, Far 10-105MU, 1, FM	Far 10-105MU			0.0	16.0	-16.0	1		113	48.0	32	81	0.20	2.78	1.35	73.9	109.4	109.7	1.8	1.7	0.77	2.33	0.38	0.37	0.19	0.17	CH	OX Brenna	FM	
Brenna, Far 10-105MU, 2, FM	Far 10-105MU			0.0	26.0	-26.0	2		119	61.6	32	87	0.34	2.72	1.65	64.1	103.6	102.9	3.7	3.2	1.01	3.66	0.78	0.83	0.22	0.20	CH	Brenna	FM	
???, Far 10-105MU, 3, FM	Far 10-105MU			0.0	36.0	-36.0	3								1.77	62.1	100.7		3.3	3.1	1.23	2.64	0.97	0.94	0.24	0.20	CH	???	FM	
???, Far 10-105MU, 5, FM	Far 10-105MU			0.0	56.0	-56.0	5								1.35	73.1	108.2		3.8	3.8	1.67	2.25	0.70	0.65	0.09	0.09	CH	???	FM	
Argusville, Far 10-105MU, 4, FM	Far 10-105MU			0.0	46.0	-46.0	4		90	56.0	27	63	0.46	2.71	1.63	64.4	100.5	103.0	2.6	2.7	1.45	1.80	0.95	1.03	0.23	0.22	CH	Argusville	FM	
Brenna, Moor 11-107MU, 1, FM	Moor 11-107MU			0.0	21.0	-21.0	1		71	40.2	19	52	0.41	2.74	1.10	81.4	114.1	114.1	4.0	3.9	0.86	4.65	0.43	0.39	0.10	0.09	CH	Brenna	FM	
Brenna, Moor 11-107MU, 2, FM	Moor 11-107MU			0.0	31.0	-31.0	2		52	39.5	21	31	0.60	2.76	1.09	82.3	114.8	114.9	3.8	3.6	1.13	3.32	0.30	0.30		0.04	CH	Brenna	FM	
Argusville, Moor 11-107MU, 4, FM	Moor 11-107MU			0.0	51.0	-51.0	4		63	35.1	19	44	0.37	2.71	0.97	85.8	115.9	116.4	4.5	4.5	1.65	2.73	0.39	0.37	0.08	0.08	CH	Argusville	FM	
OX Brenna, Far 11-110MU, 1, FM	Far 11-110MU	917.6		917.6	26.0	891.6	1		82	44.0	23	59	0.36	2.71	1.20	76.8	110.6	110.9	4.0	3.4	0.96	4.15	0.56	0.57	0.17	0.15	CH	OX Brenna	FM	
Brenna, Far 11-110MU, 2, FM	Far 11-110MU	917.6		917.6	36.0	881.6	2		95	50.3	28	67	0.33	2.72	1.33	73.0	109.7	108.5	4.1	4.3	1.18	3.47	0.64	0.67	0.18	0.16	CH	Brenna	FM	
Brenna, Far 11-110MU, 3, FM	Far 11-110MU	917.6		917.6	49.0	868.6	3		86	53.1	22	64	0.49	2.71	1.44	69.4	106.3	106.1	3.8	4.0	1.47	2.56	0.78	0.94	0.15	0.15	CH	Brenna	FM	
Argusville, Far 11-110MU, 4, FM	Far 11-110MU	917.6		917.6	56.0	861.6	4		85	49.2	21	64	0.44	2.69	1.34	71.9	107.3	107.6	3.7	4.2	1.62	2.26	0.65	0.72	0.13	0.13	CH	Argusville	FM	
Argusville, Far 11-110MU, 5, FM	Far 11-110MU	917.6		917.6	61.0	856.6	5		70	45.5	22	48	0.49	2.68	1.22	75.4	109.7	109.6	3.7	4.3	1.73	2.14	0.67	0.83	0.11	0.10	CH	Argusville	FM	
Till, Far 11-110MU, 6, FM	Far 11-110MU	917.6		917.6	66.0	851.6	6		66	42.9	20	46	0.50	2.69	1.17	77.2	110.3	110.9	4.5	4.5	1.84	2.45	0.64	0.56	0.11	0.11	CH	Till	FM	
Sherack, Moor 11-111MU, 1, FM	Moor 11-111MU	920.9		920.9	9.0	911.9	1		95	48.3	22	73	0.36	2.78	1.41	72.1	106.9	108.5		2.5	0.52	4.73		0.54		0.15	CH	Sherack	FM	
Brenna, Moor 11-111MU, 3, FM	Moor 11-111MU	920.9		920.9	27.0	893.9	3		50	36.0	22	28	0.50	2.70	0.97	85.6	116.4	116.3		3.2	0.87	3.68		0.29		0.04	CH	Brenna	FM	
Brenna, Moor 11-111MU, 2, FM	Moor 11-111MU	920.9		920.9	22.0	898.9	2		78	47.0	21	57	0.46	2.80	1.35	74.5	109.5	110.2		3.1	0.98	3.15		0.54		0.10	CH	Brenna	FM	
???, Moor 11-111MU, 4, FM	Moor 11-111MU	920.9		920.9	43.0	877.9	4		74	46.8	22	52	0.48	2.69	1.27	74.0	108.6	108.9		3.7	3.6	1.33	2.68	0.80	0.59	0.12	0.12	CH	???	FM

Project, Formation, Boring, Sample No., Specimen No.	BORING NO.	TOP BORING ELEV. (feet)	Depth to GWT (feet)	Water Table Elevation (feet)	MID-DEPTH (feet)	ELEV. (feet)	SAMPLE NO.	SP EC	LL (%)	MC (%)	PL (%)	PI (%)	LI	G _s	e	γ _d (pcf)	γ _m (pcf)	γ _{sat} (pcf)	COE p _c (tsf)	Lab p _c (tsf)	p _o (tsf)	OCR	COE Cc	Lab Cc	COE Cr	Lab Cr	USCS SOIL TYPE	FORMATION	PROJECT	
OX Brenna, Far 11-118MU, 1, FM	Far 11-118MU	912.7		912.7	20.5	892.2	1		91	47.8	24	67	0.36	2.77	1.33	74.1	109.5	109.7	3.8	3.6	0.90	4.22	0.65	0.57	0.15	0.14	CH	OX Brenna	FM	
Brenna, Far 11-118MU, 2, FM	Far 11-118MU	912.7		912.7	34.0	878.7	2		72	43.5	19	53	0.46	2.70	1.21	76.3	109.5	110.4	3.7	4.0	1.29	2.87	0.65	0.72	0.13	0.13	CH	Brenna	FM	
Argusville, Far 11-118MU, 3, FM	Far 11-118MU	912.7		912.7	46.0	866.7	3		60	47.6	17	43	0.71	2.69	1.28	73.7	108.8	108.7	4.1	4.0	1.64	2.50	0.77	0.76	0.10	0.12	CH	Argusville	FM	
Argusville, Far 11-118MU, 4, FM	Far 11-118MU	912.7		912.7	56.0	856.7	4		77	45.7	22	55	0.43	2.69	1.23	75.1	109.4	109.5	4.4	4.4	1.92	2.29	0.70	0.74	0.13	0.12	CH	Argusville	FM	
Argusville, Far 11-118MU, 5, FM	Far 11-118MU	912.7		912.7	66.0	846.7	5		61	39.6	20	41	0.48	2.70	1.07	81.5	113.8	113.6	3.9	4.5	2.21	1.74	0.51	0.59	0.07	0.09	CH	Argusville	FM	
Argusville, Far 11-119MU, 2, FM	Far 11-119MU	917.6		917.6	41.0	876.6	2		56	41.5	22	34	0.57	2.70	1.13	79.1	111.9	112.1	3.3	3.2	1.49	2.21	0.49	0.46	0.09	0.09	CH	Argusville	FM	
Argusville, Far 11-119MU, 3, FM	Far 11-119MU	917.6		917.6	51.0	866.6	3		62	41.6	19	43	0.53	2.71	1.15	78.7	111.4	112.0	3.4	3.5	1.78	1.88	0.53	0.48	0.10	0.09	CH	Argusville	FM	
Sherack, Far 11-122MU, 1, FM	Far 11-122MU	893.8		893.8	9.0	884.8	1		62	32.6	20	42	0.30	2.67	0.92	86.8	115.1	116.7		3.1	0.54	5.76		0.28		0.04	CH	Sherack	FM	
???, Far 11-122MU, 2, FM	Far 11-122MU	893.8		893.8	19.0	874.8	2		116	63.3	26	90	0.41	2.70	1.70	62.3	101.7	101.6		3.2	0.86	3.70		1.07		0.24	CH	???	FM	
Brenna, Far 11-122MU, 3, FM	Far 11-122MU	893.8		893.8	43.0	850.8	3		81	54.4	24	57	0.53	2.67	1.45	67.8	104.7	104.8		3.4	1.55	2.17		0.79		0.14	CH	Brenna	FM	
???, Far 11-122MU, 4, FM	Far 11-122MU	893.8		893.8	53.0	840.8	4		90	55.3	24	66	0.47	2.65	1.49	66.6	103.4	103.9		3.6	1.84	1.95		1.00		0.17	CH	???	FM	
Brenna, Far 12-162MU, 3, FM PED	Far 12-162MU	893.4		893.4	23.9	869.5	3		95	62.6	24	71	0.54	2.67	1.70	61.8	100.5	101.1		3.9	0.95	4.08		0.94		0.25	CH	Brenna	FM PED	
B/A Transition, Far 12-162MU, 4, FM PED	Far 12-162MU	893.4		893.4	46.1	847.3	4		101	64.1	25	76	0.51	2.71	1.75	61.6	101.1	101.3		4.1	1.52	2.67		1.26		0.24	CH	B/A Transition	FM PED	
Argusville, Far 12-162MU, 5, FM PED	Far 12-162MU	893.4		893.4	56.1	837.3	5		90	59.0	22	68	0.54	2.70	1.59	65.0	103.4	103.3		4.1	1.77	2.32		1.26		0.18	CH	Argusville	FM PED	
PL Sherack, 01-5MU, 1, FRW	01-5MU				16.0	885.7	1		78	35.7	28	50	0.15	2.71	0.97	85.6	116.2	116.5	1.95		0.56	3.48	0.22			0.07		PL Sherack	FRW	
PL Sherack, 01-5MU, 1, FRW	01-5MU				16.0	885.7	1		78	35.7	28	50	0.15	2.71	0.97	85.6	116.2	116.5	1.95		0.84	2.32	0.22			0.07		PL Sherack	FRW	
Sherack, 01-12MU, 1, FRW	01-12MU				19.0	865.0	1		53	25.6	21	31	0.14	2.68	0.67	100.2	125.9	125.2	3.20		0.72	4.44	0.17			0.04		Sherack	FRW	
Brenna, 01-5MU, 2, FRW	01-5MU				49.0	852.7	2		108	71.2	35	73	0.49	2.73	1.95	57.7	98.8	99.0	2.95		1.60	1.84	1.16			0.19		Brenna	FRW	
Argusville, 01-5MU, 4, FRW	01-5MU				78.0	823.7	4		99	63.9	28	70	0.51	2.77	1.80	61.8	101.3	101.9	2.60		2.20	1.18	1.05			0.18		Argusville	FRW	
OX Brenna, B31-6, 3, CR31	B31-6	881.6	15	867	25.5	856.1	3		52.9					2.70	1.44	69.1	105.7	105.9		5.31		#DIV/0!		0.77		0.16	CH	OX Brenna	CR31	
Brenna, B31-5, 5, CR31	B31-5	882.6	15	868	50.5	832.1	5		57.3					2.70	1.55	66.0	103.8	103.9		4.15		#DIV/0!		0.86		0.17	CH	Brenna	CR31	
Brenna, B81-3, 2, CR81	B81-3	884.15	5	879	15.3	868.9	2		56.7					2.75	1.58	66.4	104.0	104.7		2.11		#DIV/0!		0.58		0.13	CH	Brenna	CR81	
Brenna, B81-3, 4, CR81	B81-3	884.15	5	879	40.3	843.9	4		58.4					2.70	1.60	64.9	102.8	103.2		3.23		#DIV/0!		0.83		0.21	CH	Brenna	CR81	
Brenna, B81-6, 3, CR81	B81-6	883.5	5	879	23.0	860.5	3		46.2					2.70	1.27	74.3	108.6	109.2		4.17		#DIV/0!		0.62		0.11	CH	Brenna	CR81	
Brenna, B29-2, 4, I29	B29-2	884.7	10	875	30.0	854.7	4		51.6					2.70	1.40	70.2	106.4	106.6		3.52		#DIV/0!		0.67		0.15	CH	Brenna	I29	
OX Brenna, B29-4, 2, I29	B29-4	883.6	10	874	15.3	868.4	2		51.1					2.70	1.41	70.0	105.8	106.5		2.99		#DIV/0!		0.60		0.19	CH	OX Brenna	I29	
Brenna, B29-5, 4, I29	B29-5	884.0	10	874	45.0	839.0	4		59.5					2.70	1.61	64.6	103.0	103.0		3.11		#DIV/0!		0.83		0.25	CH	Brenna	I29	
Brenna, B32-2, 5, CR32	B32-2	891.3	5	886	60.3	831.1	5		53.7					2.70	1.46	68.7	105.6	105.6		2.26		#DIV/0!		0.64		0.16	CH	Brenna	CR32	
Brenna, B32-4, 5, CR32	B32-4	890.0	5	885	37.8	852.3	5		61.8					2.70	1.76	61.1	98.9	100.9		3.08		#DIV/0!		1.11		0.28	CH	Brenna	CR32	
Sherack, R32-A7, 1, CR32	R32-A7	889.6	5	885	5.5	884.1	1		34.1					2.70	0.95	86.5	116.0	116.9		1.02		#DIV/0!		0.28		0.09	CH	Sherack	CR32	
OX Brenna, B22-1, 2, CR22	B22-1	890	15	875	15.5	874.7	2		51.0					2.70	1.40	70.3	106.2	106.6		3.25		#DIV/0!		0.52		0.16	CH	OX Brenna	CR22	
Brenna, B22-4, 4, CR22	B22-4	892	15	877	38.5	853.2	4		58.8					2.70	1.60	64.9	103.1	103.3		3.17		#DIV/0!		0.86		0.23	CH	Brenna	CR22	
???				0																		#DIV/0!					CH			
???				0																		#DIV/0!					CH			
ST-10, SS	ST-10	908		898	10.0	898.0			39.8					2.70	1.13	79.2	110.7	112.2	2.52		0.57	4.45	0.30			0.10		CH		SS
ST-10, SS	ST-10	908		898	20.0	888.0			60.2					2.70	1.63	64.1	102.7	102.7	4.38		0.72	6.12	0.80			0.23		CH		SS
ST-10, SS	ST-10	908		898	30.0	878.0			64.5					2.70	1.74	61.6	101.3	101.1	2.48		0.89	2.78	0.84			0.16		CH		SS
SB-11, SS	SB-11	905		895	33.3	870.0			48.9					2.75	1.35	73.1	108.8	108.9	4.30		1.13	3.82	0.60			0.10		CH		SS
SB-17, SS	SB-17	905		895	28.3	874.0			45.2					2.75	1.26	75.9	110.2	110.7	3.70		1.06	3.49	0.57			0.11		CH		SS
ST-7, SS-WRL	ST-7	908		898	15.0	892.9								2.70	1.03	83.1	114.7	114.7	1.04		0.70	1.48	0.26			0.10		CH		SS-WRL
ST-7, SS-WRL	ST-7	908		898	25.0	883.0								2.70	1.40	70.1	106.5	106.5	3.1		0.86	3.60	0.67			0.19		CH		SS-WRL
ST-9, SS-WRL	ST-9	914		904	10.0	903.8								2.70	1.06	81.8	113.9	113.9	2.3		0.57	4.04	0.32			0.12		CH		SS-WRL
ST-1, SA-52ndAVE	ST-1	905		895	20.0	885.2			60.9					2.71	1.65	63.8	102.7	102.6	4.0		0.71	5.60	0.76			0.15		CH		SA-52ndAVE
ST-2, SA-52ndAVE	ST-2	891		879	15.0	875.7								2.67	1.18	76.4	110.2	110.2	4.5		0.72	6.22	0.33			0.04		CH		SA-52ndAVE
SL-3, SA-52ndAVE	SL-3	888		859	15.5	872.3			62	32.8	23	40	0.26	2.73																