

Appendix A

Drainage Utility Servicing Calculations

DRAFT

Table 2.1 Sanitary Design Form

Project: West 240
Municipality: City of Edmonton
Design By: PP
Job Number: 145328
Date: 2025-OCT-26
Checked By: CTP
File: C:\Users\boniecd8486\DCVACCDOcs\Arcadis ACC US\ACA-00145328-West_240\Project Files\10_WIP\04-



Location	Maintenance hole			Tributary Area					Total Area ha	Total Population	Residential		Ind., Com., and Other		Infiltration and Inflow		Total Baseline Flow m³/s	Total Design Q m³/s	Design Capacity m³/s Q=0.86	Sewer Design						Upstream MH		Downstream MH			Average Cover to Invert m
	From	To	Sag Location? (Y/N)	A ha	Land Use	Units	Population Density people/unit	Population			Peak Flow Factor	Design Q m³/s	Peak Flow Factor	Design Q m³/s	Current Pipe m³/s	Total m³/s				Slope %	Diameter mm	Length m	Capacity m³/s	Velocity @ Capacity m/s	Velocity @ Design Flow m/s	Rim Elevation m	Invert Elevation m	Rim Elevation m	Invert Elevation m	Jump in MH m	
Phase 1	400	401		0.59	RS	21	3.460	73	0.59	73	3.38	0.0005			0.0001	0.0001	0.0000	0.0005	0.0006	1.000	200	110.627	0.0328	1.04	0.39	671.668	668.466	673.661	667.360		4.751
	401	402		0.54	RS	19	3.460	66	1.13	139	3.17	0.0008			0.0001	0.0002	0.0000	0.0010	0.0011	0.400	200	104.345	0.0207	0.66	0.34	673.661	667.330	673.999	666.913		6.708
	402	405		0.00					1.13	139	3.17	0.0008			0.0000	0.0002	0.0000	0.0010	0.0011	0.400	200	49.785	0.0207	0.66	0.34	673.999	666.853	671.785	666.654		6.138
	403W	404		0.49	RSM	21	3.170	67	0.49	67	3.41	0.0004			0.0001	0.0001	0.0000	0.0005	0.0006	1.000	200	53.726	0.0328	1.04	0.38	671.175	667.975	671.551	667.438		3.656
	404	405		0.19	RSM	8	3.170	26	0.68	93	3.30	0.0006			0.0000	0.0001	0.0000	0.0007	0.0008	0.400	200	33.596	0.0207	0.66	0.30	671.551	667.408	671.785	667.274		4.327
	405	406		0.00					1.81	232	3.01	0.0013			0.0000	0.0003	0.0000	0.0015	0.0018	0.400	200	53.368	0.0207	0.66	0.39	671.785	666.594	670.462	666.381		4.636
	406	418		0.00					1.81	232	3.01	0.0013			0.0000	0.0003	0.0000	0.0015	0.0018	0.400	200	54.232	0.0207	0.66	0.39	670.462	666.351	669.526	666.134		3.752
	403E	407		1.20	RSM	51	3.170	162	1.20	162	3.12	0.0009			0.0002	0.0002	0.0000	0.0011	0.0013	1.000	200	135.008	0.0328	1.04	0.48	671.175	667.975	670.212	666.625		3.393
	407PLUG	407		1.81	RSM	77	3.170	245	1.81	245	2.99	0.0014			0.0003	0.0003	0.0000	0.0016	0.0019	2.000	200	39.911	0.0464	1.48	0.69	671.969	667.423	670.212	666.625		4.066
	407	408	Y	0.00					3.01	407	2.84	0.0021			0.0000	0.0004	0.0000	0.0026	0.0030	0.400	200	80.824	0.0207	0.66	0.45	670.212	666.565	670.006	666.242		3.705
	408PLUG	408	Y	1.63	MU				1.63	0	0.00	0.0000	16.56	0.0054	0.0002	0.0002	0.0054	0.0056	0.0065	2.000	200	40.004	0.0464	1.48	1.00	670.460	667.072	670.006	666.272		3.561
	408	411		0.00					4.64	407	2.84	0.0021			0.0000	0.0006	0.0054	0.0082	0.0095	0.400	200	61.549	0.0207	0.66	0.62	670.006	666.212	670.006	665.966		3.764
	409	411							0.00	0	0.00	0.0000			0.0000	0.0000	0.0000	0.0000	0.0000	1.000	200	146.745	0.0328	1.04	0.00	669.241	666.047	669.700	664.580		4.157
	410	411		3.32	MU				3.32	0	0.00	0.0000	12.02	0.0080	0.0005	0.0005	0.0080	0.0084	0.0098	1.000	200	111.373	0.0328	1.04	0.88	670.597	667.097	669.700	665.983		3.609
	411	412							7.96	407	2.84	0.0021			0.0000	0.0011	0.0134	0.0166	0.0193	0.400	200	104.263	0.0207	0.66	0.73	669.700	664.550	668.991	664.133		5.004
	412	420	Y						7.96	407	2.84	0.0021			0.0000	0.0011	0.0134	0.0166	0.0193	0.400	200	135.048	0.0207	0.66	0.73	668.991	664.103	668.574	663.563		4.949
Phase 2	413E	414		0.63	RS	23	3.460	80	0.63	80	3.35	0.0005			0.0001	0.0001	0.0000	0.0006	0.0007	1.000	200	135.731	0.0328	1.04	0.40	669.724	666.524	670.643	665.167		4.338
	414	415		0.00					0.63	80	3.35	0.0005			0.0000	0.0001	0.0000	0.0006	0.0007	0.400	200	23.383	0.0207	0.66	0.29	670.643	665.107	670.806	665.013		5.665
	415	416		0.00					0.63	80	3.35	0.0005			0.0000	0.0001	0.0000	0.0006	0.0007	0.400	200	32.391	0.0207	0.66	0.29	670.806	664.983	670.605	664.853		5.788
	416	417		0.00					0.63	80	3.35	0.0005			0.0000	0.0001	0.0000	0.0006	0.0007	0.400	200	58.828	0.0207	0.66	0.29	670.605	664.793	670.027	664.558		5.640
	417PLUG	417		0.56	RSM	24	3.170	77	0.56	77	3.36	0.0005			0.0001	0.0001	0.0000	0.0006	0.0006	2.000	200	40.038	0.0464	1.48	0.50	672.034	663.112	670.027	662.311		8.319
	413W	421		0.56	RS	20	3.460	70	0.56	70	3.39	0.0004			0.0001	0.0001	0.0000	0.0005	0.0006	1.000	200	125.493	0.0328	1.04	0.38	669.724	666.524	668.845	665.269		3.388
	421	422		0.44	RS	16	3.460	56	1.00	126	3.20	0.0007			0.0001	0.0001	0.0000	0.0009	0.0010	0.400	200	95.017	0.0207	0.66	0.33	668.845	665.239	668.262	664.859		3.504
	422	423		0.00					1.00	126	3.20	0.0007			0.0000	0.0001	0.0000	0.0009	0.0010	0.400	200	14.874	0.0207	0.66	0.33	668.262	664.799	668.391	664.740		3.557
	423	424		0.00					1.00	126	3.20	0.0007			0.0000	0.0001	0.0000	0.0009	0.0010	0.400	200	53.005	0.0207	0.66	0.33	668.391	664.710	668.157	664.498		3.670
	416W	425		1.22	RS	43	3.460	149	1.22	149	3.15	0.0009			0.0002	0.0002	0.0000	0.0010	0.0012	1.000	200	135.771	0.0328	1.04	0.47	670.605	667.405	669.548	666.047		3.351
	425	426		0.42	RS	15	3.460	52	1.64	201	3.05	0.0011			0.0001	0.0002	0.0000	0.0014	0.0016	0.400	200	48.808	0.0207	0.66	0.37	669.548	666.017	669.116	665.822		3.412
	426	427		0.84	RS	30	3.460	104	2.48	305	2.93	0.0017			0.0001	0.0003	0.0000	0.0020	0.0023	0.400	200	97.480	0.0207	0.66	0.42	669.116	665.680	668.240	665.290		3.193
	427	424		0.38	RS	14	3.460	49	2.86	354	2.88	0.0019			0.0001	0.0004	0.0000	0.0023	0.0027	0.40.											

Location	Maintenance hole			Tributary Area					Total Area	Total Population	Residential		Ind., Com., and Other		Infiltration and Inflow		Total Baseline Flow	Total Design Q	Design Capacity	Sewer Design				Upstream MH		Downstream MH		Average Cover to Invert					
	From	To	Sag Location?	A	Land Use	Units	Population Density	Population			Peak Flow Factor	Design Q	Peak Flow Factor	Design Q	Current Pipe	Total				Velocity @ Capacity	Velocity @ Design Flow	Rim Elevation	Invert Elevation	Rim Elevation	Invert Elevation	Jump in MH							
																											(Y/N)		ha	people/unit	ha	m³/s	m³/s
			Q+0.86																														
	451S	456		0.95	RS	34	3,460	118	0.95	118	3.22	0.0007			0.0001	0.0001	0.0000	0.0008	0.0010	1.000	200	117.059	0.0328	1.04	0.44	668.343	665.143	668.684	663.972		3.956		
	456	457		0.35	RS	13	3,460	45	1.30	163	3.12	0.0009			0.0000	0.0002	0.0000	0.0011	0.0013	0.400	200	100.750	0.0207	0.66	0.35	668.684	663.942	668.900	663.539		5.051		
	457	458	Y	0.00					6.31	815	2.65	0.0040			0.0000	0.0009	0.0000	0.0049	0.0057	0.400	200	59.168	0.0207	0.66	0.54	668.900	662.335	668.589	662.098		6.528		
	459E	458	Y	0.54	RS	19	3,460	66	0.54	66	3.41	0.0004			0.0001	0.0001	0.0000	0.0005	0.0006	1.000	200	85.649	0.0328	1.04	0.38	668.567	665.616	668.589	664.760		3.390		
	458	462		0.50	RS	18	3,460	63	7.35	944	2.62	0.0046			0.0001	0.0010	0.0000	0.0056	0.0065	0.400	200	87.448	0.0207	0.66	0.56	668.589	662.068	668.789	661.718		6.796		
	462	463	Y	0.23	RS	9	3,460	32	7.58	976	2.61	0.0047			0.0000	0.0011	0.0000	0.0058	0.0067	0.400	200	44.672	0.0207	0.66	0.57	668.789	661.688	668.494	661.509		7.043		
	459S	460		0.70	RS	25	3,460	87	0.70	87	3.32	0.0005			0.0001	0.0001	0.0000	0.0006	0.0007	1.000	200	136.007	0.0328	1.04	0.41	668.567	665.616	669.061	664.256		3.878		
	460	461		0.64	RS	23	3,460	80	1.34	167	3.11	0.0010			0.0001	0.0002	0.0000	0.0011	0.0013	0.400	200	74.764	0.0207	0.66	0.35	669.061	664.226	669.078	663.927		4.993		
	463	466		0.79	RS	28	3,460	97	8.37	1073	2.58	0.0051			0.0001	0.0012	0.0000	0.0063	0.0073	0.400	200	150.066	0.0207	0.66	0.58	668.494	661.479	668.939	660.879		7.537		
Phase 7	461E	464		0.33	RS	12	3,460	42	0.33	42	3.57	0.0003			0.0000	0.0000	0.0000	0.0003	0.0004	1.000	200	40.104	0.0328	1.04	0.33	669.078	665.891	669.344	665.490		3.520		
	464	465		1.21	RS	43	3,460	149	1.54	191	3.07	0.0011			0.0002	0.0002	0.0000	0.0013	0.0015	0.400	200	140.011	0.0207	0.66	0.37	669.344	665.460	669.112	664.900		4.048		
	468W	465		1.24	RS	44	3,460	153	1.24	153	3.14	0.0009			0.0002	0.0002	0.0000	0.0011	0.0012	1.000	200	144.841	0.0328	1.04	0.48	670.150	666.950	669.112	665.502		3.405		
	465	466		0.00					2.78	344	2.89	0.0018			0.0000	0.0004	0.0000	0.0022	0.0026	0.400	200	90.067	0.0207	0.66	0.43	669.112	664.840	668.939	664.480		4.365		
	466	467	Y	0.50	RS	18	3,460	63	11.65	1480	2.50	0.0069			0.0001	0.0016	0.0000	0.0085	0.0099	0.400	200	95.698	0.0207	0.66	0.63	668.939	660.819	668.563	660.436		8.124		
	467PLUG	467	Y	1.46	RSM	62	3,170	197	1.46	197	3.06	0.0011			0.0002	0.0002	0.0000	0.0013	0.0015	2.000	200	40.008	0.0464	1.48	0.65	669.240	654.076	668.563	653.276		15.225		
Tie In	467	577561		0.00					13.11	1677	2.47	0.0077			0.0000	0.0018	0.0000	0.0095	0.0110	0.400	200	18.887	0.0207	0.66	0.65	668.563	653.216	668.848	653.140		15.528		
Ex 1200 San	577561	335969		0.00					62.5	8944	2.09	0.0346			0.0000	0.0088	0.2085	0.2519	0.2929	0.080	1200	540.000	1.1027	0.98	0.79								

General Residential Area: 0.00 ha

Apartment Residential Area: 0.00 ha

User-Defined Residential Area: 63.9 ha

Total Residential Area: 63.9 ha

Commercial Area: 0.00 ha

Industrial Area: 0.00 ha

Other Area: 0.00 ha

Non-contributing Area: 0.00 ha

Total Area: 63.9 ha

General Population: 0

Apartment Population: 0

User-Defined Population: 9111

Total Population: 9111

Residential Zones

RS (Small Scale Flex Residential Zone)

35.0 Units/ha 3.46 People/Unit

RSM (Small-Medium Scale Transition Residential Zone)

42.0 Units/ha 3.17 People/Unit

RM23 (Medium Scale Residential Zone)

125 Units/ha 2.17 People/Unit

() 0.0 Units/ha 0.00 People/Unit

() 0.0 Units/ha 0.00 People/Unit

() 0.0 Units/ha 0.00 People/Unit

() 0.0 Units/ha 0.00 People/Unit

() 0.0 Units/ha 0.00 People/Unit

Zoning Information

Industrial Zones

Commercial Zones

Other Zones - Such as hospitals, schools, etc.

MU

Non-contributing Area

N - Areas that contribute infiltration and inflow only (i.e. Transmission Mains).

Table 3.1 Storm Design Form

Project:West 240

Municipality:City of Edmonton

Design By:PP

File:C:\Users\boniecd8486\DC\ACCDocs\Arcadis ACC US\ACA-00145328-West_240\Project Files\10_WIP\04-CIV\Sheets\NDR_2.0\STORM Sewer Network

Job Number:145328

Date:2025-OCT-26

Checked By:CTP

Default Storm:1:5 year

2022 EPCOR IDF Curves



Location	Manhole		Tributary Area			Total Area	Total A×C	Time of Conc.	Intensity	Total Baseline Flow	Design Q	Sewer Design					
	From	To	A	Runoff Co-Efficient "C"	A×C	ha		min	mm/hr	m³/s	m³/s	Slope	Diameter	Length	Capacity	Velocity @ Capacity	Velocity @ Design Flow
			ha									%	mm	m	m³/sec	m/s	m/s
South Basin	102	116	1.69	0.70	1.183	1.69	1.183	8.00	76.7	0.0000	0.2520	0.250	600	35.000	0.3070	1.09	1.21
	116	208	0.18	0.70	0.126	1.87	1.309	8.48	74.8	0.0000	0.2720	0.200	750	55.000	0.4979	1.13	1.15
	1013	1011	1.31	0.75	0.983	1.31	0.983	5.00	91.4	0.0000	0.2494	1.000	600	15.000	0.6140	2.17	2.06
	1011	208	0.00	0.70	0.000	1.31	0.983	8.00	76.7	0.0000	0.2093	0.200	750	52.000	0.4979	1.13	1.08
	MR	208	0.95	0.20	0.190	0.95	0.190	8.00	76.7	0.0000	0.0405	1.000	450	15.000	0.2851	1.79	1.27
	208	973	0.43	0.70	0.301	4.56	2.783	9.28	71.9	0.0000	0.5560	0.200	900	80.000	0.8096	1.27	1.37
	973	209	0.35	0.70	0.245	4.91	3.028	10.25	68.7	0.0000	0.5781	0.200	900	70.000	0.8096	1.27	1.38
	1000	306	0.25	0.70	0.175	0.25	0.175	8.00	76.7	0.0000	0.0373	0.250	375	70.000	0.0877	0.79	0.76
	306	106	0.40	0.70	0.280	0.65	0.455	9.53	71.1	0.0000	0.0898	0.200	450	55.000	0.1275	0.80	0.87
	106	209	0.68	0.70	0.476	1.33	0.931	10.59	67.7	0.0000	0.1751	0.200	525	90.000	0.1923	0.89	1.01
	341	221	0.55	0.70	0.385	0.55	0.385	8.00	76.7	0.0000	0.0820	0.250	450	85.000	0.1426	0.90	0.93
	221	210	0.47	0.70	0.329	1.02	0.714	9.53	71.1	0.0000	0.1410	0.200	525	90.000	0.1923	0.89	0.97
	210	209	0.37	0.70	0.259	1.39	0.973	11.07	66.3	0.0000	0.1792	0.200	600	45.000	0.2746	0.97	1.03
Dry Pond Inlet	209	SWMF 2	0.73	0.70	0.511	8.36	5.443	12.08	63.6	0.0000	0.9609	0.200	1050	50.000	1.2212	1.41	1.56
North East Area	403	404	0.73	0.75	0.548	0.73	0.548	5.00	91.4	0.0000	0.1390	0.750	450	100.000	0.2469	1.55	1.60
	Stub	404	1.61	0.75	1.208	1.61	1.208	5.00	91.4	0.0000	0.3065	0.500	600	25.000	0.4342	1.54	1.66
	404	1015	0.00	0.75	0.000	2.34	1.755	6.04	85.6	0.0000	0.4172	0.400	750	45.000	0.7041	1.59	1.66
	1015	1016	0.03	0.70	0.021	2.37	1.776	8.00	76.7	0.0000	0.3783	0.400	750	35.000	0.7041	1.59	1.62
	Stub 1	1016	1.34	0.85	1.139	1.34	1.139	5.00	91.4	0.0000	0.2891	0.500	600	25.000	0.4342	1.54	1.64
	1016	411	0.88	0.70	0.616	4.59	3.531	8.36	75.3	0.0000	0.7383	0.400	900	50.000	1.1449	1.80	1.91
	410	411	0.20	0.70	0.140	0.20	0.140	8.00	76.7	0.0000	0.0298	0.300	300	55.000	0.0530	0.75	0.77
East Mixed Use Area	994N	411	4.02	0.85	3.417	4.02	3.417	5.00	91.4	0.0000	0.8673	0.200	1050	120.000	1.2212	1.41	1.53
	411	412	0.00	0.70	0.000	8.81	7.088	9.19	72.2	0.0000	1.4223	0.400	1050	50.000	1.7271	1.99	2.23
	412	200	0.35	0.70	0.245	9.16	7.333	9.56	71.0	0.0000	1.4455	0.400	1050	125.000	1.7271	1.99	2.23
	200	908	0.48	0.70	0.336	9.64	7.669	10.50	68.0	0.0000	1.4484	0.400	1050	84.000	1.7271	1.99	2.23
	Stub3	908	1.80	0.75	1.350	1.80	1.350	5.00	91.4	0.0000	0.3427	0.500	600	25.000	0.4342	1.54	1.70
North East Inlet	908	NE Inlet	0.23	0.70	0.161	11.67	9.180	11.12	66.2	0.0000	1.6869	1.540	1200	75.000	4.8382	4.28	3.89
North Residential Area	408	407	0.48	0.75	0.360	0.48	0.360	5.00	91.4	0.0000	0.0914	0.400	375	110.000	0.1109	1.00	1.12
	407	405	0.42	0.75	0.315	0.90	0.675	6.64	82.6	0.0000	0.1549	0.400	450	102.000	0.1803	1.13	1.27
	405	420	0.00	0.75	0.000	0.90	0.675	7.97	76.8	0.0000	0.1440	0.400	450	50.000	0.1803	1.13	1.26
	420	507	1.37	0.20	0.274	2.27	0.949	8.63	74.2	0.0000	0.1957	0.400	525	25.000	0.2720	1.26	1.37
	1019	508	2.08	0.75	1.560	2.08	1.560	5.00	91.4	0.0000	0.3960	0.500	750	25.000	0.7872	1.78	1.78
	508	507	0.00	0.70	0.000	2.08	1.560	8.00	76.7	0.0000	0.3323	0.500	600	25.000	0.4342	1.54	1.69
	1020	507	1.19	0.75	0.893	1.19	0.893	5.00	91.4	0.0000	0.2265	0.500	600	25.000	0.4342	1.54	1.55
	507	506	0.33	0.70	0.231	5.87	3.633	8.94	73.1	0.0000	0.7380	0.200	900	25.000	0.8096	1.27	1.44
North East Residential Area	510A	511	0.50	0.70	0.350	0.50	0.350	8.00	76.7	0.0000	0.0745	0.200	375	25.000	0.0784	0.71	0.81
	511	512	0.53	0.70	0.371	1.03	0.721	8.52	74.7	0.0000	0.1496	0.300	450	25.000	0.1562	0.98	1.12
	512	971	0.00	0.70	0.000	1.03	0.721	8.89	73.3	0.0000	0.1468	0.200	525	25.000	0.1923	0.89	0.98
	971	523	0.00	0.70	0.000	1.03	0.721	9.31	71.8	0.0000	0.1438	0.200	525	25.000	0.1923	0.89	0.97
	521	523	0.90	0.70	0.630	0.90	0.630	8.00	76.7	0.0000	0.1342	0.300	450	25.000	0.1562	0.98	1.10
	523	1022	0.90	0.70	0.630	2.83	1.981	9.74	70.4	0.0000	0.3872	0.200	750	25.000	0.4979	1.13	1.25
	1023	1022	0.45	0.75	0.338	0.45	0.338	5.00	91.4	0.0000	0.0857	0.500	450	25.000	0.2016	1.27	1.22
	1022	506	0.12	0.70	0.084	3.40	2.403	10.08	69.3	0.0000	0.4624	0.300	750	25.000	0.6098	1.38	1.52
	506	505	0.00	0.70	0.000	9.27	6.035	10.35	68.4	0.0000	1.1472	0.200	1050	25.000	1.2212	1.41	1.60
	983	1014	1.06	0.70	0.742	1.06	0.742	8.00	76.7	0.0000	0.1580	0.200	525	25.000	0.1923	0.89	0.99
	1014	345	0.86	0.70	0.602	1.92	1.344	8.42	75.0	0.0000	0.2801	0.200	750	25.000	0.4979	1.13	1.16
	345	344	0.43	0.70	0.301	2.35	1.645	8.78	73.7	0.0000	0.3368	0.200	750	25.000	0.4979	1.13	1.21
	344	502	0.88	0.70	0.616	3.23	2.261	9.12	72.5	0.0000	0.4551	0.200	750	25.000	0.4979	1.13	1.28

Location	Manhole		Tributary Area			Total Area	Total A×C	Time of Conc.	Intensity	Total Baseline Flow	Design Q	Sewer Design					
	From	To	A	Runoff Co-Efficient "C"	A×C							Slope	Diameter	Length	Capacity	Velocity @ Capacity	Velocity @ Design Flow
			ha			ha		min	mm/hr	m³/s	m³/s	%	mm	m	m³/sec	m/s	m/s
	502	505	0.00	0.70	0.000	3.23	2.261	9.45	71.3	0.0000	0.4481	0.200	750	25.000	0.4979	1.13	1.28
North Inlet	505	North Inlet	1.00	0.70	0.700	13.50	8.996	10.61	67.6	0.0000	1.6904	1.440	1200	80.000	4.6785	4.14	3.80
South East Corner	101	110	1.28	0.70	0.896	1.28	0.896	8.00	76.7	0.0000	0.1908	0.300	525	75.000	0.2356	1.09	1.21
	1031	109	1.45	0.70	1.015	1.45	1.015	8.00	76.7	0.0000	0.2162	1.000	525	15.000	0.4301	1.99	1.99
	109	110	0.37	0.70	0.259	1.82	1.274	8.13	76.2	0.0000	0.2696	0.300	600	120.000	0.3363	1.19	1.32
	110	293	0.98	0.70	0.686	4.08	2.856	9.64	70.7	0.0000	0.5610	0.200	900	138.000	0.8096	1.27	1.37
East Mixed Use Area	994S	991	4.88	0.85	4.148	4.88	4.148	5.00	91.4	0.0000	1.0528	0.250	1050	150.000	1.3654	1.58	1.74
	292	991	0.77	0.70	0.539	0.77	0.539	8.00	76.7	0.0000	0.1148	0.400	450	100.000	0.1803	1.13	1.20
	991	293	0.00	0.70	0.000	5.65	4.687	9.39	71.6	0.0000	0.9316	0.200	1050	92.000	1.2212	1.41	1.55
	293	204	0.22	0.70	0.154	9.95	7.697	11.31	65.6	0.0000	1.4029	0.200	1200	105.000	1.7436	1.54	1.71
	204	988	0.37	0.70	0.259	10.32	7.956	12.33	62.9	0.0000	1.3902	0.200	1200	105.000	1.7436	1.54	1.71
	1028	1027	2.14	0.75	1.605	2.14	1.605	5.00	91.4	0.0000	0.4074	1.000	600	15.000	0.6140	2.17	2.32
	1029	1027	1.23	0.75	0.923	1.23	0.923	5.00	91.4	0.0000	0.2341	1.000	525	15.000	0.4301	1.99	2.03
	1027	988	0.00	0.70	0.000	3.37	2.528	8.00	76.7	0.0000	0.5383	0.200	900	75.000	0.8096	1.27	1.36
	988	203	0.31	0.70	0.217	14.00	10.701	13.36	60.4	0.0000	1.7963	0.200	1350	50.000	2.3870	1.67	1.83
	1130	203	0.99	0.75	0.743	0.99	0.743	5.00	91.4	0.0000	0.1885	1.000	450	15.000	0.2851	1.79	1.92
	203	1004	0.40	0.70	0.280	15.39	11.723	13.81	59.4	0.0000	1.9345	0.200	1350	50.000	2.3870	1.67	1.86
South West Area	340	342	0.46	0.70	0.322	0.46	0.322	8.00	76.7	0.0000	0.0686	0.200	375	110.000	0.0784	0.71	0.80
	342	967	0.61	0.70	0.427	1.07	0.749	10.29	68.6	0.0000	0.1428	0.200	525	80.000	0.1923	0.89	0.97
	967	326	0.48	0.70	0.336	1.55	1.085	11.66	64.7	0.0000	0.1949	0.200	600	90.000	0.2746	0.97	1.05
South West Area	1009	325	0.62	0.70	0.434	0.62	0.434	8.00	76.7	0.0000	0.0924	0.200	450	25.000	0.1275	0.80	0.87
	325	326	0.47	0.70	0.329	1.09	0.763	8.48	74.8	0.0000	0.1586	0.200	525	25.000	0.1923	0.89	0.99
	326	1032	0.55	0.70	0.385	3.19	2.233	13.08	61.1	0.0000	0.3788	0.200	750	25.000	0.4979	1.13	1.24
	1033	1032	0.75	0.75	0.563	0.75	0.563	5.00	91.4	0.0000	0.1428	1.000	375	25.000	0.1753	1.59	1.77
	1032	327	0.00	0.70	0.000	3.94	2.796	13.42	60.3	0.0000	0.4681	0.200	900	25.000	0.8096	1.27	1.32
	1034	327	0.40	0.75	0.300	0.40	0.300	5.00	91.4	0.0000	0.0761	1.000	375	25.000	0.1753	1.59	1.53
	327	313	0.23	0.70	0.161	4.57	3.257	13.74	59.6	0.0000	0.5389	0.200	1050	25.000	1.2212	1.41	1.37
	310	311	0.20	0.75	0.150	0.20	0.150	5.00	91.4	0.0000	0.0381	0.200	375	25.000	0.0784	0.71	0.70
	311	313	0.30	0.75	0.225	0.50	0.375	5.59	88.0	0.0000	0.0916	0.200	450	25.000	0.1275	0.80	0.87
Road South of SWMF #1	313	1024	0.97	0.70	0.679	6.04	4.311	14.04	58.9	0.0000	0.7052	0.200	1050	25.000	1.2212	1.41	1.46
	1026	1024	1.87	0.75	1.403	1.87	1.403	5.00	91.4	0.0000	0.3560	1.000	525	25.000	0.4301	1.99	2.22
	1025	1024	2.41	0.75	1.808	2.41	1.808	5.00	91.4	0.0000	0.4588	1.000	600	25.000	0.6140	2.17	2.38
	1024	1004	0.12	0.70	0.084	10.44	7.605	14.33	58.3	0.0000	1.2313	0.200	1200	25.000	1.7436	1.54	1.67
	1004	South Inlet	0.40	0.70	0.280	26.23	19.608	14.58	57.8	0.0250	3.1712	0.650	1350	130.000	10.4140	7.28	2.22
SWMF #1 Outlet Control Manhole	952	953	0.00	0.70	0.000	0.00	0.000	8.00	76.7	0.1700	0.1700	0.150	600	63.000	0.2378	0.84	0.91
	953	954	0.00	0.70	0.000	0.00	0.000	9.15	72.4	0.1700	0.1700	0.150	600	44.000	0.2378	0.84	0.91
	954	1002	0.00	0.70	0.000	0.00	0.000	9.95	69.7	0.1700	0.1700	0.150	600	73.000	0.2378	0.84	0.91
	1002	955	0.00	0.70	0.000	0.00	0.000	11.28	65.7	0.1700	0.1700	0.150	600	47.000	0.2378	0.84	0.91
	955	1001	0.00	0.70	0.000	0.00	0.000	12.14	63.4	0.1700	0.1700	0.150	600	48.000	0.2378	0.84	0.91
	1001	956	0.00	0.70	0.000	0.00	0.000	13.01	61.2	0.1700	0.1700	0.150	600	16.000	0.2378	0.84	0.91
	956	957	0.00	0.70	0.000	0.00	0.000	13.31	60.5	0.1700	0.1700	0.150	750	42.000	0.4312	0.98	0.92
Outlet tie to ex	957	EX 224466	0.97	0.70	0.679	0.97	0.679	14.07	58.8	0.1700	0.2810	0.150	750	12.000	0.4312	0.98	1.04
	EX 224466	EX 224521	0.00	0.70	0.000	0.97	0.679	14.26	58.4	0.8710	0.9812	0.840	750	88.000	1.0203	2.31	2.63

1:5 year Storm Area: 60.7 ha
Total Area: 60.7 ha

Storm Water Management Pond Information

Project: West 240 Neighbourhood Design Report

Job Number: 145328

Municipality: City of Edmonton

Date: 15-Dec-25

Design By: PP

Checked By: CET

File: https://arcadiso365.sharepoint.com/sites/145328/Internal Documents/6.0_Technical/6.01_General/04_Design-Analysis/SWMF/Storm Pond Calculator-2025-10-26 - POND 1.xlsxPond 1

General Basin Data

Pond Name: SWMF 1 (Constructed Wetland)

Pond Location: West 240

Contributing Basin Area: A= 56.95 ha

Basin Runoff Co-efficient: C= 0.81 (0.65 x 1.25)

Upbasin Pond:

Upbasin Area: Au= 9.13 ha

Maximum Draw Down Rate: 3.00 L/s/ha

Allowable Draw Down Rate: 2.25 L/s/ha (0.1709 m³/s)

Curve Distribution Data

Hydrograph Name	Storm Duration	Storm Return Period	Required Storage Volume (m³)	Maximum Storm?
1937 Edmonton Design Storm	48 hrs	N/A	49360	
1978 Edmonton Design Storm	20.5 hrs	N/A	51180	
2004 Edmonton Design Storm	25.75 hrs	N/A	50213	
2012 Edmonton Design Storm	1.5 hrs	N/A	21684	
Huff Distribution	24 hrs	1:100 year	51399	*
Chicago Distribution	4 hrs	1:100 year	36768	

Pond Design Information (Used PCSWMM to confirm pond sizes)

Maximum Volume:	51399 m³	
High Water Elevation:	667.000 m	
Normal Water Elevation:	665.000 m	
Depth of Pond:	2.000 m from NWL to HWL (ACTIVE STORAGE)	
Width of Walkway:	3.000 m @ 2.0%	
Side Slopes:	7H:1V	
	Calculated	Designed
NWL Pond Area:	21407 m²	21356 m²
Mean Pond Area:	25700 m²	27214 m²
HWL Pond Area:	31284 m²	33071 m²
Volume Provided:	52045 m³	54428 m³
Volume Difference:	+ 646 m³ +	3029 m³
NWL (DEAD) STORAGE =		33874 m³
ACTIVE STORAGE =		54105 m³
HWL TOTAL STORAGE =		87979 m³

Storm Water Management Pond Information

Project: West 240
Job Number: 145328
Municipality: City of Edmonton
Date: 15-Dec-25
Design By: PP
Checked By: CTP

File: https://arcadiso365.sharepoint.com/sites/145328/Internal Documents/6.0_Technical/6.01_General/04_Design-Analysis/SWMF/Storm Pond Calculator-2025-10-26 - POND 2.xlsxPond 1

General Basin Data

Pond Name: SWMF 2 (Dry Pond)
 Pond Location:
 Contributing Basin Area: A= 9.13 ha
 Basin Runoff Co-efficient: C= 0.81 (0.65 x 1.25)
 Upbasin Pond:
 Upbasin Area: Au= 0.00 ha
 Maximum Draw Down Rate: 3.00 L/s/ha
 Allowable Draw Down Rate: 2.25 L/s/ha (0.0274 m³/s)

Curve Distribution Data

Hydrograph Name	Storm Duration	Storm Return Period	Required Storage Volume (m³)	Maximum Storm?
1937 Edmonton Design Storm	48 hrs	N/A	8340	
1978 Edmonton Design Storm	20.5 hrs	N/A	8426	
2004 Edmonton Design Storm	25.75 hrs	N/A	8327	
2012 Edmonton Design Storm	1.5 hrs	N/A	3493	
Huff Distribution	24 hrs	1:100 year	8496	*
Chicago Distribution	4 hrs	1:100 year	5942	

Pond Design Information (Used PCSWMM to confirm pond sizes)

Maximum Volume: 8496 m³
 High Water Elevation: 667.050 m
 Normal Water Elevation: 665.390 m
 Depth of Pond: 1.660 m
 Width of Walkway: 3.000 m @ 2.0%
 Side Slopes: 7H:1V

	Calculated	Designed
NWL Pond Area:	3591 m²	0 m²
Mean Pond Area:	5118 m²	6430 m²
HWL Pond Area:	7345 m²	12859 m²
Volume Provided:	8787 m³	10673 m³
Volume Difference:	+ 290 m³	+ 2177 m³

NWL (DEAD) STORAGE = 0 m³

ACTIVE STORAGE = 11093 m³

HWL TOTAL STORAGE = 11093 m³

TABLE 3-2a - SWMF 1 (Constructed Wetland) Data

1. DESCRIPTION	West 240 SWMF 1					
2. LOCATION	West 240 North Basin					
3. STAGE	1					
4. TYPE	Constructed Wetland					
5. SIZE	Dead Storage	NWL	1:5 yr	1:25 yr	1:100 yr	HWL
Active Storage Volume (m³)	33874	0.00	24128	32489	44474	54105
Depth (m)		0.00	1.00	1.30	1.70	2.00
Surface Area (ha)		0.00	2.70	2.88	3.12	3.31
Maximum Flowrate (m³/s)		0.00	0.1080	0.1160	0.1430	0.1600
Elevation (m)		665.00	666.00	666.30	666.70	667.00
6. FREEBOARD (m)	668.00					
7. CATCHMENT AREA						
Temporary (ha)						
Interim (ha)						
Ultimate (ha)	56.95					
8. STRUCTURES						
Inlet Inverts (m)	1350 mm 662.100 m	1200 mm 662.100 m	1200 mm 662.100 m			
Outlet Inverts (m)	600mm 662.100 m					
Control Type	Control Manhole with Sluice Gate and Orifice					

TABLE 3-3a - STORMWATER MANAGEMENT FACILITY DATA

1. DESCRIPTION	West 240 SWMF 2					
2. LOCATION	West 240 South Basin					
3. STAGE						
4. TYPE	Dry Pond					
5. SIZE		BOL	1:5 yr	1:25 yr	1:100 yr	HWL
Active Storage Volume (cm)		0.00	1420	3052	5107	11093
Depth (m)		0.00	0.61	0.86	1.11	1.66
Surface Area (ha)		0.00	0.56	0.74	0.90	1.29
Maximum Flowrate (cms)		0.00	0.0120	0.0170	0.0170	0.0170
Elevation (m)		665.39	666.00	666.25	666.50	667.05
6. FREEBOARD (m)		668.05				
7. CATCHMENT AREA						
Temporary (ha)						
Interim (ha)						
Ultimate (ha)		9.13				
8. STRUCTURES						
Inlet Inverts (m)	1050 mm 666.200 m					
Outlet Inverts (m)	600 mm 665.392 mm					
Control Type						

Appendix B

Geotechnical Reports

DRAFT



Memorandum

Date: April 23, 2025

File: 303; CAD: 928+32-07, 08, 13, 14;
Posse 478864897-00

TO: Stuart Carlyle, Planner
Planning Coordination, Urban Planning and Economy

FROM: Gordon Pauls, Senior Geotechnical Engineer
Engineering Services, Integrated Infrastructure Services

SUBJECT: LDA25-0034, West 240 NASP, U of A Farm, 5510 - 122 Street NW
Circulation #1 Review, Supplemental

I reviewed the additional information provided for a new Neighborhood Area Structure Plan (NASP), referred to as West 240, which proposes to redevelop a portion of the University of Alberta Farm, west of 122 Street NW, into a residential neighborhood. This supplemental information included a geotechnical letter, prepared by CT & Associates Engineering Inc. (CTA), dated April 15, 2025. I had previously reviewed the following information as part of the 2 week initial circulation:

- Report: Geotechnical Investigation UAPT 'West 240' Lands, 5510 - 122 Street NW, prepared by CT & Associates Engineering Inc., (CTA File No. 02-3637) dated February 2024.
- Report: Slope Stability Evaluation & Set-Back Distance Determination UAPT 'West 240' Lands, 5510 - 122 Street NW, prepared by CT & Associates Engineering Inc., (CTA File No. 02-3637) dated February 2024.
- Letter: UAPT 'West 240' Lands -Additional Topsoil Thickness Evaluation, 5510 - 122 Street NW, prepared by CT & Associates Engineering Inc., (CTA File No. 02-3637.01) dated November 1, 2024.
- West 240 Development Concept Shadow Plan, prepared by B & A Studios, dated December 2024.

The subject site is currently zoned as agricultural lands and is owned and operated by the University of Alberta. The site is bounded by the Whitemud Creek to the west, with related risk of instability impacting the subject parcel.

The geotechnical letter prepared by CTA, dated April 15, 2025, included responses to my previous review comments and requests for clarification by the geotechnical consultant and overall, the geotechnical consultant has provided satisfactory responses. Although I would not necessarily fully concur with various aspects of the methodology used to conduct the geotechnical slope stability assessment, the geotechnical consultant has provided qualified Professional opinion that the land may be used safely for the development intended, respecting the development restrictions recommended in the geotechnical report. The detailed engineering assessment and engineering judgement used in arriving at the geotechnical recommendations for general development and top of bank development of these lands remain fully the responsibility of the geotechnical consultant as the Engineer of Record.

The report(s) provided recommendations for general site development and foundation design, site preparation and compaction, trenching and backfill, SWMF's, LID facilities, pavement design, seismic classification, cement type, and also addressed slope stability and related development restrictions and building setback distance recommendations for lands along the top of bank of the Whitemud Creek Ravine slopes. The Slope Stability Assessment prepared by CTA dated February, 2024 appeared to provide adequate geotechnical support for planning and design addressing top of bank development aspects, in accordance with the minimum evaluation requirements for the City. The report documented site and slope reconnaissance, the review of historical aerial photographs, coal mining activity records, a geotechnical drilling investigation, quantitative slope stability analyses, and engineering assessment.

Based on review of the geotechnical report, it would appear that the consultant has provided adequate confirmation that their assessment was prepared in accordance with the minimum requirements and currently adopted levels of landslide safety for the City of Edmonton, as per the intent of City Policy C542A. In general, the geotechnical consultant as the Engineer of Record has provided qualified Professional opinion that the land may be used safely for the development intended, respecting the development restrictions recommended in the geotechnical report. Therefore, based on the available information, it would appear that the applicant through the consultant has adequately met the intent of the relevant portions of Sections 7.140.5 and 2.260 RVO of the Zoning Bylaw 20001.

The geotechnical report includes site development requirements and restrictions as outlined in Section 7.0 of the report. These restrictions must be adhered to in the development and use of the site and it is recommended that the restrictions be incorporated into a top of bank restrictive covenant for affected lots along the top of bank.

The retention of existing vegetation at the top of bank and along the ravine slopes is considered highly desirable from a slope stability perspective and all existing vegetation on the slope shall be retained. Past experience has also shown that stripping of vegetation and significant re-grading, in addition to negating the significant positive aspects of vegetative cover, can also lead to negative changes in the surface water regime which may adversely impact stability. The minimization of such disturbance is of particular importance in proximity to the sensitive top-of-bank area. Based on the Development Concept Shadow Plan provided, it appears that portions of the proposed top of bank walkway route extend beyond the existing cleared limits, into the existing forested area with trees and vegetation along the top of bank. **It is recommended that the construction of the proposed walkway avoid any removal of trees and stripping of existing vegetation.**

Recommendations pertaining to the management of water at the site and adherence to related restrictions will be of high importance in order to reduce the risk of erosion and instability. Past experience has also shown that stripping of vegetation and significant re-grading, in addition to negating the significant positive aspects of vegetative cover, can also lead to negative changes in the surface water regime and slope hydrology which may adversely impact stability. The minimization of such disturbance is of particular importance in proximity to the sensitive top-of-bank area. Any grading of the site must not involve the direction or channeling of water toward the slopes

The structure setback and the other development restrictions recommended by the geotechnical consultant must ultimately be adhered to in all future planning and development of this site. As indicated above, I would also recommend that these restrictions be enshrined in a top of bank restrictive covenant agreement, with review by the geotechnical consultant as required.

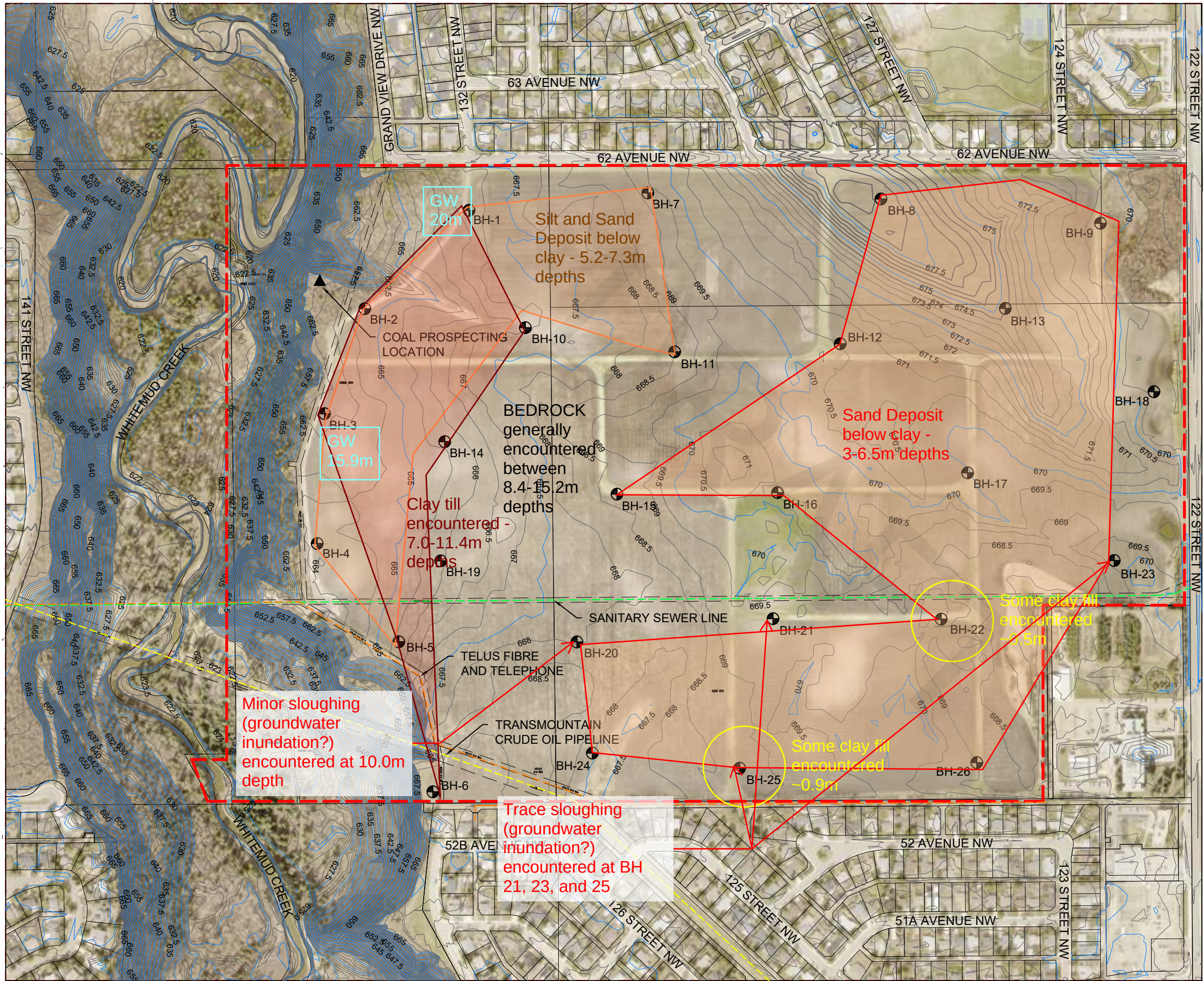
Given the development extents, site location, inherent risks, and potential complexity of the geotechnical engineering and construction issues for the proposed site development, the role of the geotechnical engineer will be important, to provide appropriate design and construction recommendations and inspection to suitably minimize risks, both to the project and existing surrounding structures and infrastructure. The ongoing review of the

geotechnical consultant and their involvement in the detailed design and construction phase engineering services aspects of this proposed project will be important.

If you have any questions on the comments herein, please call me at (780) 868-3951.

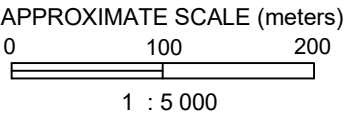
GJP

DRAFT



- LEGEND:
- SUBJECT SITE
 - BOREHOLE LOCATION
 - SANITARY SEWER LINE
 - TRANSMOUNTAIN PIPELINE
 - TELUS FIBRE AND TELEPHONE
 - COAL PROSPECTING LOCATION

NOTE: BASED ON GOOGLE EARTH AIR PHOTO (2021)



CT & ASSOCIATES ENGINEERING INC.

CLIENT
UNIVERSITY OF ALBERTA PROPERTIES TRUST

DATE
JAN. 19, 2024

DWN.
MLW

CHKD.
DSN

PROJECT
GEOTECHNICAL INVESTIGATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE
SITE PLAN AND BOREHOLE LOCATIONS

FILE NO.
02-3637-A1

DWG. NO.
A-1



GEOTECHNICAL INVESTIGATION

UAPT 'WEST 240' LANDS

**5510 - 122 STREET NW
EDMONTON, ALBERTA**

Prepared for

UNIVERSITY OF ALBERTA PROPERTIES TRUST

FEBRUARY 2024

CTA File No. 02-3637



GEOTECHNICAL INVESTIGATION

UAPT 'WEST 240' LANDS

**5510 - 122 STREET NW
EDMONTON, ALBERTA**

Prepared for

UNIVERSITY OF ALBERTA PROPERTIES TRUST

FEBRUARY 2024

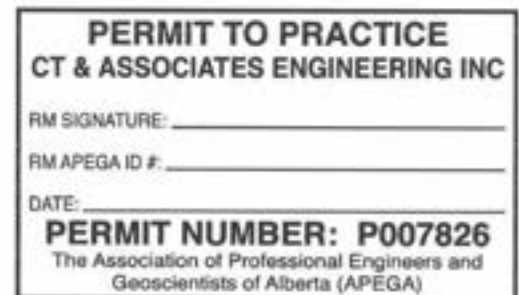
CTA File No. 02-3637

Prepared by,

CT & ASSOCIATES ENGINEERING INC.

Danny Niawchuk, P.Eng.

Mirek Witkos, P.Eng.
/DSN/MJW



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1.0 INTRODUCTION

This report presents the results of a Geotechnical Investigation conducted by CT & Associates Engineering Inc. (CTA) for the proposed 'West 240' residential development to be located within the east upland portion of the property with the municipal address of 5510 - 122 Street NW, Edmonton, Alberta.

Authorization to proceed with the Investigation was provided by Keaton Seaby, P. Eng., PMP, Manager, Development and Construction with the University of Alberta Properties Trust (UAPT) on October 31, 2023.

This assessment and document has been prepared concurrently with a 'Slope Stability Evaluation and Determination of Set-Back Distances' of the lands that is prepared under separate cover on behalf of UAPT.

2.0 SITE DESCRIPTION AND DEVELOPMENT INTENT

2.1 GENERAL SITE DESCRIPTION

The subject property occupies the lands with the municipal address of 5510 - 122 Street NW, Edmonton, Alberta, located to the west of 122 Street NW and extending 1.2 km westerly to the Whitemud Creek Ravine, and to the south of 62 Avenue NW and extending approximately 800 m to the south.

The legal land descriptions of the property include Blocks A, B, and C, Plan 4971AJ, and Parcel B, Plan 3347EO.

The subject property is indicated on Drawing No. A-1, Appendix A, with representative site photos presented in Appendix B.



2.2 DEVELOPMENT DESCRIPTION

Based on the provided concept plan, it is understood that the future development within the site will include the following:

- 1) The majority of the site is to be developed with residential subdivision, with some Mixed-Use properties (including commercial, multi-family, and a school site) to be constructed at the east portion of the lands;
- 2) At the south central portion of the site a Storm-Water Management Facility (SWMF) is proposed, though the location may be modified as part of future planning;
- 3) Within the site are to be various open spaces and parks, with connecting roadways and municipal utilities.
- 4) Potential 'Low-Impact Development' (LID) may be included as part of the site development, that may include such features as bioretention basins/bioswales, soils cells, box planters, and absorbent landscaping.

2.3 PROJECT OBJECTIVES

The main objective of this project is to conduct a 'Subdivision Level' (NDR) Geotechnical Investigation, to:

- 1) Provide a comprehensive understanding of the subsurface soils and groundwater conditions;
- 2) Provide detailed geotechnical design criteria and construction requirements for the proposed land development, to be included and taken into consideration as part of planning of the development and for the future site construction;
- 3) Identify potential risks related to construction of 'Low-Impact Development' (LID) features from a geotechnical perspective, and to provide preliminary geotechnical design criteria and construction requirements for these facilities.

During future detailed design stages and based on CTA review of the proposed development plans, further site-specific geotechnical review and additional investigations (for the future specific structures and development/grading plans, such as SWMF, deep utilities, commercial/school/multi-family developments, or significant surface grading) may be required in order to confirm the criteria presented in this report.

3.0 SITE INVESTIGATION PROGRAM

3.1 SITE STUDY AND SITE RECONNAISSANCE

A review of historical air photos of the subject site was completed (representative historical air photos are presented in Appendix C), with an initial site review conducted on November 2, 2023.

Based on the proposed site development plan and subsequent field reconnaissance, the drilling investigation program was developed for the subject site.

3.2 DRILLING PROGRAM

The field drilling program to determine soils and groundwater conditions required for the Geotechnical Investigation of the uplands area and associated Slope Stability Analysis was completed between November 24, 2023 and December 21, 2023 consisting of twenty-six (26) boreholes, as follows:

- 1) Within the east upland areas, twenty (20) boreholes (Boreholes No. 7 through 26) to between 8.8 m to 11.9 m depth below the existing ground surface;
- 2) Along the Whitemud Creek ravine top-of-bank, six (6) boreholes (Boreholes No. 1 through 6) drilled to between 13.1 m to 24.1 m depth below the existing ground surface. The deep boreholes were intended to be drilled through the approximate full



- depth of the adjacent ravine though were ultimately terminated at an auger refusal depth, due to the very hard bedrock deposit encountered;
- 3) During drilling, a piezometer was installed at each borehole location for depth to groundwater monitoring purposes.

Drilling was conducted with a B-61 truck-mounted drill rig and was supervised at all times by a CT & Associates Engineering Inc. engineer. Disturbed samples were taken from auger cuttings typically at 0.8 m intervals. Standard Penetration Testing (SPT) was conducted at 1.5 m intervals, from which disturbed samples were also taken.

The borehole drilling program was submitted to the UAPT for approval of borehole locations to take into consideration ongoing agricultural research within the property. Based on the UAPT review, slight modifications of the borehole locations was completed to accommodate and not impact such research with the drilling rig and support trucks.

Drawing No. A-1, Appendix A, shows the borehole locations with logs of boreholes included in Appendix D.

Boreholes elevations were determined by CTA based on the City of Edmonton site contour data (3TM coordinates) relative to geodetic elevation.

3.3 LABORATORY TESTING PROGRAM

Laboratory testing was also conducted on soil samples for the determination of natural moisture content, Atterberg limits, soluble sulphate concentrations, and California Bearing Ratio (CBR).

Test results are presented on the individual borehole logs contained in Appendix D and E (California Bearing Ratio).



3.4 ASSESSMENT AND REPORT PREPARATION

Based on the findings of the site and historical reviews, field program, and in consideration of the proposed site development, geotechnical design parameters and construction requirements were developed, as presented herein.

4.0 SITE CONDITIONS

4.1 SITE LOCATION

The 'West 240' subject site is described as follows:

- 1) The subject site occupies the lands with the municipal address of 5510 - 122 Street NW, located to the west of 122 Street NW and extending 1.2 km westerly to the Whitemud Creek, and to the south of 62 Avenue NW and extending approximately 800 m to the south;
- 2) The legal land descriptions of the property include Blocks A, B, and C, Plan 4971AJ, and Parcel B, Plan 3347EO. The entirety of the site occupies approximately 93.5 ha (231 acres of land), with approximately 83.5 ha (198.5 acres) over the east upland portion of the site (east of the Whitemud Creek ravine slopes) which is considered developable.

The location of the subject property is presented on Drawing No. A-1, Appendix A.

4.2 SURFACE FEATURES

The subject site is generally described as follows:

1) East Upland Areas

The east, upland, developable portion of the subject site (east of the Whitemud Creek ravine slopes) includes approximately 83.5 ha (198.5 acres) of land, the majority of which is utilized as cultivated farmland (agricultural research purposes on behalf of the University of Alberta).

The majority of this area is relatively flat, though there is a local high area at the northeast portion of the site (with an approximate elevation of 678.5 m) with a gentle slope down to the east, south and west. Elevations over the east and south portions of the site vary from about 669.0 m to 670.0 m, while over the west portion of the site about 662.0 m to 668.0 m elevation along the ravine top-of-bank.

Local tree covered areas are present at the northeast and northwest corners of the site, with small localized low-lying areas at the southeast corner and south central portion of the site. Various local grass-covered pathways for vehicle traffic to research plots within the property are present throughout the site.

Underground utilities within the subject site include the following, as indicated on Drawing No. A-1, Appendix A:

- 1) Extending in a west to east direction through the south portion of the site is an underground EPCOR sanitary sewer. This sewer utility connects at a trestle located within the ravine to the west and then crosses 122 Street NW to the east;

- 2) At the southwest portion of the site is a high pressure TransMountain pipeline and Telus fibre, both extending in a southeast to northwest direction. The pipeline crosses under the adjacent Whitemud Creek Ravine, while the Telus fibre extends along the top-of-bank area and then crosses the ravine to the west via the EPCOR trestle.

2) Adjacent Ravine Slopes

Within the west portion of the subject site is a slope from the upland areas down to Whitemud Creek. This slope area is generally described as follows:

- 1) The slopes range in height from about 40 m to 43 m, and are generally covered with mature trees and vegetation;
- 2) Slope angles generally range from about 1 (v) : 4 (h) to 1 (v) : 6 (h), though there are locally steeper areas (at about 1(v) : 3 (h)) also present;
- 3) At the base of the ravine, the Whitemud Creek meanders significantly, and at three locations is present immediately at the toe of the slope coming down from the site.

4.3 LOCAL GEOLOGY AND COAL MINING

Based on our review of geological and coal mine maps, subsurface conditions at the subject site are summarized as follows:

- 1) According to the “Urban Geology of Edmonton - Alberta Research Council Bulletin 32” (Kathol & MacPherson, 1975), the subsurface geology over the subject site area is summarized as follows:
 - Local geology is expected to consist of approximately 18 m to 20 m of glaciolacustrine deposits of bedded sands, silts, and clay, over approximately

5 m of glacial till (composed of unsorted and stratified deposits of clay, silt, and sand, with pebbles and boulders);

- Within the clay till, localized, thin rafted bedrock and disturbed Saskatchewan Sand and Gravels deposits may be encountered;
- Below the clay till, a bedrock deposit consisting of interbedded shale and sandstone is expected.

2) With respect to coal mines in vicinity of the subject site:

- According to “Atlas: Coal Mine Workings of the Edmonton Area.” (Taylor, R., 1971), there are no coal mines identified within the subject site. Similarly, the Alberta Energy Regulator (AER) documentation does not identify any coal mines within the subject site.
- Former coal mines to south but do not extend to the subject site, as per Alberta Energy Regulator drawing presented in Appendix F;
- A small ‘prospecting’ shaft is identified to the west of the northwest portion of the subject site within the heavily treed area near the top-of-bank, (as approximately indicated on Drawing No. A-1, Appendix A), summarized as follows:
 - i) AER records indicate that in 1928, there had only been a ‘prospecting’ shaft or drill, with the location being uncertain. The records indicate that due the thickness of coal encountered ‘the prospect’ was dropped and the location abandoned as it was not commercially viable, though the nature of the work was not known;
 - ii) Review of this area did not observe any remains of this prospect shaft or drill;
 - iii) Based on the above, there are no records of coal mining occurred related to this prospecting location.



4.4 REVIEW OF SITE HISTORY

Review of historical air photos (1920 through 2023) was completed as part of the site study.

This review indicates the following:

- 1) The site has historically been utilized as farmland (since prior to 1920) with a few small low-lying areas within the east and south central portions of the site. Surrounding properties have historically also been agricultural land. In 1920, areas over about the east half of the subject site had been covered with trees and vegetation;
- 2) By 1952, the majority of the site was cultivated farmland, with small treed areas at the northeast and northwest corners of the site;
- 3) Through 1962, the site remained unchanged. By this time, commencement of the construction of the residential subdivision to the north had begun and the construction of a pipeline at the southwest corner of the property is apparent;
- 4) By 1967, the sewer trestle had been constructed within the adjacent Whitemud creek ravine, with various new walking trails apparent along the ravine slopes;
- 5) Through 1980, the subject site remained relatively unchanged. At this time, various research plots are apparent within the east portion of the subject site;
- 6) In 1987, a small area of disturbance is apparent at the northeast corner of the site related to the site farming/research;
- 7) The subject site remains relatively unchanged through 2023, the various research plots throughout continuing.

In summary, the subject site had been utilized as cultivated farmland since at least 1950, as it remains today. No historical evidence of fill placement or site grading was observed within the site.

Representative historical air photos presented in Appendix C.



4.5 SOIL CONDITIONS

Generally, the surface conditions at the subject site are summarized as follows:

- 1) At the borehole locations, a topsoil layer of between 100 mm to 450 mm thick was encountered, though typically in the order of 150 mm to 200 mm thickness;
- 2) Due to limitations for drill rig access related to the ongoing agricultural research projects and operations within the property, there may be sporadic areas with a thicker topsoil layer throughout the site;
- 3) Fill materials (of 0.5 m and 0.8 m thickness) were encountered at two isolated locations (Boreholes No. 22 and 25) potentially related to access pathway construction and research within the site.

Below the topsoil and isolated fill layer, a native clay deposit was encountered at between 0.1 m to 0.45 m below the existing ground surface and of between 2.9 m to 7.4 m thickness. The clay deposit was typically moist to wet, high plastic, and firm to stiff, though at some borehole locations was found to become low to medium plastic with depth.

Below the high plastic clay deposit:

- 1) Over the east and southwest portions of the site (Boreholes No. 8, 9, 12, 13, 15 through 17, 20, 22, and 23 through 26), a sand deposit was then encountered at between 3.0 m and 6.5 m depth and extending through the remaining borehole depths, 11.9 m below the existing ground surface. The sand deposit was typically encountered to be damp to moist, fine-grained, uniform, and compact to very dense;
- 2) Over the northwest and along the west boundary of the upland areas of the site (Boreholes No. 1, 2, 3, 4, 5, 7, and 11), varying thicknesses of silt and sand deposits were encountered from between 5.2 m and 7.3 m depth below the existing ground surface, and with a total thickness of between 1.8 m to 8.9 m.



At the locations of Boreholes No. 1, 2, 3, 5, 6, 10, and 14, a moist, low plastic, stiff to very stiff clay till deposit was then encountered at between 7.0 m to 11.4 m depth below the existing ground surface, and of between 0.7 m to 5.2 m thick. Such clay till was not encountered at the remaining borehole locations.

In the vicinity of the top-of-bank (locations of Boreholes No. 1 through 6, 10, and 14), bedrock (consisting of clay shale and sandstone) was then encountered at between 8.4 m to 15.2 m depth, and extending the remaining borehole depths. Boreholes were terminated at depths as indicated on the borehole logs due to auger refusal during drilling due to the very hard nature of the bedrock deposit.

A generalized soil stratigraphy for the site is summarized in Table 1.

Details of the soil stratigraphy can be found in the borehole logs in Appendix D.

TABLE 1
GENERAL SOIL STRATIGRAPHY

Material	Soil Description	Approximate Depth to Top of Stratum (m)	Range in Thickness of Stratum (m)
TOPSOIL ¹	Organic, silty, sandy, some clay, moist to wet, black	0.0	0.1 - 0.45
CLAY	Some silt to silt, trace sand, moist to wet, high plastic, firm to stiff, dark greyish brown - becomes low to medium plastic with depth	0.1 - 0.45	3.0 - 8.6
SAND ²	Silty, trace clay, fine-grained, uniform, damp to moist, compact to very dense, dark greyish brown to dark brown	3.0 - 6.5	> 6.9
SILT / SAND ³	<u>Silt</u> - Some sand, some clay, damp to wet, non plastic, stiff, dark greyish brown <u>Sand</u> - Silty, trace clay, fine-grained, uniform damp to moist, compact to very dense, dark greyish brown	5.2 - 7.3	1.8 - 8.9
CLAY TILL ⁴	Silty, sandy, trace coal and pebbles, moist to wet, low plastic, stiff to hard, dark greyish brown	7.0 - 11.4	0.7 - 5.2
BEDROCK	<u>Clay Shale</u> - Rafted to intact, silty, trace sand, damp to moist, high plastic, hard, grey <u>Sandstone</u> - Rafted to intact, clayey, silty, some sand, damp, medium to high plastic, hard, grey	8.4 - 15.2	> 12.2

- Note: ¹ At the locations of Boreholes No. 22 and 25, clay fill of 0.5 m and 0.9 m thickness was encountered
- ² Over the east and southwest portions of the site (Boreholes No. 8, 9, 12, 13, 15, 16, 17, 19, 20, 22, 23, 24, 25, and 26), a sand deposit was encountered below the clay deposit and extended through the remaining borehole depths, 11.9 m below the existing ground surface
- ³ Over the northwest portions and along the west boundary of the upland areas of the site (locations of Boreholes No. 1, 2, 3, 4, 5, 7, and 11), varying thicknesses of silt and sand deposits were encountered below the clay
- ⁴ Encountered only at the locations of Boreholes No. 1, 2, 3, 5, 6, 10, and 14

4.6 GROUNDWATER CONDITIONS

4.6.1 Completion of Drilling

At the completion of the drilling programs, no water was encountered at any of the borehole locations. There was also no sloughing conditions encountered at the majority of borehole locations, with the exception of minor sloughing only encountered at the location of Borehole No. 20 at 10.0 m depth and trace sloughing at the locations of Boreholes No. 21, 23, and 25.

4.6.2 Groundwater Monitoring

During drilling, twenty-six (26) piezometers were installed for groundwater monitoring purposes. Groundwater measurement readings were taken as follows:

- 1) On January 4, 2024, at between fifteen (15) and forty-one (41) days after piezometer installation, groundwater was only encountered at the locations of Boreholes No. 1 (20.0 m depth) and No. 3 (15.9 m depth) and with trace water encountered at the locations of Boreholes No. 17, 21, and 26. No water was measured at any of the other borehole piezometers;
- 2) On January 24, 2024, at between thirty-five (35) and sixty-one (61) days after piezometer installation, groundwater was only encountered at the locations of Boreholes No. 2 through 6 (deep boreholes along the top-of-bank area) at between 12.1 m to 18.3 m depth below the existing ground surface, while at the locations of Boreholes No. 10, 20, and 23 (within upland areas) at between 8.2 m to 9.5 m depth below the existing ground surface. Trace water was also encountered at the locations of Boreholes No. 17 and 23. No water was measured at any of the other borehole piezometers.

A summary of piezometer installation and groundwater level readings details are provided in Table 2.

TABLE 2
SUMMARY OF PIEZOMETER INSTALLATION AND GROUNDWATER TABLE READINGS

Piezometer No.	Piezo. Depth (m)	Intersected Lithology	Ground Elevation ¹ (m)	Depth to Water at Time of Installation ² (m)	Groundwater Level Readings			
					January 4, 2024 ³		January 25, 2024 ⁴	
					Depth to Water (m)	Elevation (m)	Depth to Water (m)	Elevation (m)
BH-1	23.6	Clay / Silt / Sand / Clay Till / Bedrock	666.4	Dry	20	646.4	Frozen ⁵	
BH-2	16	Clay / Silt / Clay Till / Bedrock	664.6	Dry	Dry	< 648.6	14.9	649.7
BH-3	22.1	Clay / Silt / Sand / Clay Till / Bedrock	664	Dry	15.9	648.1	16	648
BH-4	19.1	Clay / Silt / Sand / Bedrock	664.1	Dry	Dry	< 645.0	16.4	647.7
BH-5	19.7	Clay / Silt / Clay Till / Bedrock	665.6	Dry	Dry	< 645.9	18.3	647.3
BH-6	13.1	Clay / Sand / Clay Till / Bedrock	669.2	Dry	Dry	< 656.1	12.1	657.1
BH-7	8.4	Clay / Silt / Sand	668.9	Dry	Dry	< 660.5	Dry	< 660.5
BH-8	9.9	Clay / Sand	678.3	Dry	Dry	< 668.4	Dry	< 668.4
BH-9	8.4	Clay / Sand	670.4	Dry	Dry	< 662.0	Dry	< 662.0
BH-10	8.4	Clay / Bedrock	667.3	Dry	Dry	< 658.9	8.2	659.1
BH-11	8.4	Clay / Silt	668.4	Dry	Dry	< 660.0	Dry	< 660.0
BH-12	8.4	Clay / Sand	670.5	Dry	Dry	< 662.1	Dry	< 662.1
BH-13	8.4	Clay / Sand	674	Dry	Dry	< 665.6	Dry	< 665.6
BH-14	8.4	Clay / Clay Till / Bedrock	665.4	Dry	Dry	< 657.0	Dry	< 657.0
BH-15	8.4	Clay / Sand	668.6	Dry	Dry	< 660.2	Dry	< 660.2

TABLE 2 cont'd
SUMMARY OF PIEZOMETER INSTALLATION AND GROUNDWATER TABLE READINGS

Piezometer No.	Piezo. Depth (m)	Intersected Lithology	Ground Elevation ¹ (m)	Depth to Water at Time of Installation ² (m)	Groundwater Level Readings			
					January 4, 2024 ³		January 25, 2024 ⁴	
					Depth to Water (m)	Elevation (m)	Depth to Water (m)	Elevation (m)
BH-16	8.4	Clay / Sand	667.5	Dry	Dry	< 659.1	Dry	< 659.1
BH-17	8.4	Clay / Sand	667	Dry	Trace	658.2	Trace	658.2
BH-18	8.4	Clay	667.1	Dry	Dry	< 658.7	Dry	< 658.7
BH-19	8.4	Clay / Sand	665.8	Dry	Dry	< 657.4	Dry	< 657.4
BH-20	11.4	Clay / Sand	668.3	Dry	Dry	< 656.9	9.5	658.8
BH-21	11.4	Clay / Sand	669.5	Dry	Trace	658.1	Frozen ⁵	
BH-22	8.4	Clay / Sand	669.5	Dry	Dry	< 661.1	Dry	< 661.1
BH-23	8.4	Clay / Sand	668.7	Dry	Dry	< 660.3	8.2	660.5
BH-24	8.4	Clay / Sand	667.8	Dry	Dry	< 659.4	Dry	< 659.4
BH-25	8.4	Clay / Sand	668.7	Dry	Dry	< 660.3	Dry	< 660.3
BH-26	8.4	Clay/Sand	669	Dry	Trace	660.6	Trace	660.6

Note: ¹ Boreholes elevations were determined by CTA based on the City of Edmonton site contour data (3TM coordinates) relative to geodetic elevation

² Piezometers installed on November 24, 2023, December 1, 4, 5, 8, 11, 13, 14, 19, 20, and 21, 2023

³ Groundwater measurements at between fifteen (15) and forty-one (41) days after piezometer installation

⁴ Groundwater measurements at between thirty-six (36) and sixty-two (62) days after piezometer installation

⁵ Piezometer frozen near ground surface due to recent significant cold weather

4.7 PLASTICITY AND MOISTURE CONDITION OF SHALLOW CLAYEY SOILS

With respect to the shallow clayey soils as encountered over the subject site:

- 1) Below the existing ground surface at between 0.15 m and 0.45 m, a high plastic clay deposit is present with a natural moisture content generally ranging from about 21% to 35%. At isolated borehole locations, moisture conditions ranged to as low 11% to 19% (Borehole No. 8) to as high as 38% (Borehole No. 24) though these are considered isolated within the site;
- 2) Atterberg limits (used to define the 'plasticity' of a cohesive soil, ie/ its ability to undergo deformation without cracking or fracturing, and also its swell potential, seventeen (17) tests completed) indicate:
 - Generally, the Liquid limit of the soils ranged from about 53% to 80%, with a Plastic limit ranging from about 21% to 28%. At three (3) isolated locations (Boreholes No. 8, 15, and 16), the Liquid limit ranged from 36% to 49% and the Plastic limit was between 18 and 22%;
 - Based on the Atterberg limits test results, the soils are practically defined as ranging from 'medium to high plastic' to 'high plastic', though should be considered as high plastic throughout the site;
- 3) Based on comparison of the natural moisture conditions of the clayey soils near the ground surface to the Plastic limit of the clay (which is used to compare to approximately the 'Optimum Moisture Condition' of the soil, ie/ how dry or wet the soil is in its existing state and used for assessment of the swelling potential of these soils), it is concluded that over the majority of the site, the existing soils moisture condition is at or above the expected optimum moisture content and thus considered to be on the wet of the optimum moisture content in its current state. However, over the isolated areas, the high plastic clay are also on the dry side of the optimum moisture content;

- 4) As a result, based on the existing moisture conditions of these shallow moist to wet, high plastic clayey soils, there is a potential for soil swelling, with any future water ingress resulting in an increase in moisture condition of the clayey soils, or with drying and future wetting of these soils.

5.0 GEOTECHNICAL ASSESSMENT FOR DEVELOPMENT

5.1 GENERAL

Generally, based on the soil and groundwater conditions encountered during the drilling program, the proposed residential, multi-family, and commercial development is feasible at the subject site.

The general summary of the site assessment is presented as follows:

- 1) Based on anticipated site grading that will be close to existing grades and the encountered subsurface conditions, standard design and construction practices are generally applicable for site grading, utilities installation, building foundation and roadway construction, provided that requirements and precautions with respect to the shallow, high plastic clayey soils are taken into consideration during design and construction, most notably with respect to building footing foundations;
- 2) A topsoil layer was encountered over the subject site, varying from between 100 mm to 450 mm thick. The topsoil layer will require removal as part of site preparation. Due to limitations for drill rig access related to the ongoing agricultural research projects and operations within the property, there may be sporadic areas with a thicker topsoil layer throughout the site, that should be further evaluated through additional site investigation at later design stages and once the entire site is available for study;

- 3) Over the majority of the site, groundwater levels were generally measured at greater than 8 depth below the existing ground surface, and are thus expected to have practically no detrimental effect on subdivision construction;
- 4) With respect to underground utility installation:
 - Generally, the moist wet, firm to stiff clayey soils (as encountered within upper portion of the clay deposit) can provide a stable trench for the short term utility installation in the order of between 3.0 and 5.0 m depth below the existing ground surface, provided that the trench slope is no greater than 1(h) : 1(v);
 - At depth, where the 'sugary' sand layer was encountered (at between 3.0 m and 8.5 m depth), a significantly less steep angle or a shield box for temporary shoring for trench support will be required. For trench backfill with these sand materials, mixing the sand with the upper clay will be required to improve compaction and achieve required backfill criteria;
 - Should wet and firm soils be encountered at the base of the utility installation, base improvement through sub-cutting of a minimum of a 0.3 m thick layer and replacement with washed rock wrapped in a woven geotextile (Layfield LP315, or equivalent) will be required to provide proper base support for utility construction;
- 5) With respect to a storm water management facility:
 - Due to the encountered silt and sand soils at depth, a clay liner will be required for the SWMF;
 - Consideration for appropriate equipment and construction techniques should also consider the presence of the dry to damp sand at depth;
- 6) With respect to commercial and multi-family developments and based on the encountered conditions, conventional design and construction practices are generally anticipated for the subject site area, provided that requirements and precautions with respect to the shallow, high plastic clayey soils are also taken into consideration during design and construction;

- 7) LID facilities are considered feasible for the subject site, provided considerations with respect to mitigating impacts to the local high plastic clays that may result in swelling potential are taken into consideration for their design and construction.

During future detailed design stages and based on CTA review of more detailed development plans, further site-specific geotechnical review and additional investigations (for future specific structures and development/grading plans, deep utilities, or significant surface grading) may also be required in order to confirm the criteria presented in this report.

5.2 SUBDIVISION DESIGN AND CONSTRUCTION CONSIDERATIONS FOR SHALLOW DAMP TO MOIST CLAYEY SOILS

As outlined in Sections 4.5 and 4.7, the subject site is generally underlain by high plastic clayey soils, extending from approximately 0.15 m to 7.4 m depth below the existing ground surface.

Based on the existing moisture conditions of these shallow moist to wet, high plastic clayey soils, there is a potential for significant soil swelling with any future water ingress resulting in an increase in moisture condition of the clayey soils, or with drying and future wetting of these soils.

In order to mitigate and minimize this potential, the following considerations and precautions are presented for the subdivision design and construction:

1) Residential Footings and Basements

It is anticipated that surface grading will generally maintain the existing ground elevation. As such, residential foundations and basement floor slabs will generally

be placed within the high plastic clayey soils that are prone to swelling if allowed to dry (and with future wetting).

Precautions should be in place during residential footing and basement construction to not allow the moisture condition changes (drying and/or wetting) of these clays, as this will present significant potential for swelling of the soils.

Provided such precautions and awareness are provided during construction, conventional footing and basement slab construction is anticipated.

2) Subdivision Underground Utilities

Conventional design and construction for underground utilities is expected (with uniform trench backfill), though moisture conditioning (drying) of the excavated wet clayey soils may be required for trench backfill placement to achieve required backfill criteria.

3) Surface Infrastructure

Depending on the final design elevations and grading, similar issues with respect to high plastic clayey soils and their future swelling potential could be encountered with surface infrastructure (roadways, curb and gutter, sidewalks, driveways, shallow basement slabs, and similar).

Potential impacts to surface infrastructure due to these soils conditions are to be taken as part of later grading design, and as part of construction planning and staging.

4) CTA Review of Later Detailed Design Stages

As part of on-going subdivision design, CTA is to be provided opportunity to review subdivision drawings to ensure they take into consideration geotechnical requirements for design and construction, most notably related to elevation and grading planning for residential basements (footings and basement floor slab).

5) Advisement to Designers and Contractors

It is strongly recommended that designers and contractors of construction work within the development site be advised of the presence of and potential swelling effects of these high plastic clayey soils, that indeed require appropriate planning as part of design and construction to overcome this potential.

5.3 SITE PREPARATION/GRADING AND COMPACTION STANDARDS

5.3.1 Site Preparation and Grading

Generally, the site is covered with a topsoil layer between 100 mm to 450 mm thick. The topsoil layer will require removal and replacement with engineered fill materials during site preparation and grading.

Due to limitations for drill rig access related to the ongoing agricultural research projects and operations within the property, there may be sporadic areas with a thicker topsoil layer throughout the site that should be further evaluated through additional site investigation at later design stages and once the entire site is available for study. In addition, at the isolated low-lying areas within the site, thicker topsoil and organic layers may be present.

The existing fill materials as encountered over isolated areas (Boreholes No. 22 and 25, of between 0.6 m to 0.8 m thickness) will require removal and replacement with engineered clay fill soils. As these fills potentially are related to access pathway modifications and research within the site, similar removals and replacement may be required at other pathway and access areas.

Generally, fair to good shallow sub-grade conditions are expected for site grading, however, should wetter or soft clays be encountered, additional sub-cutting and replacement of the underlying wet and soft soils may be required such to provide a 'bridge' effect during placement and compaction of engineered fill materials. Geotextile may also be required at these areas to achieve the required compaction of the engineered fill materials. The extent and thickness of any such sub-cut areas will be evaluated by CTA based on design grades and site reviews at time of site grading.

Groundwater conditions were generally measured over the majority of the site at greater than 8 m depth below the existing ground surface, and will have practically no detrimental effect on subdivision grading.

5.3.2 Compaction Standards

All imported clay fill to be used for placement on site as engineered fill is required to consist of low to medium plastic clay, and to the approval of CT & Associates Engineering Inc.

All engineered fill is required to be compacted to minimum of 98% of Standard Proctor Maximum Dry Density (ASTM D698) at between optimum to 2% above optimum water content, in maximum 150 mm compacted thickness lifts in order to provide proper sub-grade support for on-grade construction.

All engineered clay fill placement and compaction as part of site grading is also to be completed in accordance with the City of Edmonton Complete Streets Design Standards (CoE CSDS), Section 2.0 and 3.0 (2023).

Engineered fill construction requires full-time monitoring and testing by CTA during construction.

The existing native clay materials on site are considered suitable for reuse as part of site grading, though generally drying of the clayey soils near the existing ground surface will be required to meet the required compaction criteria.

5.4 UTILITY TRENCHING AND BACKFILL

5.4.1 Trench Excavation

It is expected that the utility trenches will be in the order of 3 m to 4 m deep. As such, over the majority of the site, the native clay soils can provide a stable trench for the short term utility installation, provided that the trench slope is no greater than 1(h) : 1(v), though the trench slope angle is to be modified in accordance with the construction experience gained through the site and lessened as required.

Should the dry 'sugary' sand layer was encountered at depth, a significantly less steep slope angle or a shield box for temporary shoring for trench support will be required.

All excavations are also required to be completed in accordance with pertinent OH & S regulations. Temporary surcharge loads such as excavated soils and stockpiles of materials should be kept back from the excavation crest by a minimum distance of equal to the excavation depth.

All open trench excavations are to be checked regularly for signs of cracking or sloughing, especially during and after periods of rainfall. It should be recognized that even small earth falls pose a significant danger to workers and must be guarded against at all times. Any sloughed or loosened materials on the trench walls should be promptly removed. If there is any evidence of bulging in the trench wall or cracking on the ground surface parallel to the trench, all work in the trench must be immediately terminated and the stability of the trench assessed by a CTA engineer. It may be necessary to shore that portion of the excavation, or to locally increase the cutback of the trench excavation slope.

Based on the encountered soils and groundwater conditions, groundwater seepage/inflow is expected to be nominal during construction and anticipated to be handled with conventional sump pump.

5.4.2 Utility Base Construction

Based on the encountered soils and groundwater conditions, over the majority of the site for the utility installation in the order of 3 m to 4 m deep, conventional bedding sand to City of Edmonton specification is expected to be suitable.

Should isolated areas of a wet, firm, clay deposit be encountered (such as at the locations of Boreholes No. 24 and 25), base improvement through sub-cutting of a minimum of a 0.3 m thick layer and replacement with washed rock wrapped in a woven geotextile (Layfield LP315, or equivalent) will be likely required to provide proper base support for utility construction.

The washed rock thickness should be further evaluated on site at the time of trench excavation. Trench de-watering via sump pump or draining water into downstream catch-basins may also be required.

5.4.3 Trench Backfill

Generally, underground utility installations are to be conducted following site grading and engineered clay fill placement.

The underground utility installation(s) will include a uniform trench backfill methodology in accordance with the CoE CSDS which includes excavation, placement and compaction of the clayey soils to a minimum of 98% Standard Proctor Maximum Dry Density (SPMDD - ASTM D698) within the uniform backfill zone (i.e. within 1.5 metres depth from the pavement sub-grade elevation, from property line to property line on both sides of the roadway right-of-way). This engineered fill construction will provide a suitable and uniform underlying clay sub-grade condition for the construction of subdivision surface infrastructure.

Beyond the 1.5 m depth of the clay sub-grade, all trench clay backfill is to be placed and compacted to 95% Standard Proctor Maximum Dry Density, or to the minimum standard required by the appropriate backfill zone.

It is required by the current City of Edmonton standards that all utility trench backfill (Type 1 Backfill) placement must meet the requirements of the current CoE CSDS, Section 3.1.3.7 - Density Requirements, which includes criteria related to compaction and moisture content of the backfill materials.

All backfill materials should be placed near the optimum moisture content and must be free of organics, contamination, deleterious debris, or stones greater than 75 mm in diameter.

Generally, due to the high moisture content of the clayey soils, drying of these soils will be required, or blending with dryer soils will be required, to ensure that the

trench backfill can be compacted to the required criteria. Alternatively, replacement of the materials with imported material approved by the site engineer is a viable option.

With utility installation within the 'sugary' sand at depth, mixing of the sand with the upper clay of the utility excavation will be required to improve backfill compaction to achieve the required compaction criteria.

In addition, due to the potentially high plastic nature of the bedrock soils at depth, should they be encountered during utility installation such materials should not be used as trench backfill, or alternatively be placed at the bottom of the utility trenches. Mixing with clay and sand soils from above will also reduce the plasticity of the bedrock materials and also aid in moisture conditioning.

5.4.4 Thrust Blocks

It is expected that underground water utilities will be placed between approximately 2.5 m to 3.5 m depth below the existing ground surface, with associated thrust blocks also placed at these depths. It is understood that as part of design and installation of the thrust block, a minimum soil bearing capacity of 72 kPa (1,500 psf) is required by EPCOR Water.

Generally, the allowable soil bearing capacity is estimated at 90 kPa and thus a standard thrust block installation is suitable. At later design stages, this thrust block design method should be reviewed, based on the design locations and depths of the water mains, including related to any grade changes of the site.

5.5 RESIDENTIAL BUILDING FOUNDATIONS AND BASEMENTS

It is anticipated that the majority of residential basements will be placed approximately 1.5 m to 2.5 m depth below finished grade.

Details of requirements for residential building construction are to be further evaluated at later detailed design stages, based on final grading plan, including finished grade elevations, existing subsurface conditions, and considerations for extent and thickness of any engineered fill to be placed over the existing native soils.

Based on the expected finished grade elevation as being similar to the existing ground surface elevation and encountered subsurface soils and groundwater conditions over the site, preliminary design criteria and construction requirements for footing and basement weeping tile are as follows:

5.5.1 Grading Considerations

Site grading for residential footings and basements is to take into consideration the requirements and precautions with respect to encountered the high plastic clayey soils over the site, as presented in Section 5.2, and removals of the surficial topsoil and fill materials as presented in Section 5.3.

As part of on-going subdivision design, CTA is to have opportunity to review subdivision design drawings to ensure that geotechnical requirements for design and construction are taken into account, most notably related to elevation and grading planning for residential basements (footings and basement floor slab).

5.5.2 Footing Foundation Design

Generally, strip and spread footings founded on native clay, or engineered clay fill base, are to be designed on an allowable bearing capacity of 90 kPa.

Over isolated areas (Boreholes No. 8, 13, 14, 16, and 20) where firm clay was encountered, footing foundation are to be designed based on a reduced allowable bearing capacity of 60 kPa and may require increased footing dimensions. The limits of these areas can be further evaluated at the time of grading planning preparation to determine footing depths relative to these soils conditions.

Footings should be cast on a clean, undisturbed surface. No loose or disturbed material should be allowed on the bearing surface of footing excavation prior to pouring of concrete. All footings for heated structures are to be completed to a minimum of 1.8 m depth below surrounding exterior grade to prevent movement due to frost penetration.

Footing excavations should be protected from rain, snow, wetting, drying and inflow of surface and groundwater at all times. Footings should not be cast directly onto or over frozen soil, nor should the soil beneath or adjacent to the footings be allowed to freeze subsequent to their installation. Should the soils below the footings experience such moisture changes, or freeze/thaw, significant footing movement (heave or settlement) could be experienced.

At the time of excavation and prior to footing and basement construction, the exposed base of excavation should be inspected by CTA to confirm suitability for the foundation to be constructed as such.

5.5.3 Weeping Tile and Backfill

Over the majority of the site, based on the encountered soils and groundwater conditions, provided the finished grade is maintained similar to the existing, no significant groundwater problems are expected for the residential building basements. Any groundwater flow can be handled effectively by normal weeping tile and sump operations, that are to be connected to the local municipal storm sewer system.

Backfill material around building perimeters should consist of nominally compacted clay fill, with positive drainage away from the building structures at all times.

5.6 CONSIDERATIONS FOR COMMERCIAL AND MULTI-FAMILY SITES

Design and construction of commercial and multi-family sites within the subject site is considered feasible, supported by cast-in-place concrete friction piles, with slab-on-grade, and associated infrastructure.

Site specific geotechnical studies will be required based on the nature and location of the respective developments.

Design and construction for commercial and multi-family site are to take into consideration the requirements with respect to the existing high plastic clayey soil conditions.

5.7 STORM WATER MANAGEMENT FACILITY

It is understood that future site development is to include construction of a storm water management facility (SWMF) within the south central portion of the site, expected to be in the vicinity of Boreholes No. 20 and 21. Should the intent of the SWMF structure and location be modified, additional site investigation and assessment will be required.

As encountered at the locations of Boreholes No. 20 and 21:

- 1) Soils conditions consist of about a 7 m thick clay layer, including moist to wet, firm to stiff, high plastic clay to about 4.6 m to 5.3 m depth, becoming very wet and low plastic below. Below the clay, a fine-grained sand is then present, extending to greater than 11.9 m depth;
- 2) Groundwater conditions at the area are at greater than 9.5 m depth.

The soil conditions as encountered are generally suitable for construction of the proposed SWMF, though liner requirements and SWMF slope angles are required to consider the soils conditions as encountered.

For preliminary design purposes:

- 1) Within the upper clay deposit, the SWMF side-slopes should be designed and constructed with a slope angle of no greater than 1(v) : 5 (h);
- 2) Based on the depth of the SMWF (ie/ does it extend into the sandy soils at depth, and if so, how deep? Will there be a 'silt trap' present within this sand deposit?) further stability analysis in order to determine the applicable design slope angles construction and operation feasibility will be required;
- 3) In view of the sand soils at depth, a 0.8 m thick clay liner (compacted to 95% SPMDD) is required at the base and the excavation walls to the HWL with surface

erosion protection (grass) along finished slopes. Existing shallow clayey soils can be utilized as the liner material.

Upon development of more detailed design of the proposed SWMF, CT & Associates Engineering Inc. is required to conduct a review of the proposed structure, to ensure suitability of the design, construction, and operation for the soils and groundwater conditions, including further site-specific field study.

5.8 PAVEMENT DESIGN AND STRUCTURES

It is anticipated that the major roadway systems in the proposed development are the 9.0 m local residential and 11.5 m local collectors.

It is expected that all roadway right-of-ways are to be prepared with 'uniform trench backfill' consisting of 1.5 m thick engineered clay fill (placed and compacted to 98% SPMDD) from below the sub-grade elevation, for the entire roadway right-of-way (from property line to property line).

California Bearing Ratio (CBR) testing of representative soil samples (two (2) soils samples) indicates the 'CBR' values to be in the range of 9, as presented in Appendix E.

Considering the in-situ softening processes within the pavement structure base materials during service life, freeze-thaw effects, the soil condition(s) within subject site, and the 'uniform' trench backfill preparation, a design roadbed resilient modulus of 30 MPa as per Table 1.2.1 from the City of Edmonton Complete Streets Design Standards (2023) (considered generally equivalent to a California Bearing Ratio (CBR) of 3.0) is thus considered conservative as part of pavement design, and is suitable for pavement design.

Designs for pavement structures (local residential, local collectors) are presented in Tables 3 and 4, respectively. The structures are considered to be in accordance with the revised City of Edmonton Pavement Structure designations and the design procedures as outlined within AASHTO Guide for Design of Pavement Structures (1993).

In accordance with City of Edmonton design and construction requirements, the sub-grade should be further confirmed at time of construction to ensure the sub-grade conditions are in accordance with the design values as outlined above. Sampling of the site sub-grade soils and their laboratory testing of the California Bearing Ratio (CBR) values will be required at time of detailed design and during construction to verify that the sub-grade soil conditions are in accordance with the design values as outlined in Section 5.8.1.

5.8.1 Pavement Structures

**TABLE 3
LOCAL RESIDENTIAL PAVEMENT STRUCTURE**

Material	Local Residential - ESAL Value $\approx 3.6 \times 10^4$	
	Reliability - 75%	
	Design Parameter	Design Input
Stage 2 Asphalt Concrete (LT ¹) - FAC	Thickness	35 mm
Stage 1 Asphalt Concrete (LT ¹)	Thickness	65 mm
Base Course/ Crushed Gravel (20 mm)	Thickness	200 mm
Prepared Roadbed/ Prepared Sub-grade ²	Thickness	150 mm ²
Roadbed (Uniform Trench Backfill) ³	Resilient Modulus	30 MPa ³

TABLE 4
LOCAL COLLECTOR PAVEMENT STRUCTURE

Material	Local Collector w/Bus - ESAL Value $\approx 3.6 \times 10^5$	
	Reliability - 85%	
	Design Parameter	Design Input
Stage 2 Asphalt Concrete (HT ¹) - FAC	Thickness	35 mm
Stage 1 Asphalt Concrete (HT ¹)	Thickness	75 mm
Base Course/ Crushed Gravel (20 mm)	Thickness	325 mm
Prepared Roadbed/ Prepared Sub-grade ²	Thickness	150 mm ²
Roadbed (Uniform Trench Backfill) ³	Resilient Modulus	30 MPa ³

Notes:

¹ Pre-approved asphalt supplied with 58-28 Performance Grade binder;

² Thickness and cement dosage to be confirmed at the time of proof-roll;

³ Table 1.2.1 from the City of Edmonton Complete Streets Design Standards (2023)

5.8.2 Sub-grade Preparation

In order to provide a non-deflective sub-grade condition, the clayey sub-grade soils should be properly prepared through scarifying, drying, and re-compaction, or cement stabilization.

Prior to sub-grade treatment, the sub-grade should be proof-rolled to determine the existing field conditions at that time and to determine the most effective method and depth required to be treated. The sub-grade should then be prepared according to one of the following methods:

1) Soil Drying or Material Replacement and Re-Compaction

The top of a minimum of 150 mm of the clay sub-grade should be scarified, dried, and re-compacted to 98% Standard Proctor Maximum Dry Density. The sub-grade preparation depth may have to be increased in areas of wet clayey soils at the surface or disturbance such as utility line trenches, to be determined on site.

2) Cement Stabilization

Should soil re-compaction not provide a non-deflective sub-grade condition, the sub-grade clayey soils may be cement treated by mixing a minimum of 10 kg of cement over 1 m² of surface area to a depth of 150 mm, and compacted to 100% of Standard Proctor Maximum Dry Density. The cement quantity and depth should be confirmed during site work based on field conditions at that time, and to the approval of CTA and the City of Edmonton.

Should the pavement structure be placed significantly after sub-grade preparation, the exposed base should again be proof-rolled under the supervision of CT & Associates Engineering Inc. to detect any soft areas that will require further treatment.

5.8.3 Maintenance of Roadway Areas

Precipitation and site maintenance during construction will have an effect on pavement sub-grade preparation requirements and should be taken into account during the planning of pavement construction, including the depth and quantity of cement required during the sub-grade stabilization process.

Proper on-going maintenance of the future pavement areas and mitigating of water effects during the construction period prior to the sub-grade treatment will reduce the depth and quantity of cement required during the sub-grade stabilization process that will ultimately be required.

5.9 CONSIDERATIONS FOR 'LOW-IMPACT DEVELOPMENT' FEATURES

It is understood that future site development may potentially include 'Low-Impact Development' (LID) within the development plan, including features as bioretention basins/bioswales, soils cells, box planters, and absorbent landscaping.

As part of initial evaluation of these features relative to the encountered high plastic shallow clay soils throughout the site, the following considerations are presented:

- 1) The subsurface conditions at the subject site generally consist of shallow high plastic clayey soils. With these soils types, changes of their moisture condition (whether through surface infiltration, change of groundwater condition, or the introduction of a new below-grade water source such as LID infrastructure) can result in swelling (including a soil volume increase and associated upward movements) of high plastic clay due to long-term moisture ingress into these soils, that are considered of a high degrees of swell potential.

These soil movement effects (whether upward swelling or downward settlement) can then result in impacts to the finished condition and performance of the infrastructure constructed at the ground surface, such as surface slab-on-grade, shallow infrastructure, and building foundations.

As such, at all stages of design and construction of LID facilities, mitigative measures to prevent the introduction of new water sources to these shallow soils

conditions, or a change of moisture condition during construction (ie/ drying and future wetting) resulting in a significant change to their moisture condition is of paramount concern. Alternatively, placement of the LID facilities only at locations within development areas where such movements can be tolerated (such as landscaping areas) should be considered.

Most notably, placement of the LID facilities in close proximity to building structures or sensitive concrete surface slabs should not be allowed;

- 2) The following initial LID design considerations are presented:
- Based on the high plastic, nearly impermeable native clay encountered, an underdrain system connected to the local storm sewer system, will be required beneath all LID facilities to prevent perched groundwater conditions above of the native clay layer. When absorbent landscaping LID facilities are provided with grading towards other LID facilities and water is not allowed to pond, underdrains would not be required for these areas;
 - Due to the high swelling potential of the high plastic clay, no LID facilities should be placed within 3 m of buildings foundation elements. The use of an impermeable membrane (Layfield Enviro Liner 1020, or equivalent) along the sides and bottom of the LID adjacent to the building, as outlined in the August 2023 EPCOR Design Standards - Volume 3-02 Stormwater Management and Design Manual, Section 5.2.5, is required for any LID facilities within 5 m of buildings, to be installed, sealed, and tested in accordance with manufacturer specifications. Care should be taken during installation and maintenance to avoid damage (tearing/puncturing) of the impermeable membrane;
 - For LID facilities in other development areas that are in close proximity to surface infrastructure that are sensitive to movement (such as roadways, curbs & gutters, and sidewalks), placement of an impermeable liner along the

- sides and bottom of these LID facilities should also be considered to mitigate swelling effects due to moisture changes of the adjacent high plastic clays;
- Based on the measured groundwater conditions (at greater than 8 m depth), separation of LID facilities to the groundwater condition as required by ECPOR should not be an issue;
- 3) Locations of such LID features must also take into considerations appropriate set-backs from the ravine top-of-bank, such to not introduce water ingress to the slope areas that could potentially impact the long-term stability of the ravine slopes.

5.10 SITE CLASSIFICATION FOR SEISMIC SITE RESPONSE

Based on the soil conditions as encountered during this drilling program, the subject site can be classified as Class D (Table 4.1.8.4.A. of NBCC 2020) as foundation of the buildings will be placed within stiff to very stiff clay deposit, compact to dense sand, or hard bedrock soils.

5.11 CEMENT TYPE

Initial testing for water soluble sulphate concentrations included eight (8) representative soil samples from across the site. All test results were less than 0.02% (by weight), indicating a negligible potential for sulphate attack on concrete.

As such, Cement Type GU is expected to be used for all concrete elements exposed to native soils. This requirement is also to be further evaluated and confirmed at later detailed design stages. Any imported clay fill materials should also be tested for water soluble sulphate concentrations.

Appropriate concrete design and strength parameters, in accordance with CSA requirements and in view of the above cement type and Class of Exposure, are also to be implemented as part of design. Air entrainment of 4% to 7% by volume is recommended for all concrete exposed to freezing temperatures and/or native soils.

6.0 REQUIREMENTS FOR FURTHER GEOTECHNICAL STUDY

At later design stages, additional geotechnical reviews, investigations, and studies may be required with respect to the following, though to be determined by CTA as project design and planning moves forward:

- 1) Adherence to subdivision lay-out and design with respect to findings and set-backs of the Slope Stability Evaluation and Set-Back Distance Determination report, as prepared by CTA under separate cover;
- 2) Additional confirmation of topsoil and fill thickness within the site, due to limitations for drill rig access related to the ongoing agricultural research projects and operations within the property and where there may be sporadic areas with a thicker topsoil layer throughout the site;
- 3) Upon confirmation of the SWMF details, including location, lay-out and elevations, inlet/outlet pipes, and facility function (wet pond, dry pond) further investigation will be required, including considerations of impacts due to the sand deposit at depth and inlet/outlet sewers;
- 4) Based on future site grading plans, assessment of areas with firm clayey soils at footing depth, and where reduced bearing capacities are present for footings, will be required;
- 5) With respect to multi-family and commercial development areas, site specific Geotechnical Investigations will be required based on the nature and location of the respective structures at detailed design stages;
- 6) Should there be areas of significant grade changes (greater than about 2.0 m thickness), analysis of fill settlement analysis (including both of the fill and underlying native clay soils) may be required;
- 7) Should deep utilities be constructed within the development that extend into the sand deposit at depth, additional study of excavation slope angles, backfill requirements, and impacts to adjacent developments may be necessary; and



- 8) Additional review and studies with respect to LID features may be necessary, in accordance with EPCOR requirements for geotechnical evaluation of such facilities, including potentially permeability testing.

7.0 CLOSURE

This report has been prepared in accordance with generally accepted geotechnical practices and procedures.

Classification of soil and groundwater conditions within the report have been based on generally accepted engineering practices in this area. Conditions identified during the field work, and thereby recommendations presented within this report are considered to be reasonably representative of the site. If however, conditions other than those presented are identified during any other work on the subject property, CT & Associates Engineering Inc. should be notified, and given an opportunity to review or modify our recommendations in light of new findings.

In order to ensure that the geotechnical design criteria and associated construction guidelines presented herein and any other geotechnical issues that may arise during construction are properly addressed, CT & Associates Engineering Inc., is required to be involved with on-site consulting, inspections and testing over the project duration. Without such involvement, CT & Associates Engineering Inc. will not take any responsibility for future design, construction or performance issues that may arise over time.

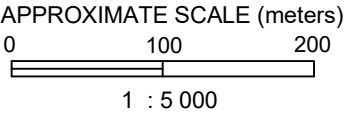


APPENDIX A
DRAWING



- LEGEND:
- SUBJECT SITE
 - BOREHOLE LOCATION
 - SANITARY SEWER LINE
 - TRANSMOUNTAIN PIPELINE
 - TELUS FIBRE AND TELEPHONE
 - COAL PROSPECTING LOCATION

NOTE: BASED ON GOOGLE EARTH AIR PHOTO (2021)



CTA CT & ASSOCIATES ENGINEERING INC.			
CLIENT UNIVERSITY OF ALBERTA PROPERTIES TRUST			
DATE JAN. 19, 2024	DWN. MLW	CHKD. DSN	
PROJECT GEOTECHNICAL INVESTIGATION 'WEST 240' LANDS EDMONTON, ALBERTA			
TITLE SITE PLAN AND BOREHOLE LOCATIONS			
FILE NO. 02-3637-A1	DWG. NO. A-1		



APPENDIX B

SITE PHOTOGRAPHS



Photo 1: Northwest portion of subject lands.
Photo taken November 21, 2023, looking southwest from near 62 Avenue NW.



Photo 2: Southeast portion of subject lands.
Photo taken November 21, 2023, looking northwest from near 122 Street NW.



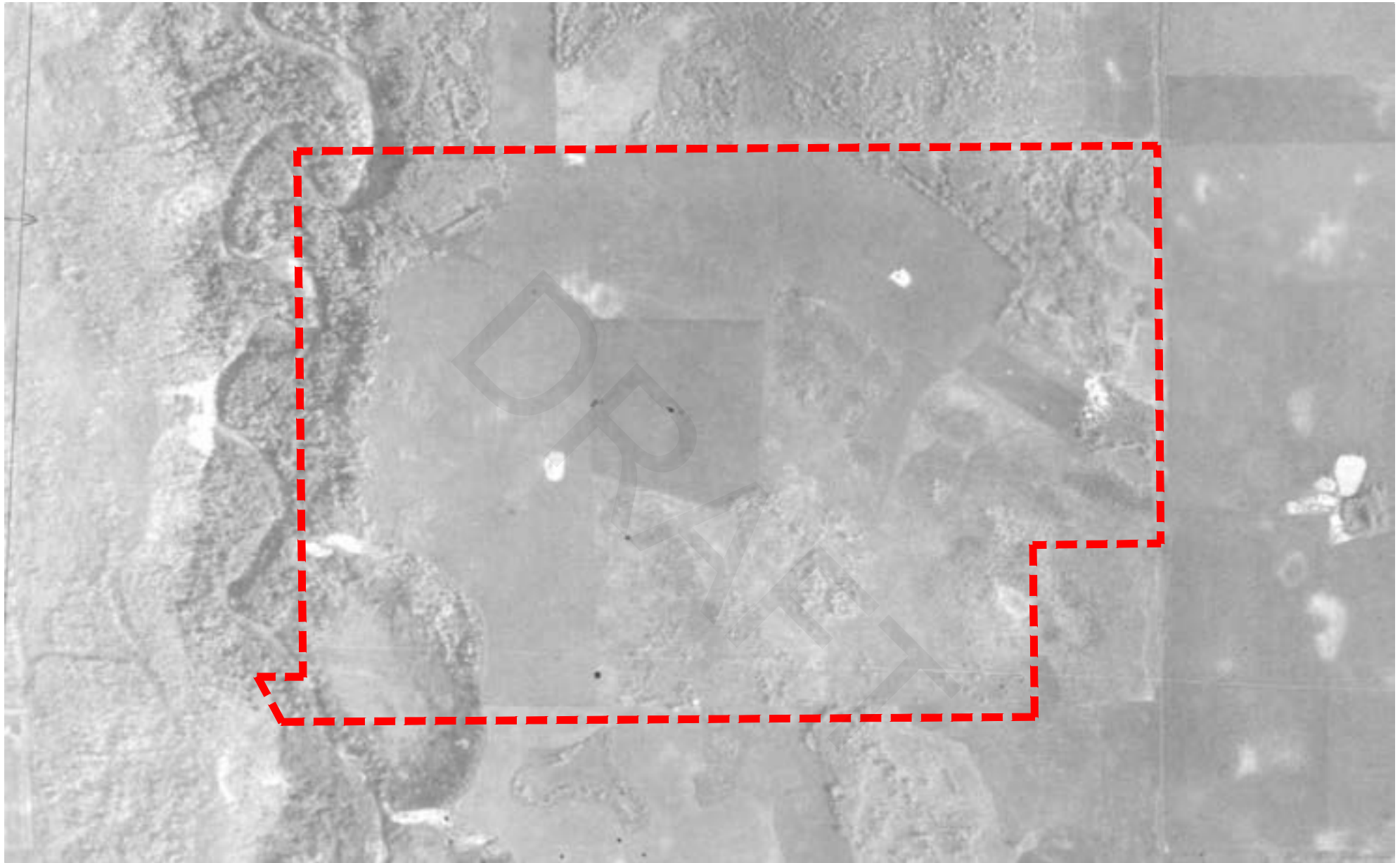
Photo 3: Southeast portion of subject lands.
Photo taken November 21, 2023, looking northeast from along south property boundary.



Photo 4: Southwest portion of subject lands.
Photo taken November 21, 2023, looking northwest from along south property boundary.



APPENDIX C
HISTORICAL AIR PHOTOS

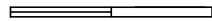


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1920)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

CLIENT

UNIVERSITY OF ALBERTA PROPERTIES TRUST (UAPT)

DATE

FEB. 5, 2024

DWN.

NL

CHKD.

DSN

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

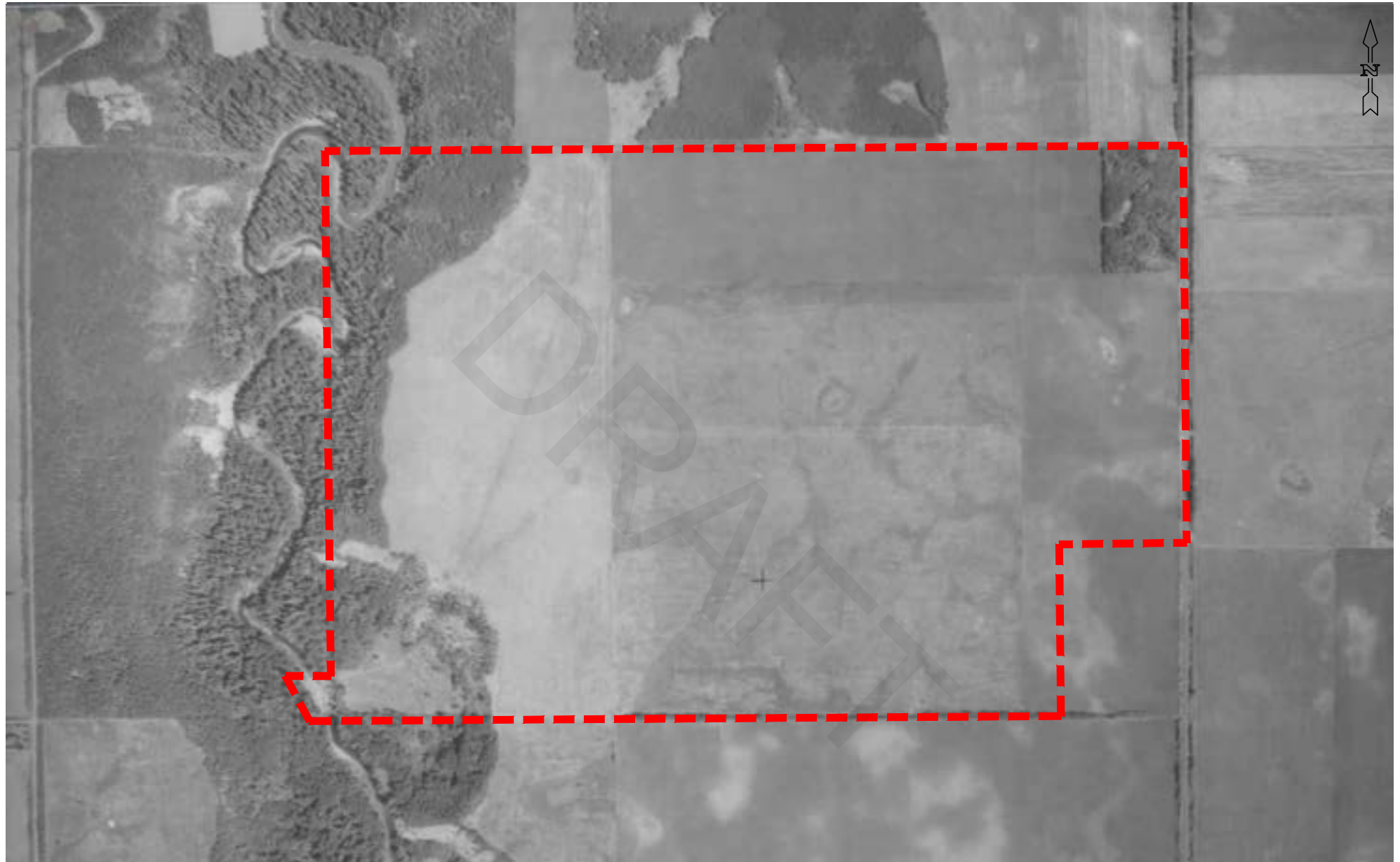
SITE AIR PHOTO - 1920

FILE NO.

02-3637

DWG. NO.

C-1

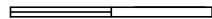


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1952)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

CLIENT

UNIVERSITY OF ALBERTA PROPERTIES TRUST (UAPT)

DATE

FEB. 5, 2024

DWN.

NL

CHKD.

DSN

PROJECT

GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1952

FILE NO.

02-3637

DWG. NO.

C-2

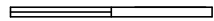


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1962)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

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GEOTECHNICAL INVESTIGATION
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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

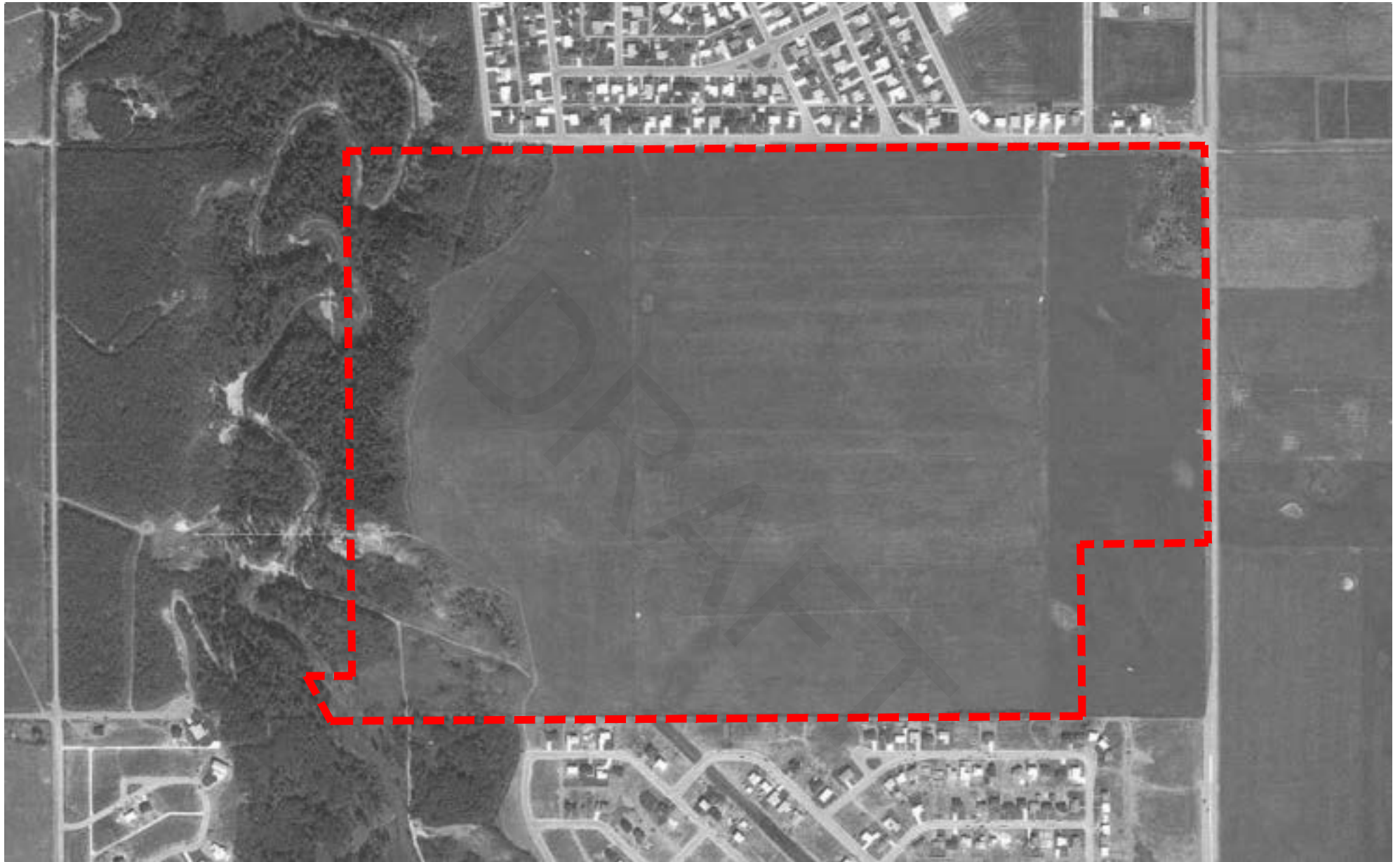
SITE AIR PHOTO - 1962

FILE NO.

02-3637

DWG. NO.

C-3

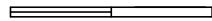


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1967)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1967

FILE NO.

02-3637

DWG. NO.

C-4

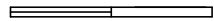


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1969)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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GEOTECHNICAL INVESTIGATION
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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1969

FILE NO.

02-3637

DWG. NO.

C-5

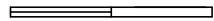


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1973)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

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AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

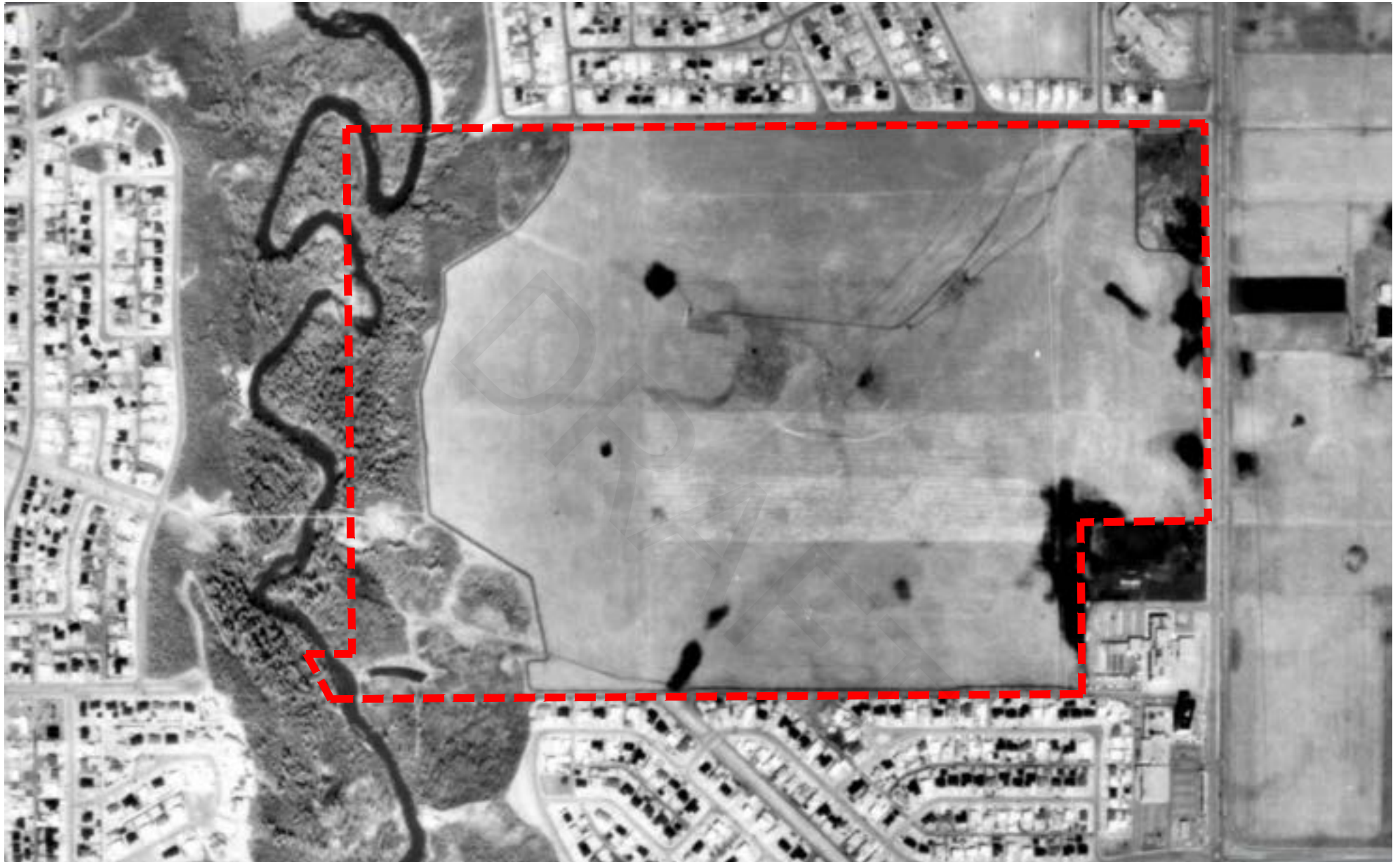
SITE AIR PHOTO - 1973

FILE NO.

02-3637

DWG. NO.

C-6

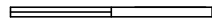


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1974)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

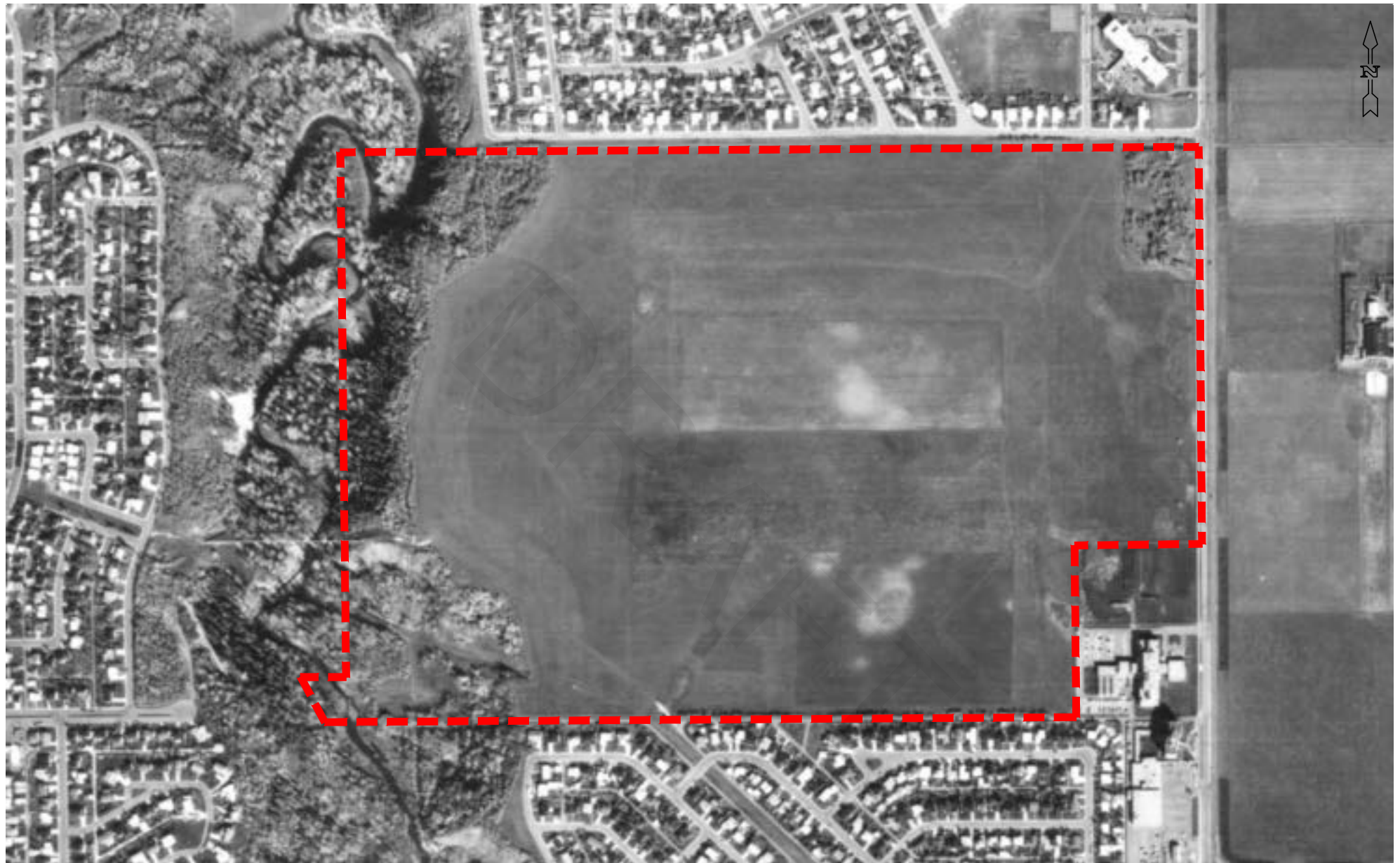
SITE AIR PHOTO - 1974

FILE NO.

02-3637

DWG. NO.

C-7

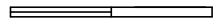


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1976)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1976

FILE NO.

02-3637

DWG. NO.

C-8

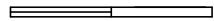


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1980)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

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UNIVERSITY OF ALBERTA PROPERTIES TRUST (UAPT)

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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1980

FILE NO.

02-3637

DWG. NO.

C-9

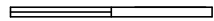


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1982)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

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CT & ASSOCIATES ENGINEERING INC.

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AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1982

FILE NO.

02-3637

DWG. NO.

C-10

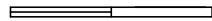


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1986)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1986

FILE NO.

02-3637

DWG. NO.

C-11

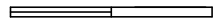


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1987)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

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'WEST 240' LANDS
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TITLE

SITE AIR PHOTO - 1987

FILE NO.

02-3637

DWG. NO.

C-12

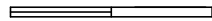


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1990)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

CLIENT

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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1990

FILE NO.

02-3637

DWG. NO.

C-13

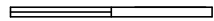


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (1993)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 1993

FILE NO.

02-3637

DWG. NO.

C-14

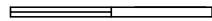


NOTE: BASED ON PROVINCE OF ALBERTA ARCHIVE
AIR PHOTO (2001)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

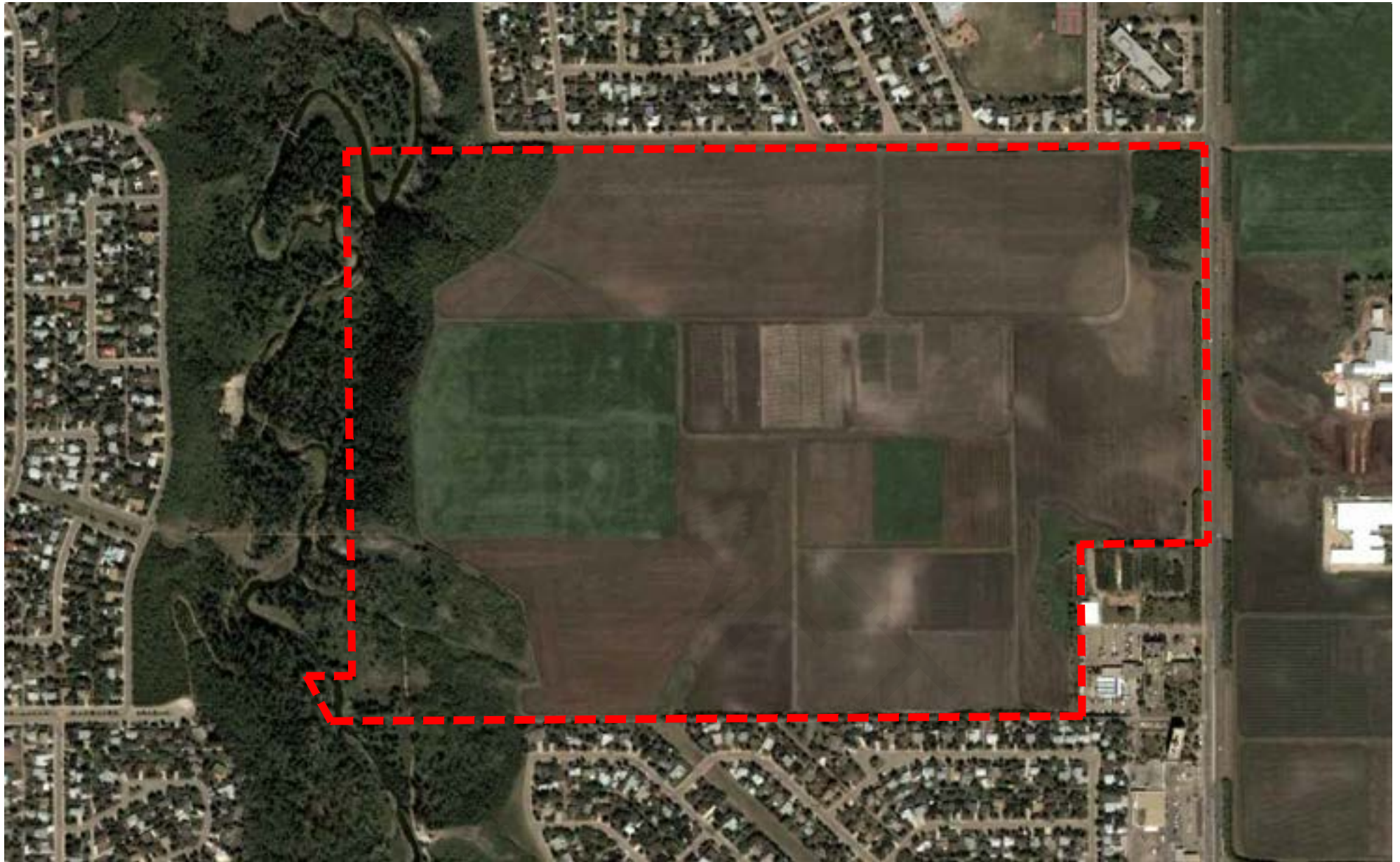
SITE AIR PHOTO - 2001

FILE NO.

02-3637

DWG. NO.

C-15

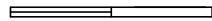


NOTE: BASED ON GOOGLE EARTH
AIR PHOTO (2004)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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DSN

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GEOTECHNICAL INVESTIGATION
AND SLOPE STABILITY EVALUATION
'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

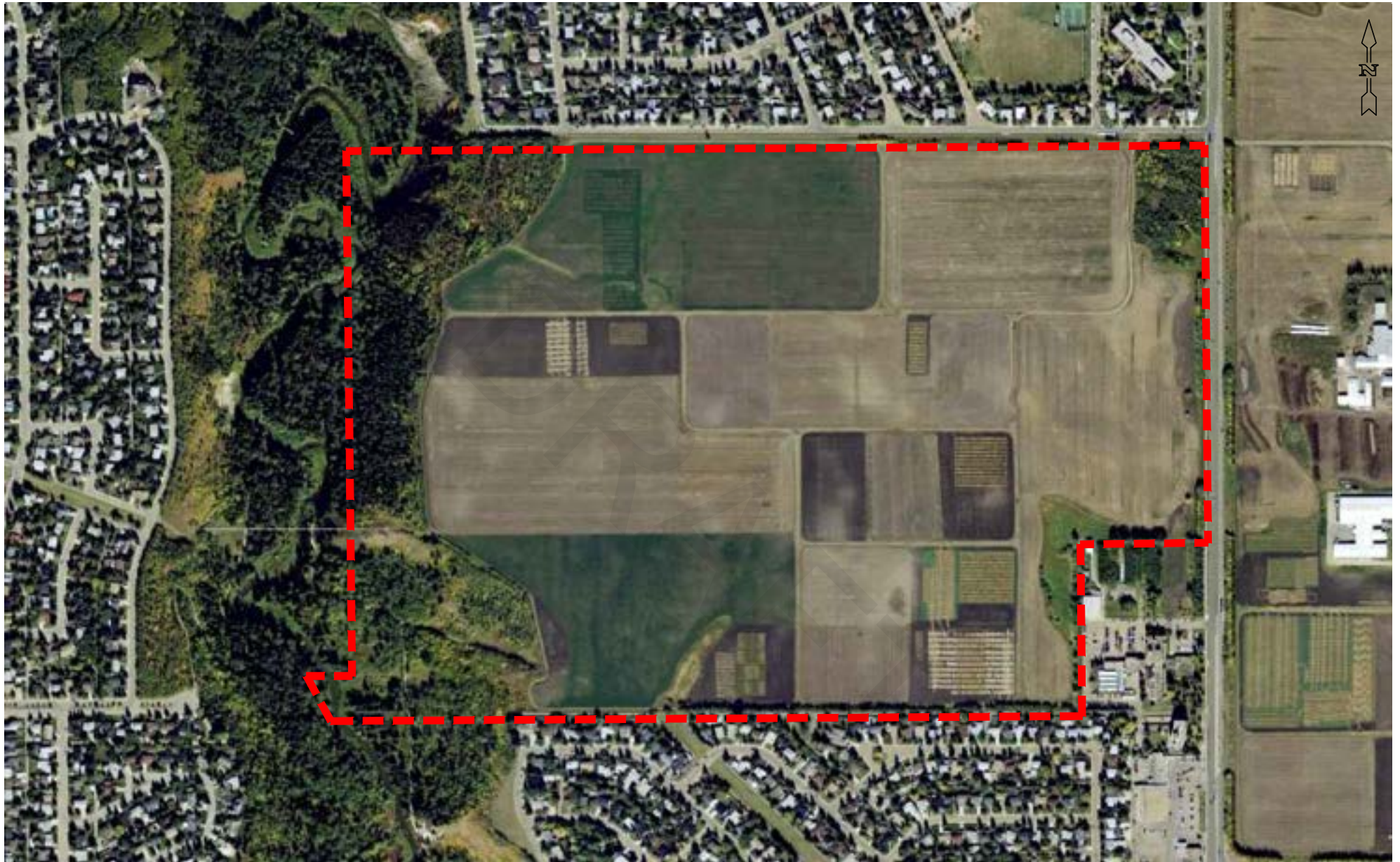
SITE AIR PHOTO - 2004

FILE NO.

02-3637

DWG. NO.

C-16

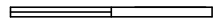


NOTE: BASED ON GOOGLE EARTH
AIR PHOTO (2008)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

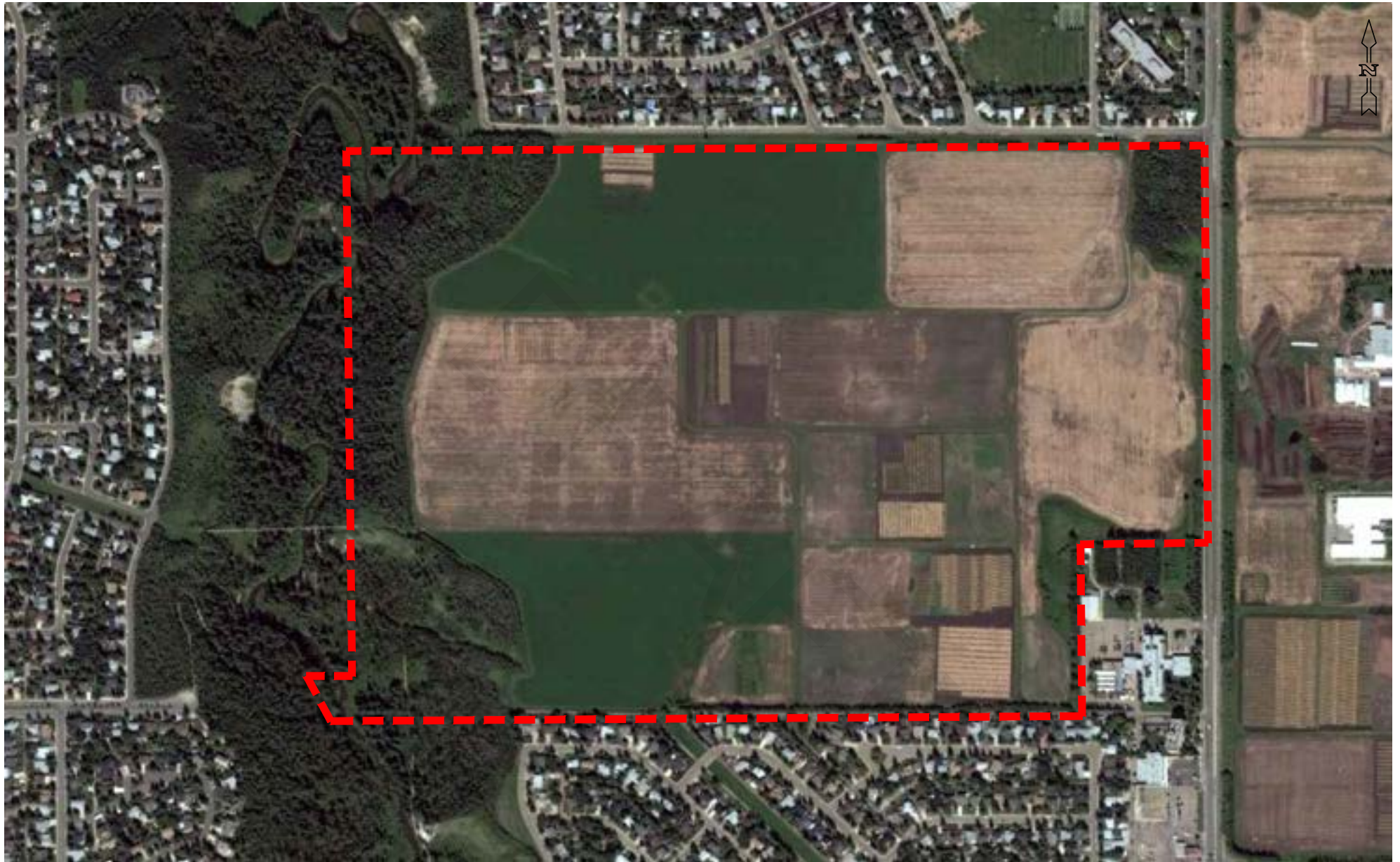
SITE AIR PHOTO - 2008

FILE NO.

02-3637

DWG. NO.

C-17

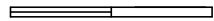


NOTE: BASED ON GOOGLE EARTH
AIR PHOTO (2012)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

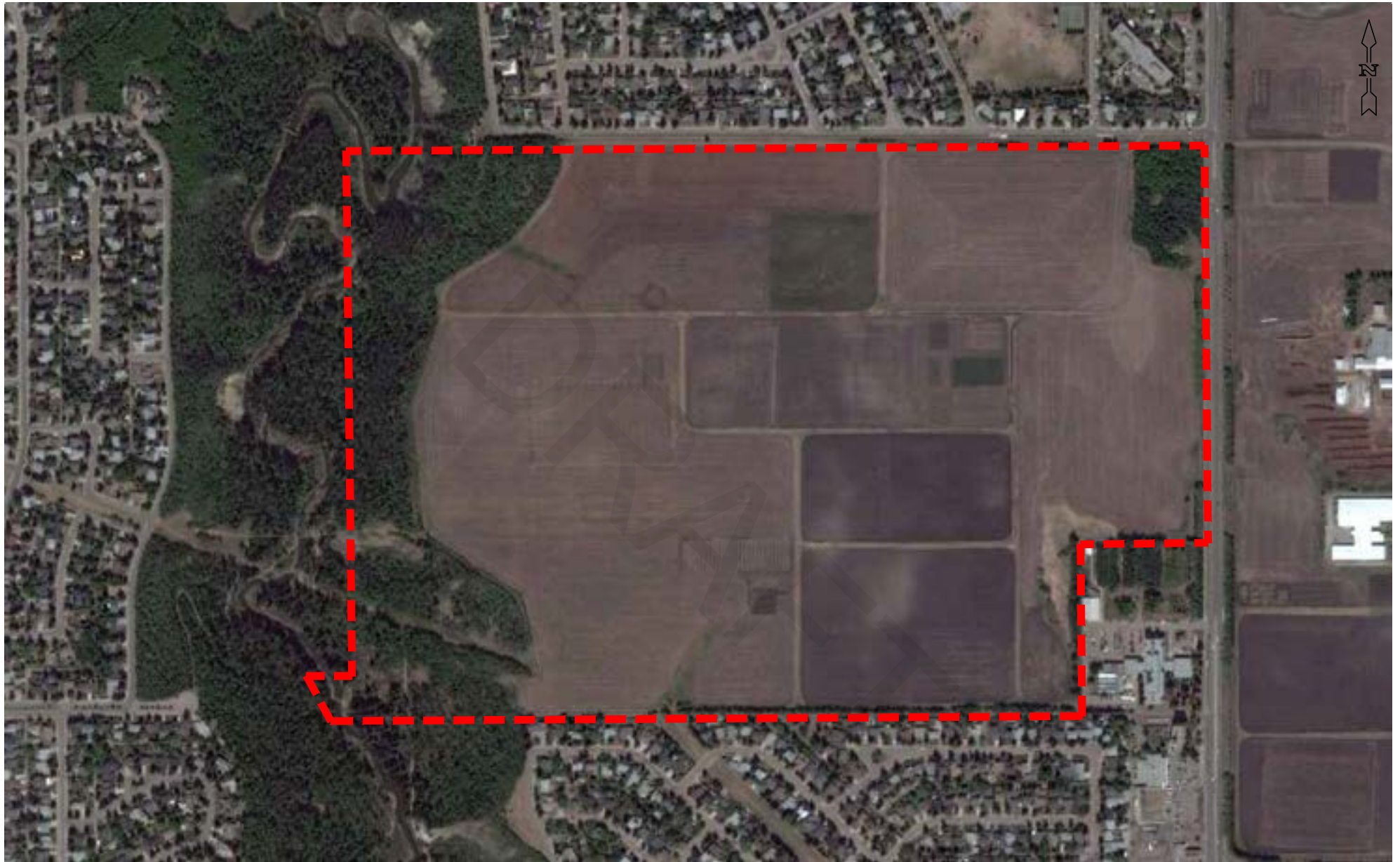
SITE AIR PHOTO - 2012

FILE NO.

02-3637

DWG. NO.

C-18

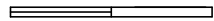


NOTE: BASED ON GOOGLE EARTH
AIR PHOTO (2016)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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GEOTECHNICAL INVESTIGATION
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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

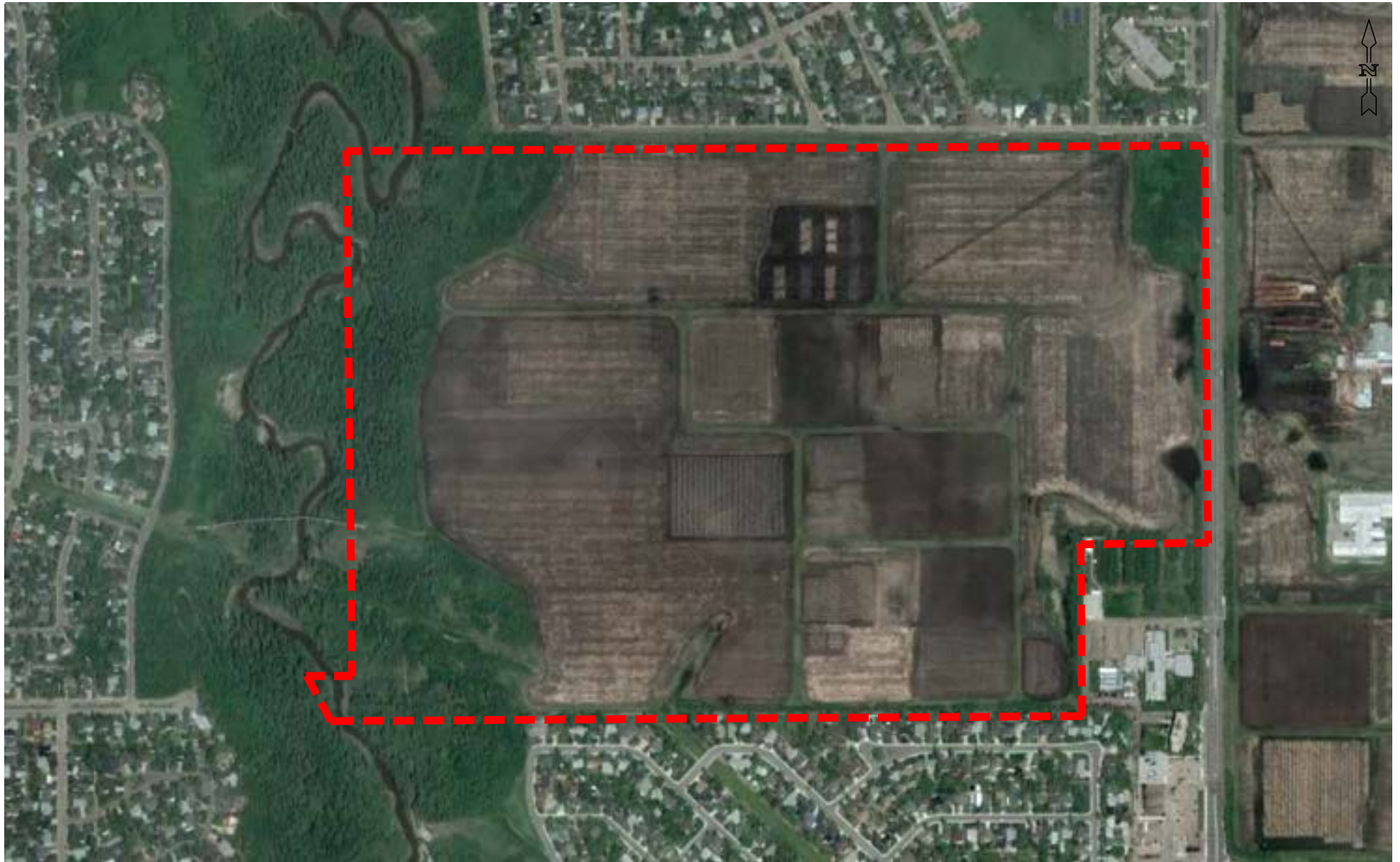
SITE AIR PHOTO - 2016

FILE NO.

02-3637

DWG. NO.

C-19

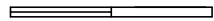


NOTE: BASED ON GOOGLE EARTH
AIR PHOTO (2020)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



CT & ASSOCIATES ENGINEERING INC.

CLIENT

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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

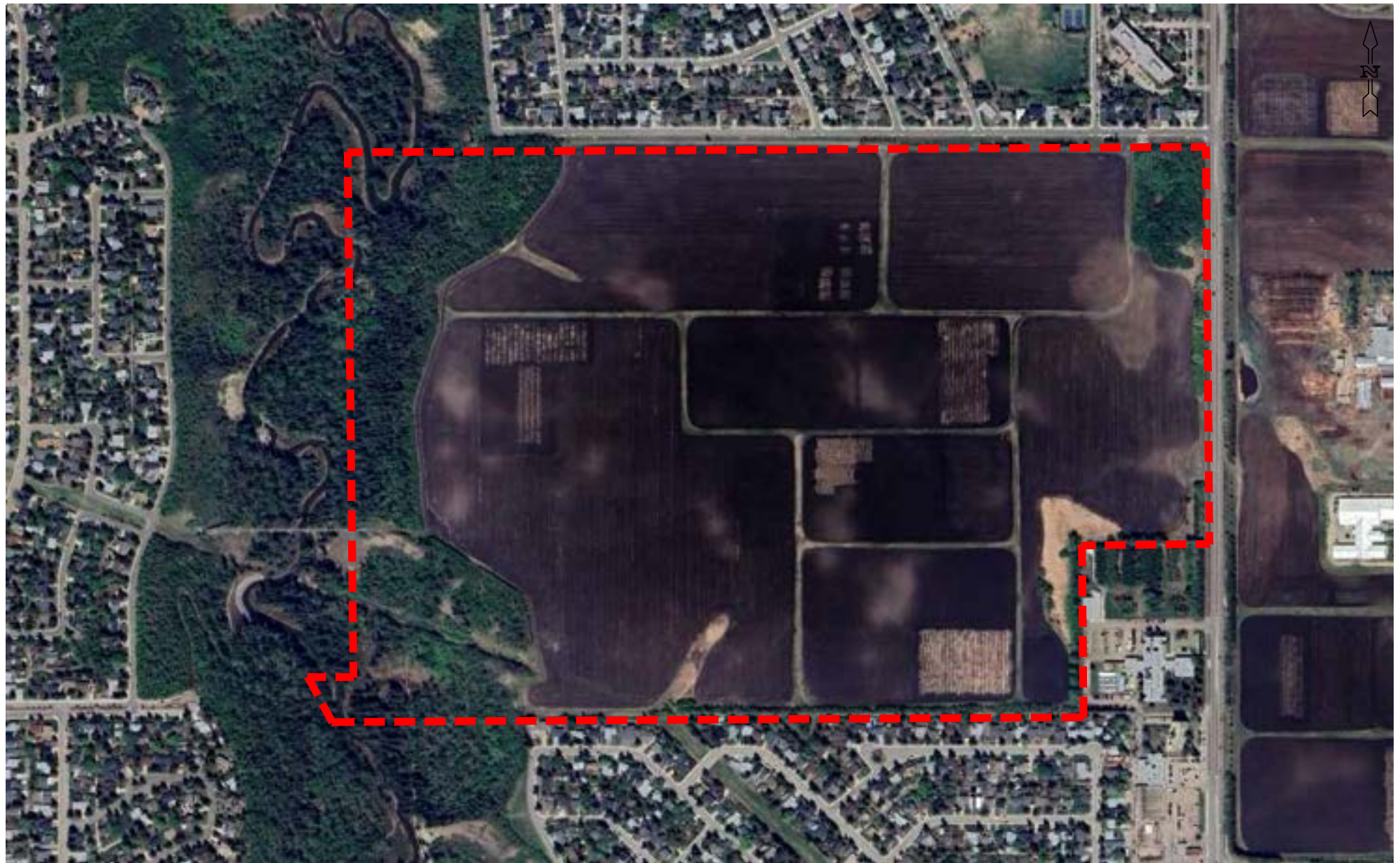
SITE AIR PHOTO - 2020

FILE NO.

02-3637

DWG. NO.

C-20

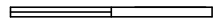


NOTE: BASED ON GOOGLE EARTH
AIR PHOTO (2023)

LEGEND: --- SUBJECT SITE

APPROXIMATE SCALE (meters)

0 100 200



1 : 7 500

SCALE ONLY VALID ON 8 1/2" x 11" PAPER



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'WEST 240' LANDS
EDMONTON, ALBERTA

TITLE

SITE AIR PHOTO - 2023

FILE NO.

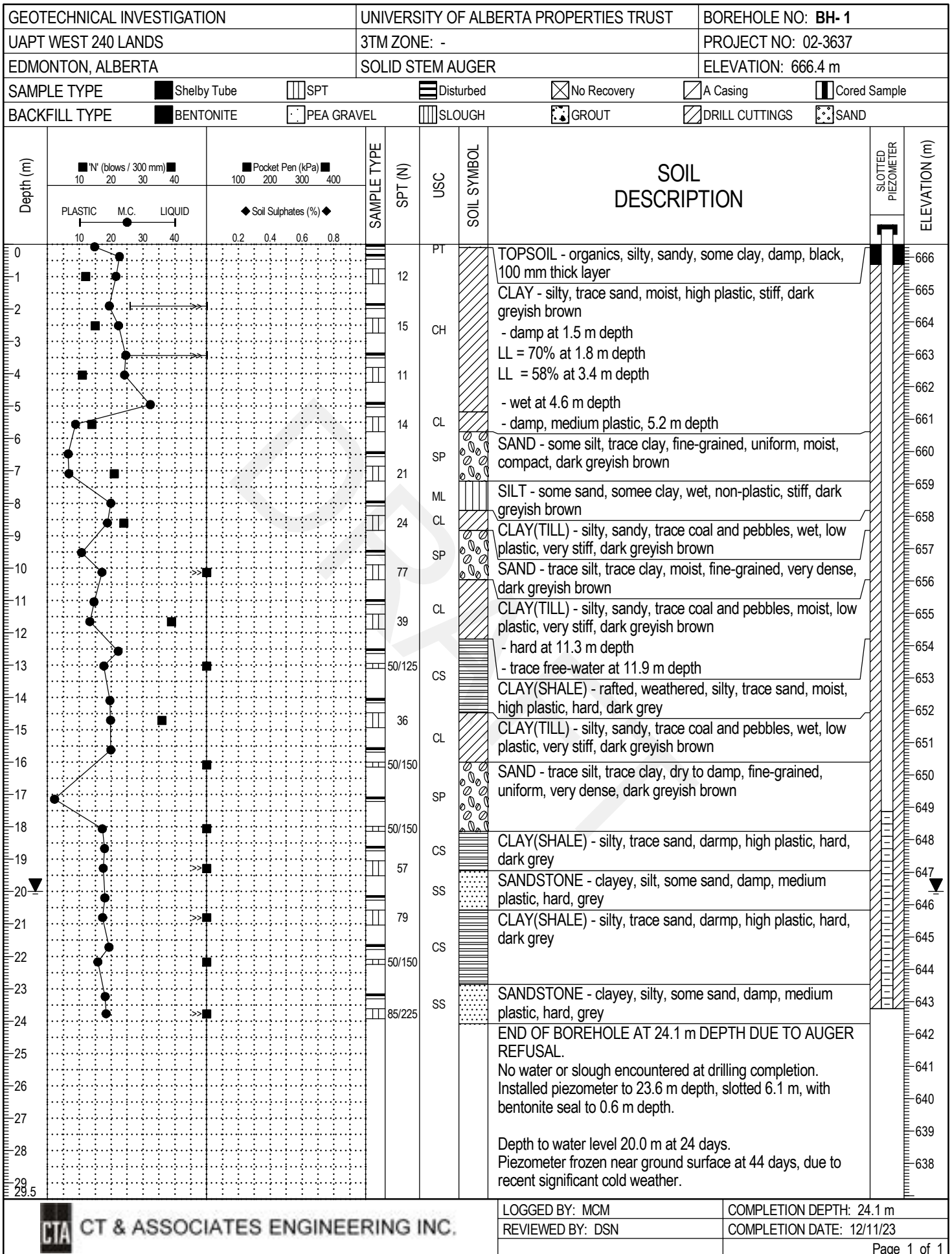
02-3637

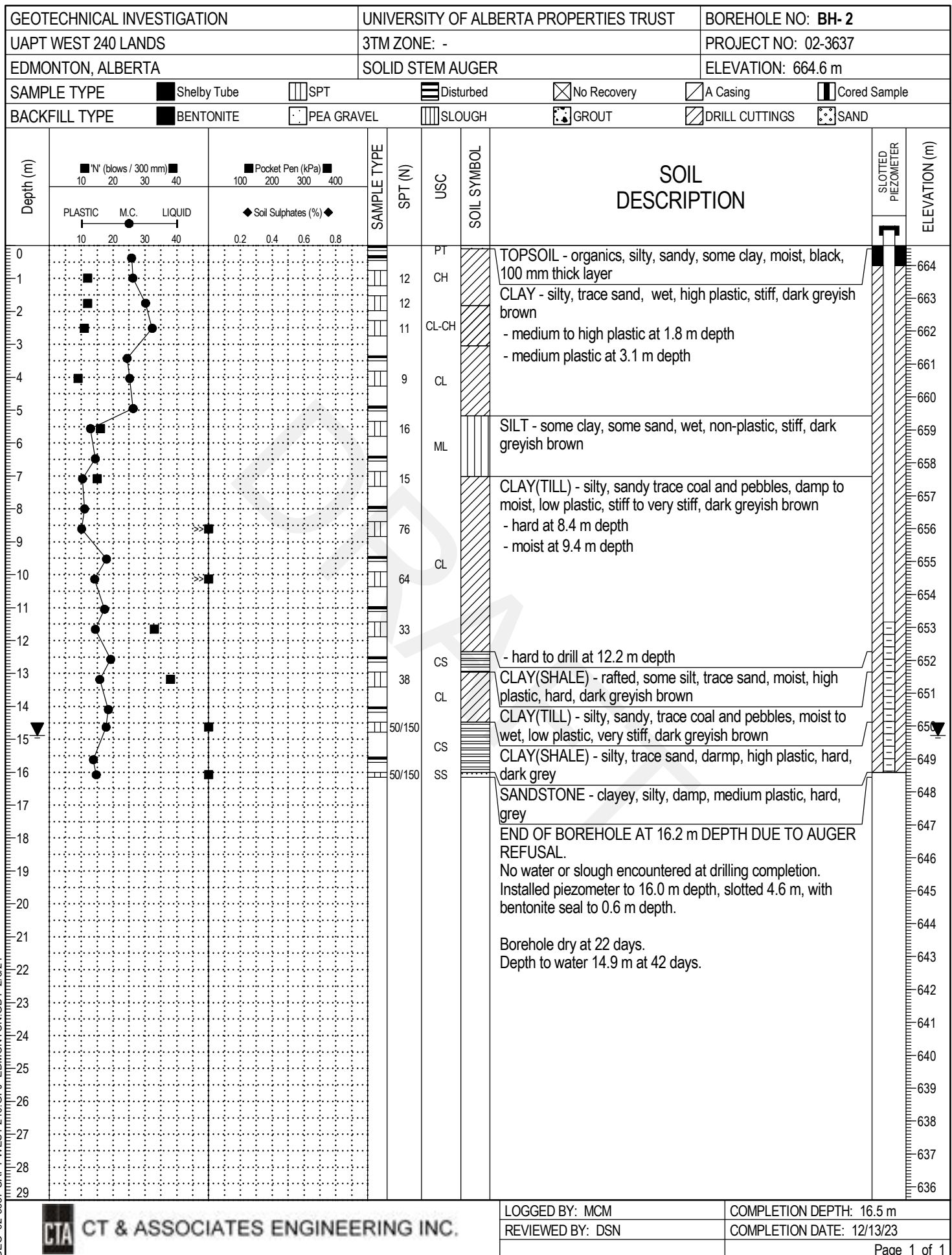
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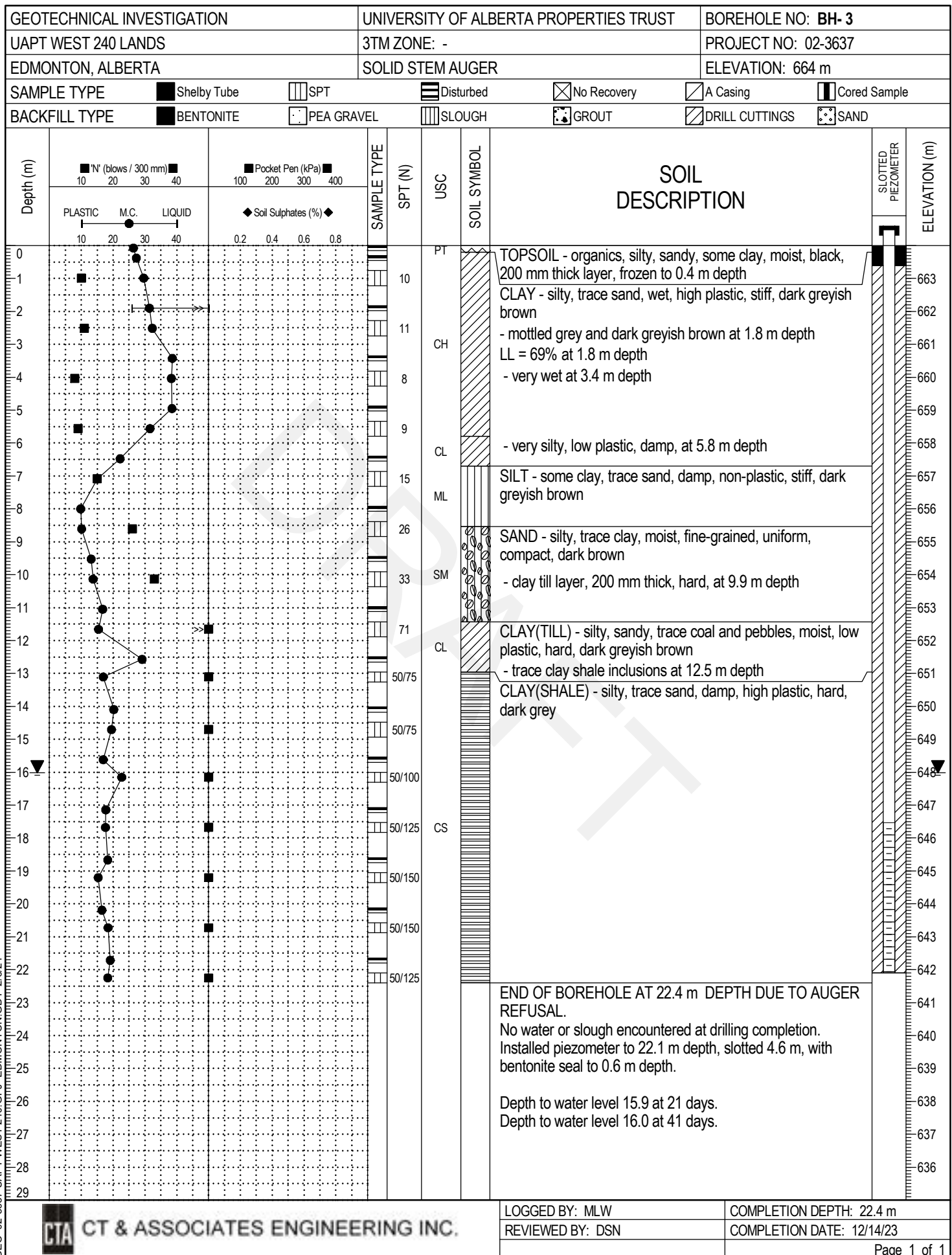
C-21

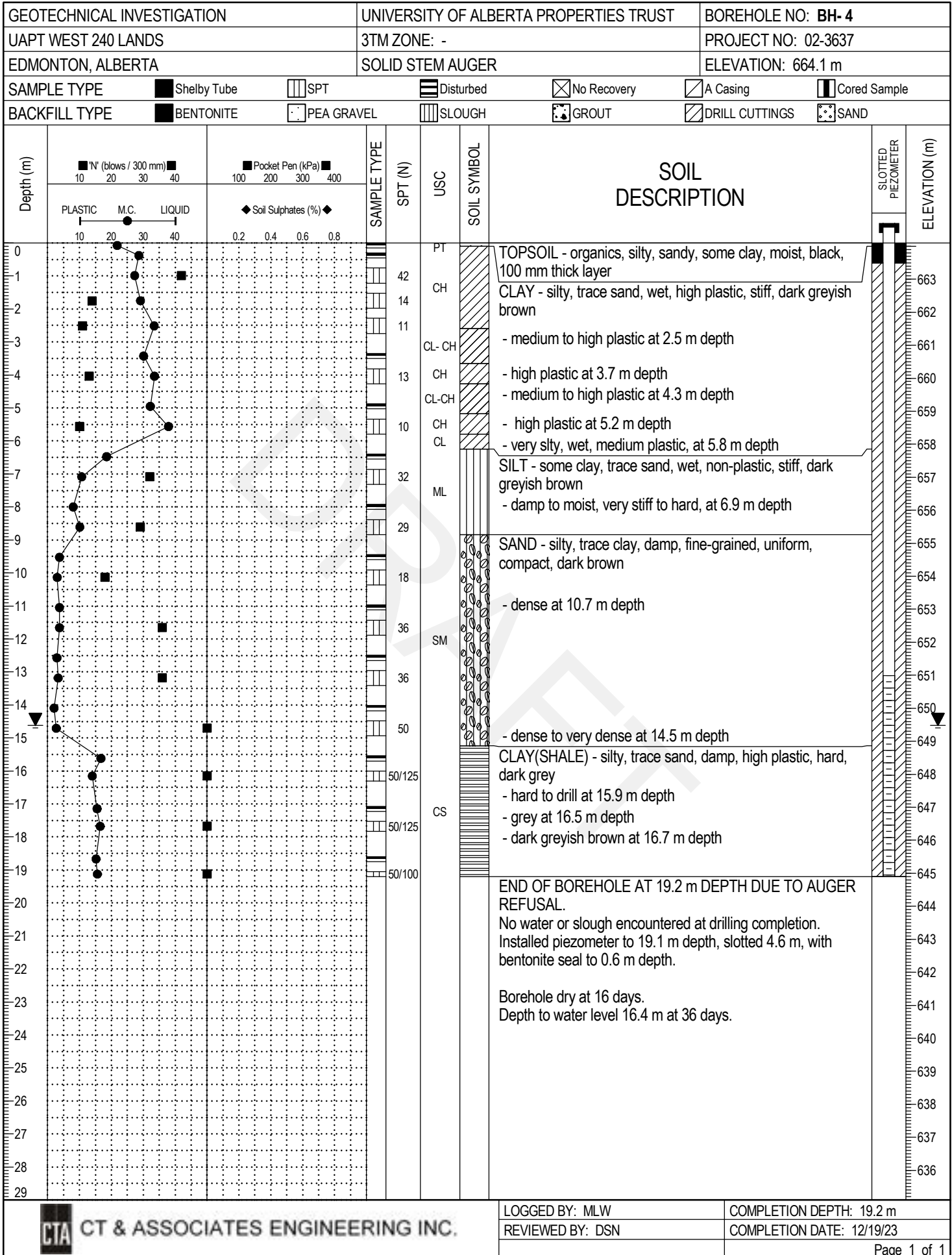


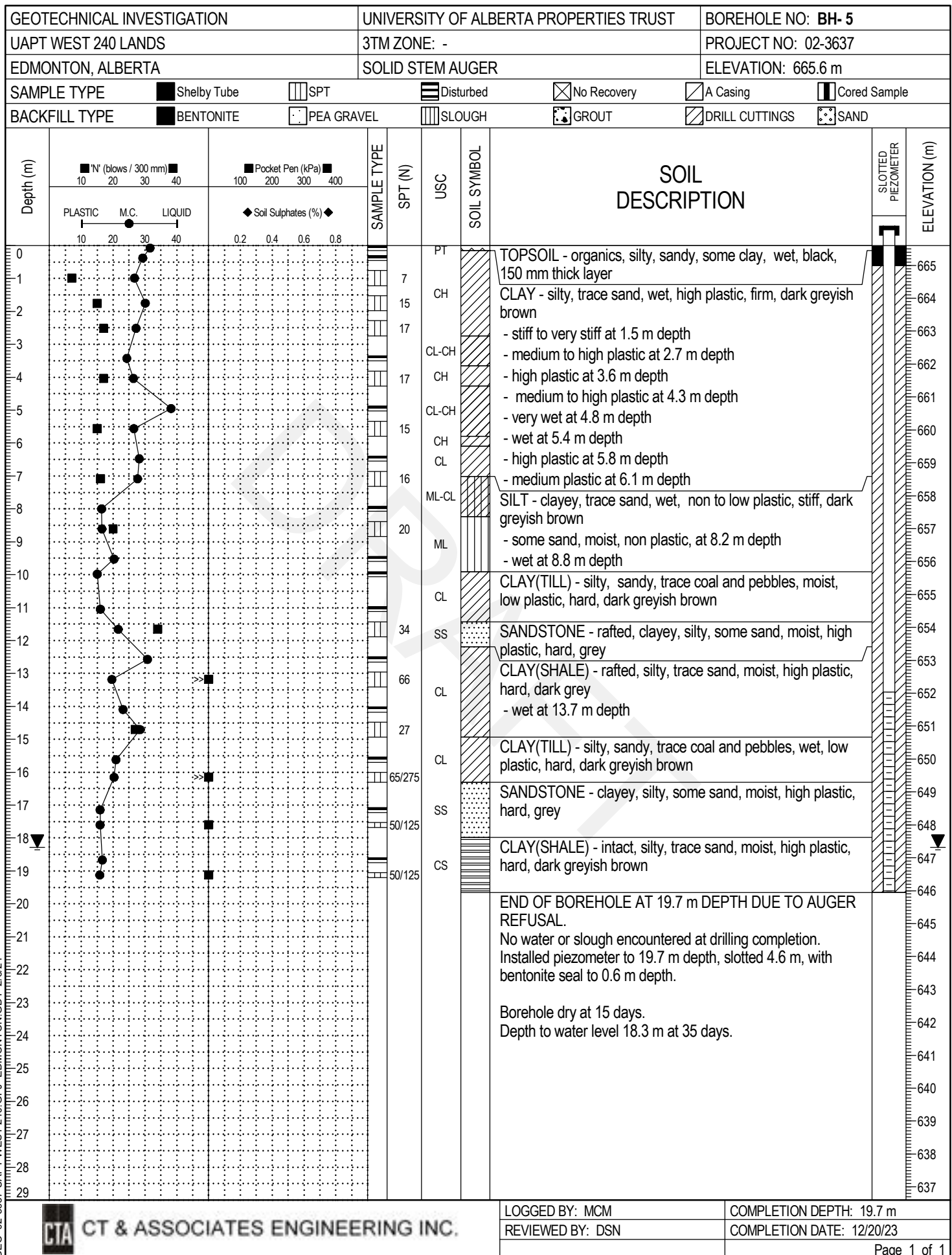
APPENDIX D
BOREHOLE LOGS

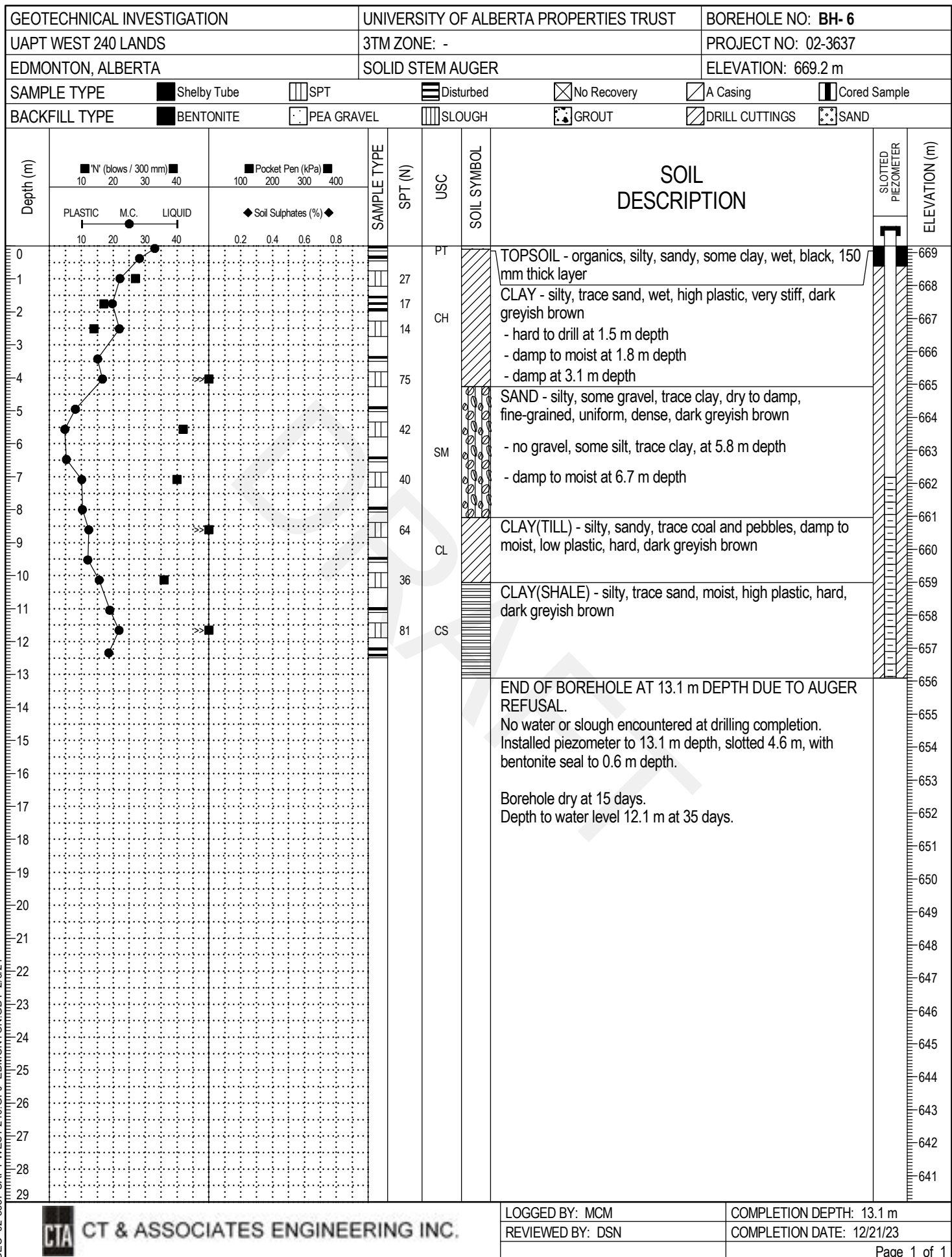


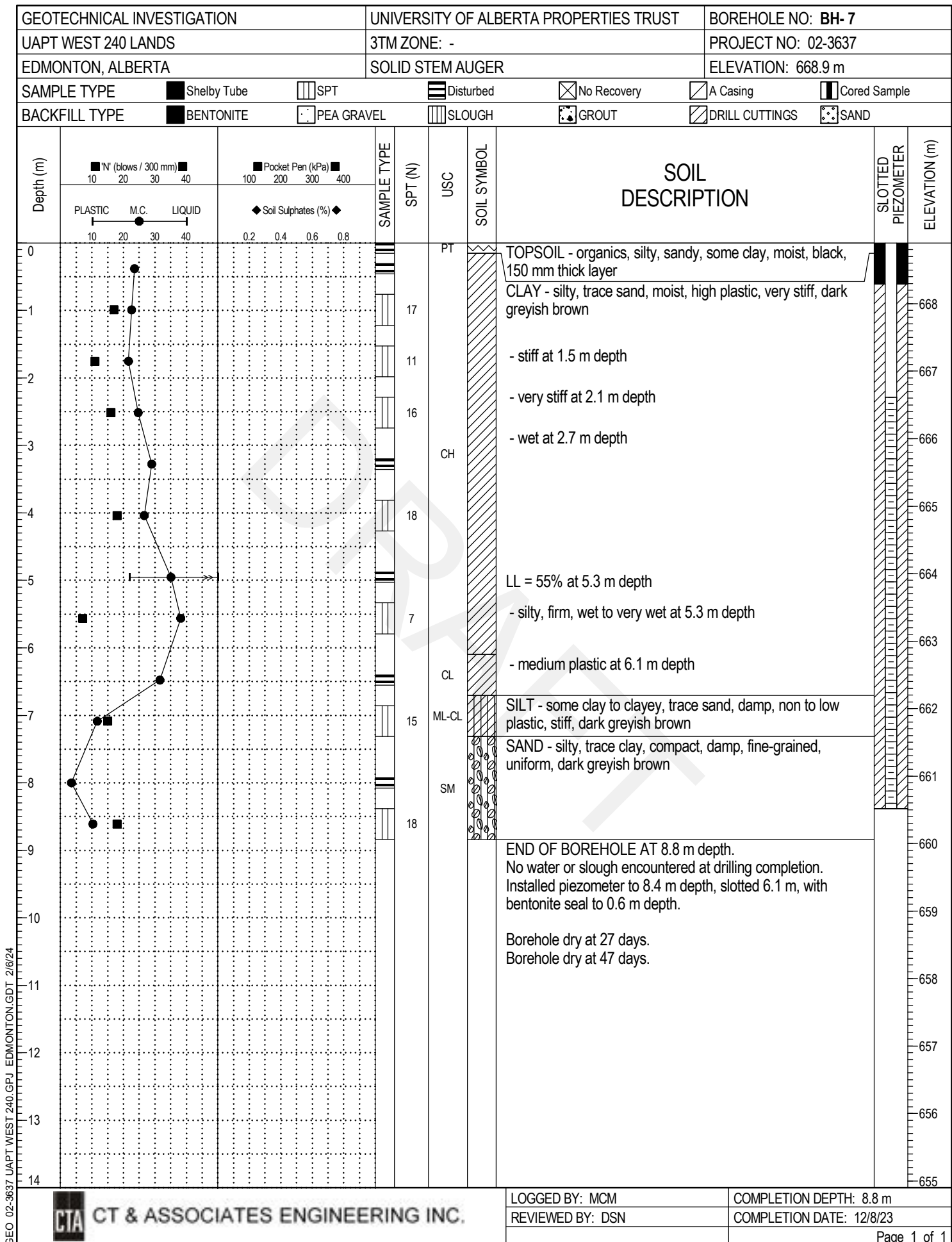










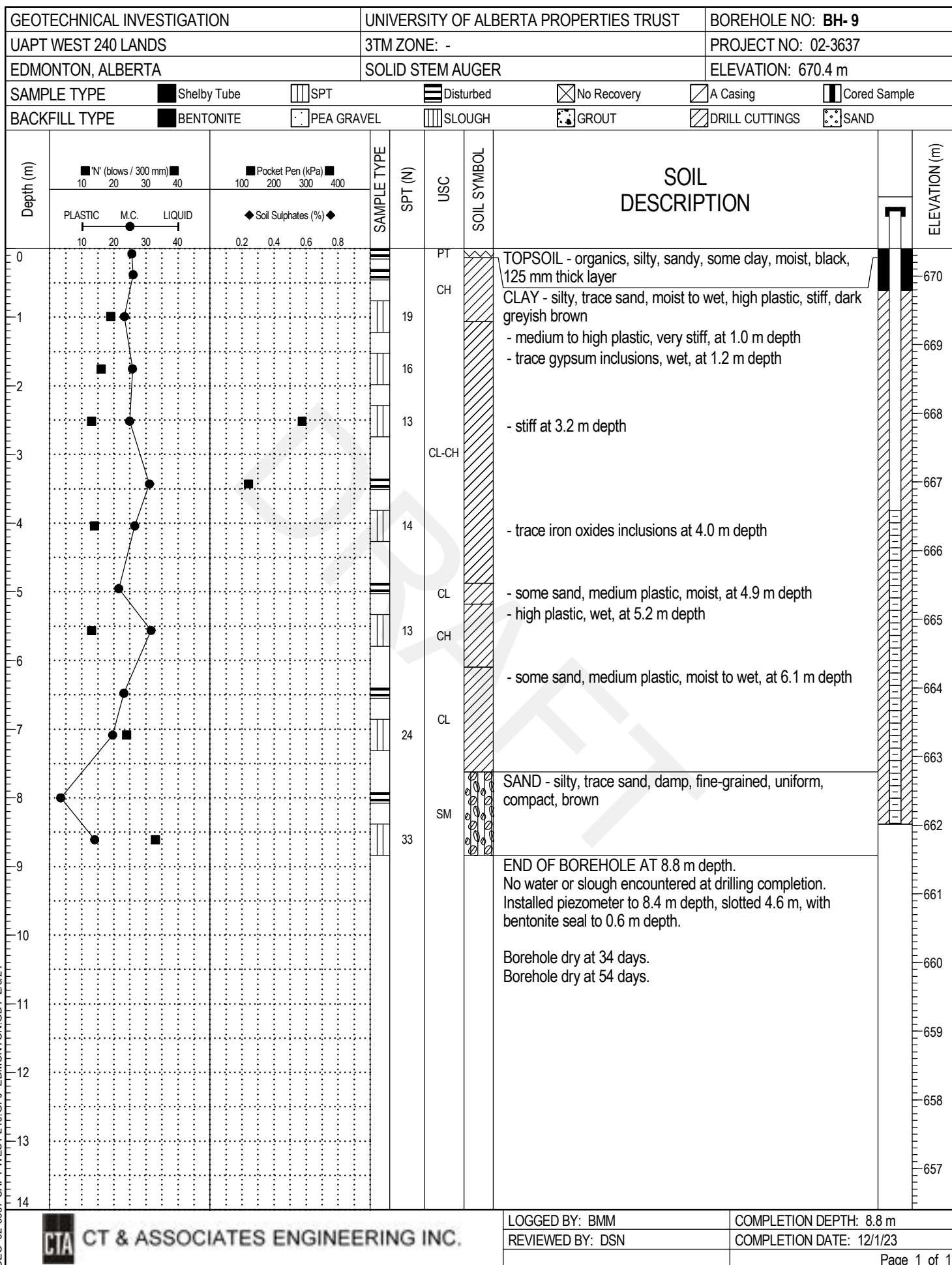


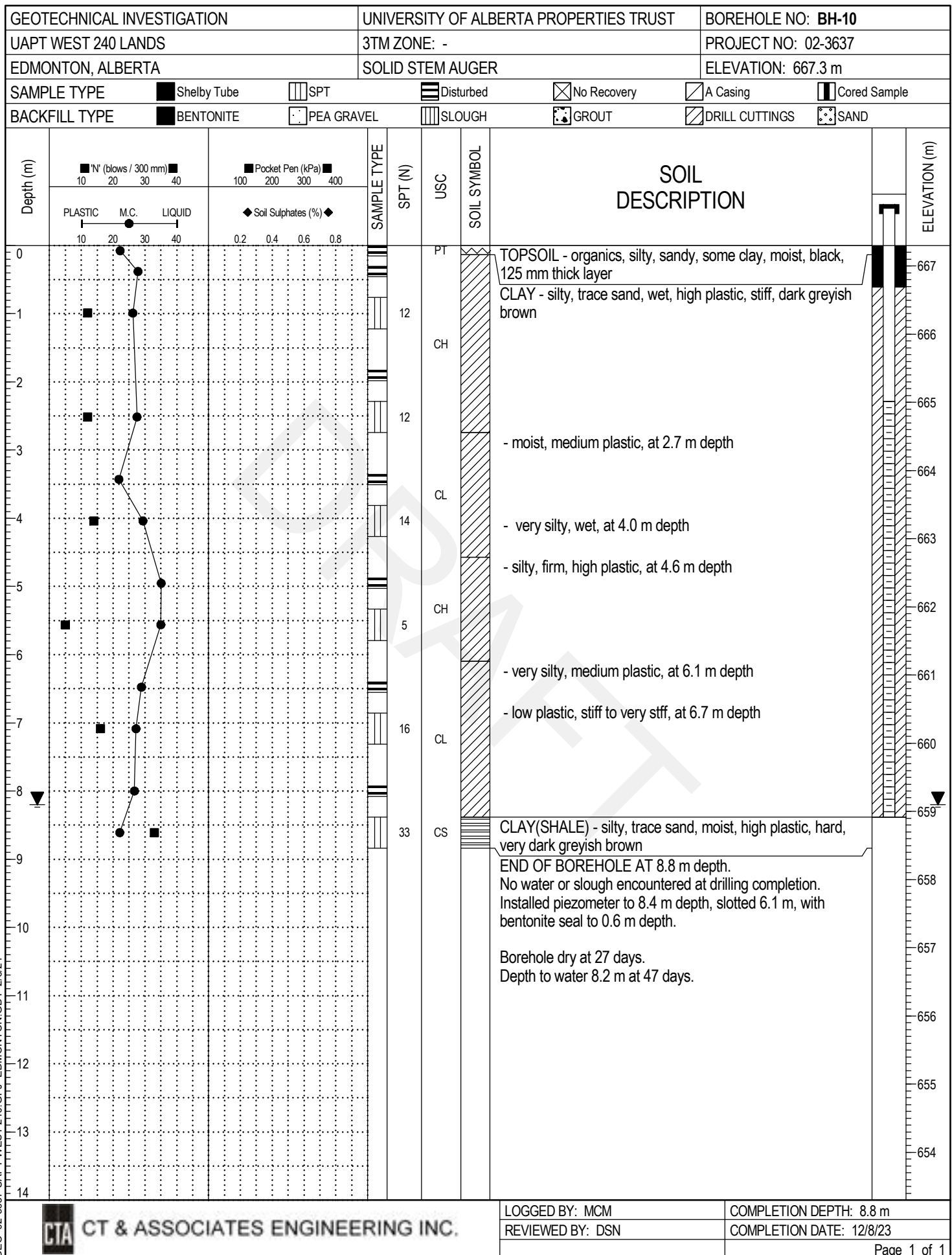
GEO 02-3637 UAPT WEST 240.GPJ EDMONTON.GDT 2/6/24

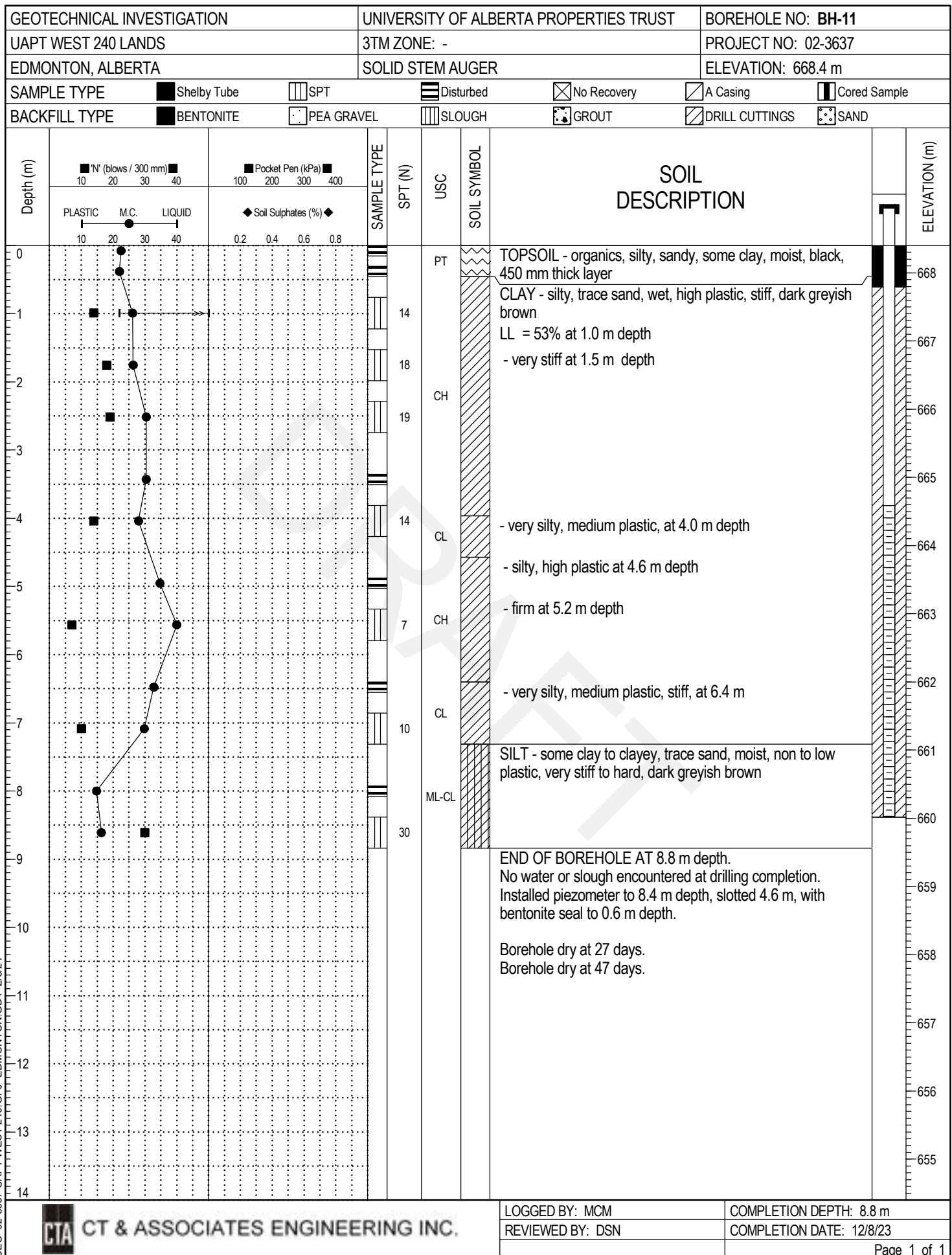
GEOTECHNICAL INVESTIGATION		UNIVERSITY OF ALBERTA PROPERTIES TRUST		BOREHOLE NO: BH- 8	
UAPT WEST 240 LANDS		3TM ZONE: -		PROJECT NO: 02-3637	
EDMONTON, ALBERTA		SOLID STEM AUGER		ELEVATION: 678.3 m	
SAMPLE TYPE	☒ Shelby Tube	☐ SPT	☐ Disturbed	☐ No Recovery	☐ A Casing
BACKFILL TYPE	☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☐ DRILL CUTTINGS
	☐ Cored Sample				

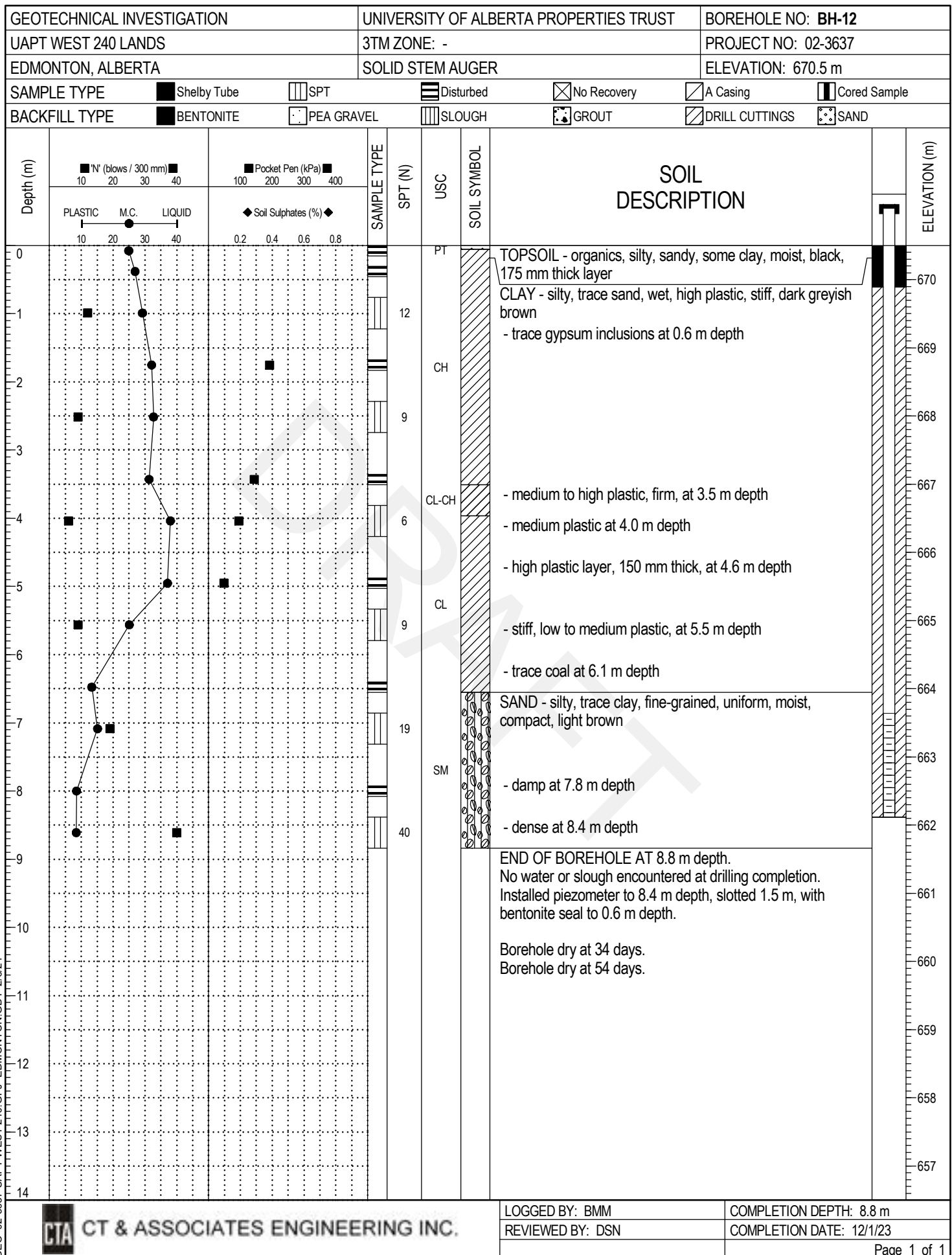
Depth (m)	☒ 'N' (blows / 300 mm) ☒ 10 20 30 40		☒ Pocket Pen (kPa) ☒ 100 200 300 400		SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
	PLASTIC M.C. LIQUID 10 20 30 40		☒ Soil Sulphates (%) ☒ 0.2 0.4 0.6 0.8							
0							PT		TOPSOIL - organics, silty, sandy, some clay, moist, black, 125 mm thick layer	678
1						8	CL		CLAY - silty, trace sand, moist, medium plastic, stiff, dark greyish brown	677
2							CL-CH		- firm, medium to high plastic, damp, at 1.3 m depth	676
3										675
4						44			SAND - silty, trace sand, fine-grained, uniform, loose, damp, brown	674
5									- dense, dry to damp, at 3.7 m depth	673
6						32			- fine to medium grained at 4.6 m depth	672
7							SM		- compact at 6.4 m depth	671
8						26			- light brown at 7.9 m depth	670
9						26				669
10						49			- dense at 9.9 m depth	668
11									END OF BOREHOLE AT 10.4 m depth. No water or slough encountered at drilling completion. Installed piezometer to 9.9 m depth, slotted 4.6 m, with bentonite seal to 0.6 m depth.	667
12									Borehole dry at 34 days. Borehole dry at 54 days.	666
13										665
14										

 CT & ASSOCIATES ENGINEERING INC.	LOGGED BY: BMM	COMPLETION DEPTH: 10.4 m
	REVIEWED BY: DSN	COMPLETION DATE: 12/1/23
		Page 1 of 1









GEOTECHNICAL INVESTIGATION		UNIVERSITY OF ALBERTA PROPERTIES TRUST		BOREHOLE NO: BH-13	
UAPT WEST 240 LANDS		3TM ZONE: -		PROJECT NO: 02-3637	
EDMONTON, ALBERTA		SOLID STEM AUGER		ELEVATION: 674 m	
SAMPLE TYPE	☒ Shelby Tube	☐ SPT	☐ Disturbed	☐ No Recovery	☐ A Casing
BACKFILL TYPE	☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☐ DRILL CUTTINGS
	☐ Cored Sample				

Depth (m)	☒ N' (blows / 300 mm) ☒ 10 20 30 40 PLASTIC M.C. LIQUID	☒ Pocket Pen (kPa) ☒ 100 200 300 400 ☒ Soil Sulphates (%) ☒ 0.2 0.4 0.6 0.8	SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
0					PT		TOPSOIL - organics, silty, sandy, some clay, moist, black, 200 mm thick layer	673
1				19			CLAY - silty, trace sand, wet, high plastic, stiff, dark greyish brown	672
2				10			- very stiff at 0.8 m depth - trace gypsum inclusions at 0.9 m depth - damp to moist, stiff, at 1.5 m depth	671
3				6	CH		- firm at 2.2 m depth - moist at 2.4 m depth	670
4				5			LL = 70% at 4.0 m depth	669
5							- stiff at 4.9 m depth - damp, medium plastic, soft to firm, at 5.2 m depth	668
6				3	CL		- sandy, low to medium plastic, at 6.1 m depth	667
7				23			SAND - silty, trace clay, fine-grained, uniform, damp, compact, light brown	666
8				28	SM			665
9							END OF BOREHOLE AT 8.8 m depth. No water or slough encountered at drilling completion. Installed piezometer to 8.4 m depth, slotted 4.6 m, with bentonite seal to 0.6 m depth.	664
10							Borehole dry at 34 days. Borehole dry at 54 days.	663
11								662
12								661
13								
14								

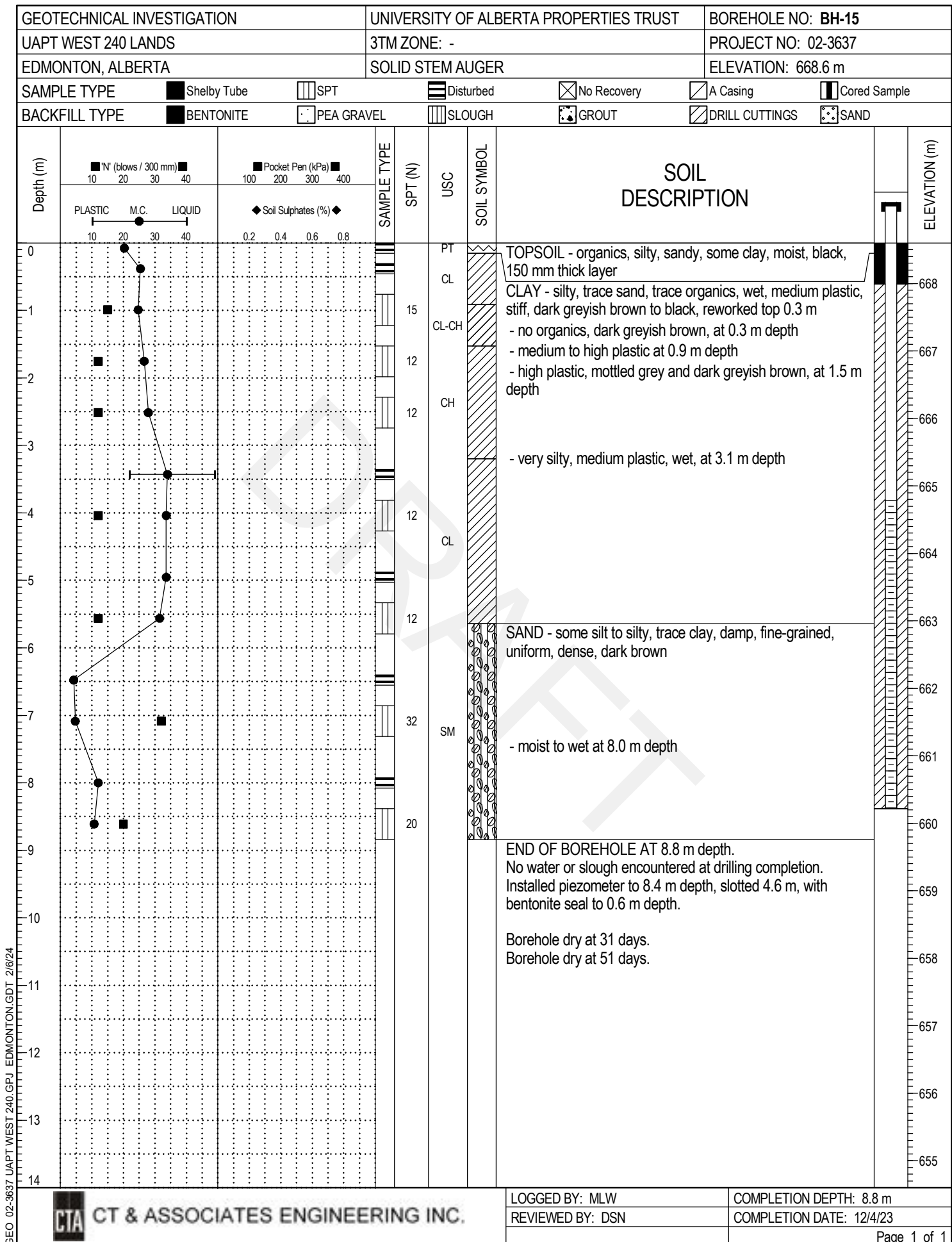
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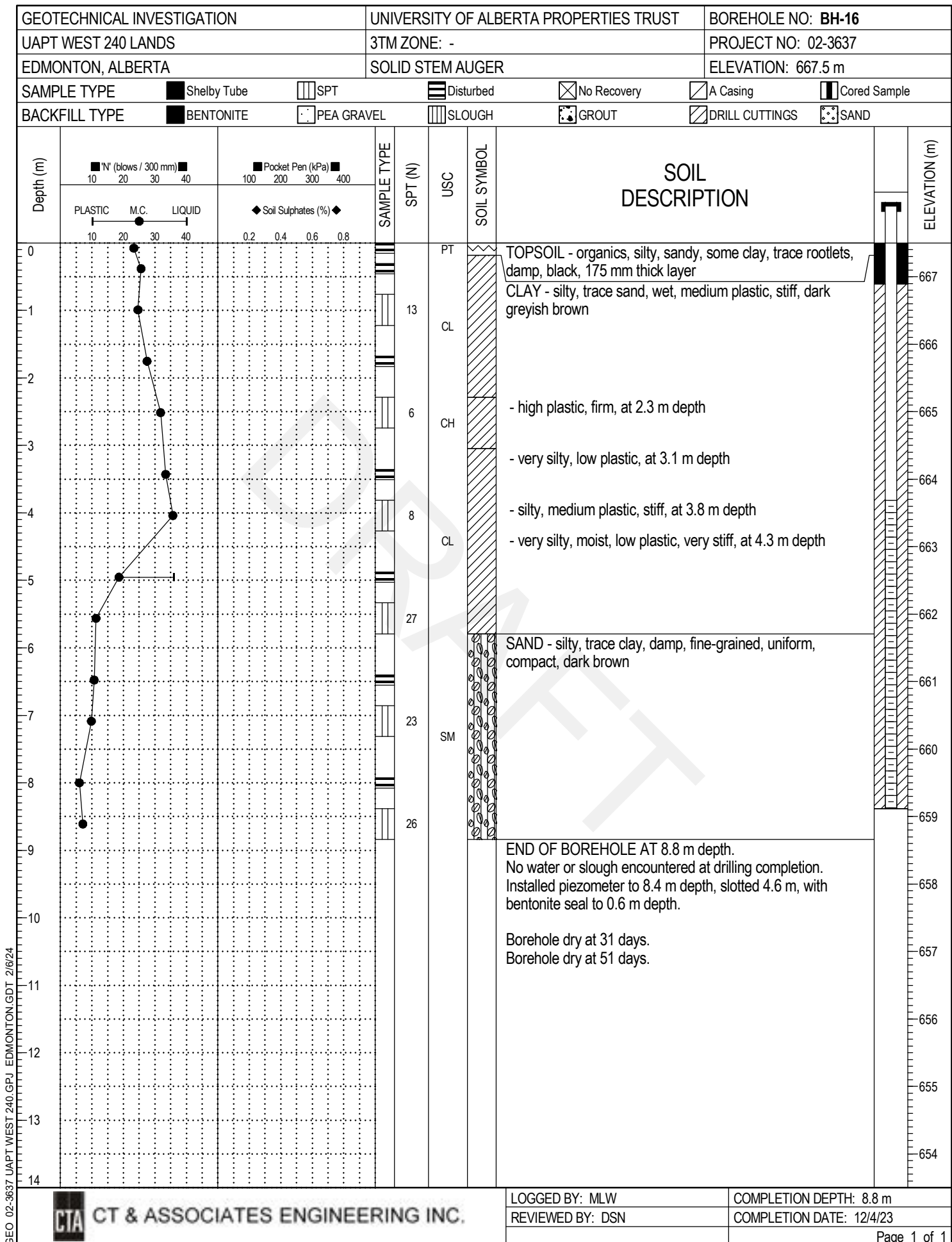
GEOTECHNICAL INVESTIGATION		UNIVERSITY OF ALBERTA PROPERTIES TRUST		BOREHOLE NO: BH-14	
UAPT WEST 240 LANDS		3TM ZONE: -		PROJECT NO: 02-3637	
EDMONTON, ALBERTA		SOLID STEM AUGER		ELEVATION: 665.4 m	
SAMPLE TYPE		☒ Shelby Tube	☐ SPT	☐ Disturbed	☐ No Recovery
BACKFILL TYPE		☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT
		☐ A Casing	☒ Cored Sample		
		☐ DRILL CUTTINGS	☐ SAND		

Depth (m)	Soil Properties		SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
	☒ 'N' (blows / 300 mm) 10 20 30 40 PLASTIC M.C. LIQUID	☒ Pocket Pen (kPa) 100 200 300 400 ☒ Soil Sulphates (%) 0.2 0.4 0.6 0.8						
0					PT		TOPSOIL - organics, silty, sandy, some clay, moist, black, 175 mm thick layer	665
1				4			CLAY - silty, trace sand, moist, high plastic, firm, dark greyish brown, reworked top 0.3 m - wet, mottled grey and dark greyish brown at 0.8 m depth	664
2					CH		- stiff at 1.8 m depth LL = 76% at 1.8 m depth	663
3				10			- very silty, low to medium plastic, at 3.4 m depth	662
4				10			- trace high plastic inclusions at 4.3 m depth	661
5					CL		- low plastic, very stiff, at 5.3 m depth	660
6				17				659
7				18			- sand layer, 200 mm thick, at 7.0 m depth	658
8					CL		CLAY(TILL) - silty, sandy, trace coal and pebbles, damp to moist, low plastic, very stiff, very dark greyish brown	657
9				67	SS		SANDSTONE - clayey, silty, some sand, damp, medium plastic, hard, dark grey	656
10							END OF BOREHOLE AT 8.8 m depth. No water or slough encountered at drilling completion. Installed piezometer to 8.4 m depth, slotted 3.1 m, with bentonite seal to 0.6 m depth.	655
11							Borehole dry at 30 days. Borehole dry at 50 days.	654
12								653
13								652
14								

CT & ASSOCIATES ENGINEERING INC.	LOGGED BY: MLW	COMPLETION DEPTH: 8.8 m
	REVIEWED BY: DSN	COMPLETION DATE: 12/5/23
		Page 1 of 1

GEO 02-3637 UAPT WEST 240.GPJ EDMONTON.GDT 2/6/24





GEOTECHNICAL INVESTIGATION		UNIVERSITY OF ALBERTA PROPERTIES TRUST		BOREHOLE NO: BH-17	
UAPT WEST 240 LANDS		3TM ZONE: -		PROJECT NO: 02-3637	
EDMONTON, ALBERTA		SOLID STEM AUGER		ELEVATION: 667 m	
SAMPLE TYPE	☒ Shelby Tube	☐ SPT	☐ Disturbed	☐ No Recovery	☐ A Casing
BACKFILL TYPE	☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☐ DRILL CUTTINGS
	☐ Cored Sample				☐ SAND

Depth (m)	N (blows / 300 mm) 10 20 30 40 PLASTIC M.C. LIQUID Pocket Pen (kPa) 100 200 300 400 Soil Sulphates (%) 0.2 0.4 0.6 0.8	SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
0				PT			
0.15					TOPSOIL - organics, silty, sandy, some clay, trace rootlets, damp, black, 150 mm thick layer	666	
0.3					CLAY - silty, trace sand, moist, high plastic, firm, dark greyish brown		
0.4					LL = 80% at 0.4 m depth		
0.9					- mottled grey and dark greyish brown, stiff, at 0.9 m depth	665	
2.3					- wet at 2.3 m depth	664	
2.5				CH			
3.5						663	
4.0						662	
4.5						661	
5.8					- very silty, low plastic, at 5.8 m depth	660	
6.0				CL			
7.0						659	
7.5						658	
8.0				SM	SAND - silty, trace clay, damp, fine-grained, uniform, dense, dark brown		
8.4					- very dense at 8.4 m depth	657	
8.8					END OF BOREHOLE AT 8.8 m depth.	656	
					No water or slough encountered at drilling completion.	655	
					Installed piezometer to 8.4 m depth, slotted 4.6 m, with bentonite seal to 0.6 m depth.	654	
					Borehole dry at 31 days.		
					Trace water at 51 days.		

GEO 02-3637 UAPT WEST 240.GPJ EDMONTON.GDT 2/6/24



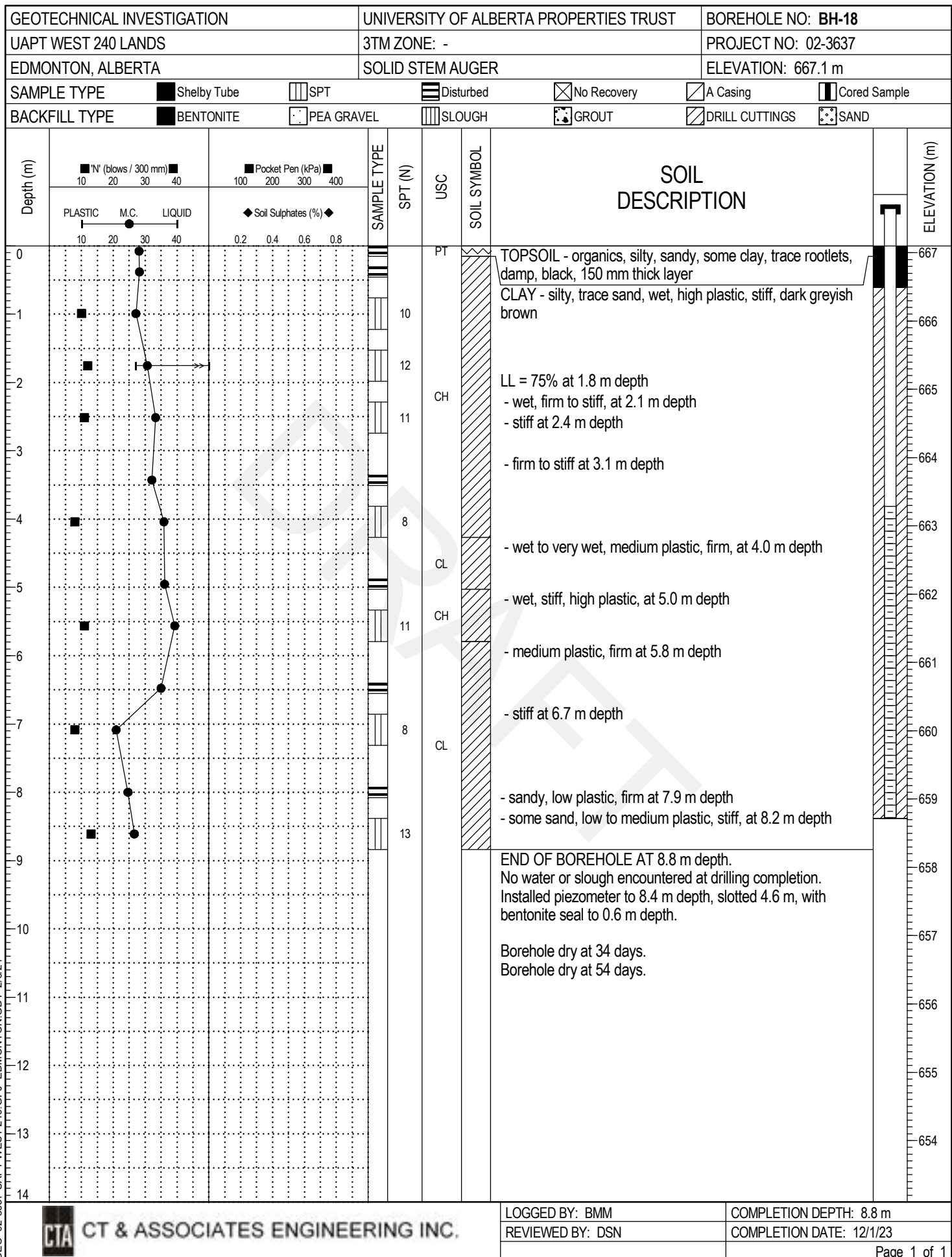
CT & ASSOCIATES ENGINEERING INC.

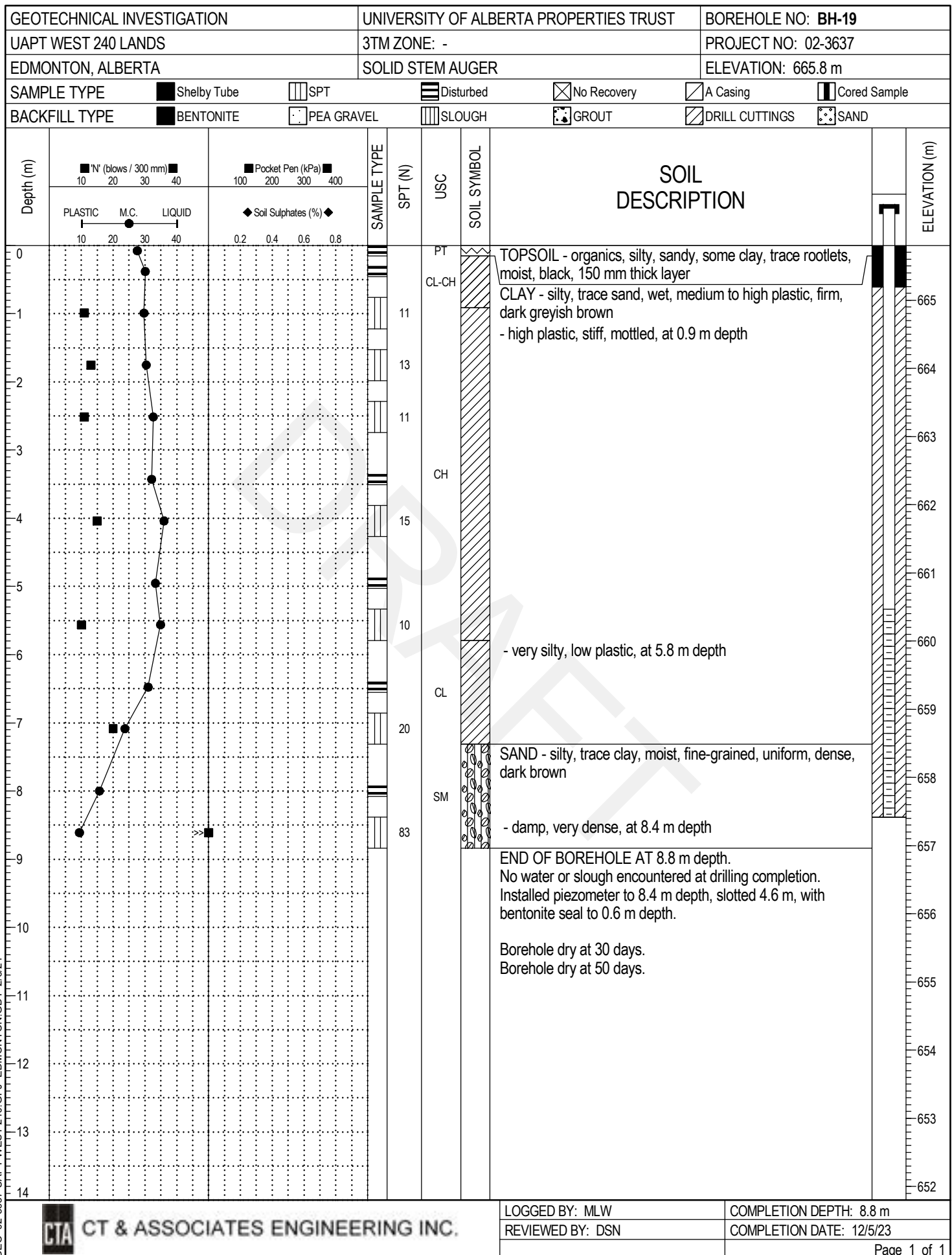
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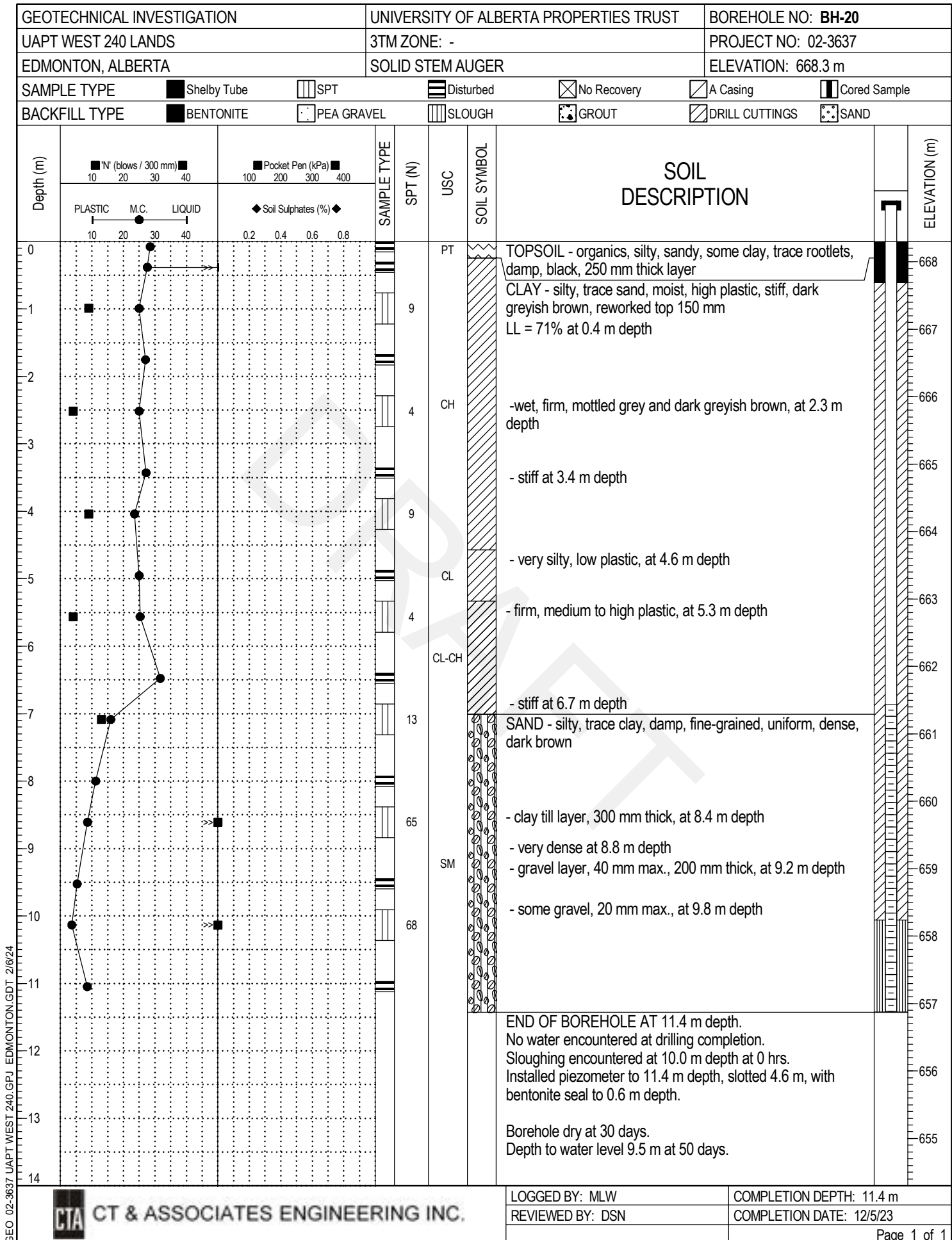
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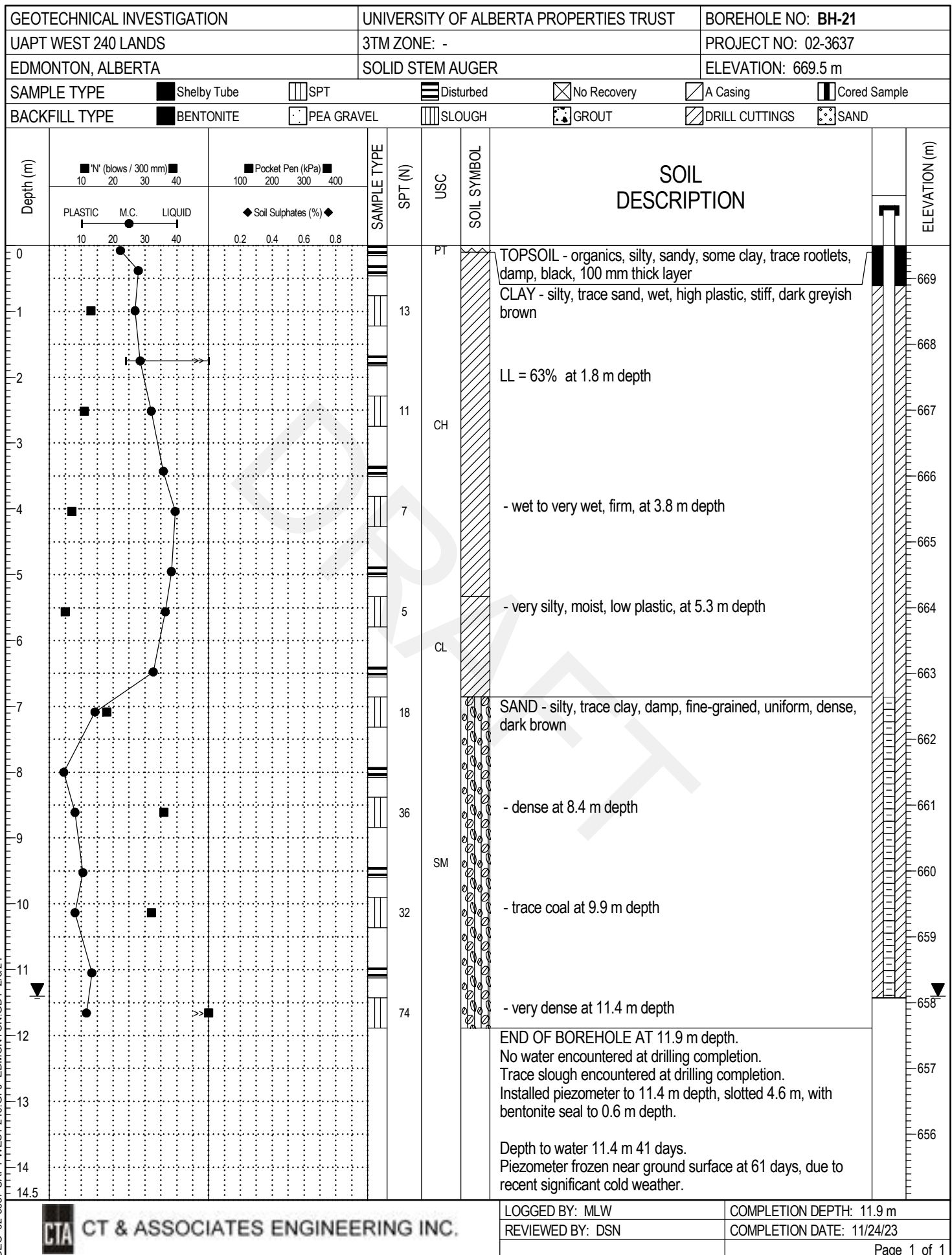
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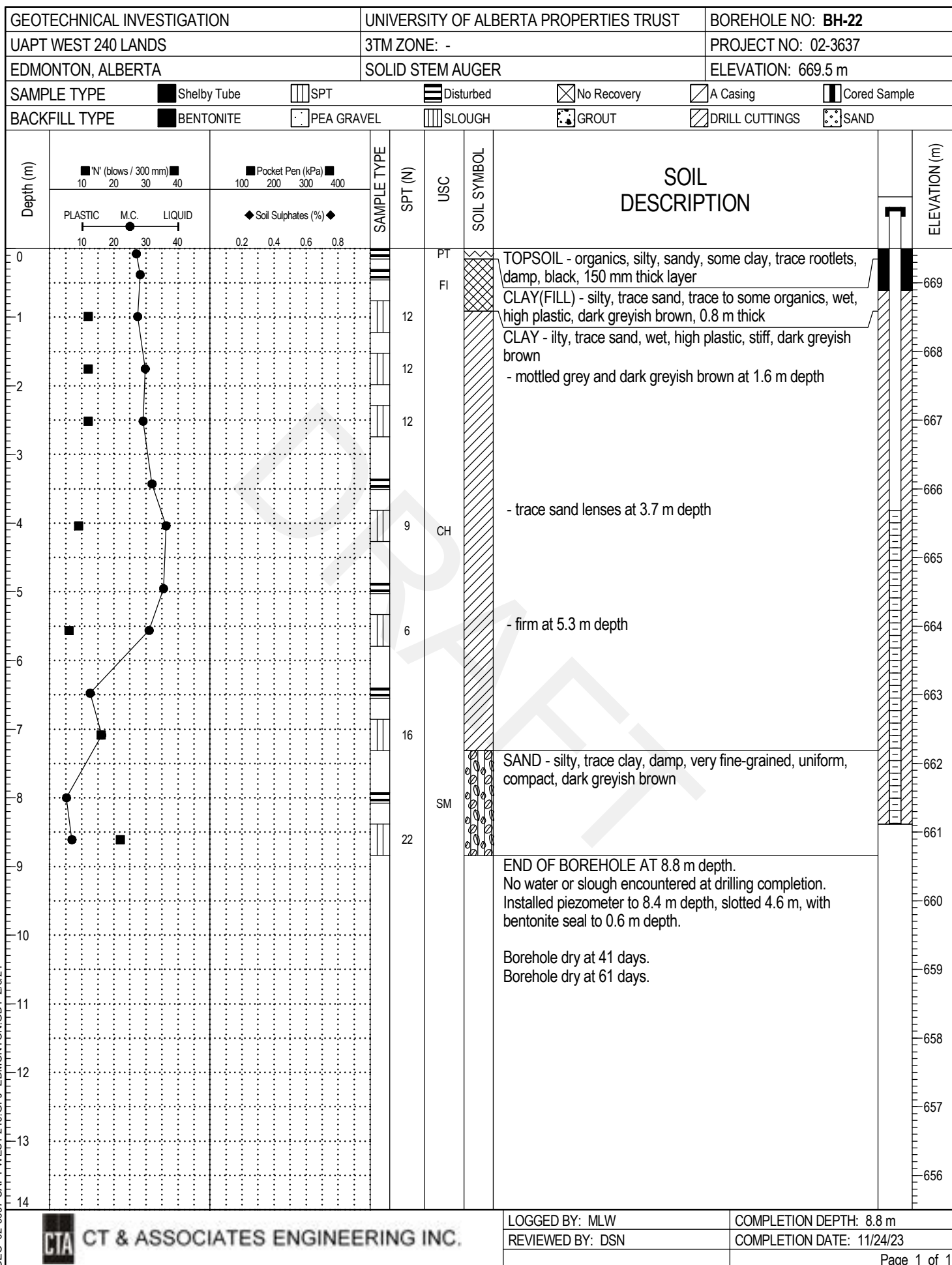
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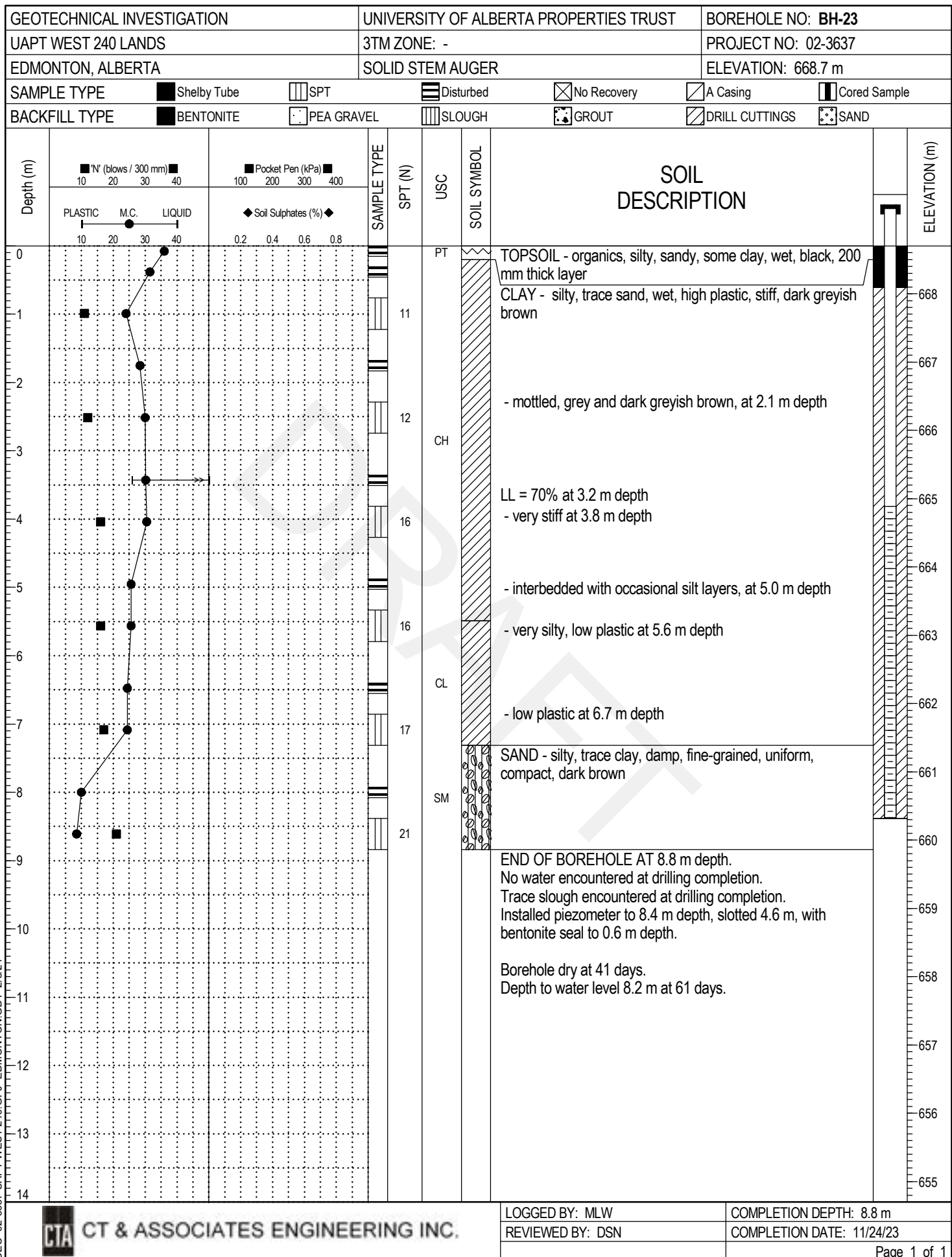


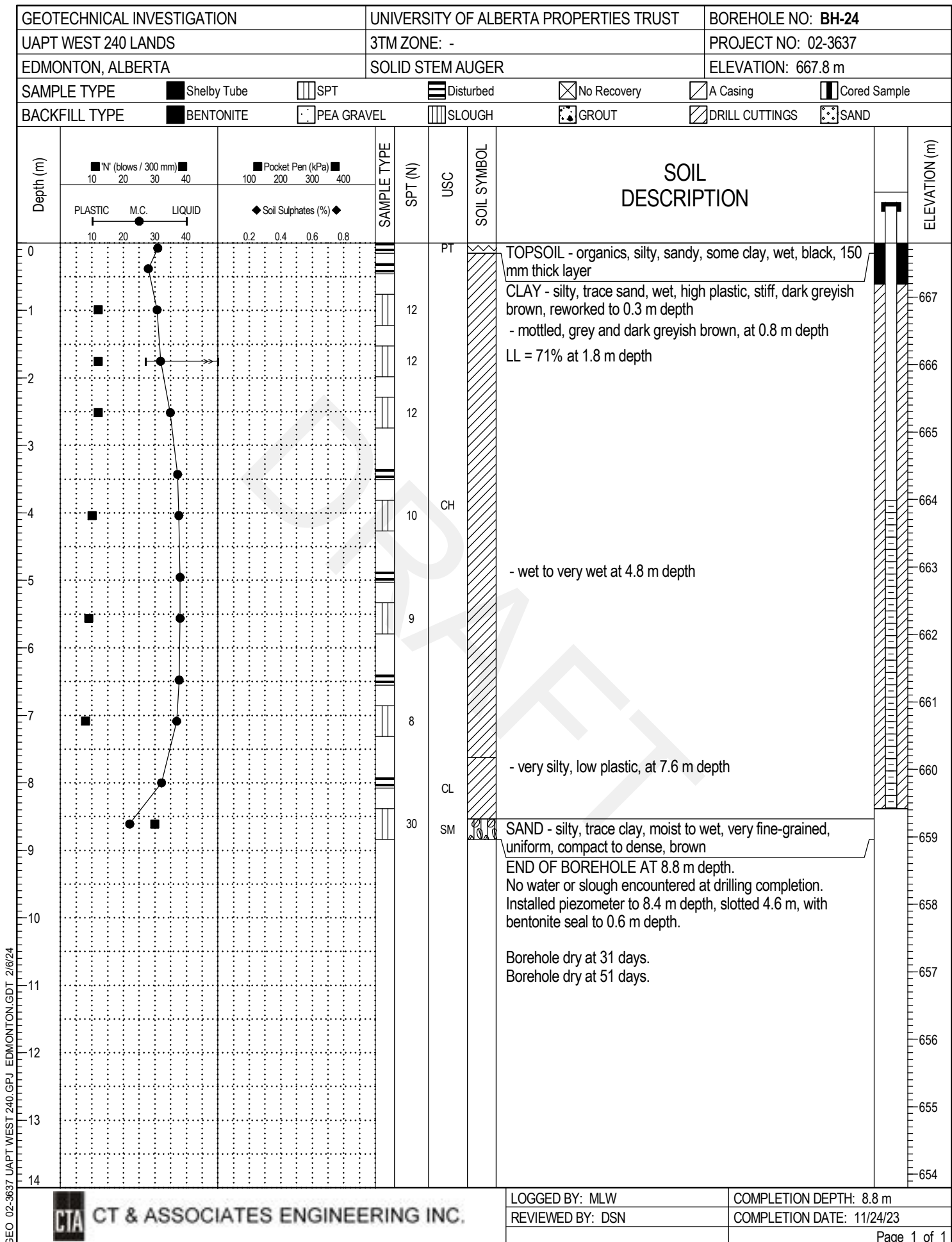








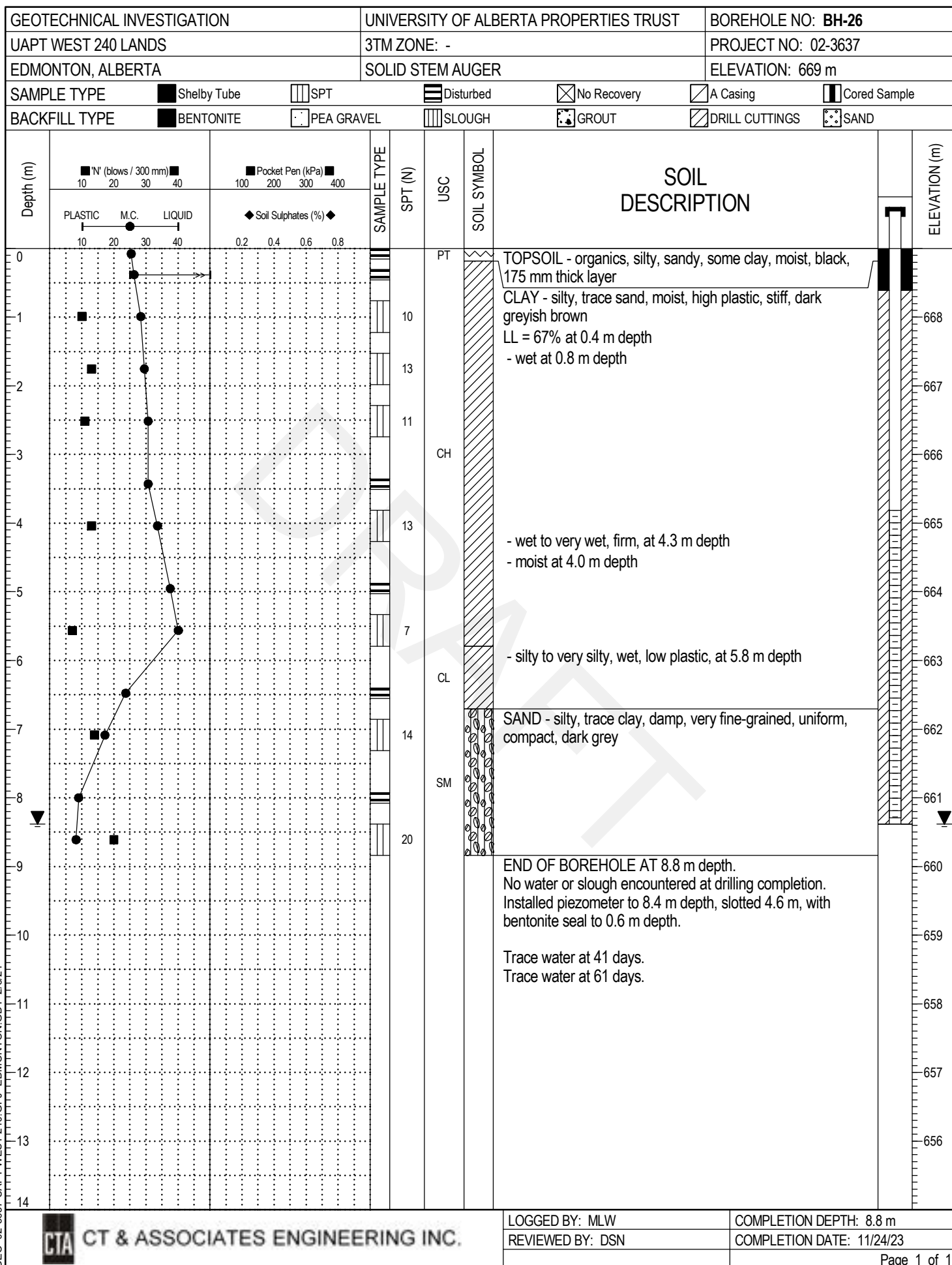




GEOTECHNICAL INVESTIGATION		UNIVERSITY OF ALBERTA PROPERTIES TRUST		BOREHOLE NO: BH-25	
UAPT WEST 240 LANDS		3TM ZONE: -		PROJECT NO: 02-3637	
EDMONTON, ALBERTA		SOLID STEM AUGER		ELEVATION: 668.7 m	
SAMPLE TYPE	☒ Shelby Tube	☐ SPT	☐ Disturbed	☐ No Recovery	☐ A Casing
BACKFILL TYPE	☒ BENTONITE	☐ PEA GRAVEL	☐ SLOUGH	☐ GROUT	☐ DRILL CUTTINGS
	☐ Cored Sample				

Depth (m)	Soil Properties		SAMPLE TYPE	SPT (N)	USC	SOIL SYMBOL	SOIL DESCRIPTION	ELEVATION (m)
	N' (blows / 300 mm)	Pocket Pen (kPa)						
0	10	100			PT		TOPSOIL - organics, silty, sandy, some clay, damp, black, 175 mm thick layer	668
0.5	20	200		18	FI		CLAY(FILL) - im-mixed with topsoil, some silt, trace sand, trace rootlets, wet, medium plastic, black, 0.5 m thick layer	667
1	25	250					CLAY - silty, trace sand, moist, high plastic, very stiff, dark greyish brown	666
1.5	30	300					- wet, stiff, at 1.5 m depth	665
2	35	350		13			- mottled grey and dark greyish brown at 2.1 m depth	664
2.5	40	400			CH		- wet, firm, at 3.4 m depth	663
3	45	450						662
3.5	50	500		7			- wet to very wet at 4.8 m depth	661
4	55	550					- very silty, low plastic, at 5.3 m depth	660
4.5	60	600		7				659
5	65	650			CL			658
5.5	70	700						657
6	75	750						656
6.5	80	800						655
7	85	850		60			SAND - silty, trace clay, damp, fine-grained, uniform, very dense, dark brown	654
7.5	90	900			SM			653
8	95	950		55				652
8.5	100	1000					END OF BOREHOLE AT 8.8 m depth. No water encountered at drilling completion. Trace slough encountered at drilling completion. Installed piezometer to 8.4 m depth, slotted 4.6 m, with bentonite seal to 0.6 m depth.	651
9							Borehole dry at 41 days. Borehole dry at 61 days.	650
10								649
11								648
12								647
13								646
14								645

CTA	CT & ASSOCIATES ENGINEERING INC.	LOGGED BY: MLW	COMPLETION DEPTH: 8.8 m
		REVIEWED BY: DSN	COMPLETION DATE: 11/24/23
			Page 1 of 1





APPENDIX E

CALIFORNIA BEARING RATIO TEST RESULTS

**CALIFORNIA BEARING RATIO TEST REPORT (ASTM D1883)**

Project:	Geo. Inv. West 240 for UAPT	Client:	University of Alberta Properties Trust
Location:	Edmonton, Alberta	Attention:	Keaton Seaby, Manager Dev't & Const'n
Project No.:	02-3637	Date Tested:	January 25, 2024
Sample No.:	BH-10 @ 1 - 5'	Tested By:	ZAB

Soil CharacteristicsSoil Description:

CLAY - some silt, high plastic

Natural Moisture Content:	29.7%	Reference Density:	1470 kg/m ³
Plasticity Index:		Optimum Moisture Content:	25.0 %
Liquid Limit:		ASTM Method:	Standard
Plastic Limit:		% Oversize (+20 mm Sieve):	N/A

California Bearing Ratio ParametersPrimary Specimen Compaction Data

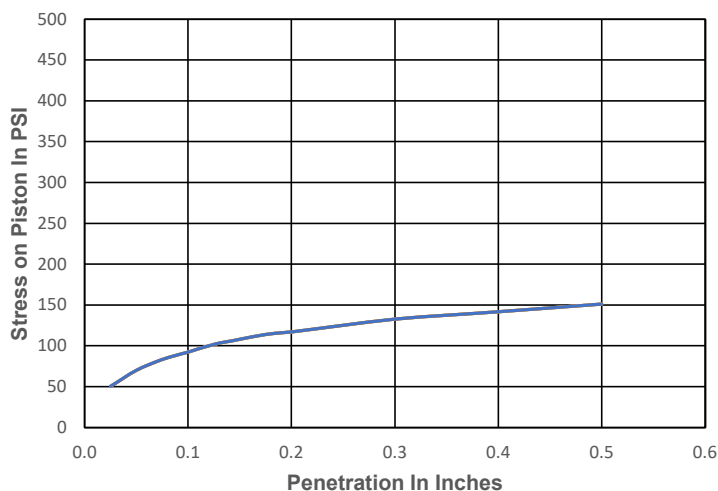
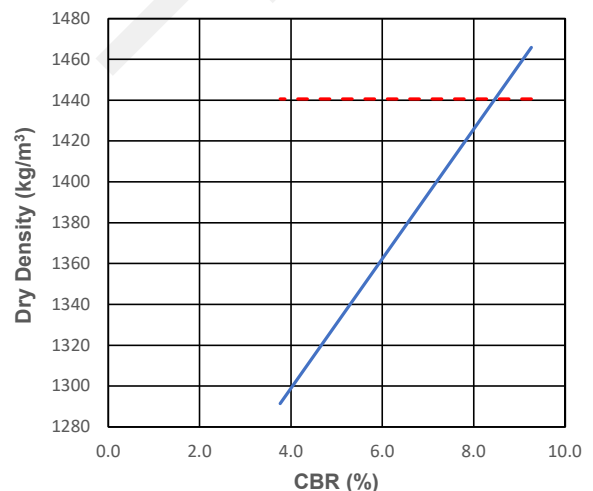
Specimen Preparation:	Unsoaked
Dry Density (kg/m ³):	1470 kg/m ³
Initial Moisture Content:	25.8%
Compaction %:	100.0%
CBR @ 0.100 in.:	9.26%

Soaked Sample Data (if applicable)

Top Inch. Moisture Content:	
Swell Percentage:	
Immersion Duration:	
CBR after Soak (%):	
CBR @ 0.100 in.:	

Other CBR Test Data

Surcharge Weight:	4.54 kg
Pavement Pressure:	2.5 kPa
10 blow Dry Density:	1300 kg/m ³
25 blow Dry Density:	
56 blow Dry Density:	1470 kg/m ³

Load Penetration Curve(s)**CBR vs Dry Density****Test Results:**
(for primary specimen)

CBR @ 0.1 Penetration: 9.3 @ 100% SPMDD
CBR @ 0.2 Penetration: 7.8 @ 100% SPMDD

** Indicates 98% SPD - - - -

Comments:

Reviewed By:

P. Eng.

**CALIFORNIA BEARING RATIO TEST REPORT (ASTM D1883)**

Project:	Geo. Inv. West 240 for UAPT	Client:	University of Alberta Properties Trust
Location:	Edmonton, Alberta	Attention:	Keaton Seaby, Manager Dev't & Const'n
Project No.:	02-3637	Date Tested:	January 23, 2024
Sample No.:	BH-25 @ 1 - 5'	Tested By:	ZAB

Soil CharacteristicsSoil Description:

CLAY - some silt, high plastic

Natural Moisture Content:	22.9%	Reference Density:	1500 kg/m ³
Plasticity Index:		Optimum Moisture Content:	25.0 %
Liquid Limit:		ASTM Method:	Standard
Plastic Limit:		% Oversize (+20 mm Sieve):	N/A

California Bearing Ratio ParametersPrimary Specimen Compaction Data

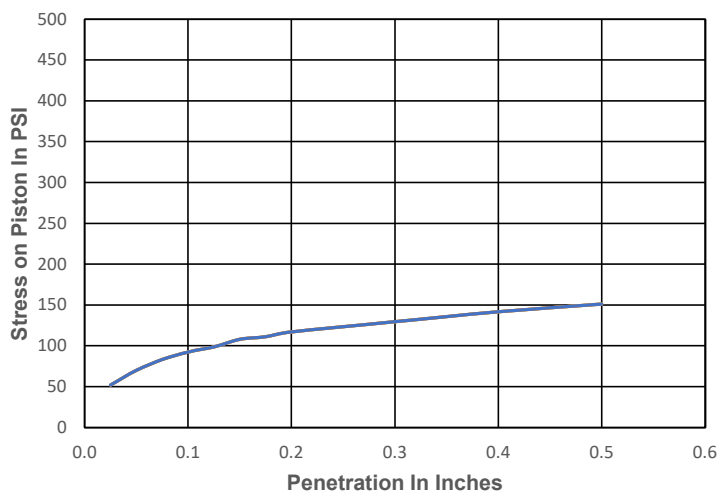
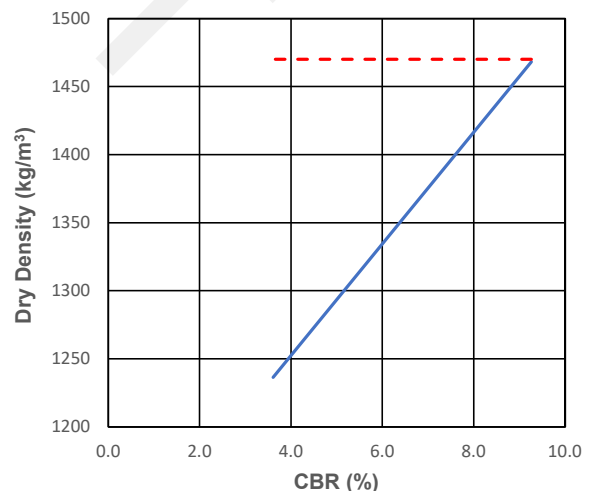
Specimen Preparation:	Unsoaked
Dry Density (kg/m ³):	1470 kg/m ³
Initial Moisture Content:	25.1%
Compaction %:	98.0%
CBR @ 0.100 in.:	9.26%

Soaked Sample Data (if applicable)

Top Inch. Moisture Content:	
Swell Percentage:	
Immersion Duration:	
CBR after Soak (%):	
CBR @ 0.100 in.:	

Other CBR Test Data

Surcharge Weight:	4.54 kg
Pavement Pressure:	2.5 kPa
10 blow Dry Density:	1240 kg/m ³
25 blow Dry Density:	
56 blow Dry Density:	1470 kg/m ³

Load Penetration Curve(s)**CBR vs Dry Density****Test Results:**
(for primary specimen)

CBR @ 0.1 Penetration: 9.3 @ 98% SPMDD
CBR @ 0.2 Penetration: 7.8 @ 98% SPMDD

** Indicates 98% SPD ----

Comments: _____

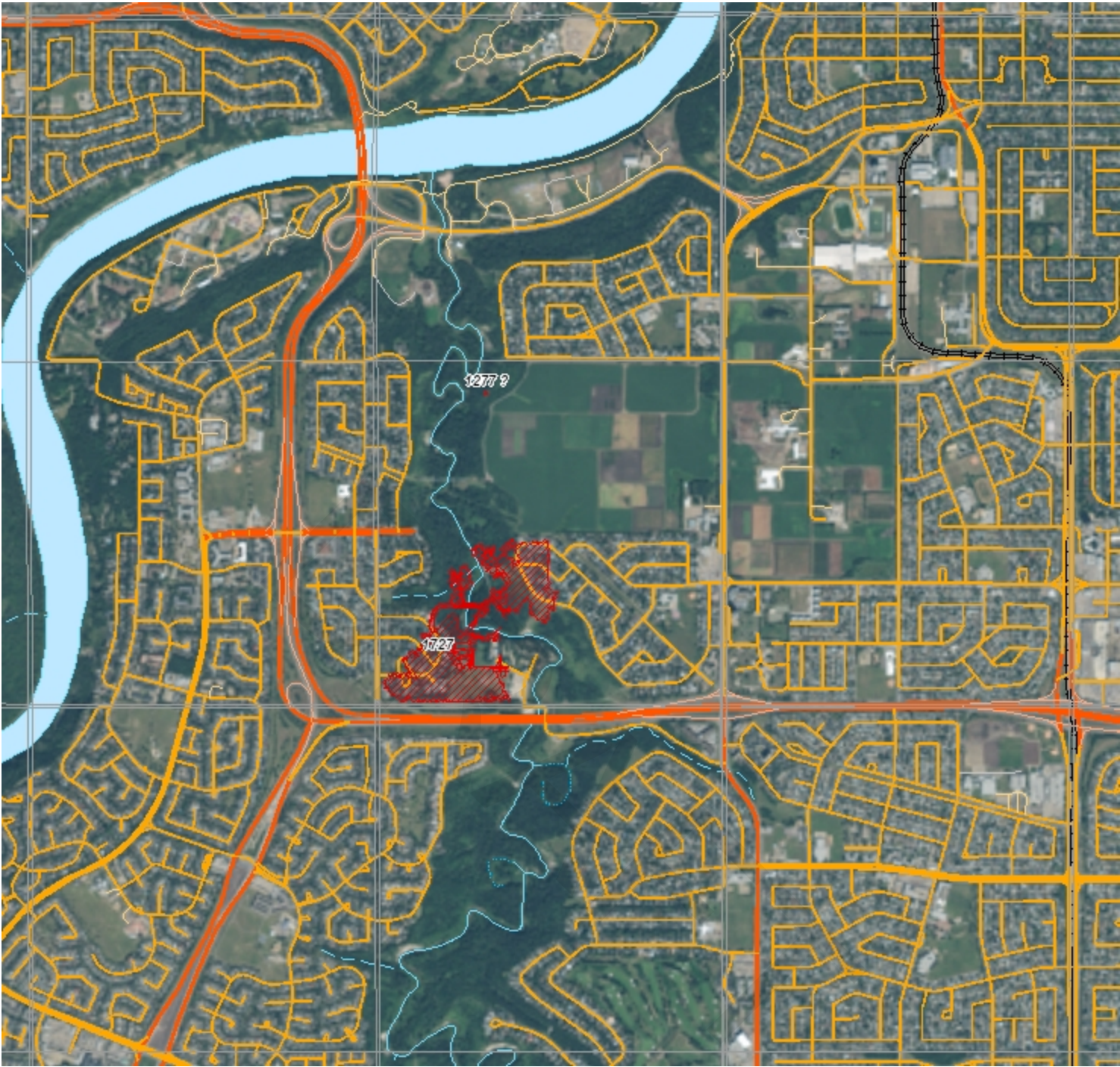
Reviewed By: _____

P. Eng.



APPENDIX F

COAL MINE RECORDS DOCUMENTATION

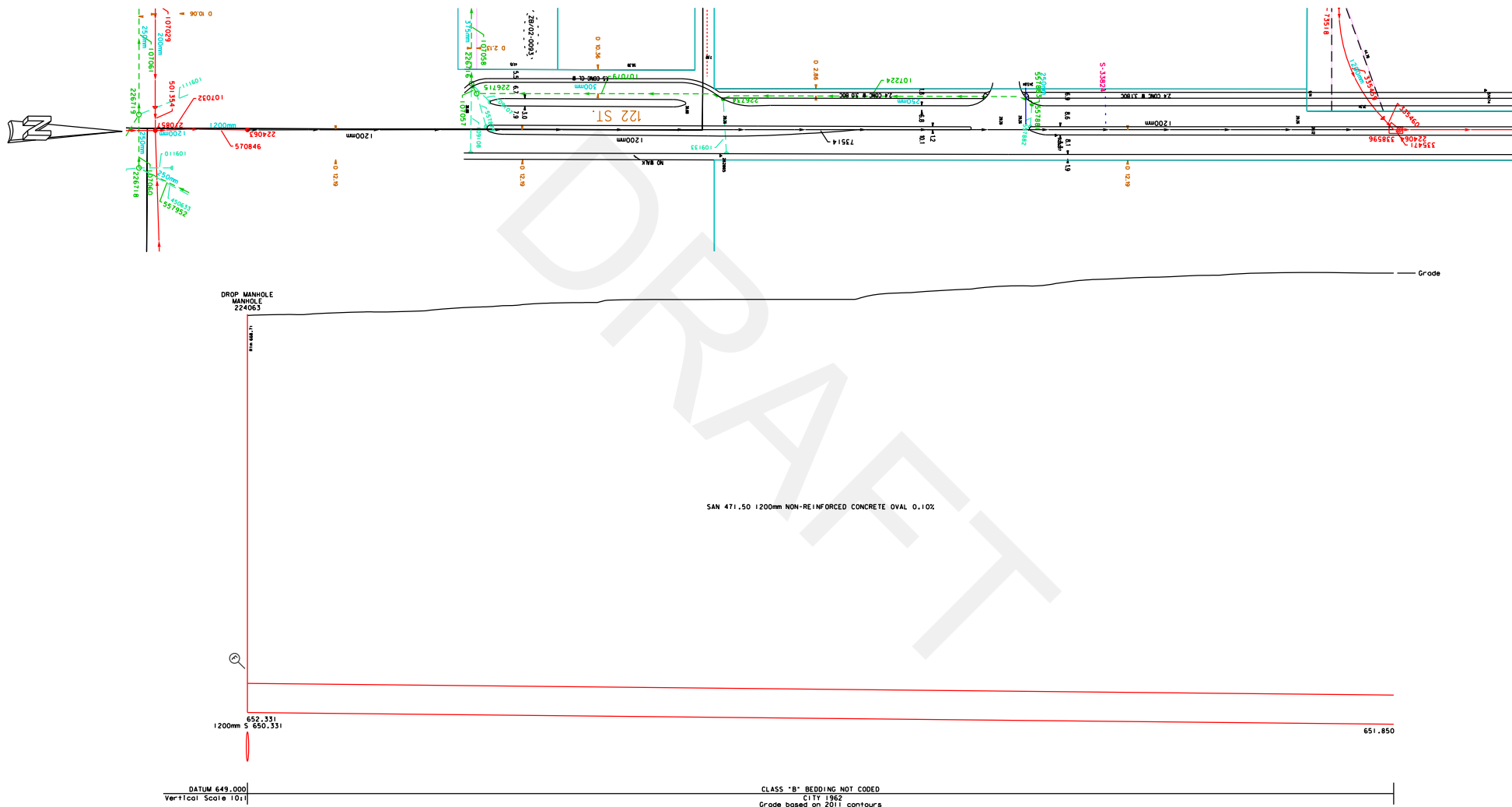


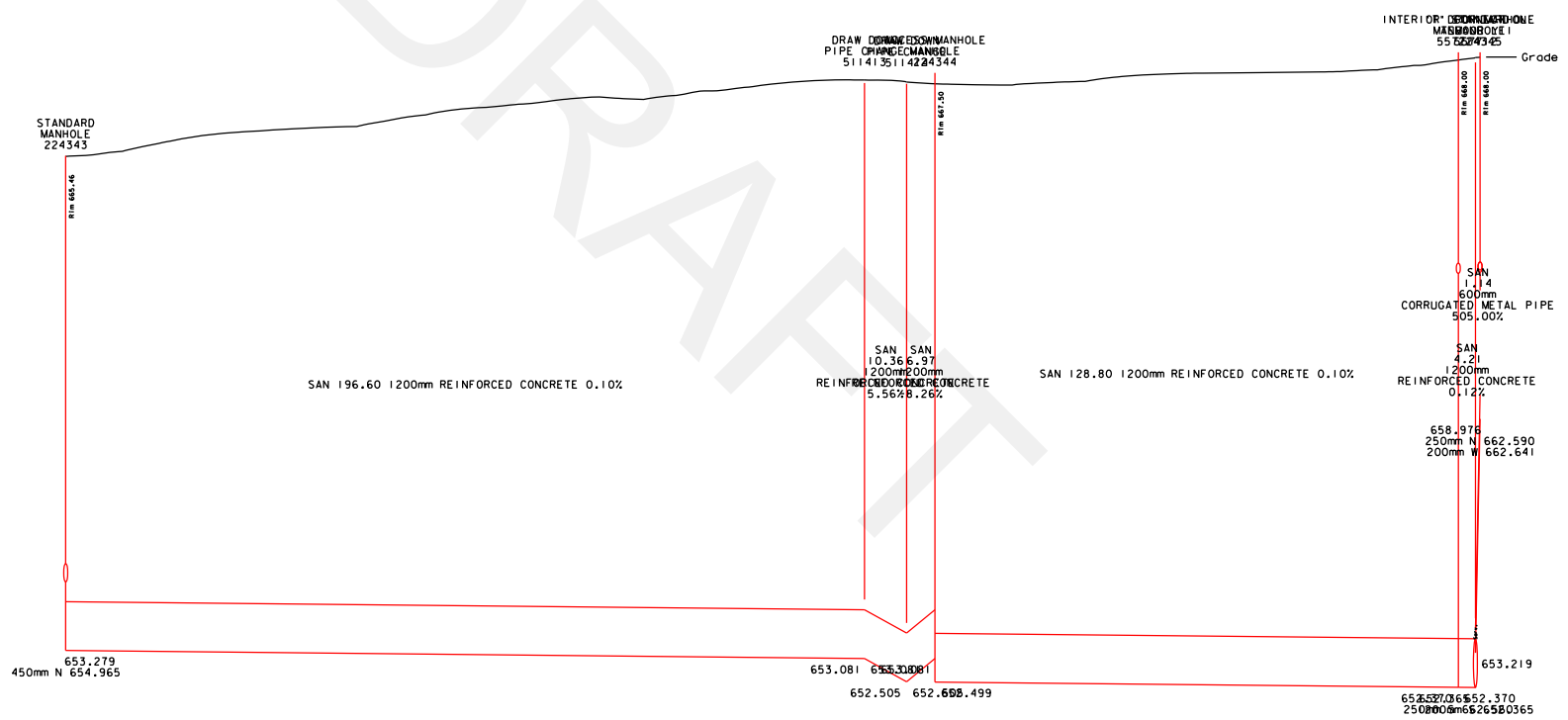
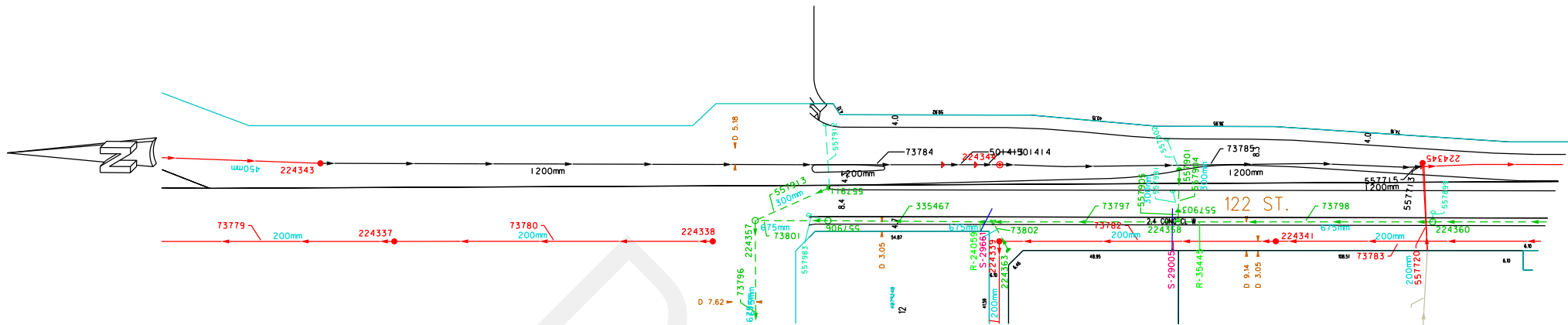
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	Author XXX	Printing Date: 2/6/2024
Legend ATS LSD label ATS LSD with Road Allowance ATS Quarter Section label ATS Quarter Section with Road Allowance ATS Section label (large scale) ATS Section with Road Allowance ATS Township (large scale) Provincial Boundary Coal Mine Permit Coal Mine Polygon Surface	Date Date (if applicable)	
	The Alberta Energy Regulator (AER) has not verified and makes no representation or warranty as to the accuracy, completeness, or reliability of any information or data in this document or that it will be suitable for any particular purpose or use. The AER is not responsible for any inaccuracies, errors or omissions in the information or data and is not liable for any direct or indirect losses arising out of any use of this information. For additional information about the limitations and restrictions applicable to this document, please refer to the AER Copyright & Disclaimer webpage: http://www.aer.ca/copyright-disclaimer.	Scale: 45,139.89 0.69 Kilometers 0
		Projection and Datum: WGS84 Web Mercator Auxiliary Sphere

Appendix C

Existing City/Adjacent Area Infrastructure Data

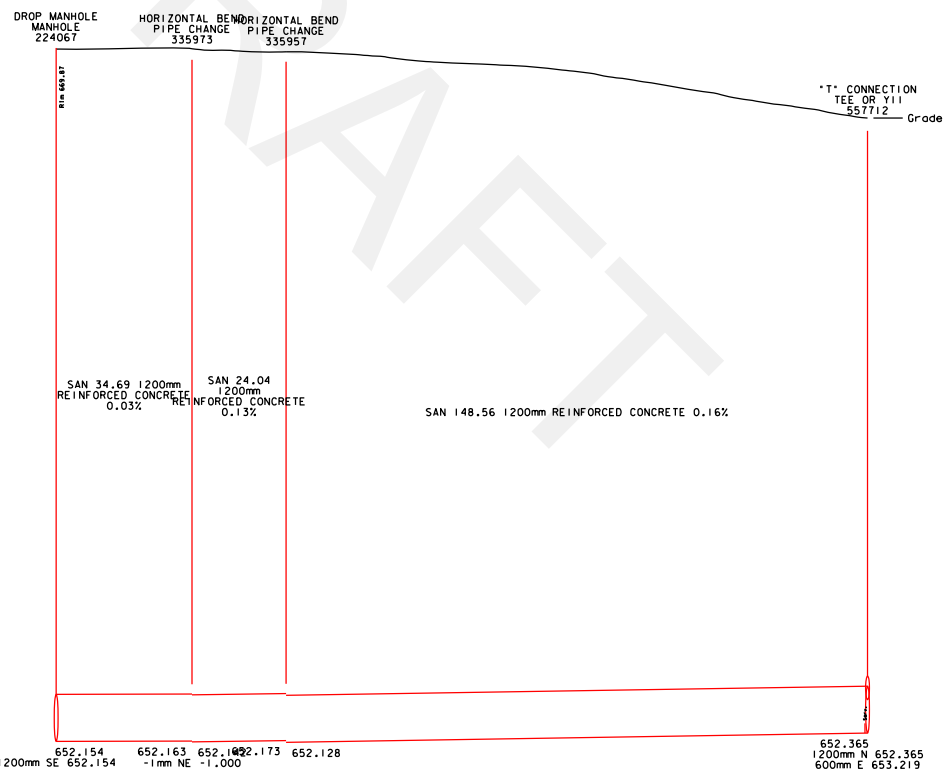
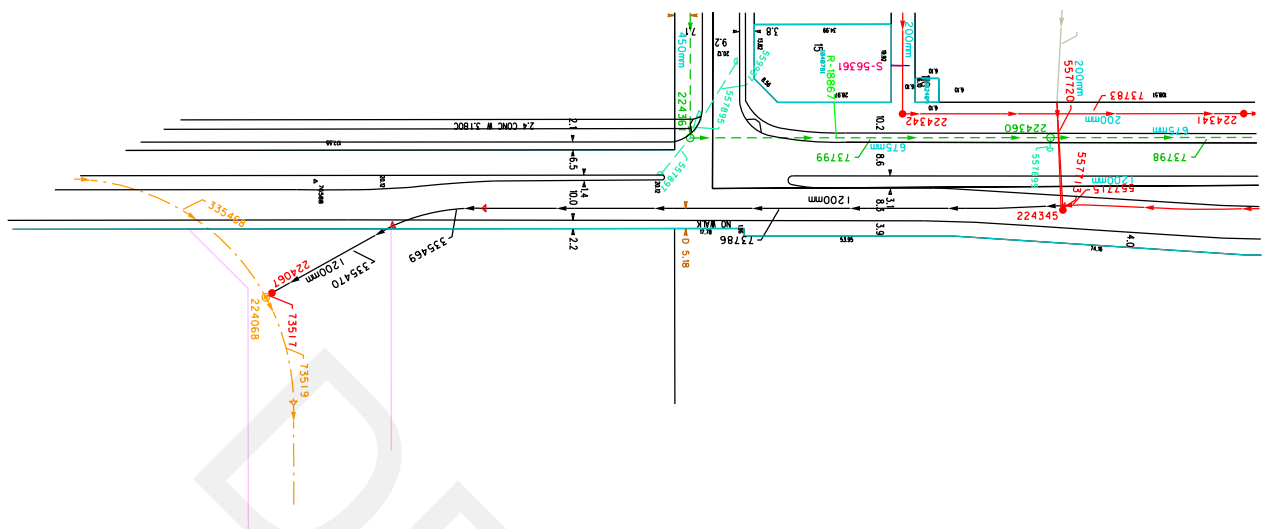
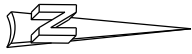
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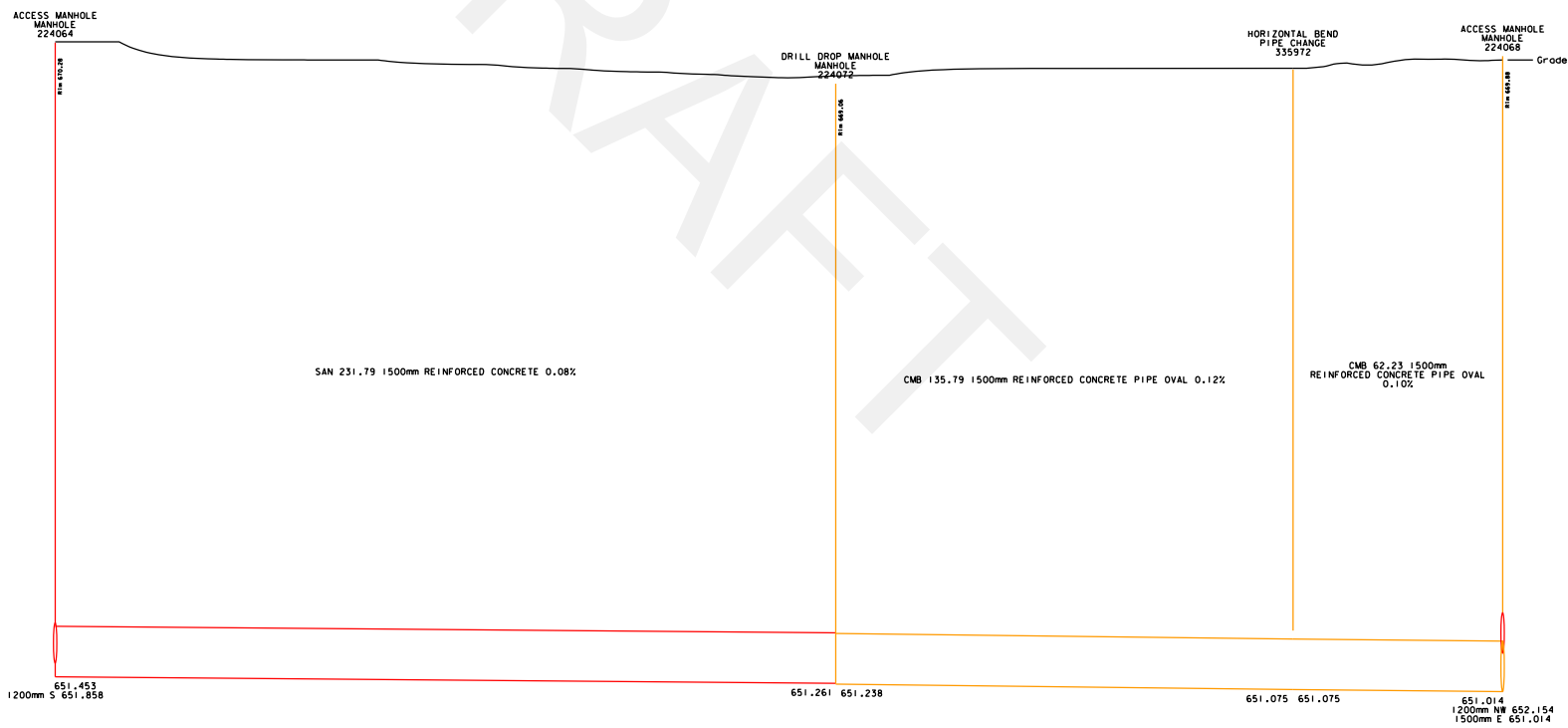
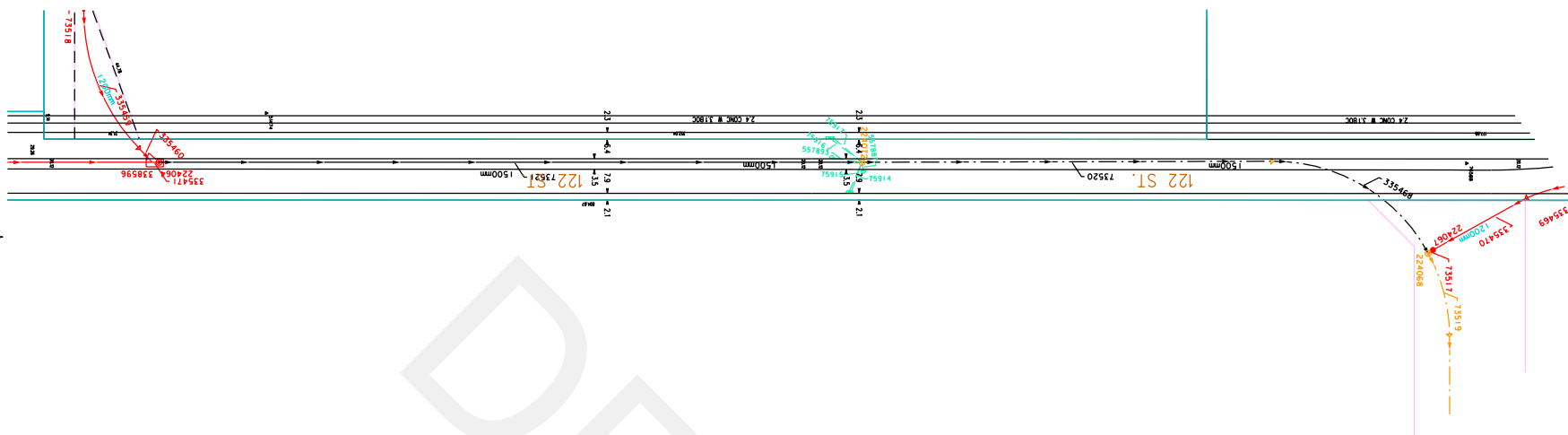
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Vertical Scale 10:1

UNKNOWN OPEN CHANNEL
CITY 1962
Grade based on 2011 contours



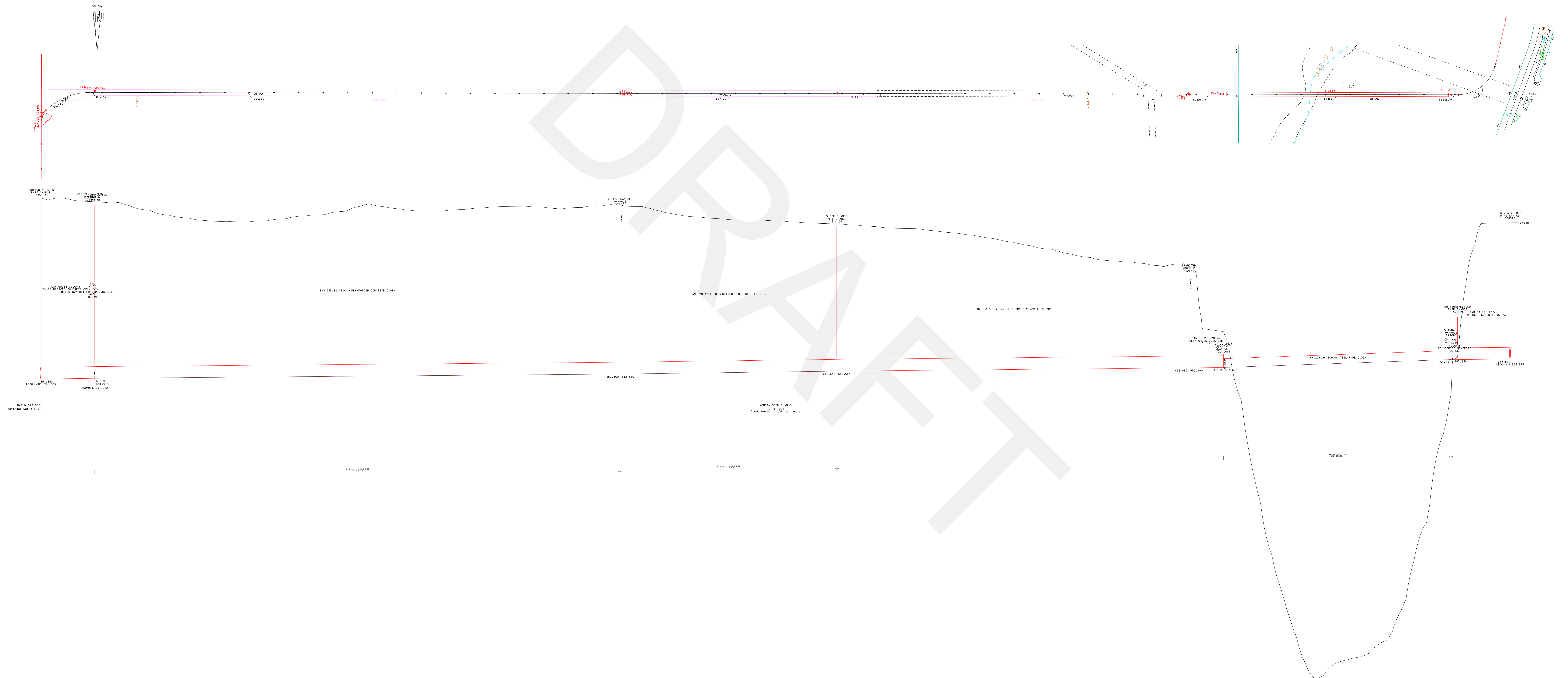
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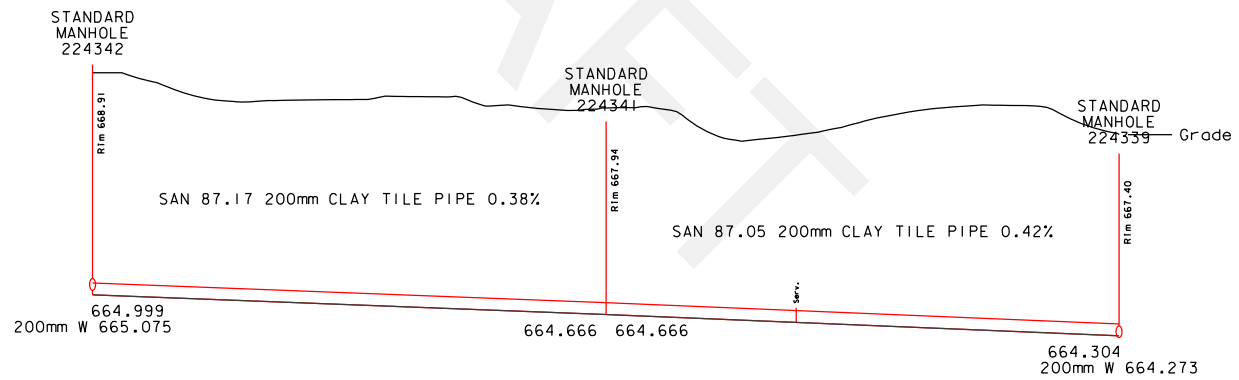
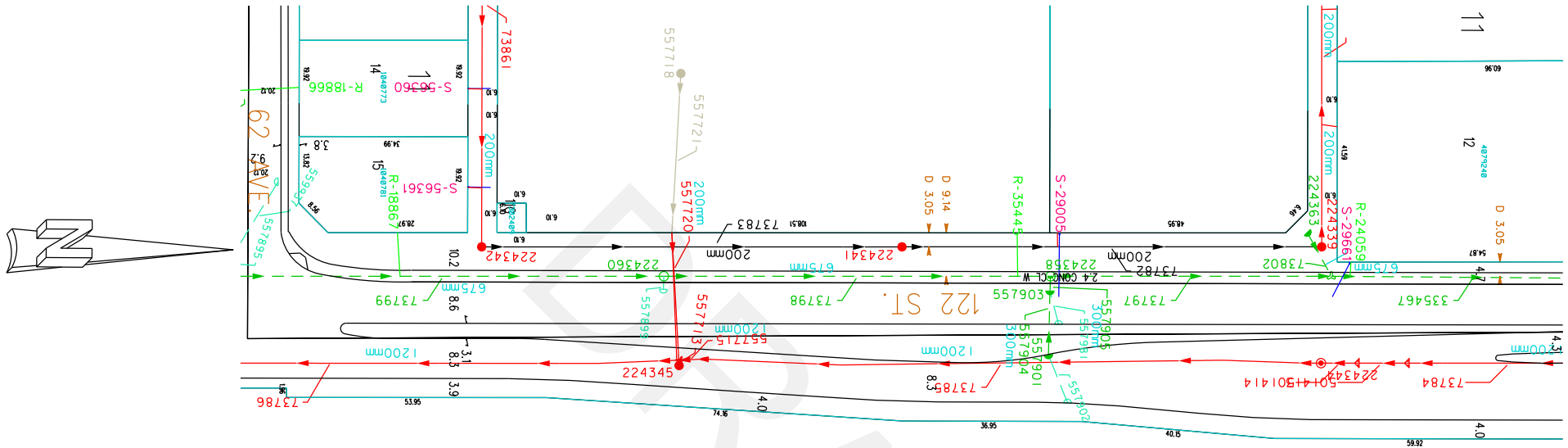
UNKNOWN OPEN CHANNEL
CITY 1962
Grade based on 2011 contours



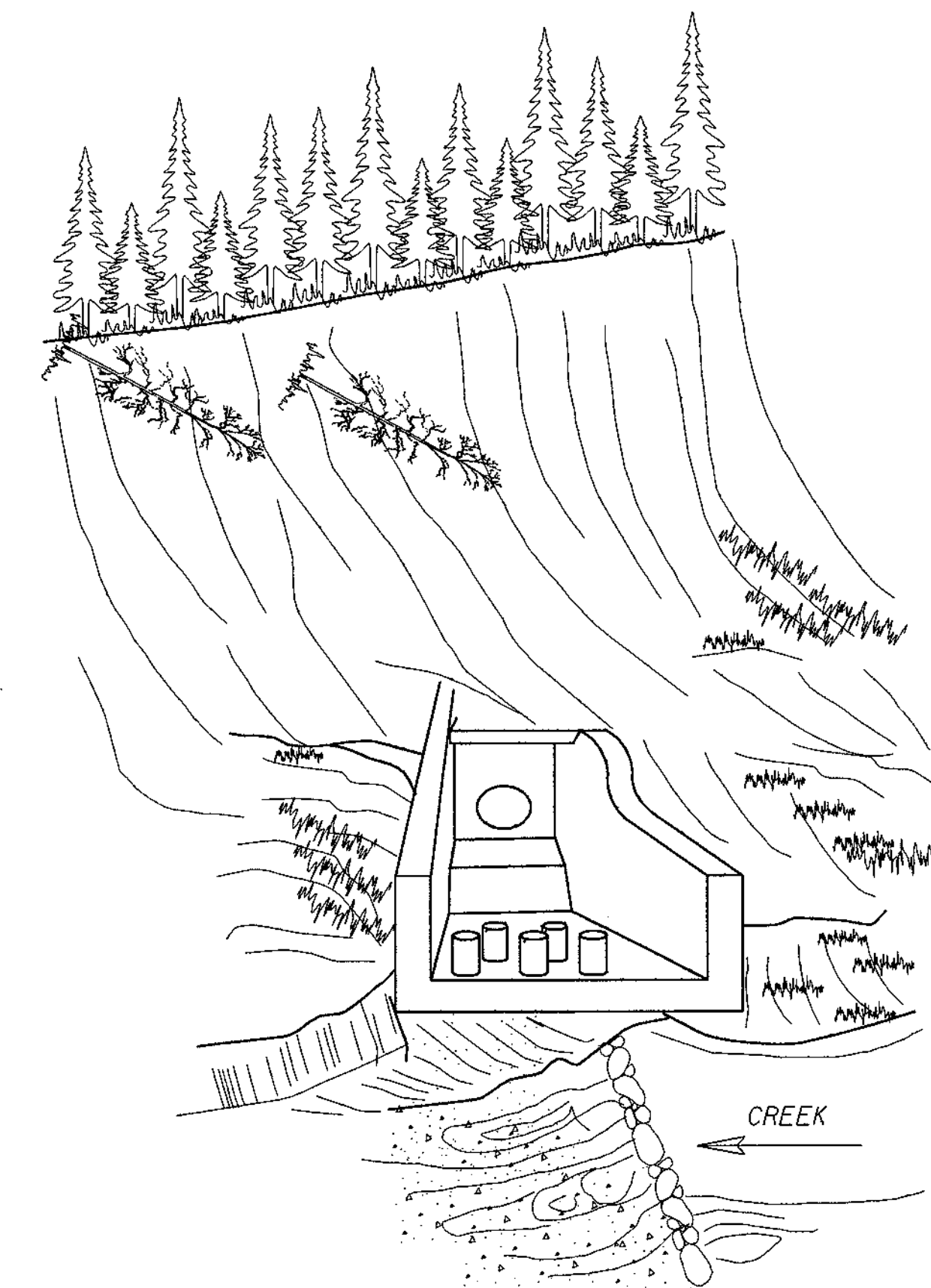
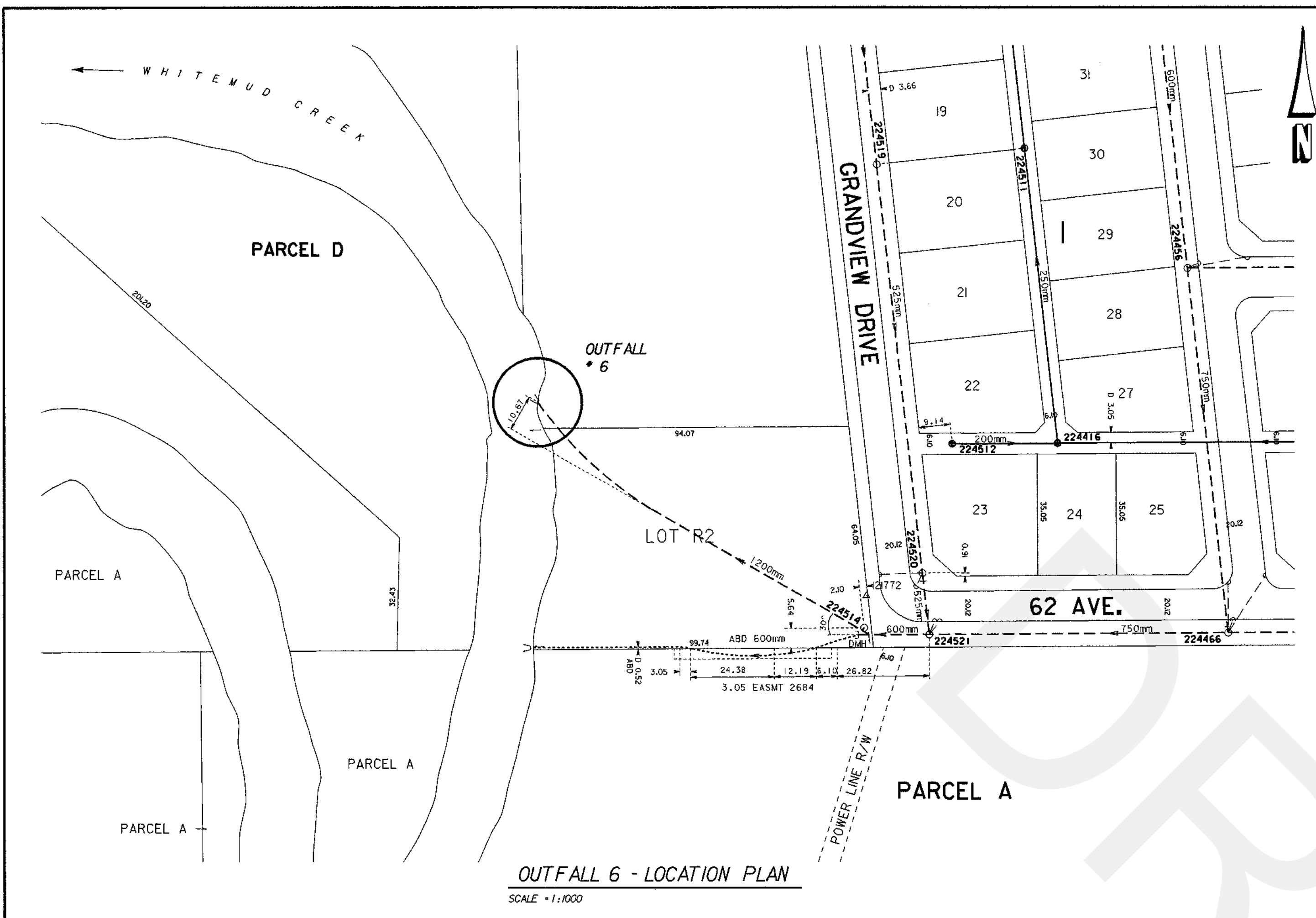
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Vertical Scale 10:1

UNKNOWN OPEN CHANNEL
CITY 1962
Grade based on 2011 contours

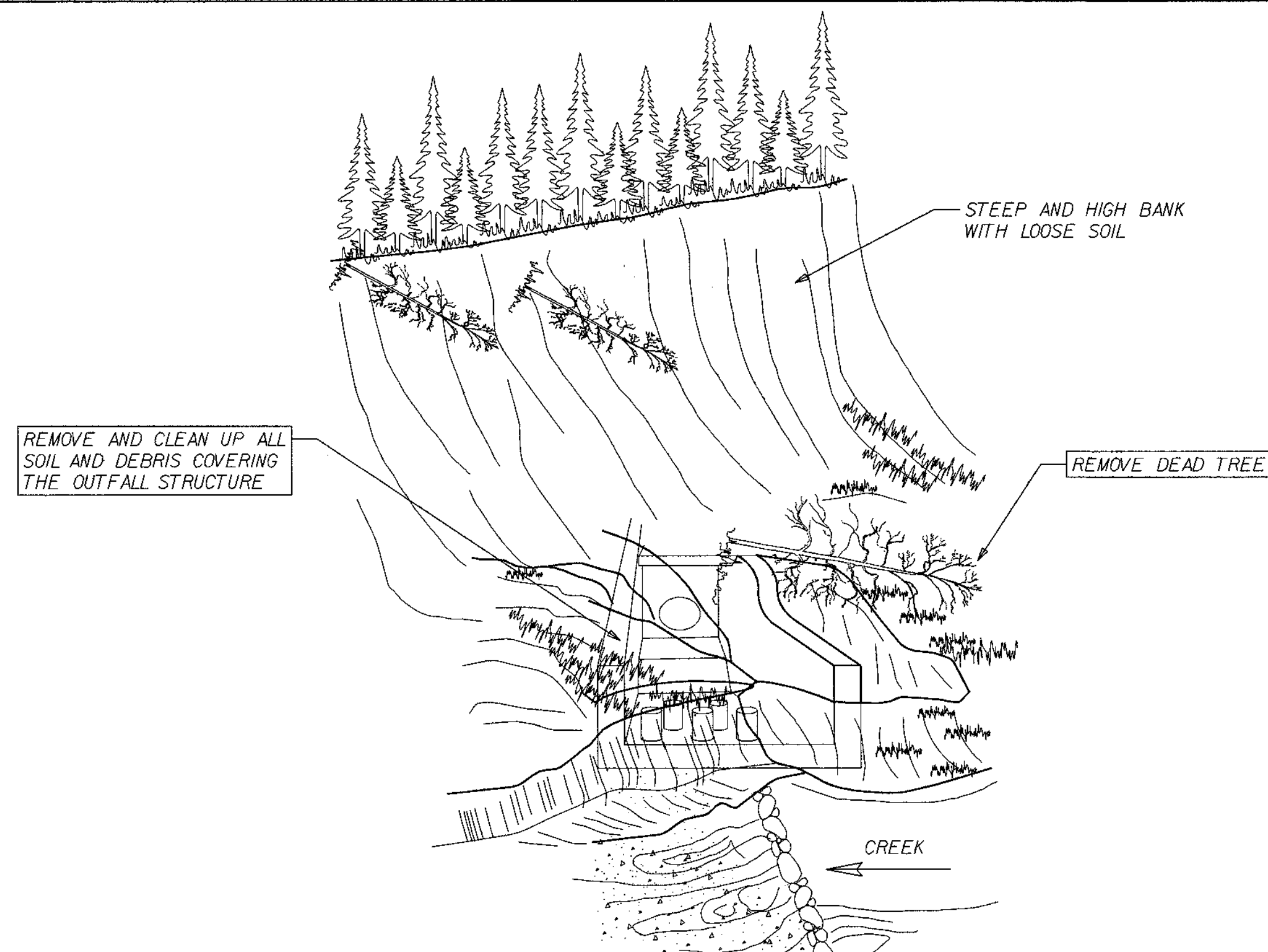




DATUM 661.000	UNKNOWN OPEN CHANNEL
Vertical Scale 10:1	CITY 1961
	Grade based on 2011 contours



IMPROVED OUTFALL CONDITION
NOT TO SCALE



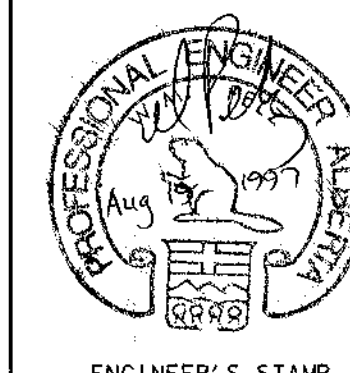
EXISTING OUTFALL CONDITION
NOT TO SCALE

- NOTE:
1. ASSUMING THE EXISTING OUTFALL STRUCTURE IS IN GOOD CONDITION,
 2. REMOVE AND CLEAN UP ALL DIRT AND DEBRIS FROM THE EXISTING OUTFALL STRUCTURE IN ORDER TO IMPROVE AND KEEP THE OUTFALL-FLOW OPERATION IN AN EFFECTIVE CONDITION.
 3. UPGRADING WORK FOR THIS OUTFALL IS NOT RECOMMENDED DUE TO THE FREQUENT LANDSLIDE OCCURRENCES FROM THE EXISTING STEEP BANK WITH AN UNSTABLE SURFACE SOIL CONDITION (eg. BARE BANK AND LACK OF VEGETATION)
 4. IMMEDIATELY INFORM AND CONTACT DESIGN ENGINEER IF ANY DEFECTS ARE FOUND IN THE OUTFALL STRUCTURE WHEN THE CLEAN-UP WORK IS BEING DONE.

ISSUED BY:	DATE:	NO.	DATE	REVISION	BY	CHK'D

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SCALE: HOR. AS SHOWN VERT. AS SHOWN

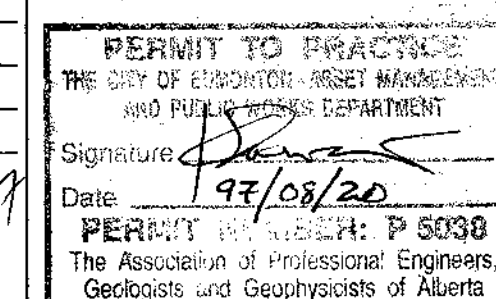
DRAWN BY: ANDY DATE: JULY 14, 1997

CHECKED BY: *Andy* DATE: *Aug 19 97*

ISSUED BY: *Paul Kan* DATE: *Aug 19 97*

DESIGNED BY: *Paul Kan* DATE: *7/16/97*

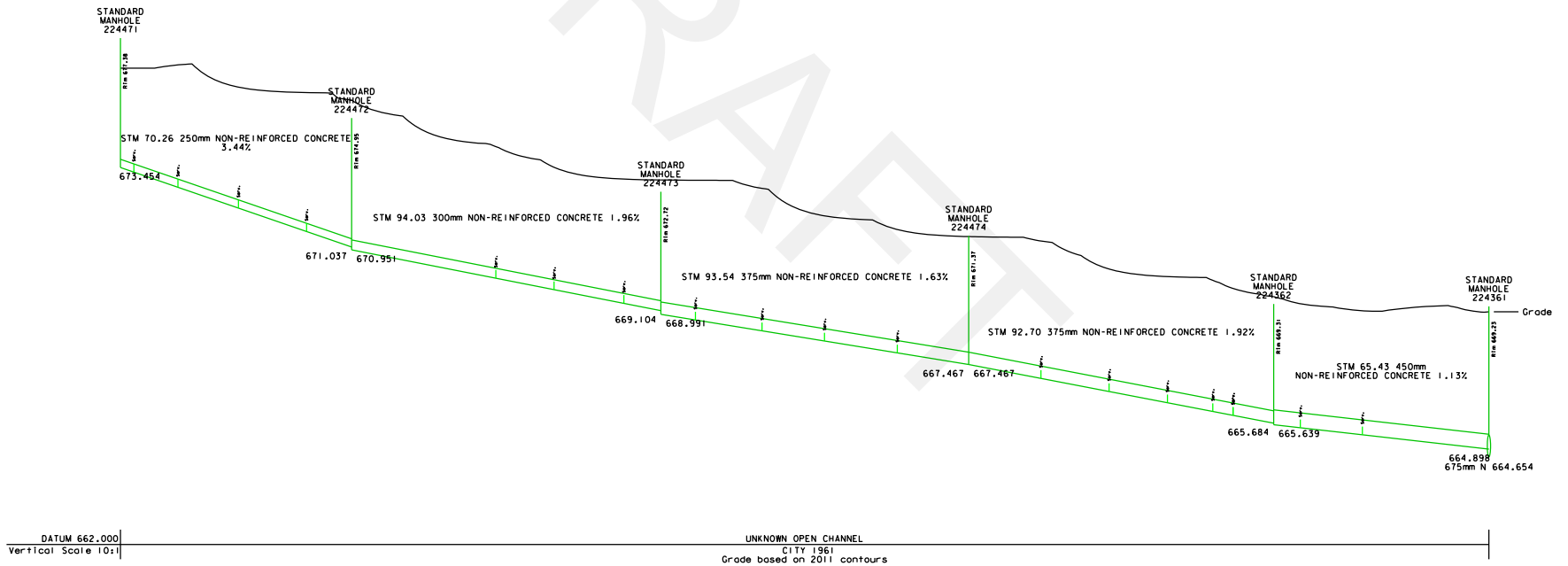
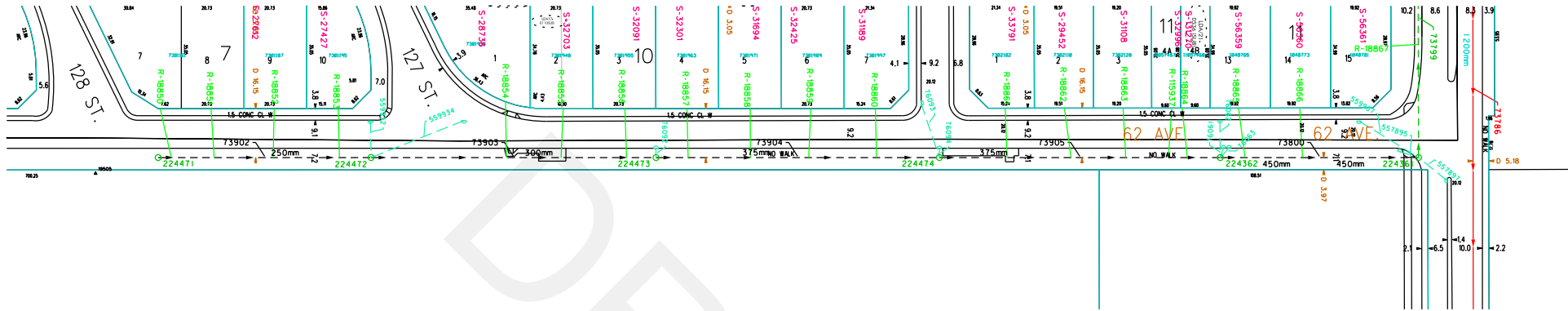
DATE: *20 AUG 97*

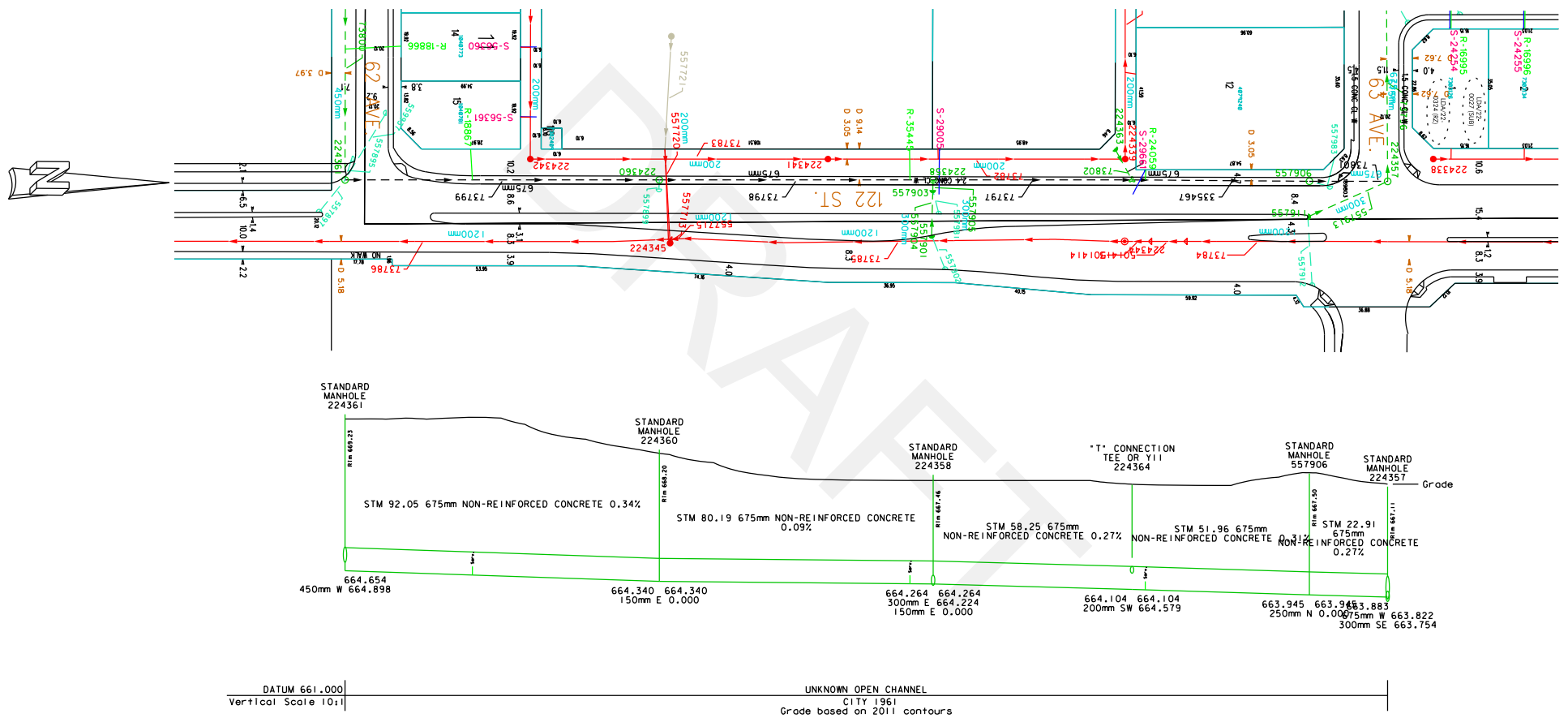


PERMIT TO PRACTICE

Edmonton
ASSET MANAGEMENT AND PUBLIC WORKS
DRAINAGE ENGINEERING SECTION

TITLE				DATE:	
OUTFALL No 6 GRANDVIEW HEIGHTS				JULY 14, 1997	
LOCATION: W GRANDVIEW DRIVE AND NW OF 62 AVE TO WHITEMUD CREEK				SCALE:	
WORK ORDER				AS SHOWN	
ACCOUNT				DRAWING NO:	
PLAN FILE No.				26-222	
PROJECT No.				SHEET	
230-899				OF	





Appendix D

PCSWMM Model Details

DRAFT

WEST 240
Huff

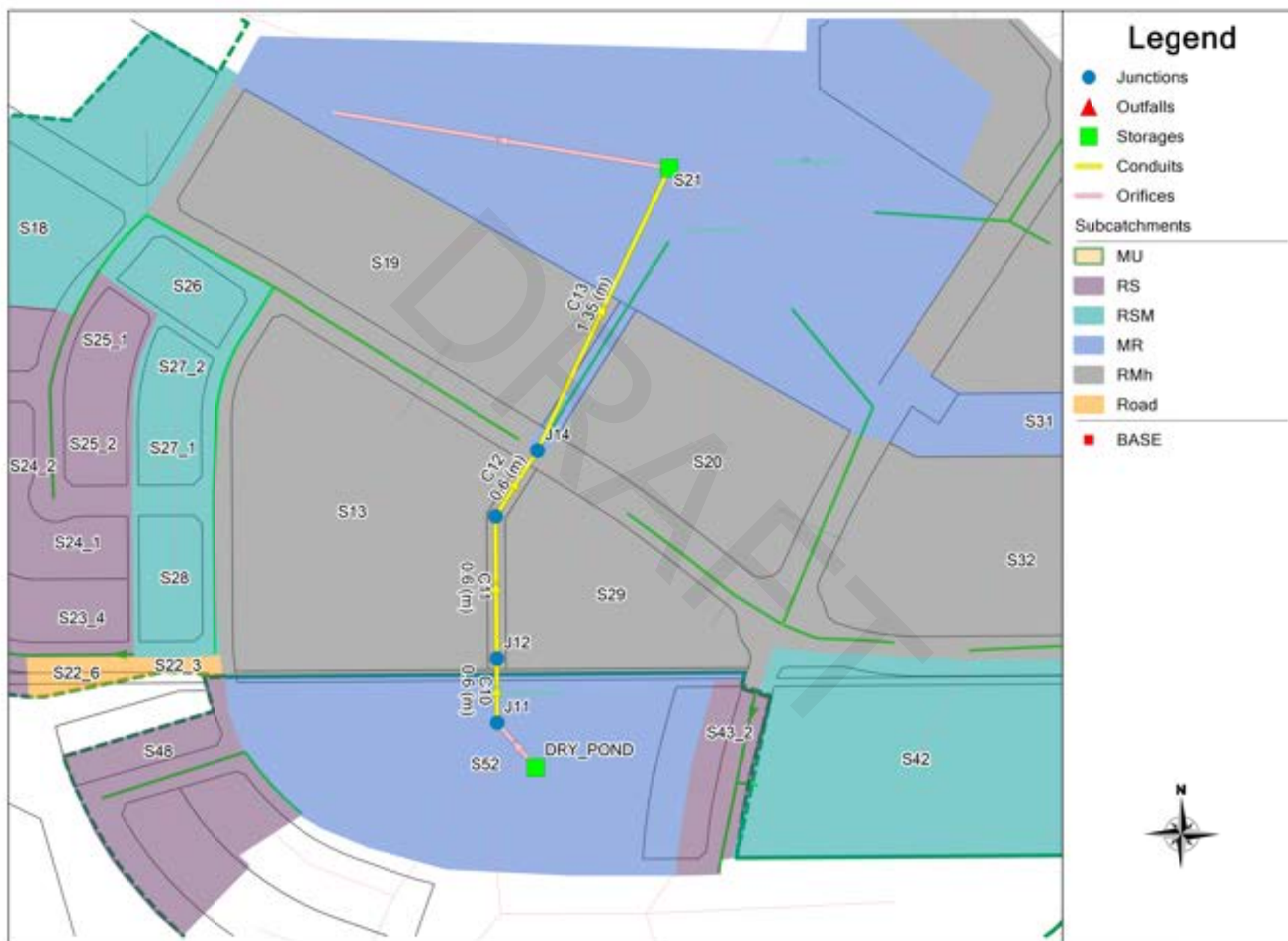


Legend

- Junctions
 - ▲ Outfalls
 - Storages
 - Conduits
 - Orifices
- Subcatchments
- MU
 - RS
 - RSM
 - MR
 - RMh
 - Road
- BASE







Name	Outlet	Area (ha)	Runoff Coefficient	Infiltration (mm)	Runoff Volume (ML)	Peak Runoff (m³/s)
S1_2	S5_6	0.1301	0.661	43.09	0.11	0.01
S1_3	S21	0.0959	0.991	49.34	5.05	0.26
S1_4	S1_3	0.1293	0.661	43.09	0.11	0.01
S10_1	S10_3	0.0805	0.734	33.81	0.08	0
S10_2	S11_3	0.4792	0.857	69.22	2.01	0.1
S10_3	S10_2	0.4348	0.759	34.81	0.48	0.02
S11_2	S14	0.2768	0.733	33.91	0.26	0.01
S11_3	S12_2	0.3039	0.914	67.86	2.19	0.11
S11_4	S14	0.3063	0.733	33.92	0.29	0.01
S12_2	S34	1.3907	0.884	33.06	3.5	0.17
S13	J14	2.8641	0.768	66.68	6.31	0.32
S14	S15	2.6471	0.714	42.15	2.8	0.13
S15	S21	0.8972	0.88	70.2	4.68	0.23
S16_1	S21	0.3147	0.66	43.22	0.26	0.01
S16_2	S1_3	0.2702	0.973	49.22	4.87	0.25
S16_4	S16_2	0.3026	0.859	47.83	0.88	0.05
S16_5	S16_4	0.7654	0.658	43.47	0.64	0.03
S17	S26	0.5406	0.733	34.01	0.5	0.02
S18	S26	0.9064	0.81	66.46	2.57	0.14
S19	S21	2.251	0.698	38.34	2	0.09
S2_1	S2_3	0.126	0.823	67.93	0.4	0.02
S2_3	S3_3	0.0684	0.908	65.13	0.44	0.02
S2_4	S2_1	0.3847	0.66	43.26	0.32	0.02
S20	S21	1.6079	0.754	31.18	1.54	0.07
S21	POND	5.3583	0.952	28.41	35.75	1.1
S22_2	S18	0.4764	0.899	47.56	2.02	0.1
S22_3	S22_6	0.0478	0.976	3.07	0.06	0
S22_4	S23_1	0.206	0.915	47.52	1.05	0.05
S22_5	S22_4	0.2771	0.871	47.2	0.88	0.05
S22_6	S23_4	0.1084	0.981	3.32	0.19	0.01
S23_1	S22_2	0.3379	0.893	46.85	1.32	0.07
S23_3	S22_5	0.3333	0.81	46.74	0.66	0.03
S23_4	S23_3	0.2514	0.769	47.29	0.39	0.02
S24_1	S27_1	0.2734	0.661	43.19	0.23	0.01
S24_2	S22_2	0.3776	0.66	43.26	0.32	0.02
S25_1	S26	0.2501	0.661	43.17	0.21	0.01
S25_2	S27_1	0.2799	0.661	43.19	0.24	0.01
S26	S13	0.3747	0.946	69.15	4.58	0.24
S27_1	S27_2	0.2548	0.848	68.86	0.98	0.05
S27_2	S26	0.1602	0.91	66.62	1.07	0.06
S28	S27_1	0.3886	0.733	33.95	0.36	0.02
S29	J14	1.2446	0.755	31.09	1.2	0.06
S3_1	S3_3	0.1108	0.886	47.26	0.41	0.02
S3_3	S5_6	0.2971	0.888	46.29	1.09	0.06
S3_4	S3_5	0.2419	0.661	43.17	0.2	0.01
S3_5	S3_1	0.1432	0.825	47.01	0.32	0.02
S30	S21	2.2211	0.734	78.1	7.36	0.21
S31	S21	0.75	0.945	69.64	9.84	0.27
S32	S31	2.6394	0.727	80.79	9.47	0.26
S33_2	S32	3.9884	0.75	31.67	3.81	0.17
S34	S30	4.6176	0.767	47.18	7.2	0.33
S35	S40_5	1.8267	0.707	53.52	2.36	0.12
S36_2	S35	0.2025	0.975	3.07	0.25	0.01
S37	S35	0.3618	0.733	33.94	0.34	0.02
S38_1	S38_2	0.2486	0.661	43.17	0.21	0.01
S38_2	S40_3	0.2283	0.788	46.35	0.39	0.02
S39_2	S35	0.5094	0.659	43.33	0.43	0.02
S39_3	S40_4	0.1535	0.871	47.92	0.5	0.03
S39_4	S39_3	0.4445	0.66	43.3	0.37	0.02
S4	S15	0.5384	0.733	34.01	0.5	0.02
S40_1	S45_5	0.6923	0.659	43.43	0.58	0.03
S40_2	S40_4	0.1299	0.911	47.35	0.63	0.03
S40_3	S40_2	0.1647	0.871	47.2	0.53	0.03
S40_4	S40_5	0.1087	0.958	48.62	1.21	0.06
S40_5	S40_7	0.4522	0.947	48.9	3.93	0.2
S40_7	S32	0.0627	0.999	3.49	4	0.2
S41	S44_1	1.0216	0.509	62.56	0.66	0.04
S42	S32	2.0036	0.729	34.45	1.86	0.09
S43_1	S44_1	0.1663	0.788	46.3	0.29	0.02
S43_2	S43_1	0.1808	0.661	43.13	0.15	0.01
S44_1	S44_2	0.3572	0.942	48.44	2.83	0.15
S44_2	S52	0.362	0.953	48.46	3.53	0.19
S45_1	S44_2	0.1398	0.862	47.4	0.42	0.02
S45_2	S45_5	0.2219	0.661	43.16	0.19	0.01
S45_3	S45_1	0.157	0.661	43.11	0.13	0.01

S45_5	S44_1	0.2438	0.931	48.76	1.6	0.08
S46_1	S45_5	0.1525	0.897	48.42	0.64	0.03
S46_2	S46_4	0.0958	0.662	43.06	0.08	0
S46_4	S49_4	0.1422	0.753	45.48	0.2	0.01
S46_5	S45_1	0.1097	0.773	45.93	0.17	0.01
S46_6	S46_5	0.0978	0.662	43.06	0.08	0
S46_7	S46_1	0.1355	0.661	43.09	0.11	0.01
S48	S50_2	0.2839	0.813	46.89	0.58	0.03
S49_1	S48	0.418	0.66	43.28	0.35	0.02
S49_3	S49_4	0.3051	0.66	43.21	0.26	0.01
S49_4	S50_3	0.2222	0.857	47.49	0.63	0.03
S5_1	S5_3	0.0624	0.662	43.03	0.05	0
S5_2	S5_4	0.2783	0.865	47.83	0.85	0.04
S5_3	S5_2	0.6904	0.676	43.75	0.63	0.03
S5_4	S5_6	0.6585	0.82	46.26	1.38	0.07
S5_6	S6	0.1923	0.967	48.99	2.73	0.14
S50_2	S50_4	0.2148	0.881	47.34	0.75	0.04
S50_3	S52	0.2058	0.946	48.38	1.73	0.09
S50_4	S50_3	0.2344	0.895	47.05	0.94	0.05
S51	S46_1	0.483	0.66	43.32	0.41	0.02
S52	DRY_POND	2.4862	0.786	69.91	6.62	0.35
S6	S16_2	1.2986	0.862	46.64	3.78	0.2
S7	S15	1.3971	0.495	64.32	0.88	0.04
S9_2	S10_2	1.3553	0.73	34.27	1.26	0.06

DRAFT

Element Count

Number of rain gages 9
Number of subcatchments ... 99
Number of nodes 16
Number of links 15
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1937	1937	INTENSITY	15 min.
1978	1978	INTENSITY	5 min.
2004	2004	INTENSITY	5 min.
2012	2012	INTENSITY	5 min.
Edmonton_Chicago_4h_100y	Edmonton_Chicago_4h_100y	INTENSITY	5 min.
Edmonton_Chicago_4h_25y	Edmonton_Chicago_4h_25y	INTENSITY	5 min.
Edmonton_Chicago_4h_2y	Edmonton_Chicago_4h_2y	INTENSITY	5 min.
Edmonton_Chicago_4h_5y	Edmonton_Chicago_4h_5y	INTENSITY	5 min.
Edmonton_Huff_24h_100y	Edmonton_Huff_24h_100y	INTENSITY	15 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1_2	0.13	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_6
S1_3	0.10	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S21
S1_4	0.13	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S1_3
S10_1	0.08	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S10_3
S10_2	0.48	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S11_3
S10_3	0.43	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S10_2
S11_2	0.28	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S14
S11_3	0.30	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S12_2
S11_4	0.31	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S14
S12_2	1.39	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	S34
S13	2.86	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	J14
S14	2.65	500.00	35.00	0.6000	Edmonton_Huff_24h_100y	S15
S15	0.90	500.00	0.10	0.6000	Edmonton_Huff_24h_100y	S21
S16_1	0.31	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S21
S16_2	0.27	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S1_3
S16_4	0.30	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S16_2
S16_5	0.77	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S16_4
S17	0.54	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S26
S18	0.91	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S26
S19	2.25	500.00	39.00	0.6000	Edmonton_Huff_24h_100y	S21
S2_1	0.13	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S2_3
S2_3	0.07	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S3_3
S2_4	0.38	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S2_1
S20	1.61	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	S21
S21	5.36	500.00	60.00	0.6000	Edmonton_Huff_24h_100y	POND
S22_2	0.48	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S18
S22_3	0.05	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S22_6
S22_4	0.21	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S23_1
S22_5	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_4
S22_6	0.11	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S23_4
S23_1	0.34	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_2
S23_3	0.33	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_5
S23_4	0.25	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S23_3
S24_1	0.27	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S27_1
S24_2	0.38	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_2
S25_1	0.25	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S26
S25_2	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S27_1
S26	0.37	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S13
S27_1	0.25	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S27_2
S27_2	0.16	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S26
S28	0.39	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S27_1
S29	1.24	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	J14
S3_1	0.11	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S3_3
S3_3	0.30	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_6
S3_4	0.24	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S3_5
S3_5	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S3_1

S30	2.22	20.00	1.00	0.6000	Edmonton_Huff_24h_100y	S21
S31	0.75	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	S21
S32	2.64	20.00	0.01	0.6000	Edmonton_Huff_24h_100y	S31
S33_2	3.99	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	S32
S34	4.62	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S30
S35	1.83	500.00	20.00	0.6000	Edmonton_Huff_24h_100y	S40_5
S36_2	0.20	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S35
S37	0.36	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S35
S38_1	0.25	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S38_2
S38_2	0.23	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_3
S39_2	0.51	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S35
S39_3	0.15	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_4
S39_4	0.44	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S39_3
S4	0.54	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S15
S40_1	0.69	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_5
S40_2	0.13	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_4
S40_3	0.16	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_2
S40_4	0.11	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_5
S40_5	0.45	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_7
S40_7	0.06	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S32
S41	1.02	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	S44_1
S42	2.00	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S32
S43_1	0.17	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_1
S43_2	0.18	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S43_1
S44_1	0.36	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_2
S44_2	0.36	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S52
S45_1	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_2
S45_2	0.22	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_5
S45_3	0.16	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_1
S45_5	0.24	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_1
S46_1	0.15	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_5
S46_2	0.10	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_4
S46_4	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S49_4
S46_5	0.11	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_1
S46_6	0.10	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_5
S46_7	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_1
S48	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_2
S49_1	0.42	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S48
S49_3	0.31	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S49_4
S49_4	0.22	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_3
S5_1	0.06	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_3
S5_2	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_4
S5_3	0.69	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_2
S5_4	0.66	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_6
S5_6	0.19	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S6
S50_2	0.21	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_4
S50_3	0.21	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S52
S50_4	0.23	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_3
S51	0.48	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_1
S52	2.49	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	DRY_POND
S6	1.30	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S16_2
S7	1.40	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	S15
S9_2	1.36	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S10_2

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J10	JUNCTION	663.65	5.22	0.0	
J11	JUNCTION	665.39	3.00	0.0	
J12	JUNCTION	665.24	3.44	0.0	
J13	JUNCTION	665.09	3.23	0.0	
J14	JUNCTION	663.65	4.50	0.0	
J2	JUNCTION	664.00	4.47	0.0	
J3	JUNCTION	664.35	3.56	0.0	
J4	JUNCTION	664.22	3.99	0.0	
J5	JUNCTION	664.05	4.45	0.0	
J6	JUNCTION	663.92	4.76	0.0	
J7	JUNCTION	663.83	4.95	0.0	
J8	JUNCTION	663.56	3.83	0.0	
J9	JUNCTION	662.64	4.36	0.0	
OF1	OUTFALL	660.90	0.75	0.0	
DRY_POND	STORAGE	665.39	5.00	0.0	
POND	STORAGE	662.00	6.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
------	-----------	---------	------	--------	--------	-----------

C10	J11	J12	CONDUIT	38.0	0.3289	0.0130
C11	J12	J13	CONDUIT	79.1	0.1492	0.0130
C12	J13	J14	CONDUIT	42.8	0.2079	0.0130
C13	J14	POND	CONDUIT	136.0	1.2133	0.0130
C16	J9	OF1	CONDUIT	87.1	2.0554	0.0100
C2	J2	J3	CONDUIT	62.9	0.3086	0.0130
C3	J3	J4	CONDUIT	44.4	0.1508	0.0130
C4	J4	J5	CONDUIT	72.6	0.1502	0.0130
C5	J5	J6	CONDUIT	46.9	0.1493	0.0130
C6	J6	J7	CONDUIT	47.6	0.1493	0.0130
C7	J10	J8	CONDUIT	42.1	0.1497	0.0130
C8	J8	J9	CONDUIT	11.7	0.1541	0.0130
C9	J7	J10	CONDUIT	16.0	0.1503	0.0130
C1	POND	J2	ORIFICE			
C14	DRY_POND	J11	ORIFICE			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C10	CIRCULAR	0.60	0.28	0.15	0.60	1	0.35
C11	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	0.28
C13	CIRCULAR	1.35	1.43	0.34	1.35	1	5.88
C16	CIRCULAR	0.75	0.44	0.19	0.75	1	2.08
C2	CIRCULAR	0.60	0.28	0.15	0.60	1	0.34
C3	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C4	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C7	CIRCULAR	0.75	0.44	0.19	0.75	1	0.43
C8	CIRCULAR	0.75	0.44	0.19	0.75	1	0.44
C9	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
Infiltration Method GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN
Starting Date 07/12/2012 00:00:00
Ending Date 07/13/2012 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	8.410	127.273
Evaporation Loss	0.000	0.000
Infiltration Loss	3.142	47.545
Surface Runoff	4.988	75.484
Final Storage	0.281	4.252
Continuity Error (%)	-0.007	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	4.987	49.871
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000

External Inflow	0.000	0.000
External Outflow	1.160	11.598
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	5.194	51.941
Final Stored Volume	9.014	90.137
Continuity Error (%)	0.076	

Highest Continuity Errors

Node J13 (2.16%)
Node J12 (2.16%)

Time-Step Critical Elements

Link C8 (99.62%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step : 2.16 sec
Average Time Step : 3.61 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.00
% of Steps Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Peak Runoff		Total	Total	Total	Total	Imperv	Perv	Total	Total
Runoff Coeff		Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Subcatchment CMS		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
S1_2		127.27	0.00	0.00	43.09	38.17	46.02	84.19	0.11
0.01	0.661								
S1_3		127.27	5192.01	0.00	49.34	1595.81	3673.90	5269.70	5.05
0.26	0.991								
S1_4		127.27	0.00	0.00	43.09	38.17	46.02	84.19	0.11
0.01	0.661								
S10_1		127.27	0.00	0.00	33.81	57.26	36.20	93.46	0.08
0.00	0.734								
S10_2		127.27	362.36	0.00	69.22	4.90	414.95	419.85	2.01
0.10	0.857								
S10_3		127.27	17.30	0.00	34.81	65.02	44.71	109.74	0.48
0.02	0.759								
S11_2		127.27	0.00	0.00	33.91	57.25	36.10	93.35	0.26
0.01	0.733								
S11_3		127.27	661.99	0.00	67.86	7.89	713.53	721.43	2.19
0.11	0.914								

S11_4		127.27	0.00	0.00	33.92	57.25	36.09	93.34	0.29
0.01	0.733								
S12_2		127.27	157.65	0.00	33.06	142.39	109.41	251.80	3.50
0.17	0.884								
S13		127.27	159.74	0.00	66.68	2.87	217.48	220.35	6.31
0.32	0.768								
S14		127.27	20.56	0.00	42.15	51.68	53.94	105.62	2.80
0.13	0.714								
S15		127.27	465.53	0.00	70.20	0.59	521.29	521.88	4.68
0.23	0.880								
S16_1		127.27	0.00	0.00	43.22	38.17	45.88	84.05	0.26
0.01	0.660								
S16_2		127.27	1724.75	0.00	49.22	555.61	1246.95	1802.56	4.87
0.25	0.973								
S16_4		127.27	211.89	0.00	47.83	101.73	189.60	291.34	0.88
0.05	0.859								
S16_5		127.27	0.00	0.00	43.47	38.16	45.63	83.79	0.64
0.03	0.658								
S17		127.27	0.00	0.00	34.01	57.24	36.00	93.23	0.50
0.02	0.733								
S18		127.27	222.61	0.00	66.46	3.50	279.95	283.45	2.57
0.14	0.810								
S19		127.27	0.00	0.00	38.34	49.57	39.30	88.87	2.00
0.09	0.698								
S2_1		127.27	256.44	0.00	67.93	3.84	311.98	315.82	0.40
0.02	0.823								
S2_3		127.27	581.77	0.00	65.13	7.09	636.92	644.01	0.44
0.02	0.908								
S2_4		127.27	0.00	0.00	43.26	38.17	45.84	84.01	0.32
0.02	0.660								
S20		127.27	0.00	0.00	31.18	63.56	32.46	96.01	1.54
0.07	0.754								
S21		127.27	573.48	0.00	28.41	419.19	248.02	667.21	35.75
1.10	0.952								
S22_2		127.27	343.83	0.00	47.56	141.31	282.25	423.56	2.02
0.10	0.899								
S22_3		127.27	0.00	0.00	3.07	120.88	3.30	124.18	0.06
0.00	0.976								
S22_4		127.27	429.51	0.00	47.52	167.03	342.27	509.30	1.05
0.05	0.915								
S22_5		127.27	239.24	0.00	47.20	109.94	209.39	319.33	0.88
0.05	0.871								
S22_6		127.27	54.74	0.00	3.32	172.86	5.78	178.63	0.19
0.01	0.981								
S23_1		127.27	310.48	0.00	46.85	131.31	259.61	390.92	1.32
0.07	0.893								
S23_3		127.27	118.39	0.00	46.74	73.68	125.24	198.92	0.66
0.03	0.810								
S23_4		127.27	76.99	0.00	47.29	61.27	95.72	156.98	0.39
0.02	0.769								
S24_1		127.27	0.00	0.00	43.19	38.17	45.91	84.08	0.23
0.01	0.661								
S24_2		127.27	0.00	0.00	43.26	38.17	45.84	84.01	0.32
0.02	0.660								
S25_1		127.27	0.00	0.00	43.17	38.17	45.93	84.10	0.21
0.01	0.661								
S25_2		127.27	0.00	0.00	43.19	38.17	45.91	84.08	0.24
0.01	0.661								
S26		127.27	1162.78	0.00	69.15	12.90	1208.12	1221.02	4.58
0.24	0.946								
S27_1		127.27	324.79	0.00	68.86	4.52	378.63	383.15	0.98
0.05	0.848								
S27_2		127.27	609.41	0.00	66.62	7.37	662.79	670.15	1.07
0.06	0.910								
S28		127.27	0.00	0.00	33.95	57.24	36.06	93.30	0.36
0.02	0.733								
S29		127.27	0.00	0.00	31.09	63.57	32.55	96.11	1.20
0.06	0.755								
S3_1		127.27	287.30	0.00	47.26	124.37	242.97	367.34	0.41
0.02	0.886								
S3_3		127.27	285.25	0.00	46.29	123.74	242.52	366.26	1.09
0.06	0.888								
S3_4		127.27	0.00	0.00	43.17	38.17	45.93	84.10	0.20
0.01	0.661								
S3_5		127.27	142.04	0.00	47.01	80.79	141.53	222.32	0.32
0.02	0.825								
S30		127.27	323.98	0.00	78.10	4.51	326.63	331.15	7.36
0.21	0.734								
S31		127.27	1262.12	0.00	69.64	0.00	1312.61	1312.61	9.84
0.27	0.945								
S32		127.27	366.32	0.00	80.79	0.05	358.92	358.97	9.47
0.26	0.727								
S33_2		127.27	0.00	0.00	31.67	63.49	31.97	95.46	3.81
0.17	0.750								

S34		127.27	75.83	0.00	47.18	60.86	95.00	155.86	7.20
0.33	0.767								
S35		127.27	55.63	0.00	53.52	36.56	92.81	129.37	2.36
0.12	0.707								
S36_2		127.27	0.00	0.00	3.07	120.84	3.30	124.14	0.25
0.01	0.975								
S37		127.27	0.00	0.00	33.94	57.24	36.07	93.31	0.34
0.02	0.733								
S38_1		127.27	0.00	0.00	43.17	38.17	45.93	84.10	0.21
0.01	0.661								
S38_2		127.27	91.56	0.00	46.35	65.64	106.85	172.49	0.39
0.02	0.788								
S39_2		127.27	0.00	0.00	43.33	38.16	45.77	83.93	0.43
0.02	0.659								
S39_3		127.27	243.11	0.00	47.92	111.11	211.38	322.48	0.50
0.03	0.871								
S39_4		127.27	0.00	0.00	43.30	38.16	45.80	83.97	0.37
0.02	0.660								
S4		127.27	0.00	0.00	34.01	57.24	36.00	93.24	0.50
0.02	0.733								
S40_1		127.27	0.00	0.00	43.43	38.16	45.67	83.83	0.58
0.03	0.659								
S40_2		127.27	404.62	0.00	47.35	159.56	325.02	484.58	0.63
0.03	0.911								
S40_3		127.27	239.06	0.00	47.20	109.89	209.26	319.15	0.53
0.03	0.871								
S40_4		127.27	1034.41	0.00	48.62	348.51	764.63	1113.13	1.21
0.06	0.958								
S40_5		127.27	790.11	0.00	48.90	275.20	593.25	868.45	3.93
0.20	0.947								
S40_7		127.27	6263.08	0.00	3.49	6070.99	316.03	6387.03	4.00
0.20	0.999								
S41		127.27	0.00	0.00	62.56	0.00	64.72	64.72	0.66
0.04	0.509								
S42		127.27	0.00	0.00	34.45	57.19	35.56	92.75	1.86
0.09	0.729								
S43_1		127.27	91.47	0.00	46.30	65.61	106.83	172.44	0.29
0.02	0.788								
S43_2		127.27	0.00	0.00	43.13	38.17	45.98	84.15	0.15
0.01	0.661								
S44_1		127.27	712.63	0.00	48.44	251.95	539.55	791.51	2.83
0.15	0.942								
S44_2		127.27	895.72	0.00	48.46	306.88	667.70	974.58	3.53
0.19	0.953								
S45_1		127.27	217.23	0.00	47.40	103.34	193.78	297.13	0.42
0.02	0.862								
S45_2		127.27	0.00	0.00	43.16	38.17	45.95	84.12	0.19
0.01	0.661								
S45_3		127.27	0.00	0.00	43.11	38.17	45.99	84.17	0.13
0.01	0.661								
S45_5		127.27	576.90	0.00	48.76	211.25	444.09	655.33	1.60
0.08	0.931								
S46_1		127.27	340.61	0.00	48.42	140.35	279.12	419.48	0.64
0.03	0.897								
S46_2		127.27	0.00	0.00	43.06	38.18	46.04	84.22	0.08
0.00	0.662								
S46_4		127.27	56.73	0.00	45.48	55.19	83.34	138.53	0.20
0.01	0.753								
S46_5		127.27	75.07	0.00	45.93	60.70	95.73	156.42	0.17
0.01	0.773								
S46_6		127.27	0.00	0.00	43.06	38.18	46.04	84.22	0.08
0.00	0.662								
S46_7		127.27	0.00	0.00	43.09	38.17	46.01	84.18	0.11
0.01	0.661								
S48		127.27	123.63	0.00	46.89	75.26	128.76	204.02	0.58
0.03	0.813								
S49_1		127.27	0.00	0.00	43.28	38.17	45.82	83.98	0.35
0.02	0.660								
S49_3		127.27	0.00	0.00	43.21	38.17	45.89	84.06	0.26
0.01	0.660								
S49_4		127.27	204.04	0.00	47.49	99.38	184.45	283.83	0.63
0.03	0.857								
S5_1		127.27	0.00	0.00	43.03	38.18	46.08	84.25	0.05
0.00	0.662								
S5_2		127.27	226.03	0.00	47.83	105.97	199.50	305.48	0.85
0.04	0.865								
S5_3		127.27	7.61	0.00	43.75	40.44	50.68	91.13	0.63
0.03	0.676								
S5_4		127.27	129.09	0.00	46.26	76.89	133.21	210.10	1.38
0.07	0.820								
S5_6		127.27	1342.15	0.00	48.99	440.83	979.48	1420.31	2.73
0.14	0.967								
S50_2		127.27	269.62	0.00	47.34	119.05	230.51	349.56	0.75
0.04	0.881								

S50_3		127.27	762.61	0.00	48.38	266.96	574.60	841.57	1.73
0.09	0.946								
S50_4		127.27	320.31	0.00	47.05	134.26	266.29	400.55	0.94
0.05	0.895								
S51		127.27	0.00	0.00	43.32	38.16	45.78	83.94	0.41
0.02	0.660								
S52		127.27	211.56	0.00	69.91	0.00	266.37	266.37	6.62
0.35	0.786								
S6		127.27	210.31	0.00	46.64	101.31	189.69	291.01	3.78
0.20	0.862								
S7		127.27	0.00	0.00	64.32	0.00	62.96	62.96	0.88
0.04	0.495								
S9_2		127.27	0.00	0.00	34.27	57.21	35.74	92.95	1.26
0.06	0.730								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J10	JUNCTION	0.27	0.29	663.94	0 18:27	0.29
J11	JUNCTION	0.62	0.88	666.28	0 18:25	0.88
J12	JUNCTION	0.75	1.04	666.28	0 18:25	1.04
J13	JUNCTION	0.87	1.19	666.27	0 18:25	1.19
J14	JUNCTION	2.30	2.62	666.27	0 18:25	2.62
J2	JUNCTION	0.86	0.89	664.89	0 18:25	0.89
J3	JUNCTION	0.30	0.33	664.68	0 18:25	0.33
J4	JUNCTION	0.32	0.35	664.56	0 18:26	0.35
J5	JUNCTION	0.30	0.33	664.38	0 18:26	0.33
J6	JUNCTION	0.30	0.33	664.25	0 18:27	0.33
J7	JUNCTION	0.27	0.29	664.12	0 18:27	0.29
J8	JUNCTION	0.24	0.26	663.82	0 18:28	0.26
J9	JUNCTION	0.18	0.19	662.83	0 18:28	0.19
OF1	OUTFALL	0.13	0.14	661.04	0 18:28	0.14
DRY_POND	STORAGE	0.84	1.04	666.43	0 16:25	1.04
POND	STORAGE	3.95	4.27	666.27	0 18:24	4.27

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J10	JUNCTION	0.000	0.160	0 18:27	0	11.6	0.055
J11	JUNCTION	0.000	0.017	0 05:15	0	0.834	0.716
J12	JUNCTION	0.000	0.017	0 05:14	0	0.828	2.211
J13	JUNCTION	0.000	0.015	0 05:14	0	0.81	2.213
J14	JUNCTION	0.373	0.385	0 04:28	7.51	8.3	0.376
J2	JUNCTION	0.000	0.160	0 18:24	0	11.7	0.072
J3	JUNCTION	0.000	0.160	0 18:25	0	11.6	0.054
J4	JUNCTION	0.000	0.160	0 18:25	0	11.6	0.100
J5	JUNCTION	0.000	0.160	0 18:26	0	11.6	0.063
J6	JUNCTION	0.000	0.160	0 18:26	0	11.6	0.055
J7	JUNCTION	0.000	0.160	0 18:27	0	11.6	0.030
J8	JUNCTION	0.000	0.160	0 18:28	0	11.6	0.014
J9	JUNCTION	0.000	0.160	0 18:28	0	11.6	0.022
OF1	OUTFALL	0.000	0.160	0 18:28	0	11.6	0.000
DRY_POND	STORAGE	0.349	0.349	0 04:15	6.62	6.62	0.010
POND	STORAGE	1.102	1.473	0 04:45	35.7	95.8	0.050

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J11	JUNCTION	15.07	0.283	2.117
J12	JUNCTION	16.29	0.408	2.403
J13	JUNCTION	17.36	0.556	2.044

J14 JUNCTION 18.08 0.675 1.877

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
DRY_POND	4.587	7.6	0.0	0.0	5.950	9.8	0 16:25	0.017
POND	76.251	53.4	0.0	0.0	85.055	59.5	0 18:24	0.160

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.69	0.138	0.160	11.598
System	99.69	0.138	0.160	11.598

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C10	CONDUIT	0.017	0 05:14	0.65	0.05	1.00
C11	CONDUIT	0.015	0 05:14	0.47	0.06	1.00
C12	CONDUIT	0.014	0 07:44	0.28	0.05	1.00
C13	CONDUIT	0.382	0 04:28	0.27	0.06	1.00
C16	CONDUIT	0.160	0 18:28	2.78	0.08	0.19
C2	CONDUIT	0.160	0 18:25	1.23	0.47	0.47
C3	CONDUIT	0.160	0 18:25	1.09	0.67	0.52
C4	CONDUIT	0.160	0 18:26	1.09	0.67	0.52
C5	CONDUIT	0.160	0 18:26	1.12	0.67	0.50
C6	CONDUIT	0.160	0 18:27	1.14	0.67	0.50
C7	CONDUIT	0.160	0 18:28	1.14	0.37	0.35
C8	CONDUIT	0.160	0 18:28	1.23	0.37	0.34
C9	CONDUIT	0.160	0 18:27	1.27	0.67	0.46
C1	ORIFICE	0.160	0 18:24			1.00
C14	ORIFICE	0.017	0 05:15			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C10	1.00	0.09	0.00	0.00	0.82	0.00	0.00	0.09	0.03	0.00
C11	1.00	0.09	0.00	0.00	0.85	0.00	0.00	0.06	0.02	0.00
C12	1.00	0.08	0.01	0.00	0.90	0.00	0.00	0.00	0.05	0.00
C13	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.76	0.00	0.00	0.24	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.85	0.00	0.00	0.15	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.77	0.00	0.00	0.23	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.80	0.00	0.00	0.20	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

C91.000.000.000.000.000.000.001.000.000.00

Conduit Surcharge Summary

Conduit	----- Hours Full -----		-----	Hours	Hours
	Both Ends	Upstream		Above Full	Capacity
			Dnstream	Normal Flow	Limited
C10	15.07	15.07	16.29	0.01	0.01
C11	16.53	16.53	17.36	0.01	0.01
C12	17.55	17.55	18.08	0.01	0.01
C13	21.99	21.99	24.00	0.01	0.01

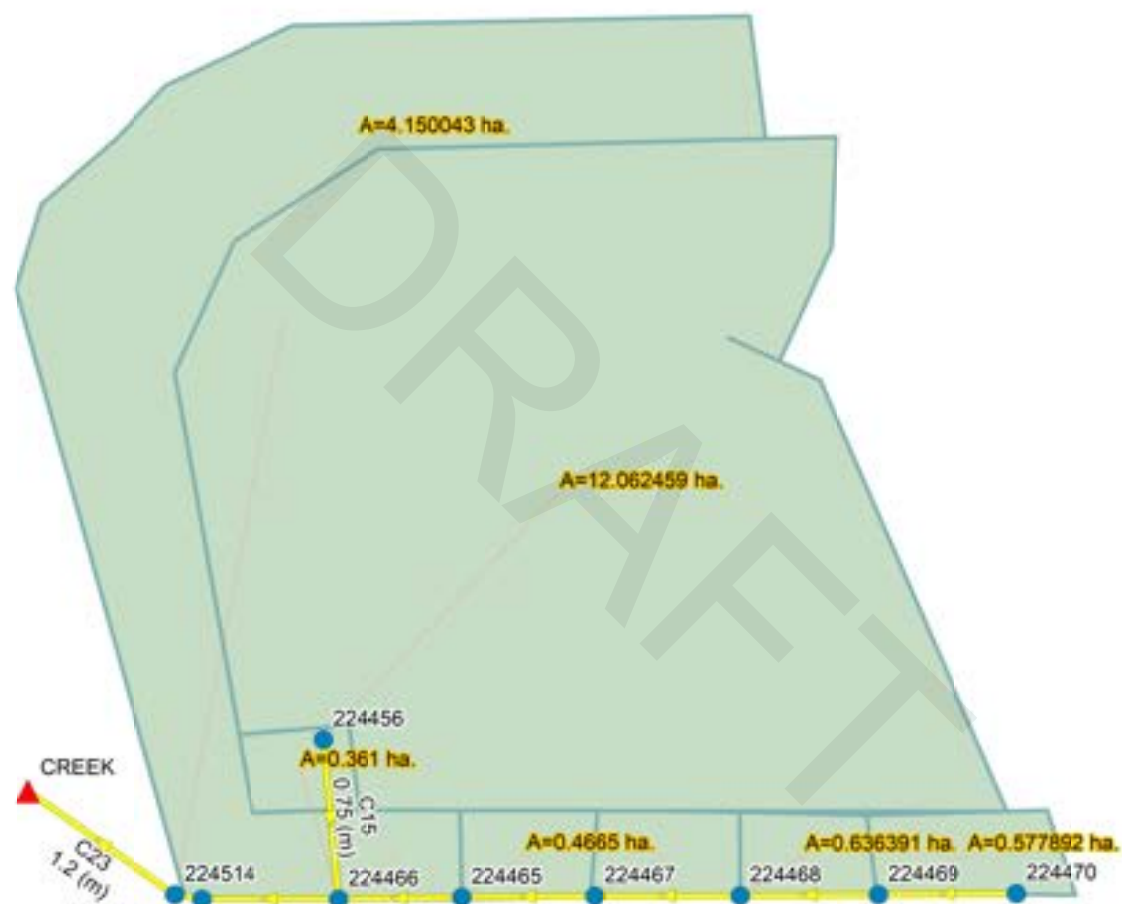
Analysis begun on: Mon Dec 15 10:09:40 2025
Analysis ended on: Mon Dec 15 10:09:41 2025
Total elapsed time: 00:00:01

DRAFT

Grandview

Legend

- Junctions
- ▲ Outfalls
- Conduits
- Subcatchments
- BASE



Name	Outlet	Area (ha)	Runoff Coefficient	Infiltration (mm)	Runoff Volume (ML)	Peak Runoff (m³/s)
S1	224469	0.577892	0.858	5.19	0.18	0.06
S10	224466	0.361	0.683	11.46	0.09	0.05
S16	224514	4.150043	0.74	9.35	1.1	0.13
S2	224468	0.636391	0.868	4.83	0.2	0.08
S3	224467	0.499633	0.874	4.64	0.16	0.07
S5	224465	0.4665	0.876	4.6	0.15	0.07
S8	224466	0.471643	0.875	4.6	0.15	0.07
S9	224456	12.062459	0.667	11.95	2.88	0.33

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WARNING 05: minimum slope used for Conduit C23

Element Count

Number of rain gages 6
Number of subcatchments ... 8
Number of nodes 10
Number of links 9
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1937	1937	INTENSITY	15 min.
1978	1978	INTENSITY	5 min.
2004	2004	INTENSITY	5 min.
2012	2012	INTENSITY	5 min.
Edmonton_Chicago_4h_5y	Edmonton_Chicago_4h_5y	INTENSITY	5 min.
Edmonton_Huff_24h_100y	Edmonton_Huff_24h_100y	INTENSITY	15 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	0.58	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224469
S10	0.36	500.00	65.00	0.5000	Edmonton_Chicago_4h_5y	224466
S16	4.15	500.00	1.00	0.6090	Edmonton_Chicago_4h_5y	224514
S2	0.64	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224468
S3	0.50	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224467
S5	0.47	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224465
S8	0.47	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224466
S9	12.06	500.00	10.00	0.6480	Edmonton_Chicago_4h_5y	224456

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
224456	JUNCTION	663.00	4.00	0.0	
224465	JUNCTION	663.85	3.90	0.0	
224466	JUNCTION	662.73	4.45	0.0	
224467	JUNCTION	665.07	3.79	0.0	
224468	JUNCTION	666.00	3.88	0.0	
224469	JUNCTION	669.07	3.58	0.0	
224470	JUNCTION	673.04	3.79	0.0	
224514	JUNCTION	619.75	46.85	0.0	
224521	JUNCTION	660.53	6.01	0.0	
CREEK	OUTFALL	619.66	1.20	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C15	224456	224466	CONDUIT	102.3	0.1886	0.0130
C16	224465	224466	CONDUIT	79.0	1.3618	0.0130
C17	224467	224465	CONDUIT	85.9	1.3476	0.0130
C18	224468	224467	CONDUIT	90.5	1.0198	0.0130
C19	224469	224468	CONDUIT	89.7	3.2626	0.0130
C20	224470	224469	CONDUIT	87.5	4.4765	0.0130
C21	224466	224521	CONDUIT	87.0	0.8377	0.0130
C22	224521	224514	CONDUIT	17.4	9.4684	0.0130
C23	224514	CREEK	CONDUIT	116.2	0.1000	0.0130

Cross Section Summary

Full Full Hyd. Max. No. of Full

Conduit	Shape	Depth	Area	Rad.	Width	Barrels	Flow
C15	CIRCULAR	0.75	0.44	0.19	0.75	1	0.48
C16	CIRCULAR	0.45	0.16	0.11	0.45	1	0.33
C17	CIRCULAR	0.38	0.11	0.09	0.38	1	0.20
C18	CIRCULAR	0.38	0.11	0.09	0.38	1	0.18
C19	CIRCULAR	0.25	0.05	0.06	0.25	1	0.11
C20	CIRCULAR	0.25	0.05	0.06	0.25	1	0.13
C21	CIRCULAR	0.75	0.44	0.19	0.75	1	1.02
C22	CIRCULAR	0.60	0.28	0.15	0.60	1	1.89
C23	CIRCULAR	1.20	1.13	0.30	1.20	1	1.23

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
Infiltration Method GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN
Starting Date 07/12/2012 00:00:00
Ending Date 07/13/2012 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

	Volume hectare-m	Depth mm
Runoff Quantity Continuity	-----	-----
Total Precipitation	0.689	35.828
Evaporation Loss	0.000	0.000
Infiltration Loss	0.200	10.392
Surface Runoff	0.490	25.471
Final Storage	0.000	0.004
Continuity Error (%)	-0.111	

	Volume hectare-m	Volume 10^6 ltr
Flow Routing Continuity	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.490	4.897
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	0.490	4.897
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	-0.003	

Time-Step Critical Elements

Link C22 (45.76%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step	:	1.73 sec
Average Time Step	:	4.14 sec
Maximum Time Step	:	5.00 sec
% of Time in Steady State	:	0.00
Average Iterations per Step	:	2.00
% of Steps Not Converging	:	0.00
Time Step Frequencies	:	
5.000 - 3.155 sec	:	74.51 %
3.155 - 1.991 sec	:	22.35 %
1.991 - 1.256 sec	:	3.14 %
1.256 - 0.792 sec	:	0.00 %
0.792 - 0.500 sec	:	0.00 %

Subcatchment Runoff Summary

		Total	Total	Total	Total	Imperv	Perv	Total	Total
		Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Runoff	Coeff	mm	mm	mm	mm	mm	mm	mm	10^6 ltr
Subcatchment									
CMS									
S1		35.83	0.00	0.00	5.19	0.36	30.38	30.74	0.18
0.06	0.858								
S10		35.83	0.00	0.00	11.46	23.29	1.16	24.46	0.09
0.05	0.683								
S16		35.83	0.00	0.00	9.35	0.36	26.14	26.50	1.10
0.13	0.740								
S2		35.83	0.00	0.00	4.83	0.36	30.75	31.11	0.20
0.08	0.868								
S3		35.83	0.00	0.00	4.64	0.36	30.96	31.32	0.16
0.07	0.874								
S5		35.83	0.00	0.00	4.60	0.36	31.01	31.37	0.15
0.07	0.876								
S8		35.83	0.00	0.00	4.60	0.36	31.00	31.36	0.15
0.07	0.875								
S9		35.83	0.00	0.00	11.95	3.59	20.30	23.90	2.88
0.33	0.667								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min		Reported Max Depth Meters
224456	JUNCTION	0.12	0.45	663.45	0	01:25	0.44
224465	JUNCTION	0.03	0.31	664.16	0	01:26	0.30
224466	JUNCTION	0.09	0.46	663.19	0	01:26	0.46
224467	JUNCTION	0.03	0.31	665.38	0	01:26	0.31
224468	JUNCTION	0.03	0.25	666.25	0	01:26	0.25
224469	JUNCTION	0.02	0.13	669.20	0	01:26	0.13
224470	JUNCTION	0.00	0.00	673.04	0	00:00	0.00
224514	JUNCTION	0.16	0.65	620.40	0	01:26	0.65
224521	JUNCTION	0.05	0.25	660.78	0	01:26	0.25
CREEK	OUTFALL	0.11	0.49	620.14	0	01:27	0.49

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
------	------	-------------------------------------	-----------------------------------	--	---	---------------------------------------	-------------------------------------

224456	JUNCTION	0.332	0.332	0	01:25	2.88	2.88	0.057
224465	JUNCTION	0.066	0.267	0	01:26	0.146	0.678	0.057
224466	JUNCTION	0.120	0.705	0	01:25	0.236	3.8	-0.056
224467	JUNCTION	0.070	0.207	0	01:25	0.156	0.532	-0.000
224468	JUNCTION	0.081	0.140	0	01:25	0.198	0.376	0.002
224469	JUNCTION	0.062	0.062	0	01:25	0.178	0.178	-0.001
224470	JUNCTION	0.000	0.000	0	00:00	0	0	0.000 ltr
224514	JUNCTION	0.131	0.809	0	01:26	1.1	4.9	-0.001
224521	JUNCTION	0.000	0.701	0	01:26	0	3.8	0.000
CREEK	OUTFALL	0.000	0.812	0	01:27	0	4.9	0.000

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
CREEK	75.87	0.125	0.812	4.897
System	75.87	0.125	0.812	4.897

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C15	CONDUIT	0.328	0 01:25	1.33	0.68	0.55
C16	CONDUIT	0.267	0 01:26	1.98	0.80	0.80
C17	CONDUIT	0.205	0 01:26	2.11	1.01	0.85
C18	CONDUIT	0.140	0 01:26	1.60	0.79	0.74
C19	CONDUIT	0.061	0 01:26	2.26	0.57	0.54
C20	CONDUIT	0.000	0 00:00	0.00	0.00	0.15
C21	CONDUIT	0.701	0 01:26	2.49	0.69	0.61
C22	CONDUIT	0.701	0 01:26	6.18	0.37	0.42
C23	CONDUIT	0.812	0 01:27	1.55	0.66	0.47

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C15	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.99	0.00	0.00
C16	1.00	0.54	0.17	0.00	0.21	0.04	0.00	0.04	0.95	0.00
C17	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C18	1.00	0.00	0.01	0.00	0.78	0.21	0.00	0.00	0.98	0.00
C19	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C20	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C23	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

Conduit Surcharge Summary

Conduit	----- Hours Full -----		-----	Hours	
	Both Ends	Upstream		Above Full	Capacity

C17	0.01	0.01	0.01	0.02	0.01

Analysis begun on: Tue Nov 25 10:36:45 2025
Analysis ended on: Tue Nov 25 10:36:45 2025
Total elapsed time: < 1 sec

DRAFT

Grandview and W240

Legend

- Junctions
- ▲ Outfalls
- Storages
- Conduits
- Orifices
- Subcatchments



Name	Outlet	Area (ha)	Runoff Coefficient	Infiltration (mm)	Runoff Volume (ML)	Peak Runoff (m³/s)
S1	224469	0.577892	0.858	5.19	0.18	0.06
S1_2	S5_6	0.1301	0.617	13.96	0.03	0.02
S1_3	S21	0.0959	0.986	19	1.24	0.29
S1_4	S1_3	0.1293	0.617	13.96	0.03	0.02
S10	224466	0.361	0.683	11.46	0.09	0.05
S10_1	S10_3	0.0805	0.702	10.88	0.02	0.01
S10_2	S11_3	0.4792	0.808	25.49	0.5	0.21
S10_3	S10_2	0.4348	0.719	11.51	0.13	0.07
S11_2	S14	0.2768	0.695	11.07	0.07	0.04
S11_3	S12_2	0.3039	0.882	24.48	0.54	0.2
S11_4	S14	0.3063	0.694	11.09	0.08	0.05
S12_2	S34	1.3907	0.839	12.1	0.87	0.22
S13	J14	2.8641	0.609	29.17	1.3	0.2
S14	S15	2.6471	0.623	15.64	0.68	0.25
S15	S21	0.8972	0.807	27.83	1.03	0.27
S16	224514	4.150043	0.74	9.35	1.1	0.13
S16_1	S21	0.3147	0.607	14.22	0.07	0.04
S16_2	S1_3	0.2702	0.961	18.69	1.2	0.29
S16_4	S16_2	0.3026	0.82	16.32	0.22	0.1
S16_5	S16_4	0.7654	0.59	14.78	0.16	0.08
S17	S26	0.5406	0.688	11.29	0.13	0.07
S18	S26	0.9064	0.731	24.91	0.61	0.14
S19	S21	2.251	0.615	13.86	0.5	0.21
S2	224468	0.636391	0.868	4.83	0.2	0.08
S2_1	S2_3	0.126	0.779	23.01	0.1	0.06
S2_3	S3_3	0.0684	0.883	22.01	0.11	0.06
S2_4	S2_1	0.3847	0.604	14.31	0.08	0.05
S20	S21	1.6079	0.7	10.84	0.4	0.19
S21	POND	5.3583	0.851	19.92	6.25	0.88
S22_2	S18	0.4764	0.866	16.8	0.51	0.14
S22_3	S22_6	0.0478	0.973	0.98	0.02	0.01
S22_4	S23_1	0.206	0.89	16.36	0.27	0.1
S22_5	S22_4	0.2771	0.839	16.11	0.23	0.09
S22_6	S23_4	0.1084	0.979	1.09	0.05	0.03
S23_1	S22_2	0.3379	0.861	16.26	0.34	0.1
S23_3	S22_5	0.3333	0.769	15.78	0.17	0.08
S23_4	S23_3	0.2514	0.727	15.88	0.11	0.06
S24_1	S27_1	0.2734	0.609	14.16	0.06	0.04
S24_2	S22_2	0.3776	0.605	14.3	0.08	0.05
S25_1	S26	0.2501	0.611	14.13	0.05	0.04
S25_2	S27_1	0.2799	0.609	14.17	0.06	0.04
S26	S13	0.3747	0.92	26.32	1.11	0.3
S27_1	S27_2	0.2548	0.806	24.1	0.25	0.14
S27_2	S26	0.1602	0.884	22.99	0.27	0.14
S28	S27_1	0.3886	0.692	11.16	0.1	0.06
S29	J14	1.2446	0.705	10.65	0.31	0.15
S3	224467	0.499633	0.874	4.64	0.16	0.07
S3_1	S3_3	0.1108	0.859	15.82	0.1	0.05
S3_3	S5_6	0.2971	0.858	15.68	0.28	0.12
S3_4	S3_5	0.2419	0.611	14.12	0.05	0.03
S3_5	S3_1	0.1432	0.789	15.64	0.08	0.05
S30	S21	2.2211	0.391	65.86	0.94	0.04
S31	S21	0.75	0.736	59.75	1.25	0.06
S32	S31	2.6394	0.424	73.29	1.42	0.06
S33_2	S32	3.9884	0.672	11.85	0.96	0.41
S34	S30	4.6176	0.636	19.98	1.61	0.36
S35	S40_5	1.8267	0.612	19.69	0.57	0.16
S36_2	S35	0.2025	0.973	0.98	0.07	0.04
S37	S35	0.3618	0.693	11.14	0.09	0.05
S38_1	S38_2	0.2486	0.611	14.13	0.05	0.04
S38_2	S40_3	0.2283	0.747	15.36	0.1	0.06
S39_2	S35	0.5094	0.599	14.47	0.11	0.06
S39_3	S40_4	0.1535	0.839	16.17	0.13	0.07
S39_4	S39_3	0.4445	0.602	14.39	0.1	0.05
S4	S15	0.5384	0.688	11.29	0.13	0.07
S40_1	S45_5	0.6923	0.593	14.69	0.15	0.07
S40_2	S40_4	0.1299	0.888	15.97	0.16	0.07
S40_3	S40_2	0.1647	0.841	15.81	0.14	0.07
S40_4	S40_5	0.1087	0.946	16.83	0.31	0.13
S40_5	S40_7	0.4522	0.923	18.12	0.96	0.29
S40_7	S32	0.0627	0.999	1.33	0.98	0.29
S41	S44_1	1.0216	0.385	22.1	0.14	0.05
S42	S32	2.0036	0.661	12.24	0.47	0.21
S43_1	S44_1	0.1663	0.749	15.28	0.07	0.04
S43_2	S43_1	0.1808	0.614	14.03	0.04	0.03

S44_1	S44_2	0.3572	0.921	17.05	0.69	0.29
S44_2	S52	0.362	0.934	17.36	0.87	0.34
S45_1	S44_2	0.1398	0.833	15.84	0.11	0.07
S45_2	S45_5	0.2219	0.612	14.09	0.05	0.03
S45_3	S45_1	0.157	0.615	14	0.03	0.02
S45_5	S44_1	0.2438	0.909	17.17	0.41	0.2
S46_1	S45_5	0.1525	0.869	16.54	0.16	0.09
S46_2	S46_4	0.0958	0.619	13.91	0.02	0.02
S46_4	S49_4	0.1422	0.712	14.86	0.05	0.03
S46_5	S45_1	0.1097	0.734	15.04	0.04	0.03
S46_6	S46_5	0.0978	0.619	13.91	0.02	0.02
S46_7	S46_1	0.1355	0.617	13.97	0.03	0.02
S48	S50_2	0.2839	0.771	15.7	0.15	0.07
S49_1	S48	0.418	0.603	14.36	0.09	0.05
S49_3	S49_4	0.3051	0.608	14.21	0.07	0.04
S49_4	S50_3	0.2222	0.824	15.98	0.16	0.09
S5	224465	0.4665	0.876	4.6	0.15	0.07
S5_1	S5_3	0.0624	0.62	13.85	0.01	0.01
S5_2	S5_4	0.2783	0.828	16.29	0.21	0.1
S5_3	S5_2	0.6904	0.611	14.83	0.16	0.08
S5_4	S5_6	0.6585	0.768	16.05	0.35	0.12
S5_6	S6	0.1923	0.954	17.61	0.69	0.24
S50_2	S50_4	0.2148	0.85	16.01	0.19	0.08
S50_3	S52	0.2058	0.929	16.84	0.44	0.18
S50_4	S50_3	0.2344	0.866	16.04	0.24	0.09
S51	S46_1	0.483	0.6	14.44	0.1	0.06
S52	DRY_POND	2.4862	0.632	32.6	1.39	0.28
S6	S16_2	1.2986	0.805	17.38	0.93	0.24
S7	S15	1.3971	0.292	25.4	0.15	0.03
S8	224466	0.471643	0.875	4.6	0.15	0.07
S9	224456	12.062459	0.667	11.95	2.88	0.33
S9_2	S10_2	1.3553	0.671	11.86	0.33	0.15

WARNING 05: minimum slope used for Conduit C23
WARNING 10: crest elevation raised to downstream invert for regulator Link C1

Element Count

Number of rain gages 6
Number of subcatchments ... 107
Number of nodes 24
Number of links 23
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1937	1937	INTENSITY	15 min.
1978	1978	INTENSITY	5 min.
2004	2004	INTENSITY	5 min.
2012	2012	INTENSITY	5 min.
Edmonton_Chicago_4h_5y	Edmonton_Chicago_4h_5y	INTENSITY	5 min.
Edmonton_Huff_24h_100y	Edmonton_Huff_24h_100y	INTENSITY	15 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1	0.58	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224469
S1_2	0.13	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S5_6
S1_3	0.10	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S21
S1_4	0.13	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S1_3
S10	0.36	500.00	65.00	0.5000	Edmonton_Chicago_4h_5y	224466
S10_1	0.08	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S10_3
S10_2	0.48	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S11_3
S10_3	0.43	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S10_2
S11_2	0.28	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S14
S11_3	0.30	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S12_2
S11_4	0.31	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S14
S12_2	1.39	500.00	50.00	0.6000	Edmonton_Chicago_4h_5y	S34
S13	2.86	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	J14
S14	2.65	500.00	35.00	0.6000	Edmonton_Chicago_4h_5y	S15
S15	0.90	500.00	0.10	0.6000	Edmonton_Chicago_4h_5y	S21
S16	4.15	500.00	1.00	0.6090	Edmonton_Chicago_4h_5y	224514
S16_1	0.31	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S21
S16_2	0.27	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S1_3
S16_4	0.30	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S16_2
S16_5	0.77	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S16_4
S17	0.54	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S26
S18	0.91	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S26
S19	2.25	500.00	39.00	0.6000	Edmonton_Chicago_4h_5y	S21
S2	0.64	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224468
S2_1	0.13	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S2_3
S2_3	0.07	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S3_3
S2_4	0.38	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S2_1
S20	1.61	500.00	50.00	0.6000	Edmonton_Chicago_4h_5y	S21
S21	5.36	500.00	60.00	0.6000	Edmonton_Chicago_4h_5y	POND
S22_2	0.48	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S18
S22_3	0.05	500.00	95.00	0.6000	Edmonton_Chicago_4h_5y	S22_6
S22_4	0.21	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S23_1
S22_5	0.28	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S22_4
S22_6	0.11	500.00	95.00	0.6000	Edmonton_Chicago_4h_5y	S23_4
S23_1	0.34	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S22_2
S23_3	0.33	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S22_5
S23_4	0.25	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S23_3
S24_1	0.27	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S27_1
S24_2	0.38	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S22_2
S25_1	0.25	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S26
S25_2	0.28	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S27_1
S26	0.37	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S13
S27_1	0.25	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S27_2
S27_2	0.16	500.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S26
S28	0.39	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S27_1
S29	1.24	500.00	50.00	0.6000	Edmonton_Chicago_4h_5y	J14
S3	0.50	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224467

S3_1	0.11	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S3_3
S3_3	0.30	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S5_6
S3_4	0.24	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S3_5
S3_5	0.14	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S3_1
S30	2.22	20.00	1.00	0.6000	Edmonton_Chicago_4h_5y	S21
S31	0.75	500.00	0.00	0.6000	Edmonton_Chicago_4h_5y	S21
S32	2.64	20.00	0.01	0.6000	Edmonton_Chicago_4h_5y	S31
S33_2	3.99	500.00	50.00	0.6000	Edmonton_Chicago_4h_5y	S32
S34	4.62	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S30
S35	1.83	500.00	20.00	0.6000	Edmonton_Chicago_4h_5y	S40_5
S36_2	0.20	500.00	95.00	0.6000	Edmonton_Chicago_4h_5y	S35
S37	0.36	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S35
S38_1	0.25	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S38_2
S38_2	0.23	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S40_3
S39_2	0.51	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S35
S39_3	0.15	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S40_4
S39_4	0.44	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S39_3
S4	0.54	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S15
S40_1	0.69	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S45_5
S40_2	0.13	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S40_4
S40_3	0.16	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S40_2
S40_4	0.11	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S40_5
S40_5	0.45	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S40_7
S40_7	0.06	500.00	95.00	0.6000	Edmonton_Chicago_4h_5y	S32
S41	1.02	500.00	0.00	0.6000	Edmonton_Chicago_4h_5y	S44_1
S42	2.00	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S32
S43_1	0.17	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S44_1
S43_2	0.18	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S43_1
S44_1	0.36	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S44_2
S44_2	0.36	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S52
S45_1	0.14	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S44_2
S45_2	0.22	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S45_5
S45_3	0.16	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S45_1
S45_5	0.24	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S44_1
S46_1	0.15	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S45_5
S46_2	0.10	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S46_4
S46_4	0.14	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S49_4
S46_5	0.11	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S45_1
S46_6	0.10	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S46_5
S46_7	0.14	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S46_1
S48	0.28	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S50_2
S49_1	0.42	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S48
S49_3	0.31	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S49_4
S49_4	0.22	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S50_3
S5	0.47	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224465
S5_1	0.06	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S5_3
S5_2	0.28	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S5_4
S5_3	0.69	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S5_2
S5_4	0.66	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S5_6
S5_6	0.19	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S6
S50_2	0.21	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S50_4
S50_3	0.21	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S52
S50_4	0.23	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S50_3
S51	0.48	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S46_1
S52	2.49	500.00	0.00	0.6000	Edmonton_Chicago_4h_5y	DRY_POND
S6	1.30	500.00	30.00	0.6000	Edmonton_Chicago_4h_5y	S16_2
S7	1.40	500.00	0.00	0.6000	Edmonton_Chicago_4h_5y	S15
S8	0.47	500.00	1.00	0.7000	Edmonton_Chicago_4h_5y	224466
S9	12.06	500.00	10.00	0.6480	Edmonton_Chicago_4h_5y	224456
S9_2	1.36	500.00	45.00	0.6000	Edmonton_Chicago_4h_5y	S10_2

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
224456	JUNCTION	663.00	4.00	0.0	
224465	JUNCTION	663.85	3.90	0.0	
224466	JUNCTION	662.73	4.45	0.0	
224467	JUNCTION	665.07	3.79	0.0	
224468	JUNCTION	666.00	3.88	0.0	
224469	JUNCTION	669.07	3.58	0.0	
224470	JUNCTION	673.04	3.79	0.0	
224514	JUNCTION	619.75	46.85	0.0	
224521	JUNCTION	660.53	6.01	0.0	
J10	JUNCTION	663.65	5.22	0.0	
J11	JUNCTION	665.39	3.00	0.0	
J12	JUNCTION	665.24	3.44	0.0	
J13	JUNCTION	665.09	3.23	0.0	
J14	JUNCTION	663.65	4.50	0.0	
J2	JUNCTION	664.40	4.08	0.0	
J3	JUNCTION	664.35	3.56	0.0	

J4	JUNCTION	664.22	3.99	0.0
J5	JUNCTION	664.05	4.45	0.0
J6	JUNCTION	663.92	4.76	0.0
J7	JUNCTION	663.83	4.95	0.0
J8	JUNCTION	663.56	3.83	0.0
CREEK	OUTFALL	619.66	1.20	0.0
DRY_POND	STORAGE	665.39	5.00	0.0
POND	STORAGE	662.00	6.00	0.0

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C10	J11	J12	CONDUIT	38.0	0.3289	0.0130
C11	J12	J13	CONDUIT	79.1	0.1492	0.0130
C12	J13	J14	CONDUIT	42.8	0.2079	0.0130
C13	J14	POND	CONDUIT	136.0	1.2133	0.0130
C15	224456	224466	CONDUIT	102.3	0.1886	0.0130
C16	224465	224466	CONDUIT	79.0	1.3618	0.0130
C17	224467	224465	CONDUIT	85.9	1.3476	0.0130
C18	224468	224467	CONDUIT	90.5	1.0198	0.0130
C19	224469	224468	CONDUIT	89.7	3.2626	0.0130
C2	J2	J3	CONDUIT	62.9	0.1495	0.0130
C20	224470	224469	CONDUIT	87.5	4.4765	0.0130
C21	224466	224521	CONDUIT	87.0	0.8377	0.0130
C22	224521	224514	CONDUIT	17.4	9.4684	0.0130
C23	224514	CREEK	CONDUIT	116.2	0.1000	0.0130
C3	J3	J4	CONDUIT	44.4	0.1508	0.0130
C4	J4	J5	CONDUIT	72.6	0.1502	0.0130
C5	J5	J6	CONDUIT	46.9	0.1493	0.0130
C6	J6	J7	CONDUIT	47.6	0.1493	0.0130
C7	J10	J8	CONDUIT	42.1	0.1497	0.0130
C8	J8	224466	CONDUIT	10.0	0.1806	0.0130
C9	J7	J10	CONDUIT	16.0	0.1503	0.0130
C1	POND	J2	ORIFICE			
C14	DRY_POND	J11	ORIFICE			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C10	CIRCULAR	0.60	0.28	0.15	0.60	1	0.35
C11	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	0.28
C13	CIRCULAR	1.35	1.43	0.34	1.35	1	5.88
C15	CIRCULAR	0.75	0.44	0.19	0.75	1	0.48
C16	CIRCULAR	0.45	0.16	0.11	0.45	1	0.33
C17	CIRCULAR	0.38	0.11	0.09	0.38	1	0.20
C18	CIRCULAR	0.38	0.11	0.09	0.38	1	0.18
C19	CIRCULAR	0.25	0.05	0.06	0.25	1	0.11
C2	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C20	CIRCULAR	0.25	0.05	0.06	0.25	1	0.13
C21	CIRCULAR	0.75	0.44	0.19	0.75	1	1.02
C22	CIRCULAR	0.60	0.28	0.15	0.60	1	1.89
C23	CIRCULAR	1.20	1.13	0.30	1.20	1	1.23
C3	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C4	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C7	CIRCULAR	0.75	0.44	0.19	0.75	1	0.43
C8	CIRCULAR	0.75	0.44	0.19	0.75	1	0.47
C9	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
Infiltration Method GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN

Starting Date 07/12/2012 00:00:00
Ending Date 07/13/2012 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	3.056	35.827
Evaporation Loss	0.000	0.000
Infiltration Loss	1.647	19.307
Surface Runoff	1.415	16.591
Final Storage	0.004	0.051
Continuity Error (%)	-0.339	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.415	14.154
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	0.000	0.000
External Outflow	1.250	12.503
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	5.194	51.941
Final Stored Volume	5.359	53.593
Continuity Error (%)	-0.002	

Time-Step Critical Elements

Link C22 (99.64%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step : 0.12 sec
Average Time Step : 2.87 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.00
% of Steps Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 21.87 %
3.155 - 1.991 sec : 74.84 %
1.991 - 1.256 sec : 3.29 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

-----	Total	Total	Total	Total	Imperv	Perv	Total	Total

Peak Runoff	Runoff Coeff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Subcatchment CMS		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
S1	0.06	35.83	0.00	0.00	5.19	0.36	30.38	30.74	0.18
S1_2	0.858	35.83	0.00	0.00	13.96	10.75	11.35	22.10	0.03
S1_3	0.617	35.83	1277.54	0.00	19.00	394.01	900.81	1294.82	1.24
S1_4	0.986	35.83	0.00	0.00	13.96	10.75	11.35	22.11	0.03
S10	0.617	35.83	0.00	0.00	11.46	23.29	1.16	24.46	0.09
S10_1	0.683	35.83	0.00	0.00	10.88	16.13	9.02	25.14	0.02
S10_2	0.702	35.83	94.44	0.00	25.49	1.30	103.93	105.23	0.50
S10_3	0.808	35.83	4.65	0.00	11.51	18.22	10.88	29.11	0.13
S11_2	0.719	35.83	0.00	0.00	11.07	16.13	8.79	24.91	0.07
S11_3	0.695	35.83	165.93	0.00	24.48	2.02	175.89	177.90	0.54
S11_4	0.882	35.83	0.00	0.00	11.09	16.13	8.75	24.88	0.08
S12_2	0.694	35.83	38.88	0.00	12.10	37.39	25.31	62.70	0.87
S13	0.839	35.83	38.61	0.00	29.17	0.74	44.57	45.31	1.30
S14	0.609	35.83	5.48	0.00	15.64	14.50	11.25	25.75	0.68
S15	0.623	35.83	107.03	0.00	27.83	0.14	115.17	115.31	1.03
S16	0.807	35.83	0.00	0.00	9.35	0.36	26.14	26.50	1.10
S16_1	0.740	35.83	0.00	0.00	14.22	10.75	11.01	21.76	0.07
S16_2	0.607	35.83	425.21	0.00	18.69	138.31	304.53	442.85	1.20
S16_4	0.961	35.83	53.47	0.00	16.32	26.79	46.46	73.25	0.22
S16_5	0.820	35.83	0.00	0.00	14.78	10.75	10.39	21.14	0.16
S17	0.590	35.83	0.00	0.00	11.29	16.13	8.52	24.65	0.13
S18	0.688	35.83	56.17	0.00	24.91	0.92	66.30	67.22	0.61
S19	0.731	35.83	0.00	0.00	13.86	14.02	8.03	22.04	0.50
S2	0.615	35.83	0.00	0.00	4.83	0.36	30.75	31.11	0.20
S2_1	0.868	35.83	66.11	0.00	23.01	1.02	78.39	79.41	0.10
S2_3	0.779	35.83	146.28	0.00	22.01	1.82	158.95	160.77	0.11
S2_4	0.883	35.83	0.00	0.00	14.31	10.75	10.90	21.65	0.08
S20	0.604	35.83	0.00	0.00	10.84	17.97	7.12	25.08	0.40
S21	0.700	35.83	101.34	0.00	19.92	81.72	34.99	116.71	6.25
S22_2	0.851	35.83	87.62	0.00	16.80	37.03	69.83	106.87	0.51
S22_3	0.866	35.83	0.00	0.00	0.98	34.05	0.81	34.86	0.02
S22_4	0.973	35.83	110.66	0.00	16.36	43.95	86.49	130.44	0.27
S22_5	0.890	35.83	62.28	0.00	16.11	29.43	52.83	82.27	0.23
S22_6	0.839	35.83	15.37	0.00	1.09	48.65	1.47	50.12	0.05
S23_1	0.979	35.83	79.52	0.00	16.26	34.61	64.71	99.32	0.34
S23_3	0.861	35.83	31.51	0.00	15.78	20.20	31.58	51.78	0.17
S23_4	0.769	35.83	21.61	0.00	15.88	17.23	24.54	41.77	0.11
S24_1	0.727	35.83	0.00	0.00	14.16	10.75	11.08	21.83	0.06
S24_1	0.609								

S24_2		35.83	0.00	0.00	14.30	10.75	10.91	21.66	0.08
0.05	0.605								
S25_1		35.83	0.00	0.00	14.13	10.75	11.12	21.88	0.05
0.04	0.611								
S25_2		35.83	0.00	0.00	14.17	10.75	11.07	21.82	0.06
0.04	0.609								
S26		35.83	284.93	0.00	26.32	3.21	291.88	295.09	1.11
0.30	0.920								
S27_1		35.83	85.21	0.00	24.10	1.21	96.33	97.54	0.25
0.14	0.806								
S27_2		35.83	155.14	0.00	22.99	1.91	166.88	168.79	0.27
0.14	0.884								
S28		35.83	0.00	0.00	11.16	16.13	8.67	24.79	0.10
0.06	0.692								
S29		35.83	0.00	0.00	10.65	17.95	7.32	25.27	0.31
0.15	0.705								
S3		35.83	0.00	0.00	4.64	0.36	30.96	31.32	0.16
0.07	0.874								
S3_1		35.83	74.27	0.00	15.82	33.03	61.58	94.61	0.10
0.05	0.859								
S3_3		35.83	72.30	0.00	15.68	32.44	60.30	92.74	0.28
0.12	0.858								
S3_4		35.83	0.00	0.00	14.12	10.75	11.14	21.89	0.05
0.03	0.611								
S3_5		35.83	36.98	0.00	15.64	21.84	35.62	57.47	0.08
0.05	0.789								
S30		35.83	72.35	0.00	65.86	1.08	41.24	42.32	0.94
0.04	0.391								
S31		35.83	189.91	0.00	59.75	0.00	166.08	166.08	1.25
0.06	0.736								
S32		35.83	91.42	0.00	73.29	0.01	53.95	53.97	1.42
0.06	0.424								
S33_2		35.83	0.00	0.00	11.85	17.99	6.09	24.08	0.96
0.41	0.672								
S34		35.83	18.88	0.00	19.98	16.45	18.35	34.80	1.61
0.36	0.636								
S35		35.83	14.77	0.00	19.69	10.13	20.86	30.98	0.57
0.16	0.612								
S36_2		35.83	0.00	0.00	0.98	34.05	0.82	34.86	0.07
0.04	0.973								
S37		35.83	0.00	0.00	11.14	16.13	8.69	24.82	0.09
0.05	0.693								
S38_1		35.83	0.00	0.00	14.13	10.75	11.13	21.88	0.05
0.04	0.611								
S38_2		35.83	23.82	0.00	15.36	17.90	26.64	44.54	0.10
0.06	0.747								
S39_2		35.83	0.00	0.00	14.47	10.75	10.72	21.47	0.11
0.06	0.599								
S39_3		35.83	62.44	0.00	16.17	29.48	52.93	82.41	0.13
0.07	0.839								
S39_4		35.83	0.00	0.00	14.39	10.75	10.81	21.56	0.10
0.05	0.602								
S4		35.83	0.00	0.00	11.29	16.13	8.52	24.65	0.13
0.07	0.688								
S40_1		35.83	0.00	0.00	14.69	10.75	10.48	21.23	0.15
0.07	0.593								
S40_2		35.83	104.05	0.00	15.97	41.96	82.28	124.25	0.16
0.07	0.888								
S40_3		35.83	61.73	0.00	15.81	29.27	52.79	82.06	0.14
0.07	0.841								
S40_4		35.83	264.85	0.00	16.83	90.21	194.12	284.33	0.31
0.13	0.946								
S40_5		35.83	193.50	0.00	18.12	68.80	142.76	211.56	0.96
0.29	0.923								
S40_7		35.83	1525.81	0.00	1.33	1483.59	76.76	1560.35	0.98
0.29	0.999								
S41		35.83	0.00	0.00	22.10	0.00	13.80	13.80	0.14
0.05	0.385								
S42		35.83	0.00	0.00	12.24	16.17	7.51	23.68	0.47
0.21	0.661								
S43_1		35.83	23.92	0.00	15.28	17.93	26.81	44.74	0.07
0.04	0.749								
S43_2		35.83	0.00	0.00	14.03	10.75	11.25	22.00	0.04
0.03	0.614								
S44_1		35.83	174.01	0.00	17.05	62.95	130.32	193.28	0.69
0.29	0.921								
S44_2		35.83	220.51	0.00	17.36	76.90	162.57	239.48	0.87
0.34	0.934								
S45_1		35.83	56.80	0.00	15.84	27.79	49.36	77.15	0.11
0.07	0.833								
S45_2		35.83	0.00	0.00	14.09	10.75	11.18	21.93	0.05
0.03	0.612								
S45_3		35.83	0.00	0.00	14.00	10.75	11.30	22.05	0.03
0.02	0.615								

S45_5		35.83	147.44	0.00	17.17	54.98	111.61	166.60	0.41
0.20	0.909								
S46_1		35.83	87.75	0.00	16.54	37.08	70.36	107.44	0.16
0.09	0.869								
S46_2		35.83	0.00	0.00	13.91	10.75	11.42	22.17	0.02
0.02	0.619								
S46_4		35.83	14.94	0.00	14.86	15.23	20.93	36.16	0.05
0.03	0.712								
S46_5		35.83	19.76	0.00	15.04	16.68	24.15	40.83	0.04
0.03	0.734								
S46_6		35.83	0.00	0.00	13.91	10.75	11.42	22.17	0.02
0.02	0.619								
S46_7		35.83	0.00	0.00	13.97	10.75	11.34	22.09	0.03
0.02	0.617								
S48		35.83	31.81	0.00	15.70	20.29	31.88	52.17	0.15
0.07	0.771								
S49_1		35.83	0.00	0.00	14.36	10.75	10.85	21.60	0.09
0.05	0.603								
S49_3		35.83	0.00	0.00	14.21	10.75	11.03	21.78	0.07
0.04	0.608								
S49_4		35.83	53.05	0.00	15.98	26.67	46.57	73.24	0.16
0.09	0.824								
S5		35.83	0.00	0.00	4.60	0.36	31.01	31.37	0.15
0.07	0.876								
S5_1		35.83	0.00	0.00	13.85	10.75	11.48	22.23	0.01
0.01	0.620								
S5_2		35.83	57.33	0.00	16.29	27.95	49.20	77.15	0.21
0.10	0.828								
S5_3		35.83	2.01	0.00	14.83	11.35	11.75	23.11	0.16
0.08	0.611								
S5_4		35.83	32.60	0.00	16.05	20.53	31.99	52.53	0.35
0.12	0.768								
S5_6		35.83	338.10	0.00	17.61	112.18	244.72	356.90	0.69
0.24	0.954								
S50_2		35.83	68.95	0.00	16.01	31.44	57.63	89.07	0.19
0.08	0.850								
S50_3		35.83	194.91	0.00	16.84	69.22	145.16	214.38	0.44
0.18	0.929								
S50_4		35.83	81.62	0.00	16.04	35.24	66.47	101.70	0.24
0.09	0.866								
S51		35.83	0.00	0.00	14.44	10.75	10.76	21.51	0.10
0.06	0.600								
S52		35.83	52.61	0.00	32.60	0.00	55.93	55.93	1.39
0.28	0.632								
S6		35.83	52.85	0.00	17.38	26.61	44.79	71.40	0.93
0.24	0.805								
S7		35.83	0.00	0.00	25.40	0.00	10.46	10.46	0.15
0.03	0.292								
S8		35.83	0.00	0.00	4.60	0.36	31.00	31.36	0.15
0.07	0.875								
S9		35.83	0.00	0.00	11.95	3.59	20.30	23.90	2.88
0.33	0.667								
S9_2		35.83	0.00	0.00	11.86	16.16	7.90	24.06	0.33
0.15	0.671								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
224456	JUNCTION	0.10	0.45	663.45	0 01:25	0.45
224465	JUNCTION	0.02	0.31	664.16	0 01:26	0.30
224466	JUNCTION	0.18	0.49	663.22	0 01:26	0.49
224467	JUNCTION	0.02	0.31	665.38	0 01:26	0.31
224468	JUNCTION	0.02	0.25	666.25	0 01:26	0.25
224469	JUNCTION	0.01	0.13	669.20	0 01:26	0.13
224470	JUNCTION	0.00	0.00	673.04	0 00:00	0.00
224514	JUNCTION	0.29	0.68	620.43	0 01:26	0.68
224521	JUNCTION	0.11	0.27	660.80	0 01:26	0.27
J10	JUNCTION	0.22	0.23	663.88	0 05:18	0.23
J11	JUNCTION	0.07	0.08	665.47	0 04:42	0.08
J12	JUNCTION	0.08	0.10	665.33	0 02:54	0.10
J13	JUNCTION	0.09	0.15	665.24	0 05:13	0.15
J14	JUNCTION	1.50	1.58	665.23	0 05:16	1.58
J2	JUNCTION	0.35	0.36	664.76	0 05:15	0.36
J3	JUNCTION	0.24	0.25	664.60	0 05:15	0.25
J4	JUNCTION	0.25	0.26	664.48	0 05:16	0.26
J5	JUNCTION	0.24	0.25	664.30	0 05:17	0.25
J6	JUNCTION	0.24	0.25	664.18	0 05:17	0.25

J7	JUNCTION	0.22	0.23	664.05	0	05:17	0.23
J8	JUNCTION	0.19	0.20	663.76	0	05:18	0.20
CREEK	OUTFALL	0.20	0.51	620.17	0	01:27	0.51
DRY_POND	STORAGE	0.27	0.38	665.77	0	04:41	0.38
POND	STORAGE	3.15	3.23	665.23	0	05:14	3.23

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
224456	JUNCTION	0.332	0.332	0 01:25	2.88	2.88	-0.047
224465	JUNCTION	0.066	0.267	0 01:26	0.146	0.678	-0.022
224466	JUNCTION	0.120	0.779	0 01:25	0.236	11.4	0.075
224467	JUNCTION	0.070	0.207	0 01:25	0.156	0.532	0.000
224468	JUNCTION	0.081	0.140	0 01:25	0.198	0.376	0.002
224469	JUNCTION	0.062	0.062	0 01:25	0.178	0.178	-0.001
224470	JUNCTION	0.000	0.000	0 00:00	0	0	0.000 ltr
224514	JUNCTION	0.131	0.885	0 01:26	1.1	12.5	0.062
224521	JUNCTION	0.000	0.777	0 01:26	0	11.4	0.003
J10	JUNCTION	0.000	0.097	0 05:18	0	7.63	0.052
J11	JUNCTION	0.000	0.012	0 04:41	0	0.838	0.084
J12	JUNCTION	0.000	0.012	0 04:42	0	0.837	0.217
J13	JUNCTION	0.000	0.012	0 04:43	0	0.836	0.057
J14	JUNCTION	0.221	0.227	0 02:05	1.61	2.45	0.078
J2	JUNCTION	0.000	0.097	0 00:00	0	7.65	0.038
J3	JUNCTION	0.000	0.097	0 05:15	0	7.65	0.055
J4	JUNCTION	0.000	0.097	0 05:15	0	7.64	0.094
J5	JUNCTION	0.000	0.097	0 05:16	0	7.64	0.058
J6	JUNCTION	0.000	0.097	0 05:17	0	7.63	0.057
J7	JUNCTION	0.000	0.097	0 05:17	0	7.63	0.019
J8	JUNCTION	0.000	0.097	0 05:18	0	7.62	0.011
CREEK	OUTFALL	0.000	0.888	0 01:27	0	12.5	0.000
DRY_POND	STORAGE	0.282	0.282	0 02:00	1.39	1.39	0.004
POND	STORAGE	0.876	1.080	0 01:25	6.25	60.4	0.003

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
DRY_POND	0.839	1.4	0.0	0.0	1.260	2.1	0 04:41	0.012
POND	55.173	38.6	0.0	0.0	57.274	40.1	0 05:14	0.097

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
CREEK	99.88	0.163	0.888	12.503
System	99.88	0.163	0.888	12.503

Link Flow Summary

Link	Type	Maximum	Time of Max		Maximum	Max/	Max/
		Flow CMS	Occurrence	days hr:min	Veloc m/sec	Full Flow	Full Depth
C10	CONDUIT	0.012	0	04:42	0.62	0.04	0.12
C11	CONDUIT	0.012	0	04:43	0.48	0.05	0.17
C12	CONDUIT	0.012	0	04:53	0.50	0.04	0.32
C13	CONDUIT	0.226	0	02:05	0.16	0.04	1.00
C15	CONDUIT	0.328	0	01:25	1.28	0.68	0.57
C16	CONDUIT	0.267	0	01:26	1.90	0.80	0.83
C17	CONDUIT	0.205	0	01:26	2.11	1.01	0.85
C18	CONDUIT	0.140	0	01:26	1.60	0.79	0.74
C19	CONDUIT	0.061	0	01:26	2.26	0.57	0.54
C2	CONDUIT	0.097	0	05:15	0.98	0.41	0.38
C20	CONDUIT	0.000	0	00:00	0.00	0.00	0.15
C21	CONDUIT	0.777	0	01:26	2.54	0.76	0.65
C22	CONDUIT	0.777	0	01:26	6.35	0.41	0.45
C23	CONDUIT	0.888	0	01:27	1.60	0.72	0.49
C3	CONDUIT	0.097	0	05:15	0.98	0.41	0.38
C4	CONDUIT	0.097	0	05:16	0.97	0.41	0.38
C5	CONDUIT	0.097	0	05:17	1.00	0.41	0.38
C6	CONDUIT	0.097	0	05:17	0.99	0.41	0.38
C7	CONDUIT	0.097	0	05:18	0.97	0.23	0.28
C8	CONDUIT	0.097	0	05:18	1.07	0.21	0.26
C9	CONDUIT	0.097	0	05:18	1.08	0.41	0.36
C1	ORIFICE	0.097	0	00:00			1.00
C14	ORIFICE	0.012	0	04:41			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C10	1.00	0.06	0.00	0.00	0.57	0.00	0.00	0.37	0.00	0.00
C11	1.00	0.06	0.00	0.00	0.39	0.00	0.00	0.55	0.25	0.00
C12	1.00	0.05	0.01	0.00	0.90	0.00	0.00	0.04	0.36	0.00
C13	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C15	1.00	0.00	0.00	0.00	0.76	0.00	0.00	0.24	0.62	0.00
C16	1.00	0.00	0.68	0.00	0.30	0.01	0.00	0.00	1.00	0.00
C17	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C18	1.00	0.00	0.00	0.00	0.78	0.21	0.00	0.00	0.98	0.00
C19	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C20	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C22	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C23	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.93	0.00	0.00	0.07	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C6	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

Conduit Surcharge Summary

Conduit	Hours Full			Hours	Hours
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C13	22.71	22.71	24.00	0.01	0.01
C17	0.01	0.01	0.01	0.02	0.01

Analysis begun on: Mon Dec 15 11:04:29 2025
Analysis ended on: Mon Dec 15 11:04:30 2025
Total elapsed time: 00:00:01

1937

Element Count

Number of rain gages 9
Number of subcatchments ... 99
Number of nodes 16
Number of links 15
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1937	1937	INTENSITY	15 min.
1978	1978	INTENSITY	5 min.
2004	2004	INTENSITY	5 min.
2012	2012	INTENSITY	5 min.
Edmonton_Chicago_4h_100y	Edmonton_Chicago_4h_100y	INTENSITY	5 min.
Edmonton_Chicago_4h_25y	Edmonton_Chicago_4h_25y	INTENSITY	5 min.
Edmonton_Chicago_4h_2y	Edmonton_Chicago_4h_2y	INTENSITY	5 min.
Edmonton_Chicago_4h_5y	Edmonton_Chicago_4h_5y	INTENSITY	5 min.
Edmonton_Huff_24h_100y	Edmonton_Huff_24h_100y	INTENSITY	15 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1_2	0.13	500.00	30.00	0.6000	1937	S5_6
S1_3	0.10	500.00	30.00	0.6000	1937	S21
S1_4	0.13	500.00	30.00	0.6000	1937	S1_3
S10_1	0.08	500.00	45.00	0.6000	1937	S10_3
S10_2	0.48	500.00	1.00	0.6000	1937	S11_3
S10_3	0.43	500.00	45.00	0.6000	1937	S10_2
S11_2	0.28	500.00	45.00	0.6000	1937	S14
S11_3	0.30	500.00	1.00	0.6000	1937	S12_2
S11_4	0.31	500.00	45.00	0.6000	1937	S14
S12_2	1.39	500.00	50.00	0.6000	1937	S34
S13	2.86	500.00	1.00	0.6000	1937	J14
S14	2.65	500.00	35.00	0.6000	1937	S15
S15	0.90	500.00	0.10	0.6000	1937	S21
S16_1	0.31	500.00	30.00	0.6000	1937	S21
S16_2	0.27	500.00	30.00	0.6000	1937	S1_3
S16_4	0.30	500.00	30.00	0.6000	1937	S16_2
S16_5	0.77	500.00	30.00	0.6000	1937	S16_4
S17	0.54	500.00	45.00	0.6000	1937	S26
S18	0.91	500.00	1.00	0.6000	1937	S26
S19	2.25	500.00	39.00	0.6000	1937	S21
S2_1	0.13	500.00	1.00	0.6000	1937	S2_3
S2_3	0.07	500.00	1.00	0.6000	1937	S3_3
S2_4	0.38	500.00	30.00	0.6000	1937	S2_1
S20	1.61	500.00	50.00	0.6000	1937	S21
S21	5.36	500.00	60.00	0.6000	1937	POND
S22_2	0.48	500.00	30.00	0.6000	1937	S18
S22_3	0.05	500.00	95.00	0.6000	1937	S22_6
S22_4	0.21	500.00	30.00	0.6000	1937	S23_1
S22_5	0.28	500.00	30.00	0.6000	1937	S22_4
S22_6	0.11	500.00	95.00	0.6000	1937	S23_4
S23_1	0.34	500.00	30.00	0.6000	1937	S22_2
S23_3	0.33	500.00	30.00	0.6000	1937	S22_5
S23_4	0.25	500.00	30.00	0.6000	1937	S23_3
S24_1	0.27	500.00	30.00	0.6000	1937	S27_1
S24_2	0.38	500.00	30.00	0.6000	1937	S22_2
S25_1	0.25	500.00	30.00	0.6000	1937	S26
S25_2	0.28	500.00	30.00	0.6000	1937	S27_1
S26	0.37	500.00	1.00	0.6000	1937	S13
S27_1	0.25	500.00	1.00	0.6000	1937	S27_2
S27_2	0.16	500.00	1.00	0.6000	1937	S26
S28	0.39	500.00	45.00	0.6000	1937	S27_1
S29	1.24	500.00	50.00	0.6000	1937	J14
S3_1	0.11	500.00	30.00	0.6000	1937	S3_3
S3_3	0.30	500.00	30.00	0.6000	1937	S5_6
S3_4	0.24	500.00	30.00	0.6000	1937	S3_5
S3_5	0.14	500.00	30.00	0.6000	1937	S3_1

S30	2.22	20.00	1.00	0.6000	1937	S21
S31	0.75	500.00	0.00	0.6000	1937	S21
S32	2.64	20.00	0.01	0.6000	1937	S31
S33_2	3.99	500.00	50.00	0.6000	1937	S32
S34	4.62	500.00	30.00	0.6000	1937	S30
S35	1.83	500.00	20.00	0.6000	1937	S40_5
S36_2	0.20	500.00	95.00	0.6000	1937	S35
S37	0.36	500.00	45.00	0.6000	1937	S35
S38_1	0.25	500.00	30.00	0.6000	1937	S38_2
S38_2	0.23	500.00	30.00	0.6000	1937	S40_3
S39_2	0.51	500.00	30.00	0.6000	1937	S35
S39_3	0.15	500.00	30.00	0.6000	1937	S40_4
S39_4	0.44	500.00	30.00	0.6000	1937	S39_3
S4	0.54	500.00	45.00	0.6000	1937	S15
S40_1	0.69	500.00	30.00	0.6000	1937	S45_5
S40_2	0.13	500.00	30.00	0.6000	1937	S40_4
S40_3	0.16	500.00	30.00	0.6000	1937	S40_2
S40_4	0.11	500.00	30.00	0.6000	1937	S40_5
S40_5	0.45	500.00	30.00	0.6000	1937	S40_7
S40_7	0.06	500.00	95.00	0.6000	1937	S32
S41	1.02	500.00	0.00	0.6000	1937	S44_1
S42	2.00	500.00	45.00	0.6000	1937	S32
S43_1	0.17	500.00	30.00	0.6000	1937	S44_1
S43_2	0.18	500.00	30.00	0.6000	1937	S43_1
S44_1	0.36	500.00	30.00	0.6000	1937	S44_2
S44_2	0.36	500.00	30.00	0.6000	1937	S52
S45_1	0.14	500.00	30.00	0.6000	1937	S44_2
S45_2	0.22	500.00	30.00	0.6000	1937	S45_5
S45_3	0.16	500.00	30.00	0.6000	1937	S45_1
S45_5	0.24	500.00	30.00	0.6000	1937	S44_1
S46_1	0.15	500.00	30.00	0.6000	1937	S45_5
S46_2	0.10	500.00	30.00	0.6000	1937	S46_4
S46_4	0.14	500.00	30.00	0.6000	1937	S49_4
S46_5	0.11	500.00	30.00	0.6000	1937	S45_1
S46_6	0.10	500.00	30.00	0.6000	1937	S46_5
S46_7	0.14	500.00	30.00	0.6000	1937	S46_1
S48	0.28	500.00	30.00	0.6000	1937	S50_2
S49_1	0.42	500.00	30.00	0.6000	1937	S48
S49_3	0.31	500.00	30.00	0.6000	1937	S49_4
S49_4	0.22	500.00	30.00	0.6000	1937	S50_3
S5_1	0.06	500.00	30.00	0.6000	1937	S5_3
S5_2	0.28	500.00	30.00	0.6000	1937	S5_4
S5_3	0.69	500.00	30.00	0.6000	1937	S5_2
S5_4	0.66	500.00	30.00	0.6000	1937	S5_6
S5_6	0.19	500.00	30.00	0.6000	1937	S6
S50_2	0.21	500.00	30.00	0.6000	1937	S50_4
S50_3	0.21	500.00	30.00	0.6000	1937	S52
S50_4	0.23	500.00	30.00	0.6000	1937	S50_3
S51	0.48	500.00	30.00	0.6000	1937	S46_1
S52	2.49	500.00	0.00	0.6000	1937	DRY_POND
S6	1.30	500.00	30.00	0.6000	1937	S16_2
S7	1.40	500.00	0.00	0.6000	1937	S15
S9_2	1.36	500.00	45.00	0.6000	1937	S10_2

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J10	JUNCTION	663.65	5.22	0.0	
J11	JUNCTION	665.39	3.00	0.0	
J12	JUNCTION	665.24	3.44	0.0	
J13	JUNCTION	665.09	3.23	0.0	
J14	JUNCTION	663.65	4.50	0.0	
J2	JUNCTION	664.00	4.47	0.0	
J3	JUNCTION	664.35	3.56	0.0	
J4	JUNCTION	664.22	3.99	0.0	
J5	JUNCTION	664.05	4.45	0.0	
J6	JUNCTION	663.92	4.76	0.0	
J7	JUNCTION	663.83	4.95	0.0	
J8	JUNCTION	663.56	3.83	0.0	
J9	JUNCTION	662.64	4.36	0.0	
OF1	OUTFALL	660.90	0.75	0.0	
DRY_POND	STORAGE	665.39	5.00	0.0	
POND	STORAGE	662.00	6.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope Roughness
------	-----------	---------	------	--------	------------------

C10	J11	J12	CONDUIT	38.0	0.3289	0.0130
C11	J12	J13	CONDUIT	79.1	0.1492	0.0130
C12	J13	J14	CONDUIT	42.8	0.2079	0.0130
C13	J14	POND	CONDUIT	136.0	1.2133	0.0130
C16	J9	OF1	CONDUIT	87.1	2.0554	0.0100
C2	J2	J3	CONDUIT	62.9	0.3086	0.0130
C3	J3	J4	CONDUIT	44.4	0.1508	0.0130
C4	J4	J5	CONDUIT	72.6	0.1502	0.0130
C5	J5	J6	CONDUIT	46.9	0.1493	0.0130
C6	J6	J7	CONDUIT	47.6	0.1493	0.0130
C7	J10	J8	CONDUIT	42.1	0.1497	0.0130
C8	J8	J9	CONDUIT	11.7	0.1541	0.0130
C9	J7	J10	CONDUIT	16.0	0.1503	0.0130
C1	POND	J2	ORIFICE			
C14	DRY_POND	J11	ORIFICE			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C10	CIRCULAR	0.60	0.28	0.15	0.60	1	0.35
C11	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	0.28
C13	CIRCULAR	1.35	1.43	0.34	1.35	1	5.88
C16	CIRCULAR	0.75	0.44	0.19	0.75	1	2.08
C2	CIRCULAR	0.60	0.28	0.15	0.60	1	0.34
C3	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C4	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C7	CIRCULAR	0.75	0.44	0.19	0.75	1	0.43
C8	CIRCULAR	0.75	0.44	0.19	0.75	1	0.44
C9	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
Infiltration Method GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN
Starting Date 07/14/1937 00:00:00
Ending Date 07/15/1937 23:45:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	10.238	154.925
Evaporation Loss	0.000	0.000
Infiltration Loss	4.235	64.088
Surface Runoff	5.772	87.354
Final Storage	0.234	3.536
Continuity Error (%)	-0.034	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	5.772	57.719
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000

External Inflow	0.000	0.000
External Outflow	2.124	21.242
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	5.194	51.941
Final Stored Volume	8.834	88.343
Continuity Error (%)	0.068	

Highest Continuity Errors

Node J12 (1.00%)

Time-Step Critical Elements

Link C8 (99.81%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step : 1.75 sec
Average Time Step : 3.70 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.00
% of Steps Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Peak Runoff		Total	Total	Total	Total	Imperv	Perv	Total	Total
Runoff Coeff		Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Subcatchment CMS		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
S1_2		154.93	0.00	0.00	55.25	46.48	53.25	99.73	0.13
0.01	0.644								
S1_3		154.93	6051.39	0.00	73.22	1861.91	4271.56	6133.46	5.88
0.27	0.988								
S1_4		154.92	0.00	0.00	55.25	46.48	53.25	99.73	0.13
0.01	0.644								
S10_1		154.92	0.00	0.00	43.26	69.72	42.02	111.73	0.09
0.00	0.721								
S10_2		154.92	431.02	0.00	99.44	5.86	480.75	486.61	2.33
0.10	0.830								
S10_3		154.92	20.69	0.00	44.56	79.05	52.05	131.11	0.57
0.02	0.747								
S11_2		154.93	0.00	0.00	43.57	69.74	41.67	111.41	0.31
0.01	0.719								
S11_3		154.92	767.30	0.00	89.73	9.22	823.43	832.65	2.53
0.12	0.903								
S11_4		154.93	0.00	0.00	43.61	69.74	41.63	111.37	0.34

0.01	0.719								
S12_2		154.92	181.95	0.00	43.02	168.45	125.44	293.90	4.09
0.18	0.872								
S13		154.92	185.47	0.00	90.97	3.40	246.05	249.45	7.14
0.32	0.733								
S14		154.93	24.54	0.00	55.57	62.82	61.09	123.91	3.28
0.14	0.690								
S15		154.92	538.25	0.00	101.25	0.69	591.31	592.01	5.31
0.23	0.854								
S16_1		154.92	0.00	0.00	55.65	46.49	52.83	99.32	0.31
0.01	0.641								
S16_2		154.93	2016.98	0.00	72.09	651.58	1448.47	2100.05	5.67
0.26	0.967								
S16_4		154.92	249.38	0.00	62.20	121.30	220.87	342.17	1.04
0.05	0.846								
S16_5		154.93	0.00	0.00	56.37	46.50	52.09	98.59	0.75
0.03	0.636								
S17		154.92	0.00	0.00	43.88	69.75	41.35	111.10	0.60
0.02	0.717								
S18		154.92	262.58	0.00	87.98	4.17	325.41	329.58	2.99
0.14	0.789								
S19		154.93	0.00	0.00	50.45	60.43	44.07	104.50	2.35
0.10	0.675								
S2_1		154.92	302.85	0.00	88.33	4.58	364.99	369.57	0.47
0.02	0.807								
S2_3		154.93	680.78	0.00	83.02	8.36	744.53	752.89	0.51
0.03	0.901								
S2_4		154.92	0.00	0.00	55.78	46.49	52.70	99.19	0.38
0.02	0.640								
S20		154.93	0.00	0.00	40.64	77.48	36.83	114.31	1.84
0.07	0.738								
S21		154.92	667.69	0.00	41.13	492.48	284.63	777.10	41.64
1.12	0.945								
S22_2		154.92	406.71	0.00	62.13	168.50	331.08	499.58	2.38
0.11	0.890								
S22_3		154.92	0.00	0.00	3.91	147.18	3.84	151.03	0.07
0.00	0.975								
S22_4		154.93	510.14	0.00	61.75	199.52	403.90	603.42	1.24
0.06	0.907								
S22_5		154.93	285.09	0.00	60.84	132.01	247.24	379.25	1.05
0.05	0.862								
S22_6		154.92	66.60	0.00	4.20	210.47	6.89	217.36	0.24
0.01	0.981								
S23_1		154.92	367.87	0.00	60.32	156.85	305.71	462.55	1.56
0.07	0.885								
S23_3		154.92	141.74	0.00	59.70	89.01	148.01	237.02	0.79
0.03	0.799								
S23_4		154.93	93.72	0.00	60.78	74.60	113.32	187.92	0.47
0.02	0.756								
S24_1		154.92	0.00	0.00	55.57	46.49	52.91	99.39	0.27
0.01	0.642								
S24_2		154.93	0.00	0.00	55.77	46.49	52.71	99.20	0.37
0.02	0.640								
S25_1		154.93	0.00	0.00	55.53	46.49	52.96	99.44	0.25
0.01	0.642								
S25_2		154.92	0.00	0.00	55.59	46.49	52.90	99.38	0.28
0.01	0.641								
S26		154.93	1356.00	0.00	93.47	15.11	1402.57	1417.68	5.31
0.25	0.938								
S27_1		154.93	385.52	0.00	95.75	5.41	439.42	444.83	1.13
0.05	0.823								
S27_2		154.93	707.51	0.00	85.90	8.62	768.10	776.73	1.24
0.06	0.901								
S28		154.93	0.00	0.00	43.71	69.74	41.52	111.27	0.43
0.02	0.718								
S29		154.92	0.00	0.00	40.39	77.49	37.08	114.57	1.43
0.06	0.740								
S3_1		154.92	339.93	0.00	60.67	148.45	285.83	434.28	0.48
0.02	0.878								
S3_3		154.93	335.29	0.00	58.90	147.07	284.33	431.40	1.28
0.06	0.880								
S3_4		154.92	0.00	0.00	55.51	46.49	52.97	99.46	0.24
0.01	0.642								
S3_5		154.93	168.01	0.00	59.99	96.88	166.14	263.02	0.38
0.02	0.814								
S30		154.92	372.54	0.00	108.86	5.27	377.50	382.78	8.50
0.16	0.726								
S31		154.93	1498.03	0.00	101.74	0.00	1545.24	1545.24	11.59
0.22	0.935								
S32		154.93	430.79	0.00	113.92	0.06	425.87	425.93	11.24
0.21	0.727								
S33_2		154.93	0.00	0.00	42.04	77.44	35.43	112.87	4.50
0.17	0.729								
S34		154.92	88.51	0.00	64.25	73.03	106.17	179.20	8.27

0.33	0.736								
S35		154.93	66.39	0.00	70.24	44.28	106.84	151.11	2.76
0.12	0.683								
S36_2		154.92	0.00	0.00	3.92	147.24	3.84	151.08	0.31
0.01	0.975								
S37		154.92	0.00	0.00	43.68	69.74	41.55	111.30	0.40
0.02	0.718								
S38_1		154.92	0.00	0.00	55.52	46.49	52.96	99.45	0.25
0.01	0.642								
S38_2		154.93	108.29	0.00	58.80	78.97	125.50	204.47	0.47
0.02	0.777								
S39_2		154.93	0.00	0.00	55.98	46.50	52.49	98.98	0.50
0.02	0.639								
S39_3		154.93	286.94	0.00	62.16	132.56	247.23	379.79	0.58
0.03	0.860								
S39_4		154.92	0.00	0.00	55.88	46.49	52.60	99.09	0.44
0.02	0.640								
S4		154.92	0.00	0.00	43.88	69.75	41.35	111.10	0.60
0.02	0.717								
S40_1		154.93	0.00	0.00	56.26	46.50	52.20	98.70	0.68
0.03	0.637								
S40_2		154.93	479.08	0.00	61.02	190.20	382.89	573.09	0.74
0.03	0.904								
S40_3		154.92	283.43	0.00	60.58	131.51	246.35	377.85	0.62
0.03	0.862								
S40_4		154.92	1221.17	0.00	67.21	412.82	896.26	1309.08	1.42
0.07	0.951								
S40_5		154.93	925.10	0.00	68.51	324.01	687.62	1011.63	4.57
0.21	0.937								
S40_7		154.92	7296.02	0.00	5.18	7078.42	367.38	7445.80	4.67
0.21	0.999								
S41		154.92	0.00	0.00	81.85	0.00	73.10	73.10	0.75
0.04	0.472								
S42		154.92	0.00	0.00	45.13	69.73	40.09	109.82	2.20
0.09	0.709								
S43_1		154.92	108.28	0.00	58.62	78.96	125.68	204.64	0.34
0.02	0.777								
S43_2		154.92	0.00	0.00	55.37	46.48	53.12	99.60	0.18
0.01	0.643								
S44_1		154.92	826.18	0.00	63.76	294.34	623.15	917.49	3.28
0.16	0.935								
S44_2		154.92	1041.25	0.00	64.08	358.86	773.39	1132.25	4.10
0.19	0.947								
S45_1		154.93	257.88	0.00	60.93	123.84	228.14	351.98	0.49
0.02	0.853								
S45_2		154.92	0.00	0.00	55.47	46.48	53.02	99.50	0.22
0.01	0.642								
S45_3		154.92	0.00	0.00	55.32	46.48	53.18	99.66	0.16
0.01	0.643								
S45_5		154.92	677.98	0.00	68.45	249.87	514.72	764.59	1.86
0.09	0.918								
S46_1		154.93	402.24	0.00	66.26	167.15	323.87	491.02	0.75
0.03	0.881								
S46_2		154.93	0.00	0.00	55.15	46.48	53.36	99.83	0.10
0.00	0.644								
S46_4		154.92	67.26	0.00	57.51	66.65	98.08	164.73	0.23
0.01	0.741								
S46_5		154.92	89.00	0.00	57.97	73.17	112.84	186.01	0.20
0.01	0.763								
S46_6		154.93	0.00	0.00	55.16	46.48	53.35	99.83	0.10
0.00	0.644								
S46_7		154.92	0.00	0.00	55.26	46.48	53.24	99.72	0.14
0.01	0.644								
S48		154.92	145.96	0.00	59.90	90.27	150.77	241.04	0.68
0.03	0.801								
S49_1		154.93	0.00	0.00	55.83	46.49	52.64	99.13	0.41
0.02	0.640								
S49_3		154.92	0.00	0.00	55.64	46.49	52.85	99.33	0.30
0.01	0.641								
S49_4		154.93	241.81	0.00	61.23	119.02	216.57	335.59	0.75
0.03	0.846								
S5_1		154.93	0.00	0.00	55.05	46.47	53.48	99.95	0.06
0.00	0.645								
S5_2		154.93	266.37	0.00	62.17	126.39	232.80	359.19	1.00
0.05	0.853								
S5_3		154.93	9.03	0.00	56.63	49.21	58.17	107.37	0.74
0.03	0.655								
S5_4		154.92	151.80	0.00	59.65	92.19	155.10	247.28	1.63
0.07	0.806								
S5_6		154.93	1580.76	0.00	70.09	520.70	1145.12	1665.81	3.20
0.15	0.960								
S50_2		154.92	318.58	0.00	61.03	142.05	270.50	412.56	0.89
0.04	0.871								
S50_3		154.93	900.61	0.00	63.64	316.66	675.38	992.04	2.04

0.09	0.940								
S50_4		154.93	378.06	0.00	60.47	159.90	312.70	472.60	1.11
0.05	0.887								
S51		154.93	0.00	0.00	55.94	46.49	52.53	99.03	0.48
0.02	0.639								
S52		154.92	246.98	0.00	98.77	0.00	302.26	302.26	7.51
0.35	0.752								
S6		154.92	246.68	0.00	61.71	120.49	219.45	339.94	4.41
0.20	0.846								
S7		154.93	0.00	0.00	86.86	0.00	68.08	68.08	0.95
0.04	0.439								
S9_2		154.92	0.00	0.00	44.62	69.74	40.60	110.34	1.50
0.06	0.712								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J10	JUNCTION	0.26	0.29	663.94	1 14:55	0.29
J11	JUNCTION	0.46	0.84	666.24	1 14:50	0.84
J12	JUNCTION	0.58	1.00	666.24	1 14:50	1.00
J13	JUNCTION	0.71	1.15	666.24	1 14:50	1.15
J14	JUNCTION	2.13	2.58	666.23	1 14:50	2.58
J2	JUNCTION	0.85	0.89	664.89	1 14:52	0.89
J3	JUNCTION	0.29	0.33	664.68	1 14:53	0.33
J4	JUNCTION	0.30	0.34	664.56	1 14:53	0.34
J5	JUNCTION	0.29	0.33	664.38	1 14:54	0.33
J6	JUNCTION	0.29	0.33	664.25	1 14:54	0.33
J7	JUNCTION	0.26	0.29	664.12	1 14:55	0.29
J8	JUNCTION	0.23	0.26	663.82	1 14:55	0.26
J9	JUNCTION	0.17	0.19	662.83	1 14:55	0.19
OF1	OUTFALL	0.12	0.14	661.04	1 14:56	0.14
DRY_POND	STORAGE	0.73	1.04	666.43	1 14:17	1.04
POND	STORAGE	3.78	4.23	666.23	1 14:52	4.23

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J10	JUNCTION	0.000	0.158	1 14:55	0	21.3	0.030
J11	JUNCTION	0.000	0.017	0 10:38	0	1.8	0.328
J12	JUNCTION	0.000	0.017	0 10:37	0	1.79	1.011
J13	JUNCTION	0.000	0.016	0 11:02	0	1.78	0.992
J14	JUNCTION	0.373	0.385	0 09:35	8.57	10.3	0.300
J2	JUNCTION	0.000	0.158	1 14:52	0	21.3	0.039
J3	JUNCTION	0.000	0.158	1 14:52	0	21.3	0.029
J4	JUNCTION	0.000	0.158	1 14:53	0	21.3	0.054
J5	JUNCTION	0.000	0.158	1 14:53	0	21.3	0.034
J6	JUNCTION	0.000	0.158	1 14:54	0	21.3	0.030
J7	JUNCTION	0.000	0.158	1 14:55	0	21.3	0.016
J8	JUNCTION	0.000	0.158	1 14:55	0	21.2	0.007
J9	JUNCTION	0.000	0.158	1 14:55	0	21.2	0.012
OF1	OUTFALL	0.000	0.158	1 14:56	0	21.2	0.000
DRY_POND	STORAGE	0.355	0.355	0 09:20	7.51	7.51	0.008
POND	STORAGE	1.117	1.495	0 10:00	41.6	104	0.044

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J11	JUNCTION	15.90	0.243	2.157
J12	JUNCTION	18.27	0.368	2.443
J13	JUNCTION	33.35	0.516	2.084
J14	JUNCTION	36.01	0.635	1.917

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min		Maximum Outflow CMS
DRY_POND	3.737	6.2	0.0	0.0	5.964	9.9	1	14:17	0.017
POND	71.482	50.0	0.0	0.0	83.873	58.7	1	14:52	0.158

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.84	0.127	0.158	21.242
System	99.84	0.127	0.158	21.242

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min		Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C10	CONDUIT	0.017	0	10:37	0.66	0.05	1.00
C11	CONDUIT	0.016	0	11:02	0.49	0.07	1.00
C12	CONDUIT	0.015	0	11:47	0.41	0.05	1.00
C13	CONDUIT	0.382	0	09:35	0.27	0.06	1.00
C16	CONDUIT	0.158	1	14:56	2.77	0.08	0.19
C2	CONDUIT	0.158	1	14:52	1.23	0.46	0.46
C3	CONDUIT	0.158	1	14:53	1.08	0.66	0.51
C4	CONDUIT	0.158	1	14:53	1.08	0.66	0.51
C5	CONDUIT	0.158	1	14:54	1.12	0.66	0.50
C6	CONDUIT	0.158	1	14:55	1.14	0.66	0.49
C7	CONDUIT	0.158	1	14:55	1.13	0.37	0.35
C8	CONDUIT	0.158	1	14:55	1.22	0.36	0.33
C9	CONDUIT	0.158	1	14:55	1.26	0.66	0.45
C1	ORIFICE	0.158	1	14:52			1.00
C14	ORIFICE	0.017	0	10:38			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C10	1.00	0.15	0.00	0.00	0.80	0.00	0.00	0.04	0.02	0.00
C11	1.00	0.15	0.00	0.00	0.81	0.00	0.00	0.04	0.01	0.00
C12	1.00	0.16	0.00	0.00	0.83	0.00	0.00	0.01	0.01	0.00
C13	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.77	0.00	0.00	0.23	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.81	0.00	0.00	0.19	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.77	0.00	0.00	0.23	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.79	0.00	0.00	0.21	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.89	0.00	0.00	0.11	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

Conduit Surcharge Summary

Conduit	-----		-----		Hours	Hours
	Both Ends	Hours Full Upstream	Dnstream	Above Full Normal Flow	Capacity Limited	

C10	15.90	15.90	18.27	0.01	0.01	
C11	19.17	19.17	33.35	0.01	0.01	
C12	34.39	34.39	36.01	0.01	0.01	
C13	39.90	39.90	47.75	0.01	0.01	

Analysis begun on: Mon Dec 15 12:49:16 2025
Analysis ended on: Mon Dec 15 12:49:18 2025
Total elapsed time: 00:00:02

DRAFT

1978

Element Count

Number of rain gages 9
Number of subcatchments ... 99
Number of nodes 16
Number of links 15
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1937	1937	INTENSITY	15 min.
1978	1978	INTENSITY	5 min.
2004	2004	INTENSITY	5 min.
2012	2012	INTENSITY	5 min.
Edmonton_Chicago_4h_100y	Edmonton_Chicago_4h_100y	INTENSITY	5 min.
Edmonton_Chicago_4h_25y	Edmonton_Chicago_4h_25y	INTENSITY	5 min.
Edmonton_Chicago_4h_2y	Edmonton_Chicago_4h_2y	INTENSITY	5 min.
Edmonton_Chicago_4h_5y	Edmonton_Chicago_4h_5y	INTENSITY	5 min.
Edmonton_Huff_24h_100y	Edmonton_Huff_24h_100y	INTENSITY	15 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1_2	0.13	500.00	30.00	0.6000	1978	S5_6
S1_3	0.10	500.00	30.00	0.6000	1978	S21
S1_4	0.13	500.00	30.00	0.6000	1978	S1_3
S10_1	0.08	500.00	45.00	0.6000	1978	S10_3
S10_2	0.48	500.00	1.00	0.6000	1978	S11_3
S10_3	0.43	500.00	45.00	0.6000	1978	S10_2
S11_2	0.28	500.00	45.00	0.6000	1978	S14
S11_3	0.30	500.00	1.00	0.6000	1978	S12_2
S11_4	0.31	500.00	45.00	0.6000	1978	S14
S12_2	1.39	500.00	50.00	0.6000	1978	S34
S13	2.86	500.00	1.00	0.6000	1978	J14
S14	2.65	500.00	35.00	0.6000	1978	S15
S15	0.90	500.00	0.10	0.6000	1978	S21
S16_1	0.31	500.00	30.00	0.6000	1978	S21
S16_2	0.27	500.00	30.00	0.6000	1978	S1_3
S16_4	0.30	500.00	30.00	0.6000	1978	S16_2
S16_5	0.77	500.00	30.00	0.6000	1978	S16_4
S17	0.54	500.00	45.00	0.6000	1978	S26
S18	0.91	500.00	1.00	0.6000	1978	S26
S19	2.25	500.00	39.00	0.6000	1978	S21
S2_1	0.13	500.00	1.00	0.6000	1978	S2_3
S2_3	0.07	500.00	1.00	0.6000	1978	S3_3
S2_4	0.38	500.00	30.00	0.6000	1978	S2_1
S20	1.61	500.00	50.00	0.6000	1978	S21
S21	5.36	500.00	60.00	0.6000	1978	POND
S22_2	0.48	500.00	30.00	0.6000	1978	S18
S22_3	0.05	500.00	95.00	0.6000	1978	S22_6
S22_4	0.21	500.00	30.00	0.6000	1978	S23_1
S22_5	0.28	500.00	30.00	0.6000	1978	S22_4
S22_6	0.11	500.00	95.00	0.6000	1978	S23_4
S23_1	0.34	500.00	30.00	0.6000	1978	S22_2
S23_3	0.33	500.00	30.00	0.6000	1978	S22_5
S23_4	0.25	500.00	30.00	0.6000	1978	S23_3
S24_1	0.27	500.00	30.00	0.6000	1978	S27_1
S24_2	0.38	500.00	30.00	0.6000	1978	S22_2
S25_1	0.25	500.00	30.00	0.6000	1978	S26
S25_2	0.28	500.00	30.00	0.6000	1978	S27_1
S26	0.37	500.00	1.00	0.6000	1978	S13
S27_1	0.25	500.00	1.00	0.6000	1978	S27_2
S27_2	0.16	500.00	1.00	0.6000	1978	S26
S28	0.39	500.00	45.00	0.6000	1978	S27_1
S29	1.24	500.00	50.00	0.6000	1978	J14
S3_1	0.11	500.00	30.00	0.6000	1978	S3_3
S3_3	0.30	500.00	30.00	0.6000	1978	S5_6
S3_4	0.24	500.00	30.00	0.6000	1978	S3_5
S3_5	0.14	500.00	30.00	0.6000	1978	S3_1

S30	2.22	20.00	1.00	0.6000	1978	S21
S31	0.75	500.00	0.00	0.6000	1978	S21
S32	2.64	20.00	0.01	0.6000	1978	S31
S33_2	3.99	500.00	50.00	0.6000	1978	S32
S34	4.62	500.00	30.00	0.6000	1978	S30
S35	1.83	500.00	20.00	0.6000	1978	S40_5
S36_2	0.20	500.00	95.00	0.6000	1978	S35
S37	0.36	500.00	45.00	0.6000	1978	S35
S38_1	0.25	500.00	30.00	0.6000	1978	S38_2
S38_2	0.23	500.00	30.00	0.6000	1978	S40_3
S39_2	0.51	500.00	30.00	0.6000	1978	S35
S39_3	0.15	500.00	30.00	0.6000	1978	S40_4
S39_4	0.44	500.00	30.00	0.6000	1978	S39_3
S4	0.54	500.00	45.00	0.6000	1978	S15
S40_1	0.69	500.00	30.00	0.6000	1978	S45_5
S40_2	0.13	500.00	30.00	0.6000	1978	S40_4
S40_3	0.16	500.00	30.00	0.6000	1978	S40_2
S40_4	0.11	500.00	30.00	0.6000	1978	S40_5
S40_5	0.45	500.00	30.00	0.6000	1978	S40_7
S40_7	0.06	500.00	95.00	0.6000	1978	S32
S41	1.02	500.00	0.00	0.6000	1978	S44_1
S42	2.00	500.00	45.00	0.6000	1978	S32
S43_1	0.17	500.00	30.00	0.6000	1978	S44_1
S43_2	0.18	500.00	30.00	0.6000	1978	S43_1
S44_1	0.36	500.00	30.00	0.6000	1978	S44_2
S44_2	0.36	500.00	30.00	0.6000	1978	S52
S45_1	0.14	500.00	30.00	0.6000	1978	S44_2
S45_2	0.22	500.00	30.00	0.6000	1978	S45_5
S45_3	0.16	500.00	30.00	0.6000	1978	S45_1
S45_5	0.24	500.00	30.00	0.6000	1978	S44_1
S46_1	0.15	500.00	30.00	0.6000	1978	S45_5
S46_2	0.10	500.00	30.00	0.6000	1978	S46_4
S46_4	0.14	500.00	30.00	0.6000	1978	S49_4
S46_5	0.11	500.00	30.00	0.6000	1978	S45_1
S46_6	0.10	500.00	30.00	0.6000	1978	S46_5
S46_7	0.14	500.00	30.00	0.6000	1978	S46_1
S48	0.28	500.00	30.00	0.6000	1978	S50_2
S49_1	0.42	500.00	30.00	0.6000	1978	S48
S49_3	0.31	500.00	30.00	0.6000	1978	S49_4
S49_4	0.22	500.00	30.00	0.6000	1978	S50_3
S5_1	0.06	500.00	30.00	0.6000	1978	S5_3
S5_2	0.28	500.00	30.00	0.6000	1978	S5_4
S5_3	0.69	500.00	30.00	0.6000	1978	S5_2
S5_4	0.66	500.00	30.00	0.6000	1978	S5_6
S5_6	0.19	500.00	30.00	0.6000	1978	S6
S50_2	0.21	500.00	30.00	0.6000	1978	S50_4
S50_3	0.21	500.00	30.00	0.6000	1978	S52
S50_4	0.23	500.00	30.00	0.6000	1978	S50_3
S51	0.48	500.00	30.00	0.6000	1978	S46_1
S52	2.49	500.00	0.00	0.6000	1978	DRY_POND
S6	1.30	500.00	30.00	0.6000	1978	S16_2
S7	1.40	500.00	0.00	0.6000	1978	S15
S9_2	1.36	500.00	45.00	0.6000	1978	S10_2

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J10	JUNCTION	663.65	5.22	0.0	
J11	JUNCTION	665.39	3.00	0.0	
J12	JUNCTION	665.24	3.44	0.0	
J13	JUNCTION	665.09	3.23	0.0	
J14	JUNCTION	663.65	4.50	0.0	
J2	JUNCTION	664.00	4.47	0.0	
J3	JUNCTION	664.35	3.56	0.0	
J4	JUNCTION	664.22	3.99	0.0	
J5	JUNCTION	664.05	4.45	0.0	
J6	JUNCTION	663.92	4.76	0.0	
J7	JUNCTION	663.83	4.95	0.0	
J8	JUNCTION	663.56	3.83	0.0	
J9	JUNCTION	662.64	4.36	0.0	
OF1	OUTFALL	660.90	0.75	0.0	
DRY_POND	STORAGE	665.39	5.00	0.0	
POND	STORAGE	662.00	6.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope Roughness
------	-----------	---------	------	--------	------------------

C10	J11	J12	CONDUIT	38.0	0.3289	0.0130
C11	J12	J13	CONDUIT	79.1	0.1492	0.0130
C12	J13	J14	CONDUIT	42.8	0.2079	0.0130
C13	J14	POND	CONDUIT	136.0	1.2133	0.0130
C16	J9	OF1	CONDUIT	87.1	2.0554	0.0100
C2	J2	J3	CONDUIT	62.9	0.3086	0.0130
C3	J3	J4	CONDUIT	44.4	0.1508	0.0130
C4	J4	J5	CONDUIT	72.6	0.1502	0.0130
C5	J5	J6	CONDUIT	46.9	0.1493	0.0130
C6	J6	J7	CONDUIT	47.6	0.1493	0.0130
C7	J10	J8	CONDUIT	42.1	0.1497	0.0130
C8	J8	J9	CONDUIT	11.7	0.1541	0.0130
C9	J7	J10	CONDUIT	16.0	0.1503	0.0130
C1	POND	J2	ORIFICE			
C14	DRY_POND	J11	ORIFICE			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C10	CIRCULAR	0.60	0.28	0.15	0.60	1	0.35
C11	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	0.28
C13	CIRCULAR	1.35	1.43	0.34	1.35	1	5.88
C16	CIRCULAR	0.75	0.44	0.19	0.75	1	2.08
C2	CIRCULAR	0.60	0.28	0.15	0.60	1	0.34
C3	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C4	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C7	CIRCULAR	0.75	0.44	0.19	0.75	1	0.43
C8	CIRCULAR	0.75	0.44	0.19	0.75	1	0.44
C9	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
Infiltration Method GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN
Starting Date 07/10/1978 20:00:00
Ending Date 07/11/1978 16:25:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

*****	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	8.833	133.667
Evaporation Loss	0.000	0.000
Infiltration Loss	2.349	35.541
Surface Runoff	5.528	83.656
Final Storage	0.999	15.120
Continuity Error (%)	-0.486	

*****	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	5.520	55.201
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000

External Inflow	0.000	0.000
External Outflow	0.681	6.808
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	5.194	51.941
Final Stored Volume	10.024	100.246
Continuity Error (%)	0.082	

Highest Continuity Errors

Node J13 (3.27%)
Node J12 (3.26%)
Node J11 (1.07%)

Time-Step Critical Elements

Link C8 (99.51%)

Highest Flow Instability Indexes

Link C13 (4)

Most Frequent Nonconverging Nodes

Node J2 (0.01%)
Node OF1 (0.01%)

Routing Time Step Summary

Minimum Time Step : 1.10 sec
Average Time Step : 4.04 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.00
% of Steps Not Converging : 0.01
Time Step Frequencies :
5.000 - 3.155 sec : 99.99 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.01 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

		Total	Total	Total	Total	Imperv	Perv	Total	Total
Peak	Runoff	Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Runoff	Coeff	mm	mm	mm	mm	mm	mm	mm	10^6 ltr
Subcatchment									
CMS									
S1_2		133.67	0.00	0.00	26.23	40.15	68.33	108.48	0.14
0.03	0.812								
S1_3		133.67	6590.87	0.00	36.62	2017.39	4672.11	6689.50	6.42
0.88	0.995								
S1_4		133.67	0.00	0.00	26.22	40.15	68.34	108.49	0.14
0.03	0.812								
S10_1		133.67	0.00	0.00	20.00	60.22	54.60	114.82	0.09
0.02	0.859								
S10_2		133.67	434.68	0.00	48.40	5.68	515.48	521.17	2.50
0.47	0.917								
S10_3		133.67	21.22	0.00	22.09	70.02	63.49	133.50	0.58
0.12	0.862								
S11_2		133.67	0.00	0.00	21.12	60.40	52.93	113.33	0.31
0.07	0.848								

S11_3		133.67	821.75	0.00	48.65	9.55	898.14	907.69	2.76
0.50	0.950								
S11_4		133.67	0.00	0.00	21.22	60.42	52.79	113.21	0.35
0.08	0.847								
S12_2		133.67	198.34	0.00	24.28	166.46	141.70	308.16	4.29
0.59	0.928								
S13		133.67	205.67	0.00	54.21	3.39	276.42	279.81	8.01
0.95	0.825								
S14		133.67	24.91	0.00	30.83	56.02	71.96	127.98	3.39
0.58	0.807								
S15		133.67	573.65	0.00	52.70	0.71	651.65	652.36	5.85
0.90	0.922								
S16_1		133.67	0.00	0.00	27.39	40.22	66.67	106.90	0.34
0.08	0.800								
S16_2		133.67	2188.82	0.00	36.19	696.79	1590.82	2287.61	6.18
0.86	0.985								
S16_4		133.67	265.57	0.00	30.99	119.83	249.37	369.20	1.12
0.22	0.925								
S16_5		133.67	0.00	0.00	29.03	40.38	64.71	105.09	0.80
0.16	0.786								
S17		133.67	0.00	0.00	21.89	60.60	51.91	112.51	0.61
0.13	0.842								
S18		133.67	280.46	0.00	49.74	4.14	359.80	363.94	3.30
0.45	0.879								
S19		133.67	0.00	0.00	27.54	52.78	53.99	106.77	2.40
0.43	0.799								
S2_1		133.67	324.89	0.00	42.30	4.59	413.74	418.32	0.53
0.12	0.912								
S2_3		133.67	770.57	0.00	42.79	9.04	854.35	863.39	0.59
0.13	0.955								
S2_4		133.67	0.00	0.00	27.70	40.25	66.28	106.53	0.41
0.09	0.797								
S20		133.67	0.00	0.00	21.46	67.67	45.43	113.10	1.82
0.35	0.846								
S21		133.67	600.96	0.00	25.03	439.10	258.27	697.37	37.37
3.29	0.949								
S22_2		133.67	432.67	0.00	33.20	169.99	363.74	533.72	2.54
0.38	0.942								
S22_3		133.67	0.00	0.00	1.72	127.17	5.04	132.21	0.06
0.01	0.989								
S22_4		133.67	535.39	0.00	31.67	200.75	437.49	638.25	1.31
0.22	0.954								
S22_5		133.67	294.78	0.00	31.03	128.59	269.55	398.14	1.10
0.20	0.929								
S22_6		133.67	58.13	0.00	1.83	182.53	7.83	190.36	0.21
0.04	0.992								
S23_1		133.67	389.03	0.00	32.04	156.87	334.32	491.19	1.66
0.25	0.940								
S23_3		133.67	141.04	0.00	30.13	82.48	162.72	245.20	0.82
0.16	0.893								
S23_4		133.67	81.92	0.00	29.24	64.73	122.38	187.11	0.47
0.10	0.868								
S24_1		133.67	0.00	0.00	27.18	40.21	66.94	107.15	0.29
0.07	0.802								
S24_2		133.67	0.00	0.00	27.67	40.25	66.31	106.56	0.40
0.09	0.797								
S25_1		133.67	0.00	0.00	27.07	40.20	67.11	107.31	0.27
0.06	0.803								
S25_2		133.67	0.00	0.00	27.21	40.21	66.90	107.11	0.30
0.07	0.801								
S26		133.67	1489.49	0.00	51.54	16.23	1555.95	1572.18	5.89
0.89	0.969								
S27_1		133.67	404.35	0.00	45.05	5.38	490.02	495.40	1.26
0.27	0.921								
S27_2		133.67	787.92	0.00	45.48	9.22	869.11	878.33	1.41
0.29	0.953								
S28		133.67	0.00	0.00	21.48	60.50	52.43	112.93	0.44
0.10	0.845								
S29		133.67	0.00	0.00	20.99	67.64	45.94	113.58	1.41
0.28	0.850								
S3_1		133.67	371.26	0.00	29.39	151.49	325.23	476.72	0.53
0.11	0.944								
S3_3		133.67	376.51	0.00	31.00	153.11	326.82	479.94	1.43
0.26	0.941								
S3_4		133.67	0.00	0.00	27.02	40.20	67.18	107.37	0.26
0.06	0.803								
S3_5		133.67	181.17	0.00	28.64	94.48	192.90	287.38	0.41
0.09	0.913								
S30		133.67	387.67	0.00	67.42	5.22	290.88	296.10	6.58
0.45	0.568								
S31		133.67	1139.86	0.00	60.92	0.00	1190.23	1190.23	8.93
0.59	0.935								
S32		133.67	441.61	0.00	70.47	0.06	326.30	326.36	8.61
0.57	0.567								

S33_2		133.67	0.00	0.00	23.30	67.49	43.26	110.75	4.42
0.76	0.829								
S34		133.67	92.77	0.00	36.83	68.27	118.34	186.61	8.62
1.07	0.824								
S35		133.67	66.56	0.00	38.74	40.23	121.09	161.33	2.95
0.49	0.806								
S36_2		133.67	0.00	0.00	1.75	127.76	5.05	132.81	0.27
0.06	0.994								
S37		133.67	0.00	0.00	21.40	60.47	52.54	113.01	0.41
0.09	0.845								
S38_1		133.67	0.00	0.00	27.06	40.20	67.13	107.32	0.27
0.06	0.803								
S38_2		133.67	116.73	0.00	28.77	75.18	147.30	222.47	0.51
0.11	0.888								
S39_2		133.67	0.00	0.00	28.19	40.30	65.68	105.98	0.54
0.12	0.793								
S39_3		133.67	307.34	0.00	29.69	132.33	280.43	412.77	0.63
0.14	0.936								
S39_4		133.67	0.00	0.00	27.95	40.28	65.98	106.25	0.47
0.10	0.795								
S4		133.67	0.00	0.00	21.89	60.59	51.92	112.51	0.61
0.13	0.842								
S40_1		133.67	0.00	0.00	28.81	40.36	64.96	105.32	0.73
0.15	0.788								
S40_2		133.67	523.70	0.00	30.39	197.23	430.77	628.00	0.82
0.15	0.955								
S40_3		133.67	308.21	0.00	29.72	132.60	280.58	413.17	0.68
0.14	0.935								
S40_4		133.67	1333.04	0.00	31.64	440.03	996.74	1436.76	1.56
0.29	0.980								
S40_5		133.67	996.77	0.00	35.15	339.19	756.64	1095.83	4.96
0.80	0.969								
S40_7		133.67	7902.00	0.00	2.49	7633.99	399.31	8033.30	5.04
0.80	1.000								
S41		133.67	0.00	0.00	43.85	0.00	89.87	89.87	0.92
0.17	0.672								
S42		133.67	0.00	0.00	24.29	60.90	49.25	110.15	2.21
0.41	0.824								
S43_1		133.67	117.17	0.00	28.29	75.29	148.25	223.55	0.37
0.08	0.891								
S43_2		133.67	0.00	0.00	26.64	40.17	67.73	107.90	0.20
0.05	0.807								
S44_1		133.67	931.60	0.00	33.58	319.63	713.45	1033.08	3.69
0.68	0.970								
S44_2		133.67	1168.87	0.00	34.26	390.81	878.63	1269.44	4.60
0.80	0.975								
S45_1		133.67	281.53	0.00	29.07	124.59	262.92	387.51	0.54
0.12	0.933								
S45_2		133.67	0.00	0.00	26.91	40.19	67.33	107.52	0.24
0.06	0.804								
S45_3		133.67	0.00	0.00	26.45	40.16	67.98	108.14	0.17
0.04	0.809								
S45_5		133.67	732.58	0.00	32.18	259.91	576.15	836.06	2.04
0.42	0.965								
S46_1		133.67	431.85	0.00	30.13	169.68	367.68	537.37	0.82
0.18	0.950								
S46_2		133.67	0.00	0.00	25.86	40.13	68.84	108.98	0.10
0.03	0.815								
S46_4		133.67	73.33	0.00	27.59	62.14	118.28	180.42	0.26
0.06	0.872								
S46_5		133.67	97.01	0.00	27.53	69.23	135.09	204.32	0.22
0.05	0.886								
S46_6		133.67	0.00	0.00	25.88	40.14	68.81	108.94	0.11
0.03	0.815								
S46_7		133.67	0.00	0.00	26.28	40.15	68.25	108.40	0.15
0.04	0.811								
S48		133.67	156.44	0.00	29.65	87.10	174.16	261.26	0.74
0.16	0.901								
S49_1		133.67	0.00	0.00	27.84	40.27	66.10	106.37	0.44
0.10	0.796								
S49_3		133.67	0.00	0.00	27.34	40.22	66.73	106.96	0.33
0.07	0.800								
S49_4		133.67	262.07	0.00	29.81	118.77	248.34	367.11	0.82
0.17	0.928								
S5_1		133.67	0.00	0.00	25.44	40.12	69.51	109.63	0.07
0.02	0.820								
S5_2		133.67	284.80	0.00	30.89	125.60	262.96	388.56	1.08
0.21	0.929								
S5_3		133.67	9.90	0.00	29.11	43.31	71.60	114.91	0.79
0.16	0.800								
S5_4		133.67	164.16	0.00	31.75	89.48	177.00	266.48	1.75
0.30	0.895								
S5_6		133.67	1726.76	0.00	33.56	558.16	1270.86	1829.02	3.52
0.58	0.983								

S50_2		133.67	345.15	0.00	30.56	143.69	305.49	449.18	0.96
0.19	0.938								
S50_3		133.67	982.37	0.00	32.42	334.85	750.14	1084.99	2.23
0.39	0.972								
S50_4		133.67	411.51	0.00	31.19	163.60	351.15	514.74	1.21
0.21	0.944								
S51		133.67	0.00	0.00	28.10	40.29	65.80	106.09	0.51
0.11	0.794								
S52		133.67	274.62	0.00	58.98	0.00	341.34	341.34	8.49
1.17	0.836								
S6		133.67	270.83	0.00	34.90	121.53	247.99	369.52	4.80
0.65	0.914								
S7		133.67	0.00	0.00	47.96	0.00	82.79	82.79	1.16
0.16	0.619								
S9_2		133.67	0.00	0.00	23.45	60.87	50.14	111.02	1.50
0.29	0.831								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J10	JUNCTION	0.23	0.30	663.95	0 20:25	0.30
J11	JUNCTION	0.27	1.11	666.50	0 20:25	1.11
J12	JUNCTION	0.33	1.27	666.50	0 20:25	1.27
J13	JUNCTION	0.37	1.42	666.50	0 20:25	1.42
J14	JUNCTION	1.76	2.86	666.51	0 20:25	2.86
J2	JUNCTION	0.82	0.90	664.90	0 20:25	0.90
J3	JUNCTION	0.25	0.35	664.69	0 20:25	0.35
J4	JUNCTION	0.26	0.36	664.58	0 20:25	0.36
J5	JUNCTION	0.25	0.35	664.40	0 20:25	0.35
J6	JUNCTION	0.25	0.34	664.27	0 20:25	0.34
J7	JUNCTION	0.22	0.30	664.13	0 20:25	0.30
J8	JUNCTION	0.20	0.27	663.83	0 20:25	0.27
J9	JUNCTION	0.16	0.20	662.84	0 20:25	0.20
OF1	OUTFALL	0.11	0.15	661.05	0 20:25	0.15
DRY_POND	STORAGE	0.45	1.23	666.62	0 20:25	1.23
POND	STORAGE	3.41	4.50	666.50	0 20:25	4.50

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J10	JUNCTION	0.000	0.172	0 20:25	0	6.82	0.099
J11	JUNCTION	0.000	0.016	0 15:32	0	0.561	1.087
J12	JUNCTION	0.000	0.019	0 15:34	0	0.555	3.374
J13	JUNCTION	0.000	0.019	0 15:27	0	0.538	3.385
J14	JUNCTION	1.066	1.074	0 16:00	9.42	9.95	0.316
J2	JUNCTION	0.000	0.172	0 20:25	0	6.86	0.127
J3	JUNCTION	0.000	0.172	0 20:25	0	6.86	0.096
J4	JUNCTION	0.000	0.172	0 20:25	0	6.85	0.178
J5	JUNCTION	0.000	0.172	0 20:25	0	6.84	0.115
J6	JUNCTION	0.000	0.172	0 20:25	0	6.83	0.100
J7	JUNCTION	0.000	0.172	0 20:25	0	6.82	0.056
J8	JUNCTION	0.000	0.172	0 20:25	0	6.81	0.024
J9	JUNCTION	0.000	0.172	0 20:25	0	6.81	0.039
OF1	OUTFALL	0.000	0.172	0 20:25	0	6.81	0.000
DRY_POND	STORAGE	1.166	1.166	0 16:00	8.48	8.48	0.010
POND	STORAGE	3.290	4.319	0 15:45	37.3	99	0.059

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J11	JUNCTION	3.91	0.513	1.887

J12	JUNCTION	4.22	0.638	2.173
J13	JUNCTION	4.49	0.786	1.814
J14	JUNCTION	4.69	0.905	1.647

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
DRY_POND	2.332	3.9	0.0	0.0	7.923	13.1	0 20:25	0.016
POND	62.313	43.6	0.0	0.0	92.037	64.4	0 20:25	0.172

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.59	0.097	0.172	6.808
System	99.59	0.097	0.172	6.808

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C10	CONDUIT	0.019	0 15:34	0.65	0.05	1.00
C11	CONDUIT	0.019	0 15:27	0.48	0.08	1.00
C12	CONDUIT	0.020	0 15:26	0.34	0.07	1.00
C13	CONDUIT	1.074	0 16:00	0.75	0.18	1.00
C16	CONDUIT	0.172	0 20:25	2.84	0.08	0.19
C2	CONDUIT	0.172	0 20:25	1.24	0.50	0.49
C3	CONDUIT	0.172	0 20:25	1.10	0.72	0.54
C4	CONDUIT	0.172	0 20:25	1.10	0.72	0.54
C5	CONDUIT	0.172	0 20:25	1.14	0.72	0.53
C6	CONDUIT	0.172	0 20:25	1.17	0.72	0.52
C7	CONDUIT	0.172	0 20:25	1.17	0.40	0.37
C8	CONDUIT	0.172	0 20:25	1.26	0.39	0.35
C9	CONDUIT	0.172	0 20:25	1.30	0.72	0.47
C1	ORIFICE	0.172	0 20:25			1.00
C14	ORIFICE	0.016	0 15:32			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C10	1.00	0.13	0.00	0.00	0.63	0.00	0.00	0.23	0.02	0.00
C11	1.00	0.14	0.00	0.00	0.31	0.00	0.00	0.55	0.03	0.00
C12	1.00	0.13	0.01	0.00	0.78	0.00	0.00	0.08	0.42	0.00
C13	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.40	0.00	0.00	0.60	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.23	0.00	0.00	0.77	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.25	0.00	0.00	0.75	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00

C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C9	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

Conduit Surcharge Summary

Conduit	Hours Full			Hours	
	Both Ends	Upstream	Dnstream	Above Full Normal Flow	Capacity Limited
C10	3.91	3.91	4.22	0.01	0.01
C11	4.26	4.26	4.49	0.01	0.01
C12	4.55	4.55	4.69	0.01	0.01
C13	17.55	17.55	20.42	0.01	0.01

Analysis begun on: Mon Dec 15 12:52:22 2025
Analysis ended on: Mon Dec 15 12:52:23 2025
Total elapsed time: 00:00:01

DRAFT

2004

Element Count

Number of rain gages 9
Number of subcatchments ... 99
Number of nodes 16
Number of links 15
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
1937	1937	INTENSITY	15 min.
1978	1978	INTENSITY	5 min.
2004	2004	INTENSITY	5 min.
2012	2012	INTENSITY	5 min.
Edmonton_Chicago_4h_100y	Edmonton_Chicago_4h_100y	INTENSITY	5 min.
Edmonton_Chicago_4h_25y	Edmonton_Chicago_4h_25y	INTENSITY	5 min.
Edmonton_Chicago_4h_2y	Edmonton_Chicago_4h_2y	INTENSITY	5 min.
Edmonton_Chicago_4h_5y	Edmonton_Chicago_4h_5y	INTENSITY	5 min.
Edmonton_Huff_24h_100y	Edmonton_Huff_24h_100y	INTENSITY	15 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
S1_2	0.13	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_6
S1_3	0.10	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S21
S1_4	0.13	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S1_3
S10_1	0.08	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S10_3
S10_2	0.48	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S11_3
S10_3	0.43	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S10_2
S11_2	0.28	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S14
S11_3	0.30	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S12_2
S11_4	0.31	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S14
S12_2	1.39	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	S34
S13	2.86	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	J14
S14	2.65	500.00	35.00	0.6000	Edmonton_Huff_24h_100y	S15
S15	0.90	500.00	0.10	0.6000	Edmonton_Huff_24h_100y	S21
S16_1	0.31	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S21
S16_2	0.27	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S1_3
S16_4	0.30	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S16_2
S16_5	0.77	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S16_4
S17	0.54	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S26
S18	0.91	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S26
S19	2.25	500.00	39.00	0.6000	Edmonton_Huff_24h_100y	S21
S2_1	0.13	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S2_3
S2_3	0.07	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S3_3
S2_4	0.38	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S2_1
S20	1.61	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	S21
S21	5.36	500.00	60.00	0.6000	Edmonton_Huff_24h_100y	POND
S22_2	0.48	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S18
S22_3	0.05	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S22_6
S22_4	0.21	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S23_1
S22_5	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_4
S22_6	0.11	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S23_4
S23_1	0.34	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_2
S23_3	0.33	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_5
S23_4	0.25	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S23_3
S24_1	0.27	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S27_1
S24_2	0.38	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S22_2
S25_1	0.25	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S26
S25_2	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S27_1
S26	0.37	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S13
S27_1	0.25	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S27_2
S27_2	0.16	500.00	1.00	0.6000	Edmonton_Huff_24h_100y	S26
S28	0.39	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S27_1
S29	1.24	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	J14
S3_1	0.11	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S3_3
S3_3	0.30	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_6
S3_4	0.24	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S3_5
S3_5	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S3_1

S30	2.22	20.00	1.00	0.6000	Edmonton_Huff_24h_100y	S21
S31	0.75	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	S21
S32	2.64	20.00	0.01	0.6000	Edmonton_Huff_24h_100y	S31
S33_2	3.99	500.00	50.00	0.6000	Edmonton_Huff_24h_100y	S32
S34	4.62	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S30
S35	1.83	500.00	20.00	0.6000	Edmonton_Huff_24h_100y	S40_5
S36_2	0.20	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S35
S37	0.36	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S35
S38_1	0.25	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S38_2
S38_2	0.23	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_3
S39_2	0.51	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S35
S39_3	0.15	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_4
S39_4	0.44	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S39_3
S4	0.54	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S15
S40_1	0.69	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_5
S40_2	0.13	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_4
S40_3	0.16	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_2
S40_4	0.11	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_5
S40_5	0.45	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S40_7
S40_7	0.06	500.00	95.00	0.6000	Edmonton_Huff_24h_100y	S32
S41	1.02	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	S44_1
S42	2.00	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S32
S43_1	0.17	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_1
S43_2	0.18	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S43_1
S44_1	0.36	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_2
S44_2	0.36	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S52
S45_1	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_2
S45_2	0.22	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_5
S45_3	0.16	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_1
S45_5	0.24	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S44_1
S46_1	0.15	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_5
S46_2	0.10	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_4
S46_4	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S49_4
S46_5	0.11	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S45_1
S46_6	0.10	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_5
S46_7	0.14	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_1
S48	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_2
S49_1	0.42	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S48
S49_3	0.31	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S49_4
S49_4	0.22	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_3
S5_1	0.06	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_3
S5_2	0.28	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_4
S5_3	0.69	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_2
S5_4	0.66	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S5_6
S5_6	0.19	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S6
S50_2	0.21	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_4
S50_3	0.21	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S52
S50_4	0.23	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S50_3
S51	0.48	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S46_1
S52	2.49	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	DRY_POND
S6	1.30	500.00	30.00	0.6000	Edmonton_Huff_24h_100y	S16_2
S7	1.40	500.00	0.00	0.6000	Edmonton_Huff_24h_100y	S15
S9_2	1.36	500.00	45.00	0.6000	Edmonton_Huff_24h_100y	S10_2

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J10	JUNCTION	663.65	5.22	0.0	
J11	JUNCTION	665.39	3.00	0.0	
J12	JUNCTION	665.24	3.44	0.0	
J13	JUNCTION	665.09	3.23	0.0	
J14	JUNCTION	663.65	4.50	0.0	
J2	JUNCTION	664.00	4.47	0.0	
J3	JUNCTION	664.35	3.56	0.0	
J4	JUNCTION	664.22	3.99	0.0	
J5	JUNCTION	664.05	4.45	0.0	
J6	JUNCTION	663.92	4.76	0.0	
J7	JUNCTION	663.83	4.95	0.0	
J8	JUNCTION	663.56	3.83	0.0	
J9	JUNCTION	662.64	4.36	0.0	
OF1	OUTFALL	660.90	0.75	0.0	
DRY_POND	STORAGE	665.39	5.00	0.0	
POND	STORAGE	662.00	6.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope Roughness
------	-----------	---------	------	--------	------------------

C10	J11	J12	CONDUIT	38.0	0.3289	0.0130
C11	J12	J13	CONDUIT	79.1	0.1492	0.0130
C12	J13	J14	CONDUIT	42.8	0.2079	0.0130
C13	J14	POND	CONDUIT	136.0	1.2133	0.0130
C16	J9	OF1	CONDUIT	87.1	2.0554	0.0100
C2	J2	J3	CONDUIT	62.9	0.3086	0.0130
C3	J3	J4	CONDUIT	44.4	0.1508	0.0130
C4	J4	J5	CONDUIT	72.6	0.1502	0.0130
C5	J5	J6	CONDUIT	46.9	0.1493	0.0130
C6	J6	J7	CONDUIT	47.6	0.1493	0.0130
C7	J10	J8	CONDUIT	42.1	0.1497	0.0130
C8	J8	J9	CONDUIT	11.7	0.1541	0.0130
C9	J7	J10	CONDUIT	16.0	0.1503	0.0130
C1	POND	J2	ORIFICE			
C14	DRY_POND	J11	ORIFICE			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C10	CIRCULAR	0.60	0.28	0.15	0.60	1	0.35
C11	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C12	CIRCULAR	0.60	0.28	0.15	0.60	1	0.28
C13	CIRCULAR	1.35	1.43	0.34	1.35	1	5.88
C16	CIRCULAR	0.75	0.44	0.19	0.75	1	2.08
C2	CIRCULAR	0.60	0.28	0.15	0.60	1	0.34
C3	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C4	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C5	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C6	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24
C7	CIRCULAR	0.75	0.44	0.19	0.75	1	0.43
C8	CIRCULAR	0.75	0.44	0.19	0.75	1	0.44
C9	CIRCULAR	0.60	0.28	0.15	0.60	1	0.24

Analysis Options

Flow Units CMS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed YES
 Water Quality NO
Infiltration Method GREEN_AMPT
Flow Routing Method DYNWAVE
Surcharge Method EXTRAN
Starting Date 07/12/2012 00:00:00
Ending Date 07/13/2012 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00
Routing Time Step 5.00 sec
Variable Time Step YES
Maximum Trials 8
Number of Threads 1
Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm
*****	-----	-----
Total Precipitation	8.410	127.273
Evaporation Loss	0.000	0.000
Infiltration Loss	3.142	47.545
Surface Runoff	4.988	75.484
Final Storage	0.281	4.252
Continuity Error (%)	-0.007	

	Volume	Volume
Flow Routing Continuity	hectare-m	10^6 ltr
*****	-----	-----
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	4.987	49.871
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000

External Inflow	0.000	0.000
External Outflow	1.160	11.598
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	5.194	51.941
Final Stored Volume	9.014	90.137
Continuity Error (%)	0.076	

Highest Continuity Errors

Node J13 (2.16%)
Node J12 (2.16%)

Time-Step Critical Elements

Link C8 (99.62%)

Highest Flow Instability Indexes

All links are stable.

Most Frequent Nonconverging Nodes

Convergence obtained at all time steps.

Routing Time Step Summary

Minimum Time Step : 2.16 sec
Average Time Step : 3.61 sec
Maximum Time Step : 5.00 sec
% of Time in Steady State : 0.00
Average Iterations per Step : 2.00
% of Steps Not Converging : 0.00
Time Step Frequencies :
5.000 - 3.155 sec : 100.00 %
3.155 - 1.991 sec : 0.00 %
1.991 - 1.256 sec : 0.00 %
1.256 - 0.792 sec : 0.00 %
0.792 - 0.500 sec : 0.00 %

Subcatchment Runoff Summary

Peak Runoff		Total	Total	Total	Total	Imperv	Perv	Total	Total
Runoff Coeff		Precip	Runon	Evap	Infil	Runoff	Runoff	Runoff	Runoff
Subcatchment CMS		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
S1_2		127.27	0.00	0.00	43.09	38.17	46.02	84.19	0.11
0.01	0.661								
S1_3		127.27	5192.01	0.00	49.34	1595.81	3673.90	5269.70	5.05
0.26	0.991								
S1_4		127.27	0.00	0.00	43.09	38.17	46.02	84.19	0.11
0.01	0.661								
S10_1		127.27	0.00	0.00	33.81	57.26	36.20	93.46	0.08
0.00	0.734								
S10_2		127.27	362.36	0.00	69.22	4.90	414.95	419.85	2.01
0.10	0.857								
S10_3		127.27	17.30	0.00	34.81	65.02	44.71	109.74	0.48
0.02	0.759								
S11_2		127.27	0.00	0.00	33.91	57.25	36.10	93.35	0.26
0.01	0.733								
S11_3		127.27	661.99	0.00	67.86	7.89	713.53	721.43	2.19
0.11	0.914								

S11_4		127.27	0.00	0.00	33.92	57.25	36.09	93.34	0.29
0.01	0.733								
S12_2		127.27	157.65	0.00	33.06	142.39	109.41	251.80	3.50
0.17	0.884								
S13		127.27	159.74	0.00	66.68	2.87	217.48	220.35	6.31
0.32	0.768								
S14		127.27	20.56	0.00	42.15	51.68	53.94	105.62	2.80
0.13	0.714								
S15		127.27	465.53	0.00	70.20	0.59	521.29	521.88	4.68
0.23	0.880								
S16_1		127.27	0.00	0.00	43.22	38.17	45.88	84.05	0.26
0.01	0.660								
S16_2		127.27	1724.75	0.00	49.22	555.61	1246.95	1802.56	4.87
0.25	0.973								
S16_4		127.27	211.89	0.00	47.83	101.73	189.60	291.34	0.88
0.05	0.859								
S16_5		127.27	0.00	0.00	43.47	38.16	45.63	83.79	0.64
0.03	0.658								
S17		127.27	0.00	0.00	34.01	57.24	36.00	93.23	0.50
0.02	0.733								
S18		127.27	222.61	0.00	66.46	3.50	279.95	283.45	2.57
0.14	0.810								
S19		127.27	0.00	0.00	38.34	49.57	39.30	88.87	2.00
0.09	0.698								
S2_1		127.27	256.44	0.00	67.93	3.84	311.98	315.82	0.40
0.02	0.823								
S2_3		127.27	581.77	0.00	65.13	7.09	636.92	644.01	0.44
0.02	0.908								
S2_4		127.27	0.00	0.00	43.26	38.17	45.84	84.01	0.32
0.02	0.660								
S20		127.27	0.00	0.00	31.18	63.56	32.46	96.01	1.54
0.07	0.754								
S21		127.27	573.48	0.00	28.41	419.19	248.02	667.21	35.75
1.10	0.952								
S22_2		127.27	343.83	0.00	47.56	141.31	282.25	423.56	2.02
0.10	0.899								
S22_3		127.27	0.00	0.00	3.07	120.88	3.30	124.18	0.06
0.00	0.976								
S22_4		127.27	429.51	0.00	47.52	167.03	342.27	509.30	1.05
0.05	0.915								
S22_5		127.27	239.24	0.00	47.20	109.94	209.39	319.33	0.88
0.05	0.871								
S22_6		127.27	54.74	0.00	3.32	172.86	5.78	178.63	0.19
0.01	0.981								
S23_1		127.27	310.48	0.00	46.85	131.31	259.61	390.92	1.32
0.07	0.893								
S23_3		127.27	118.39	0.00	46.74	73.68	125.24	198.92	0.66
0.03	0.810								
S23_4		127.27	76.99	0.00	47.29	61.27	95.72	156.98	0.39
0.02	0.769								
S24_1		127.27	0.00	0.00	43.19	38.17	45.91	84.08	0.23
0.01	0.661								
S24_2		127.27	0.00	0.00	43.26	38.17	45.84	84.01	0.32
0.02	0.660								
S25_1		127.27	0.00	0.00	43.17	38.17	45.93	84.10	0.21
0.01	0.661								
S25_2		127.27	0.00	0.00	43.19	38.17	45.91	84.08	0.24
0.01	0.661								
S26		127.27	1162.78	0.00	69.15	12.90	1208.12	1221.02	4.58
0.24	0.946								
S27_1		127.27	324.79	0.00	68.86	4.52	378.63	383.15	0.98
0.05	0.848								
S27_2		127.27	609.41	0.00	66.62	7.37	662.79	670.15	1.07
0.06	0.910								
S28		127.27	0.00	0.00	33.95	57.24	36.06	93.30	0.36
0.02	0.733								
S29		127.27	0.00	0.00	31.09	63.57	32.55	96.11	1.20
0.06	0.755								
S3_1		127.27	287.30	0.00	47.26	124.37	242.97	367.34	0.41
0.02	0.886								
S3_3		127.27	285.25	0.00	46.29	123.74	242.52	366.26	1.09
0.06	0.888								
S3_4		127.27	0.00	0.00	43.17	38.17	45.93	84.10	0.20
0.01	0.661								
S3_5		127.27	142.04	0.00	47.01	80.79	141.53	222.32	0.32
0.02	0.825								
S30		127.27	323.98	0.00	78.10	4.51	326.63	331.15	7.36
0.21	0.734								
S31		127.27	1262.12	0.00	69.64	0.00	1312.61	1312.61	9.84
0.27	0.945								
S32		127.27	366.32	0.00	80.79	0.05	358.92	358.97	9.47
0.26	0.727								
S33_2		127.27	0.00	0.00	31.67	63.49	31.97	95.46	3.81
0.17	0.750								

S34		127.27	75.83	0.00	47.18	60.86	95.00	155.86	7.20
0.33	0.767								
S35		127.27	55.63	0.00	53.52	36.56	92.81	129.37	2.36
0.12	0.707								
S36_2		127.27	0.00	0.00	3.07	120.84	3.30	124.14	0.25
0.01	0.975								
S37		127.27	0.00	0.00	33.94	57.24	36.07	93.31	0.34
0.02	0.733								
S38_1		127.27	0.00	0.00	43.17	38.17	45.93	84.10	0.21
0.01	0.661								
S38_2		127.27	91.56	0.00	46.35	65.64	106.85	172.49	0.39
0.02	0.788								
S39_2		127.27	0.00	0.00	43.33	38.16	45.77	83.93	0.43
0.02	0.659								
S39_3		127.27	243.11	0.00	47.92	111.11	211.38	322.48	0.50
0.03	0.871								
S39_4		127.27	0.00	0.00	43.30	38.16	45.80	83.97	0.37
0.02	0.660								
S4		127.27	0.00	0.00	34.01	57.24	36.00	93.24	0.50
0.02	0.733								
S40_1		127.27	0.00	0.00	43.43	38.16	45.67	83.83	0.58
0.03	0.659								
S40_2		127.27	404.62	0.00	47.35	159.56	325.02	484.58	0.63
0.03	0.911								
S40_3		127.27	239.06	0.00	47.20	109.89	209.26	319.15	0.53
0.03	0.871								
S40_4		127.27	1034.41	0.00	48.62	348.51	764.63	1113.13	1.21
0.06	0.958								
S40_5		127.27	790.11	0.00	48.90	275.20	593.25	868.45	3.93
0.20	0.947								
S40_7		127.27	6263.08	0.00	3.49	6070.99	316.03	6387.03	4.00
0.20	0.999								
S41		127.27	0.00	0.00	62.56	0.00	64.72	64.72	0.66
0.04	0.509								
S42		127.27	0.00	0.00	34.45	57.19	35.56	92.75	1.86
0.09	0.729								
S43_1		127.27	91.47	0.00	46.30	65.61	106.83	172.44	0.29
0.02	0.788								
S43_2		127.27	0.00	0.00	43.13	38.17	45.98	84.15	0.15
0.01	0.661								
S44_1		127.27	712.63	0.00	48.44	251.95	539.55	791.51	2.83
0.15	0.942								
S44_2		127.27	895.72	0.00	48.46	306.88	667.70	974.58	3.53
0.19	0.953								
S45_1		127.27	217.23	0.00	47.40	103.34	193.78	297.13	0.42
0.02	0.862								
S45_2		127.27	0.00	0.00	43.16	38.17	45.95	84.12	0.19
0.01	0.661								
S45_3		127.27	0.00	0.00	43.11	38.17	45.99	84.17	0.13
0.01	0.661								
S45_5		127.27	576.90	0.00	48.76	211.25	444.09	655.33	1.60
0.08	0.931								
S46_1		127.27	340.61	0.00	48.42	140.35	279.12	419.48	0.64
0.03	0.897								
S46_2		127.27	0.00	0.00	43.06	38.18	46.04	84.22	0.08
0.00	0.662								
S46_4		127.27	56.73	0.00	45.48	55.19	83.34	138.53	0.20
0.01	0.753								
S46_5		127.27	75.07	0.00	45.93	60.70	95.73	156.42	0.17
0.01	0.773								
S46_6		127.27	0.00	0.00	43.06	38.18	46.04	84.22	0.08
0.00	0.662								
S46_7		127.27	0.00	0.00	43.09	38.17	46.01	84.18	0.11
0.01	0.661								
S48		127.27	123.63	0.00	46.89	75.26	128.76	204.02	0.58
0.03	0.813								
S49_1		127.27	0.00	0.00	43.28	38.17	45.82	83.98	0.35
0.02	0.660								
S49_3		127.27	0.00	0.00	43.21	38.17	45.89	84.06	0.26
0.01	0.660								
S49_4		127.27	204.04	0.00	47.49	99.38	184.45	283.83	0.63
0.03	0.857								
S5_1		127.27	0.00	0.00	43.03	38.18	46.08	84.25	0.05
0.00	0.662								
S5_2		127.27	226.03	0.00	47.83	105.97	199.50	305.48	0.85
0.04	0.865								
S5_3		127.27	7.61	0.00	43.75	40.44	50.68	91.13	0.63
0.03	0.676								
S5_4		127.27	129.09	0.00	46.26	76.89	133.21	210.10	1.38
0.07	0.820								
S5_6		127.27	1342.15	0.00	48.99	440.83	979.48	1420.31	2.73
0.14	0.967								
S50_2		127.27	269.62	0.00	47.34	119.05	230.51	349.56	0.75
0.04	0.881								

S50_3		127.27	762.61	0.00	48.38	266.96	574.60	841.57	1.73
0.09	0.946								
S50_4		127.27	320.31	0.00	47.05	134.26	266.29	400.55	0.94
0.05	0.895								
S51		127.27	0.00	0.00	43.32	38.16	45.78	83.94	0.41
0.02	0.660								
S52		127.27	211.56	0.00	69.91	0.00	266.37	266.37	6.62
0.35	0.786								
S6		127.27	210.31	0.00	46.64	101.31	189.69	291.01	3.78
0.20	0.862								
S7		127.27	0.00	0.00	64.32	0.00	62.96	62.96	0.88
0.04	0.495								
S9_2		127.27	0.00	0.00	34.27	57.21	35.74	92.95	1.26
0.06	0.730								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J10	JUNCTION	0.27	0.29	663.94	0 18:27	0.29
J11	JUNCTION	0.62	0.88	666.28	0 18:25	0.88
J12	JUNCTION	0.75	1.04	666.28	0 18:25	1.04
J13	JUNCTION	0.87	1.19	666.27	0 18:25	1.19
J14	JUNCTION	2.30	2.62	666.27	0 18:25	2.62
J2	JUNCTION	0.86	0.89	664.89	0 18:25	0.89
J3	JUNCTION	0.30	0.33	664.68	0 18:25	0.33
J4	JUNCTION	0.32	0.35	664.56	0 18:26	0.35
J5	JUNCTION	0.30	0.33	664.38	0 18:26	0.33
J6	JUNCTION	0.30	0.33	664.25	0 18:27	0.33
J7	JUNCTION	0.27	0.29	664.12	0 18:27	0.29
J8	JUNCTION	0.24	0.26	663.82	0 18:28	0.26
J9	JUNCTION	0.18	0.19	662.83	0 18:28	0.19
OF1	OUTFALL	0.13	0.14	661.04	0 18:28	0.14
DRY_POND	STORAGE	0.84	1.04	666.43	0 16:25	1.04
POND	STORAGE	3.95	4.27	666.27	0 18:24	4.27

Node Inflow Summary

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J10	JUNCTION	0.000	0.160	0 18:27	0	11.6	0.055
J11	JUNCTION	0.000	0.017	0 05:15	0	0.834	0.716
J12	JUNCTION	0.000	0.017	0 05:14	0	0.828	2.211
J13	JUNCTION	0.000	0.015	0 05:14	0	0.81	2.213
J14	JUNCTION	0.373	0.385	0 04:28	7.51	8.3	0.376
J2	JUNCTION	0.000	0.160	0 18:24	0	11.7	0.072
J3	JUNCTION	0.000	0.160	0 18:25	0	11.6	0.054
J4	JUNCTION	0.000	0.160	0 18:25	0	11.6	0.100
J5	JUNCTION	0.000	0.160	0 18:26	0	11.6	0.063
J6	JUNCTION	0.000	0.160	0 18:26	0	11.6	0.055
J7	JUNCTION	0.000	0.160	0 18:27	0	11.6	0.030
J8	JUNCTION	0.000	0.160	0 18:28	0	11.6	0.014
J9	JUNCTION	0.000	0.160	0 18:28	0	11.6	0.022
OF1	OUTFALL	0.000	0.160	0 18:28	0	11.6	0.000
DRY_POND	STORAGE	0.349	0.349	0 04:15	6.62	6.62	0.010
POND	STORAGE	1.102	1.473	0 04:45	35.7	95.8	0.050

Node Surge Summary

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Meters	Min. Depth Below Rim Meters
J11	JUNCTION	15.07	0.283	2.117
J12	JUNCTION	16.29	0.408	2.403
J13	JUNCTION	17.36	0.556	2.044

J14 JUNCTION 18.08 0.675 1.877

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m³	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m³	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CMS
DRY_POND	4.587	7.6	0.0	0.0	5.950	9.8	0 16:25	0.017
POND	76.251	53.4	0.0	0.0	85.055	59.5	0 18:24	0.160

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow CMS	Max Flow CMS	Total Volume 10^6 ltr
OF1	99.69	0.138	0.160	11.598
System	99.69	0.138	0.160	11.598

Link Flow Summary

Link	Type	Maximum Flow CMS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C10	CONDUIT	0.017	0 05:14	0.65	0.05	1.00
C11	CONDUIT	0.015	0 05:14	0.47	0.06	1.00
C12	CONDUIT	0.014	0 07:44	0.28	0.05	1.00
C13	CONDUIT	0.382	0 04:28	0.27	0.06	1.00
C16	CONDUIT	0.160	0 18:28	2.78	0.08	0.19
C2	CONDUIT	0.160	0 18:25	1.23	0.47	0.47
C3	CONDUIT	0.160	0 18:25	1.09	0.67	0.52
C4	CONDUIT	0.160	0 18:26	1.09	0.67	0.52
C5	CONDUIT	0.160	0 18:26	1.12	0.67	0.50
C6	CONDUIT	0.160	0 18:27	1.14	0.67	0.50
C7	CONDUIT	0.160	0 18:28	1.14	0.37	0.35
C8	CONDUIT	0.160	0 18:28	1.23	0.37	0.34
C9	CONDUIT	0.160	0 18:27	1.27	0.67	0.46
C1	ORIFICE	0.160	0 18:24			1.00
C14	ORIFICE	0.017	0 05:15			1.00

Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C10	1.00	0.09	0.00	0.00	0.82	0.00	0.00	0.09	0.03	0.00
C11	1.00	0.09	0.00	0.00	0.85	0.00	0.00	0.06	0.02	0.00
C12	1.00	0.08	0.01	0.00	0.90	0.00	0.00	0.00	0.05	0.00
C13	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
C16	1.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00
C2	1.00	0.00	0.00	0.00	0.76	0.00	0.00	0.24	0.00	0.00
C3	1.00	0.00	0.00	0.00	0.85	0.00	0.00	0.15	0.00	0.00
C4	1.00	0.00	0.00	0.00	0.77	0.00	0.00	0.23	0.00	0.00
C5	1.00	0.00	0.00	0.00	0.80	0.00	0.00	0.20	0.00	0.00
C6	1.00	0.00	0.00	0.00	0.99	0.00	0.00	0.00	0.00	0.00
C7	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00
C8	1.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00

C91.000.000.000.000.000.000.001.000.000.00

Conduit Surcharge Summary

Conduit	----- Hours Full -----		-----	Hours	Hours
	Both Ends	Upstream		Above Full	Capacity
			Dnstream	Normal Flow	Limited
C10	15.07	15.07	16.29	0.01	0.01
C11	16.53	16.53	17.36	0.01	0.01
C12	17.55	17.55	18.08	0.01	0.01
C13	21.99	21.99	24.00	0.01	0.01

Analysis begun on: Mon Dec 15 10:09:40 2025
Analysis ended on: Mon Dec 15 10:09:41 2025
Total elapsed time: 00:00:01

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Appendix E

Permanent Area Contribution Cost Details

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West 240 Basin 1 Onsite

Pond 1 Storm Costs				
	Qty	Unit	Unit Rate	Total Cost
<u>1.0 Nbdh Design Report</u>	86 %	@	\$106,000	\$91,354
<u>2.0 Site Preparation</u>				
2.1 -Topsoil Stripping and Haul to Stockpile (Hoe and Trucks)	5219 m3	@	\$5	\$26,094
2.2 -Common Excavation (Hoe and Truck)	54105 m3	@	\$6	\$313,809
<u>3.0 Surface</u>				
3.1 Cement Stabilization (150mm - 10 kg/sm)	1154 sm	@	\$4	\$4,271
3.2 Cement Stabilization (300mm - 20 kg/sm)	1154 sm	@	\$7	\$8,599
3.3 Supply & Install 3.0m Asphalt - SWMF	773 lm	@	\$272	\$210,323
<u>4.0 Landscaping</u>	2 ha	@	\$250,000	\$500,000
<u>5.0 Power- Walkway Lighting</u>	1 ls	@	\$80,000	\$80,000
SUB-TOTAL BASIN 1 ONSITE STORM COSTS				\$1,234,451

West 240 Basin 1 Onsite Trunks

Basin 1 Onsite Storm Trunks				
	Qty	Unit	Unit Rate	Total Cost
<u>1.0 Storm Trunk</u>				
1.1 1200mm				
1.1.1 0-4m	415 lm	@	\$2,251	\$934,202
1.2 1350mm				
1.2.1 0-4m	167 lm	@	\$2,500	\$417,500
1.3 Supply & Install Manhole Materials				
1.3.1 Barrels & Bases (2400mm Diameter)	32 vm	@	\$14,760	\$472,320
1.3.2 Type 6 Frames & Cover	8 ea	@	\$708	\$5,660
1.4 Remove & Replace Trench Materials with Crushed Rock	670 tonne	@	\$54	\$36,281
1.5 Video Camera Inspection				
1.5.1 Storm Sewers (1350mm & Smaller) @ CCC	582 lm	@	\$11	\$6,646
1.5.2 Storm Sewers (1350mm & Smaller) @ FAC	582 lm	@	\$14	\$8,125
SUB-TOTAL ONSITE STORM TRUNKS COSTS				\$1,880,734

West 240 Connecting Pipes

Pond 1 Downstream Connecting Pipes				
	Qty	Unit	Unit Rate	Total Cost
<u>1.0 Downstream Connecting Pipe</u>				
1.1 600mm				
1.1.1 0-4m	151 lm	@	\$921	\$139,460
1.1.2 4-5m	227 lm	@	\$618	\$140,437
1.2 750mm				
1.2.1 5-6m	54 lm	@	\$713	\$38,341
1.3 Supply & Install Manhole Materials				
1.3.1 Barrels & Bases (1200mm Diameter)	39 vm	@	\$2,582	\$100,698
1.3.2 Type 6 Frames & Cover	8 ea	@	\$708	\$5,660
1.4 Remove & Replace Trench Materials with Crushed Rock	240 tonne	@	\$54	\$12,996
1.5 Video Camera Inspection				
1.5.1 Storm Sewers (1350mm & Smaller) @ CCC	379 lm	@	\$11	\$4,326
1.5.2 Storm Sewers (1350mm & Smaller) @ FAC	379 lm	@	\$14	\$5,288
SUB-TOTAL CONNECTING PIPES				\$447,206

West 240 Basin 1 Onsite PAC Rate

Pond 1 Storm Costs	\$1,234,451
Basin 1 Onsite Storm Trunks	\$1,880,734
Pond 1 Downstream Connecting Pipes	\$447,206
Engineering/Admin/Testing	15%
Contingency	10%
Pond Land Costs	3.32 ha @ \$618,000
TOTAL BASIN 1 STORM COSTS	\$6,504,748
Gross Developable Area	66.59 ha
Less Arterial Road	0.00 ha
Less PUL	4.41 ha
Less MR/ER	6.19 ha
Basin 1	55.99 ha
Total Assessable Area	55.99 ha
PAC RATE	\$116,177 /ha

West 240 Basin 2 Onsite

Pond 2 Storm Costs				
	Qty	Unit	Unit Rate	Total Cost
<u>1.0 Nbhd Design Report</u>	14	% @	\$106,000	\$14,646
<u>2.0 Site Preparation</u>				
2.1 -Topsoil Stripping and Haul to Stockpile (Hoe and Trucks)	2345	m3 @	\$5	\$11,723
2.2 -Common Excavation (Hoe and Truck)	11093	m3 @	\$6	\$64,339
<u>3.0 Landscaping</u>	1	ha @	\$250,000	\$340,000
SUB-TOTAL BASIN 2 ONSITE STORM COSTS				\$430,708

West 240 Interconnecting Pipes from Pond 2 to Pond 1

Interconnecting Pipes from Pond 2 to Pond 1				
	Qty	Unit	Unit Rate	Total Cost
<u>1.0 Interconnecting Pipes</u>				
1.1 600mm				
1.1.1 0-4m	160	lm @	\$716	\$114,530
1.2 1350mm				
1.2.1 0-4m	125	lm @	\$2,500	\$313,348
1.3 Supply & Install Manhole Materials				
1.3.1 Barrels & Bases (1200mm Diameter)	8	vm @	\$2,582	\$21,508
1.3.2 Barrels & Bases (2400mm Diameter)	4	vm @	\$14,760	\$59,040
1.3.3 Type 6 Frames & Cover	3	ea @	\$708	\$2,123
1.4 Remove & Replace Trench Materials with Crushed Rock	244	tonne @	\$54	\$13,213
1.5 Video Camera Inspection				
1.5.1 Storm Sewers (1350mm & Smaller) @ CCC	285	lm @	\$11	\$3,258
1.5.2 Storm Sewers (1350mm & Smaller) @ FAC	285	lm @	\$14	\$3,982
SUB-TOTAL INTERCONNECTING PIPES				\$531,000

West 240 Basin 2 Onsite PAC Rate

Pond 2 Storm Costs					\$430,708
Interconnecting Pipes from Pond 2 to Pond 1					\$531,000
Engineering/Admin/Testing	15%				\$144,256
Contingency	10%				\$96,171
Pond Land Costs	1.86	ha	@	\$618,000	\$1,149,480
TOTAL BASIN 1 STORM COSTS					\$2,351,616
Gross Developable Area					12.67 ha
Less Arterial Road					0.00 ha
Less PUL					2.05 ha
Less MR/ER					3.89 ha
Basin 2					6.73 ha
Total Assessable Area					6.73 ha
PAC RATE					\$349,423 /ha

West 240 Sanitary Trunks Onsite

Sanitary Trunk				
	Qty	Unit	Unit Rate	Total Cost
<u>1.0 Nbhd Design Report</u>	67 %	@	\$106,000	\$71,020
<u>2.0 Sanitary Trunk</u>				
2.1 450mm				
2.1.1 8-9m	183 lm	@	\$1,160	\$2,127
2.1.2 9-10m	82 lm	@	\$1,680	\$1,386
2.1.3 10-11m	107 lm	@	\$2,420	\$2,589
2.2 Supply & Install Manhole Materials				
2.2.1 Barrels & Bases (1200mm Diameter)	29 vm	@	\$2,582	\$744
2.2.2 Type 6 Frames & Cover	3 ea	@	\$708	\$21
2.3 Remove & Replace Trench Materials with Crushed Rock	184 tonne	@	\$54	\$100
2.4 Video Camera Inspection				
2.4.1 Storm Sewers (1350mm & Smaller) @ CCC	373 lm	@	\$11	\$43
2.4.2 Storm Sewers (1350mm & Smaller) @ FAC	373 lm	@	\$14	\$52
SUB-TOTAL SANITARY TRUNKS ONSITE COSTS				\$78,082

West 240 Sanitary Trunks Onsite PAC Rate

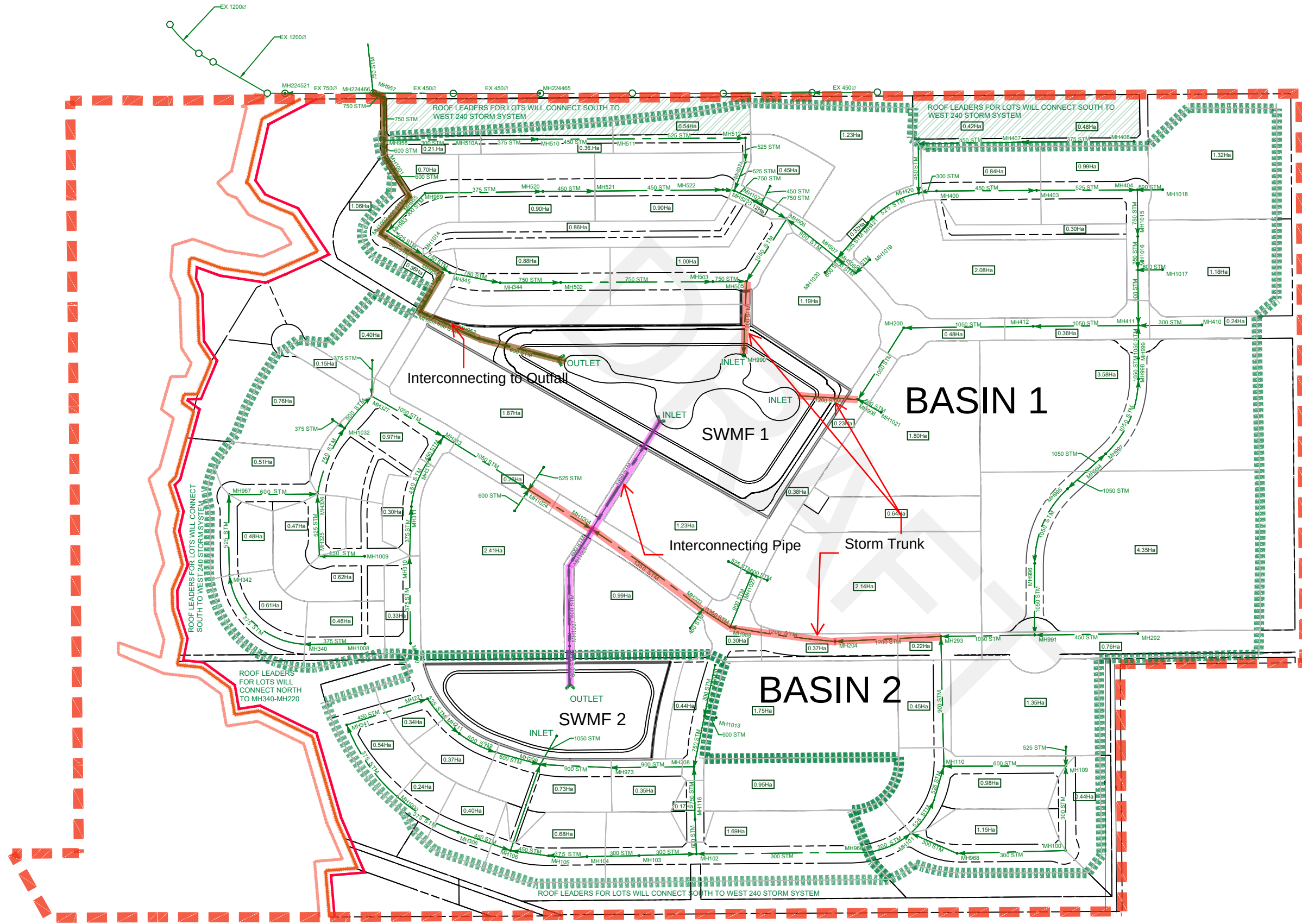
Sanitary Trunk	\$78,082
Engineering/Admin/Testing	15%
Contingency	10%
Sanitary Land Costs	29.13 ha @ \$618,000
TOTAL SANITARY TRUNKS COSTS	\$18,099,942
Gross Developable Area	29.13 ha
Less Arterial Road	0.00 ha
Less PUL	3.40 ha
Less MR/ER	2.60 ha
Basin 1	23.13 ha
Total Assessable Area	23.13 ha
PAC RATE	\$782,639 /ha

1 : 4000



LEGEND

- ▬ PROPERTY BOUNDARY
- ▬ PROPOSED STAGING
- TOP OF SLOPE
- 10.5m SETBACK (UDL)
- BUILDING LIMIT LINE
- MH404 STORM PIPE, MH# AND DIRECTION OF FLOW
- SWMF CONNECTOR
- STORM MINOR CATCHMENT BOUNDARY
- ▬ STORM MAJOR CATCHMENT BOUNDARY
- 0.51Ha TRIBUTARY AREA



WEST 240
NEIGHBOURHOOD
DESIGN REPORT
Figure 3.10
PROPOSED MINOR
STORM SERVICING



FILE NO. E0-145328

- PROPERTY BOUNDARY
- PROPOSED STAGING
- TOP OF SLOPE
- URBAN DEVELOPMENT LINE (UDL)
- BUILDING LIMIT LINE
- SAN. MAJOR CATCHMENT BOUNDARY
- SAN. MINOR CATCHMENT BOUNDARY
- MH404 SAN. MINOR PIPE, MH# AND DIRECTION OF FLOW
- MH404 SAN. TRUNK LINE

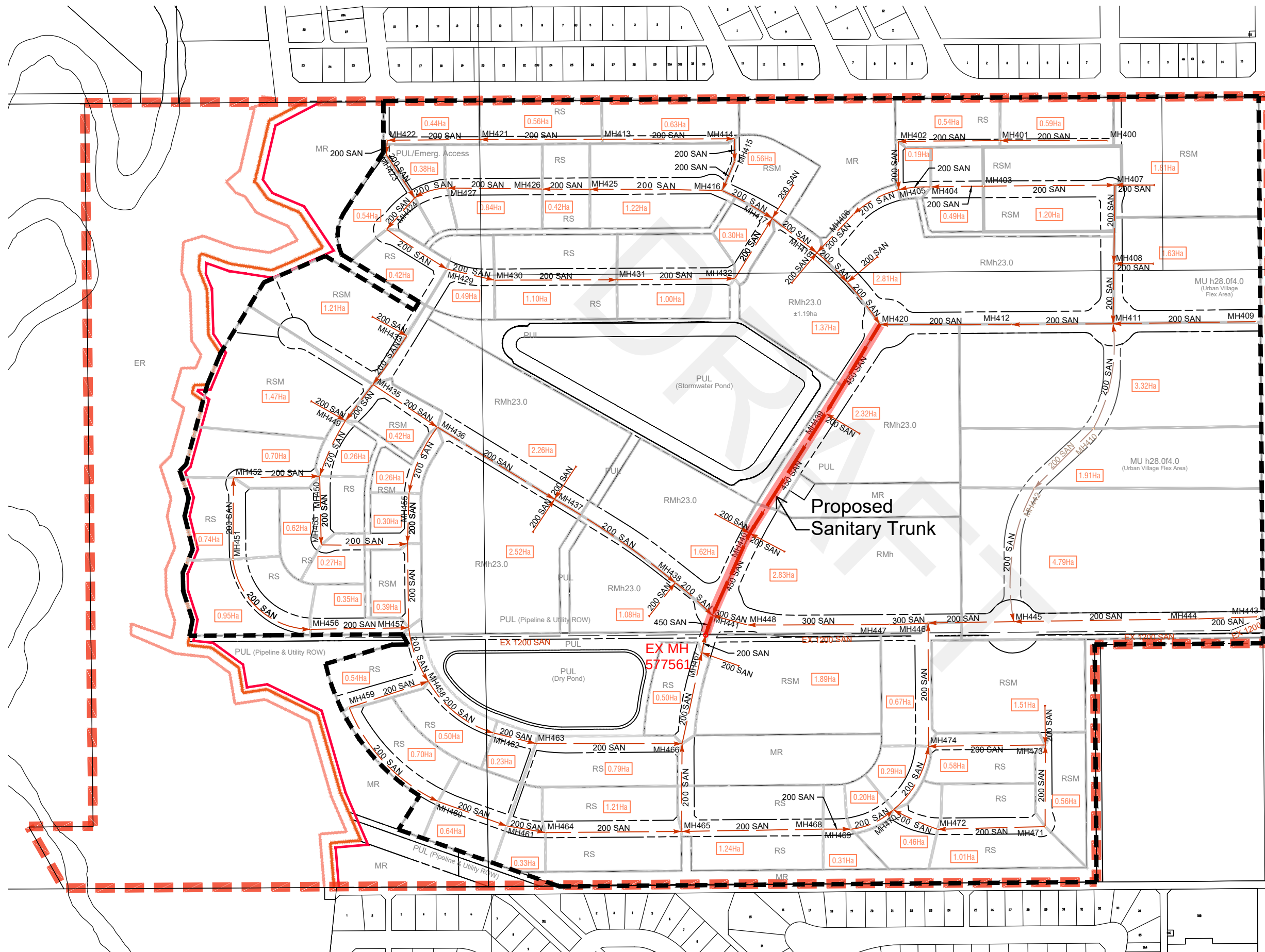


Figure 2.2
PROPOSED SANITARY
SERVICING CONCEPT



DECEMBER, 2025

Appendix F

Pre and Post Development Runoff Analysis

DRAFT

Stormwater Runoff Flow Analysis

Pre vs. Post Development Assessment

Project: West 240 Neighbourhood

Location: City of Edmonton

Date: December 20, 2025

Prepared by: Arcadis Professional Services (Canada) Inc.

1 Introduction

This analysis is prepared in support of the development concept and land use plan per the Neighbourhood Area Structure Plan (NASP) submitted by B&A and supports the servicing scheme outlined in the Neighbourhood Design Report (NDR) submitted by Arcadis, in January 2026 and December 2025. The analysis adheres to City of Edmonton Drainage Planning requirements, including applicable standards for stormwater management, overland drainage patterns and flow calculation, and environmental protection. Further detail regarding the environmental and ecological impacts of the development can be found in the Ecological Network Report (ENR) prepared by Fiera (2025) and within the supplementary information submitted with the NASP.

The analysis compares pre- and post-development stormwater runoff flow patterns for five watershed-fed areas associated with the proposed development:

- NW Tree Stand (to remain)
- NE Tree Stand (to be removed)
- South Row of Trees at boundary with Lansdowne neighbourhood (proposed MR parcel, to remain)
- Whitemud Creek Top of Bank to West (impact to be minimized)
- Existing 62 Avenue Roadway to the North within Grandview Heights

2 Site Overview

- **Total Area:** 93.59 ha
- **Current Land Use:** Undeveloped row crops and grassland – University of Alberta Farm agriculture and farming research
- **Proposed Development:** Residential and Mixed-use development located south of 62 Avenue and north of the Lansdowne neighbourhood, west of 122 Street and east of Whitemud Creek.
- **Topography:** The site is relatively flat with localized ridges and depressions where two natural marshes appear to have historically been. The elevations within the proposed project site range from 663.50m to 678.50m and are located in the uplands of the Whitemud Creek side slopes. General site topography slopes from east to west with the lowest point being the northwest corner. A portion of the drainage flows to a tree stand in the northeast corner where it appears to dissipate through transpiration.

- **Soils & Drainage:** The site is currently used for agriculture and farming research and has been observed to contain soils generally distributed as detailed below:
 - 0.1m to 0.45m of topsoil
 - 0.3m to 8.6m of clay
 - >6.9m of sand
 - 1.8m to 8.9m of silt/clay
 - 0.7m to 5.2m of clay till
 - >12.2m of bedrock
- **Applicable City Policies:**
 - Drainage Bylaw 18093
 - Drainage Design and Technical Standards
 - Stormwater Management Strategy
 - City of Edmonton Top of Bank Policy C542

3 Watershed Areas & Features

Area	Location	Feature Description	Current Condition	Post-Development Status
NW Tree Stand	NW Corner	Mature tree stand	Fed by overland flow	Remains, runoff reduced
NE Tree Stand	NE Corner	Mature tree stand	Fed by direct rainfall/runoff	Removed, habitat lost
S Tree Hedgerow	South Boundary	Linear tree row (MR parcel)	Fed by local sheet flow	Remains, runoff increased
Whitemud Creek	West of Development	Natural creek, top of bank	Receives surface runoff	Receives altered runoff direction and reduced quantity
62 Avenue Roadway	North of Development	Existing paved roadway	Minimal direct runoff	Receives increased runoff

4 Pre-Development Runoff Analysis

4.1 Hydrologic Conditions

- **Impervious Area:** Minimal [0-10%] I/P
- **Vegetative Cover:** Extensive, crop and grasses, three main areas of tree growth (NW and NE of site and along the south and east boundary)
- **Drainage Patterns:** Natural overland flow to watershed areas through planted crop vegetation and existing tree stands

4.2 Existing Watershed Area Breakdown

Area	Estimated Pre-Development Runoff Source	Hydrology Impact
NW Tree Stand	Overland flow from site & north area	Healthy, sustained
NE Tree Stand	Site runoff from east slopes of localized high point/ridge.	Healthy, sustained
S Tree Hedgerow	Local sheet flow (southern site area), small wetland (not classified) collects runoff which ponds and flows to alley in adjacent Lansdowne Neighbourhood.	Healthy, sustained
Whitemud Creek	Distributed surface runoff, concentrated flow from existing culvert on site	Stable baseflow
62 Avenue Roadway	Major and minor storm runoff from Grandview west side, some runoff from boulevards in West 240 via sheet flow from north	No significant impact

5 Post-Development Runoff Analysis

5.1 Hydrologic Conditions

- **Impervious Area:** Increased [40-60%] I/P
- **Vegetative Cover:** Reduced
- **Engineered Drainage:** Introduction of storm sewers, lot grading, SWMFs and potentially LID SWMF per City of Edmonton standards

5.2 Runoff Distribution Changes

Area	Post-Development Runoff Source	Hydrology Impact
NW Tree Stand	Runoff from back of split lots (to be zoned RS) as well as a small portion of MR backing these lots, possible overland flow from north or other sources to be refined at detailed design. Back of lots assumed to be largely pervious, with trees in stand providing support for bank integrity.	Reduced runoff volume unless proposed major drainage adjusted to convey more of West 240 toward tree stand to recharge water. Potential to reroute runoff from overland flow in Grandview Heights neighbourhood to the north. Ground water table approximated at 20m depth at time of geotechnical investigation, so inundation is unlikely due to changes in water balance in the area of the NW Tree Stand.
NE Tree Stand	Tree stand proposed to be removed as part of NASP land use. Storm event runoff from whatever portion of tree stand remains would be the only source of water, with small potential for runoff from the back of a grading berm contributing to source waters.	Significant reduction in runoff flows will not support ongoing tree health. No ground water encountered during geotechnical investigation which installed piezometer to 8.4m depth. Tree stand not likely serving to recharge groundwater, so significant hydrology impacts not expected based on rerouting of water.
S Tree Hedgerow	Runoff from south half of split lots, and small MR "triangle" at southwest of development (onto MR parcel containing trees and south into adjacent Lansdowne Alley). Proximity to high pressure pipeline that bisects in SW corner will impact grading work in area. Resident landscaping and particularly fertilizer use may result in increased nutrient loads, which can be managed through various methods (eg. Restrictive covenants, landscaping controls - increased topsoil depths, absorbent landscaping etc.). Boreholes in the area dry at 8.4m depth, so infiltration opportunities may be investigated, particularly given existing condition within Lansdowne Alley.	Increased runoff directed toward Trees, though no ponding of runoff expected within Hedgerow MR parcel. Potential for LID management of runoff within MR sites can support in maintaining a water balance closer to pre-development conditions.

Area	Post-Development Runoff Source	Hydrology Impact
Whitemud Creek	Concentrated runoff from developed areas will be avoided and closely monitored as development proceeds. To maintain balance between fills along TOB and runoff containment within the site, the west portions of RS, RSM, and MR parcels proposed to drain toward the creek. The existing culvert currently draining much of the site will be removed, improving existing erosion concerns at downstream outfall into the creek slope. Resident landscaping and particularly fertilizer use may result in increased nutrient loads, which can be managed through various methods (eg. Restrictive covenants, landscaping controls - increased topsoil depths, absorbent landscaping etc.).	Moderate reduction in runoff quantity, particularly at point source of culvert may slightly alter water balance at creek side slopes but is unlikely to be significant or adverse. Some portion of water quantities previously entering creek over the top of bank or through culvert will now be conveyed to the existing outfall, which utilizes robust erosion control and water dissipation to reduce impacts to downstream watercourse.
62 Avenue Roadway	Increased runoff from north development edge.	Unlikely to significantly impact storm system within Grandview. Attempts to retain existing trees along boulevard may be made, which can function to manage some of runoff when paired with LID implementation.

6 Stormwater Flow Impact Summary

- **Methodology:** Kerby-Hathaway method using manning's n based on proposed zoning Confirmed with PCSWMM, calibrated to City of Edmonton rainfall intensities and design standards.
- **Rainfall Event:** 1:5 year and 1:10 year storm events, per City of Edmonton IDF from Vol. 3-02.
- **Results Table:**

Area	Pre-Development		Post-Development		% Change 5 yr	% Change 10 yr
	Q _{5yr} (L/s)	Q _{10yr} (L/s)	Q _{5yr} (L/s)	Q _{10yr} (L/s)		
NW Tree Stand	4.84		0.48 ha		-60%	-61%
	100 L/s	124 L/s	40 L/s	48 L/s		
NE Tree Stand	7.81 ha		0.52 ha		-55%	-56%
	193 L/s	239 L/s	87 L/s	106 L/s		
S Tree Hedgerow	5.91 ha		1.65 ha		65%	62%
	115 L/s	142 L/s	190 L/s	230 L/s		
Creek (Overland)	26.28 ha		4.45 ha		-57%	-57%
	451 L/s	560 L/s	298L/s	366 L/s		
Creek (via Culvert) will be removed and water flowing over TOB will sheet flow from lots	5.37 ha					
	245 L/s	304 L/s				
Total to Creek	690 L/s	857 L/s				
62 Avenue Roadway (East)	0.46 ha		1.43 ha		1386%	1382%
	14 L/s	17 L/s	208 L/s	252 L/s		
62 Avenue Roadway (West)	0.16 ha		1.07 ha		2600%	2617%
	5 L/s	6 L/s	135 L/s	163 L/s		
122 Street	6.99 ha		1.39 ha		136%	128%
	132 L/s	163 L/s	311 L/s	372 L/s		

7 Environmental Risk Mitigation & Recommendations

Please refer to the ENR submitted by Fiera for further information on the ecological impacts.

7.1 NW Tree Stand

- **Impact:** Reduction in runoff, similar source direction, potential stress to trees during adjacent construction.
- **Recommendation:** Utilizing the recommendations in the Geotechnical TOB Slope Stability report, including vegetative edge/buffer zone, engineered swales where conveyance requires direction, but not directly toward TOB, rather toward LID or other measures to distribute flows evenly and match pre-development conditions to the extent possible. Tree protection measures should be implemented throughout development as per City of Edmonton Urban Forestry standards. Monitoring of tree health post-development per applicable consultant advice.

EPCOR has discussed potential to look at the overland flows in Grandview Heights due to major system sheet flows going directly into the Creek without significant treatment for quality or quantity. The reduction in flow volumes shown within this analysis suggest there may be opportunity to direct some of these flows toward the NW Tree stand to benefit the trees as well as assist with flood mitigation in the area, and water quality treatment as it flows through the tree stand and is filtered naturally prior to entering the creek watercourse.

7.2 NE Tree Stand

- **Impact:** Existing tree stand appears to manage runoff using only infiltration, and evapotranspiration. While this is a naturally occurring low impact approach to managing runoff quantities, if rainfall intensity patterns shift, as is predicted, the capacity within the tree stand may not always be sufficient. The proposed changes to land use involve an increase in grades to bring runoff that falls within the area to largely be managed internal to the development, flowing to the central constructed wetland for treatment and retention. There is a low likelihood that these trees will survive given the changes in runoff quality, quantity and direction.
- **Recommendation:** Tree replacement/compensation per City of Edmonton Tree Management Guidelines; provision for alternative green spaces.

7.3 S Row of Trees

- **Impact:** Increased runoff, trees to be maintained, possible water quality changes if adjacent residents are permitted to use fertilizers in landscaping.
- **Recommendation:** Monitor/control for erosion, implement sediment and water quality controls, maintain MR parcel integrity. Tree protection measures should be implemented throughout development as per City of Edmonton Urban Forestry standards. Monitoring of tree health post-development per applicable consultant advice.

- Restrictive covenants or other control measures imposed on these residential lots may present an opportunity to mitigate this risk. The water will sheet flow from the back of lots to the MR parcel feeding the trees and then flow past them and into the Lansdowne alley as the current flows do.
- There is potential to utilize LID features to manage the runoff water quality and quantity through additional planting or features within MR parcel to treat it prior to conveyance to trees, and to Lansdowne Alley.

7.4 Whitemud Creek

- **Impact:** Reduced sheet flow quantities, which when coupled with recommended construction, grading, and landscaping procedures represent a minimal impact in impact to vegetation, particularly if the flows from the culvert are not considered in the comparison of runoff (as they flow more directly to the creek as opposed to feeding vegetation). While representing an unlikely change in creek hydrology, erosion conditions are likely improved based on sheet flow from back of residential lots, as opposed to concentrated flows from the existing culvert.
Given the vegetated edge that is to remain, the exact boundaries used in calculating the runoff post development may vary from what exists in situ, particularly with regard to the % change calculation, where area, and runoff coefficient variability and subjectivity can impact results.
- **Recommendation:** Incorporate erosion protection measures, stormwater detention through LID implementation, vegetative buffers as per City standards.
 - There is potential to utilize LID features to manage the runoff water quality (and quantity if required for any reason) before it reaches the top of the slope that is proposed to sheet flow into the creek.
 - Given the reduction in flows, there may be potential to redirect excess runoff from other nearby areas, including Grandview Heights to the north. The specifics of this approach will require significant geotechnical consultation if it is to direct water toward the TOB, even as sheet flows.

The vegetated edge should be kept undisturbed for as long as possible during development. Additionally, where possible vegetation proposed for removal should remain for the extent possible to stabilize the top of bank. Utilizing the recommendations in the Geotechnical TOB Slope Stability report, including vegetative edge/buffer zone, engineered swales where conveyance requires direction, but not directly toward TOB, rather toward LID or other measure to distribute flows evenly and match pre-development conditions to the extent possible. Tree protection measures should be implemented throughout development as per City of Edmonton Urban Forestry standards. Monitoring of tree health post-development per applicable consultant advice.

7.5 62 Avenue Roadway

- **Impact:** Increased runoff that will flow ultimately to the creek via the curb and gutter along 62 Ave in a more controlled manner through the outfall or overland (possibly through West 240).
- **Recommendation:** Potential upgrade drainage infrastructure during any neighbourhood renewal planned for Grandview Heights, including curb & gutter improvements, alteration to overland flow outfall (possibly into West 240 NW Tree stand) while ensuring compliance with municipal design criteria.

8 Conclusion

This analysis, prepared in accordance with the City of Edmonton Drainage Planning requirements, supports the development concept and land use plan per the NASP (B&A) and the servicing scheme outlined in the NDR (Arcadis), both submitted November 2025. The analysis identifies changes in stormwater runoff patterns and recommends mitigation measures consistent with City standards to minimize environmental impacts and support sustainable development.

9 Calculations Enclosed

- **A. Site Plan/Drainage Map Pre- and Post-Development**
- **B. Detailed Hydrologic Calculations**

Prepared by:

Poulami Purkayastha, E.I.T.
Project Engineer
Arcadis

Reviewed by:

Christine Tucker, P.Eng

Note: All values and recommendations should be verified at detailed design, through modeling, and in coordination with City of Edmonton Drainage Planning and Urban Forestry departments.

C:\Users\lucierc394\OneDrive\Arcadis\AC\US\ACA-00145328-West_240\Project Files\10_WIP\04-CIV\Sheets\Pre-Post_LDev\Flows Figure 20251112.dwg Plotted At: Dec. 20, 25 1:02 AM Last Saved By: lucierc394 Last Saved At: Dec. 17, 25 4:31 PM



1 : 2000

- Legend**
- PROPERTY BOUNDARY
 - TOP OF SLOPE
 - EXISTING CONTOURS
PER SURVEY 2025-05-06
 - GENERAL
PRE-DEVELOPMENT
FLOW DIRECTION

- ASSUMPTIONS:**
1. Calculated Watershed area excludes the area of the tree stands and any area west of development boundary.

WEST 240
NEIGHBOURHOOD
DESIGN REPORT

Figure F.1
**PRE-DEVELOPMENT
RUNOFF**

FILE NO. E0-145328

Predevelopment Flow Rates Calculation

West 240 NE Tree Stand

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

$$C = 0.2$$

(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$A = 7.81 \text{ Ha}$$

(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c (\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 311.85 \text{ m} = 0.3119 \text{ km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 2.60\% = 0.0260$$

$$\therefore T_c = 0.390 \text{ hrs} = 23.38 \text{ min}$$

$$I_{5\text{yr}} = 44.49 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 55.10 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.2 \cdot 44.49 \cdot 7.81 / 360 = 0.193 \text{ m}^3/\text{s} = 193 \text{ L/s}$$

$$Q_{10\text{yr}} = 0.2 \cdot 55.10 \cdot 7.81 / 360 = 0.239 \text{ m}^3/\text{s} = 239 \text{ L/s}$$

Predevelopment Flow Rates Calculation West 240 **S Tree Hedgerow**

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 5.91 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 204.793\text{m} = 0.2048\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.21\% = 0.0021$$

$$\therefore T_c = 0.577 \text{ hrs} = 34.61 \text{ min}$$

$$I_{5\text{yr}} = 34.93 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 43.39 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.2 * 34.93 * 5.91 / 360 = 0.115 \text{ m}^3/\text{s} = \boxed{115 \text{ L/s}}$$

$$Q_{10\text{yr}} = 0.2 * 43.39 * 5.91 / 360 = 0.142 \text{ m}^3/\text{s} = \boxed{142 \text{ L/s}}$$

Predevelopment Flow Rates Calculation West 240 NW Tree Stand

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 4.84 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 543.659\text{m} = 0.5437\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 2.27\% = 0.0227$$

$$\therefore T_c = 0.521 \text{ hrs} = 31.28 \text{ min}$$

I_{5yr} = 37.24 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 46.23 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.2 * 37.24 * 4.84 / 360 = 0.100 \text{ m}^3/\text{s} = \boxed{100 \text{ L/s}}$$

$$Q_{10yr} = 0.2 * 46.23 * 4.84 / 360 = 0.124 \text{ m}^3/\text{s} = \boxed{124 \text{ L/s}}$$

Predevelopment Flow Rates Calculation West 240 Culvert

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 13.94 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 453.626\text{m} = 0.4536\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.92\% = 0.0092$$

$$\therefore T_c = 0.537 \text{ hrs} = 40.46 \text{ min}$$

I_{5yr} = 31.58 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 39.25 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.2 * 31.58 * 13.94 / 360 = 0.2446 \text{ m}^3/\text{s} = 245 \text{ L/s}$$

$$Q_{10yr} = 0.2 * 39.25 * 13.94 / 360 = 0.3039 \text{ m}^3/\text{s} = 304 \text{ L/s}$$

Predevelopment Flow Rates Calculation West 240 Creek

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 26.28 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 646.97\text{m} = 0.6470\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.92\% = 0.0092$$

$$\therefore T_c = 0.699 \text{ hrs} = 41.92 \text{ min}$$

$$I_{5\text{yr}} = 30.86 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 38.35 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.2 * 30.86 * 26.28 / 360 = 0.451 \text{ m}^3/\text{s} = 451 \text{ L/s}$$

$$Q_{10\text{yr}} = 0.2 * 38.35 * 26.28 / 360 = 0.560 \text{ m}^3/\text{s} = 560 \text{ L/s}$$

Predevelopment Flow Rates Calculation West 240 Culvert-Creek

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 40.22 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c (\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 646.97\text{m} = 0.6470\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.92\% = 0.0092$$

$$\therefore T_c = 0.699 \text{ hrs} = 41.92 \text{ min}$$

$$I_{5\text{yr}} = 30.86 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 38.35 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.2 \cdot 30.86 \cdot 40.22 / 360 = 0.6896 \text{ m}^3/\text{s} = 690 \text{ L/s}$$

$$Q_{10\text{yr}} = 0.2 \cdot 38.35 \cdot 40.22 / 360 = 0.8570 \text{ m}^3/\text{s} = 857 \text{ L/s}$$

Predevelopment Flow Rates Calculation

West 240 Culvert-Creek

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 31.65 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 646.97\text{m} = 0.647\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.92\% = 0.0092$$

$$\therefore T_c = 0.699 \text{ hrs} = 41.92 \text{ min}$$

I_{5yr} = 30.86 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 38.35 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.2 * 30.86 * 31.65 / 360 = 0.543 \text{ m}^3/\text{s} = 543 \text{ L/s}$$

$$Q_{10yr} = 0.2 * 38.35 * 31.65 / 360 = 0.674 \text{ m}^3/\text{s} = 674 \text{ L/s}$$

Predevelopment Flow Rates Calculation West 240 62 Ave (East)

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 0.46 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 81.14\text{m} = 0.081\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.82\% = 0.0082$$

$$\therefore T_c = 0.272 \text{ hrs} = 16.32 \text{ min}$$

I_{5yr} = 54.57 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 67.25 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.2 * 54.57 * 0.46 / 360 = 0.014 \text{ m}^3/\text{s} = \boxed{14 \text{ L/s}}$$

$$Q_{10yr} = 0.2 * 67.25 * 0.46 / 360 = 0.017 \text{ m}^3/\text{s} = \boxed{17 \text{ L/s}}$$

Predevelopment Flow Rates Calculation West 240 62 Ave (West)

$$Q = C * I * A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 0.16 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 86.29\text{m} = 0.086\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 0.82\% = 0.0082$$

$$\therefore T_c = 0.280 \text{ hrs} = 16.78 \text{ min}$$

I_{5yr} = 53.75 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 66.26 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.2 * 53.75 * 0.16 / 360 = 0.005 \text{ m}^3/\text{s} = \boxed{5 \text{ L/s}}$$

$$Q_{10yr} = 0.2 * 66.26 * 0.16 / 360 = 0.006 \text{ m}^3/\text{s} = \boxed{6 \text{ L/s}}$$

Predevelopment Flow Rates Calculation West 240 122 Street

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.2
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 6.99 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 568.01\text{m} = 0.568\text{km}$$

$$n = 0.20 \text{ (poor grass/row crops/ moderately rough bare soil)}$$

$$S = 1.31\% = 0.0131$$

$$\therefore T_c = 0.605 \text{ hrs} = 36.31 \text{ min}$$

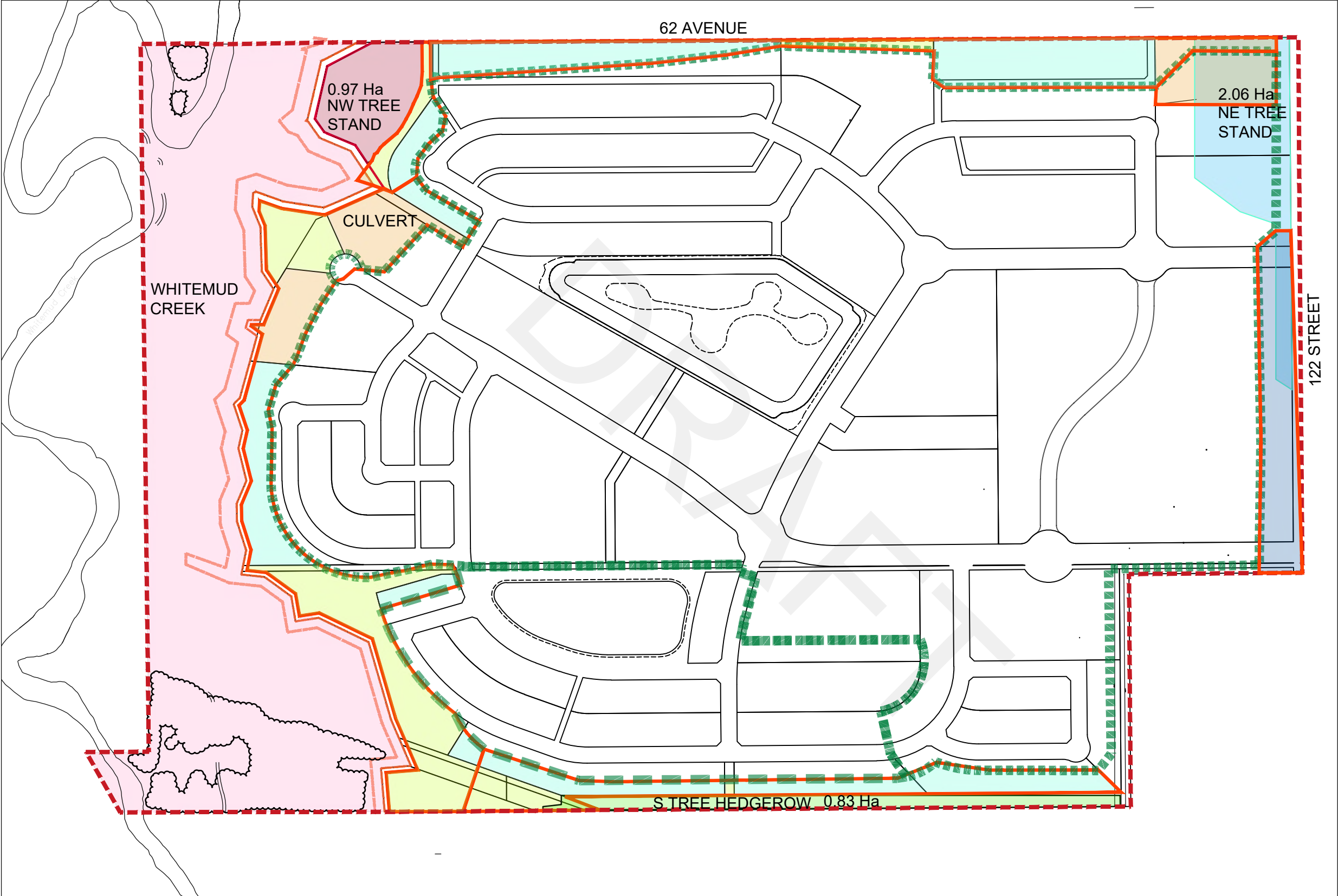
I_{5yr} = 33.88 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 42.09 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.2 \cdot 33.88 \cdot 6.99 / 360 = 0.132 \text{ m}^3/\text{s} = \boxed{132 \text{ L/s}}$$

$$Q_{10yr} = 0.2 \cdot 42.09 \cdot 6.99 / 360 = 0.163 \text{ m}^3/\text{s} = \boxed{163 \text{ L/s}}$$

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Legend

- PROPERTY BOUNDARY
- TOP OF SLOPE
- UDL LIMIT

MAJOR BASIN BOUNDARY

- RS
- RSM
- MU
- MR

WEST 240
NEIGHBOURHOOD
DESIGN REPORT
Figure F.2

**POST-DEVELOPMENT
RUNOFF**



FILE NO. E0-145328

- Assumptions:
- MR buffer between West 240 and Northern Forestry Centre will result in no post-construction runoff into Forestry parcel.
 - SW MR "triangle" will be graded to drain away from Lansdowne.
 - Slopes utilized in calculations based on minimum lot slope required.
 - MR 2%
 - RS/RSM 3%
 - Catchment areas exclude tree stand area.

Postdevelopment Flow Rates Calculation West 240 NE Tree Stand

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)
C = a dimensionless runoff coefficient
I = the average intensity of rainfall in mm/hr (calculated based on T_c)
A = the drainage area in ha
T_c = time of concentration

C = 0.7
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 0.64 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c (\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)
n = roughness factor
S = slope

$$L = 108.25 \text{ m} = 0.10825 \text{ km}$$

$$n = 0.098 \text{ (Assuming 70\% impervious for RSM)}$$

$$S = 3.00\% = 0.03$$

$$\therefore T_c = 0.165 \text{ hrs} = 9.88 \text{ min}$$

I_{5yr} = 70.116 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 85.544 mm/hr
(Table 2.4 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.7 \cdot 70.116 \cdot 0.64 / 360 = 0.087 \text{ m}^3/\text{s} = \boxed{87 \text{ L/s}} \quad \text{Post development flow} \quad \text{vs} \quad \text{Pre development flow} \quad \boxed{193 \text{ L/s}}$$

$$Q_{10yr} = 0.7 \cdot 85.544 \cdot 0.64 / 360 = 0.106 \text{ m}^3/\text{s} = \boxed{106 \text{ L/s}} \quad \boxed{239 \text{ L/s}}$$

Postdevelopment Flow Rates

Calculation West 240 S Tree Hedgerow

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.53 (For, 0.36 Ha of MR and 1.29 Ha of RS)
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 1.65 Ha of which 0.36Ha is MR and 1.29Ha is RS
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 44.151\text{m} = 0.044\text{km}$$

$$n = 0.1422 \text{ (Assuming 10\% impervious for MR and 65\% impervious for RS)}$$

$$S = 3.00\% = 0.03$$

$$\therefore T_c = 0.128 \text{ hrs} = 7.72 \text{ min}$$

$$I_{5\text{yr}} = 78.03 \text{ mm/hr}$$

(Table 2.4 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 94.64 \text{ mm/hr}$$

(Table 2.4 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.53 \cdot 78.03 \cdot 1.65 / 360 = 0.190 \text{ m}^3/\text{s} = \boxed{190 \text{ L/s}}$$

Post development flow Pre development flow

vs

$$Q_{10\text{yr}} = 0.53 \cdot 94.64 \cdot 1.65 / 360 = 0.230 \text{ m}^3/\text{s} = \boxed{230 \text{ L/s}}$$

115 L/s 142 L/s

Postdevelopment Flow Rates

Calculation West 240 NW Tree Stand

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m^3/s (predesign flow rate)
 C = a dimensionless runoff coefficient
 I = the average intensity of rainfall in mm/hr (calculated based on T_c)
 A = the drainage area in ha
 T_c = time of concentration

C = 0.39 (For, 0.23 Ha of MR and 0.25 Ha of RS)
 (Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 0.48 Ha
 (Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)
 n = roughness factor
 S = slope

$$L = 39.598\text{m} = 0.040\text{km}$$

$$n = 0.1786 \text{ (Assuming 10\% impervious for MR and 65\% impervious for RS)}$$

$$S = 3.00\% = 0.03$$

$$\therefore T_c = 0.137 \text{ hrs} = 8.22 \text{ min}$$

$$I_{5\text{yr}} = 76.04 \text{ mm/hr}$$

(Table 2.4 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 92.37 \text{ mm/hr}$$

(Table 2.4 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

	Post development flow 40 L/s Pre development flow 100 L/s	vs	
$Q_{5\text{yr}} = 0.39 \cdot 76.04 \cdot 0.48 / 360 = 0.040 \text{ m}^3/\text{s}$			
$Q_{10\text{yr}} = 0.39 \cdot 92.37 \cdot 0.48 / 360 = 0.048 \text{ m}^3/\text{s}$			
	48 L/s		124 L/s

Postdevelopment Flow Rates

Calculation West 240 Culvert + Creek

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)
 C = a dimensionless runoff coefficient
 I = the average intensity of rainfall in mm/hr (calculated based on T_c)
 A = the drainage area in ha
 T_c = time of concentration

C = 0.42
 (Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 4.45 Ha
 (Attached figure)

According to Kerby-Hathaway Formula:

$$T_c (\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse (km)
 n = roughness factor
 S = slope

L = 150 m = 0.15 km

n = 0.17 (Assuming 10% impervious for MR, 70% impervious for RSM, and 65% impervious for RS)

S = 3.00 % = 0.03

∴ T_c = 0.248 hrs = 14.89 min

I_{5yr} = 57.31 mm/hr
 (Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 70.51 mm/hr
 (Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

	Post development flow	Pre development flow
Q _{5yr} = 0.42 * 57.31 * 4.45 / 360 = 0.298 m ³ /s =	298 L/s	690 L/s

vs

Q _{10yr} = 0.42 * 70.51 * 4.45 / 360 = 0.366 m ³ /s =	366 L/s	857 L/s
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Postdevelopment Flow Rates

Calculation West 240 62 Ave (East)

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.66
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 1.43 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 50.975 \text{ m} = 0.051 \text{ km}$$

$$n = 0.11828 \text{ (Assuming 10\% impervious for MR, 70\% impervious for RSM, and 65\% impervious for RS)}$$

$$S = 3.00 \% = 0.03$$

$$\therefore T_c = 0.123 \text{ hrs} = 7.40 \text{ min}$$

$$I_{5\text{yr}} = 79.41 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 96.21 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.66 \cdot 79.41 \cdot 1.43 / 360 = 0.208 \text{ m}^3/\text{s} = \boxed{208 \text{ L/s}}$$

Post development flow Pre development flow

vs

$$Q_{10\text{yr}} = 0.66 \cdot 96.21 \cdot 1.43 / 360 = 0.252 \text{ m}^3/\text{s} = \boxed{252 \text{ L/s}}$$

14 L/s 17 L/s

Postdevelopment Flow Rates

Calculation West 240 62 Ave (West)

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.57
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 1.07 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c (\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 50.975 \text{ m} = 0.051 \text{ km}$$

$$n = 0.11828 \text{ (Assuming 10\% impervious for MR, 70\% impervious for RSM, and 65\% impervious for RS)}$$

$$S = 3.00 \% = 0.03$$

$$\therefore T_c = 0.123 \text{ hrs} = 7.40 \text{ min}$$

$$I_{5\text{yr}} = 79.41 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$I_{10\text{yr}} = 96.21 \text{ mm/hr}$$

(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5\text{yr}} = 0.57 \cdot 79.41 \cdot 1.07 / 360 = 0.135 \text{ m}^3/\text{s} = \boxed{135 \text{ L/s}}$$

Post development flow Pre development flow

vs

$$Q_{10\text{yr}} = 0.57 \cdot 96.21 \cdot 1.07 / 360 = 0.163 \text{ m}^3/\text{s} = \boxed{163 \text{ L/s}}$$

6 L/s

Postdevelopment Flow Rates

Calculation West 240 122 Street

$$Q = C \cdot I \cdot A / 360$$

Q = discharge in m³/s (predesign flow rate)

C = a dimensionless runoff coefficient

I = the average intensity of rainfall in mm/hr (calculated based on T_c)

A = the drainage area in ha

T_c = time of concentration

C = 0.85
(Table 2.1 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

A = 1.39 Ha
(Attached figure)

According to Kerby-Hathaway Formula:

$$T_c(\text{in hrs}) = \frac{0.606 \times (Ln)^{0.467}}{S^{0.234}}$$

L = length of the principal watercourse(km)

n = roughness factor

S = slope

$$L = 35.368 \text{ m} = 0.035 \text{ km}$$

$$n = 0.072 \text{ (Assuming 80\% impervious for MU)}$$

$$S = 5.00 \% = 0.05$$

$$\therefore T_c = 0.075 \text{ hrs} = 4.48 \text{ min}$$

I_{5yr} = 94.87 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

I_{10yr} = 113.48 mm/hr
(Table 2.6 – Vol. 3-02 Stormwater Management and Design Manual, City of Edmonton)

$$Q_{5yr} = 0.85 \cdot 94.87 \cdot 1.39 / 360 = 0.311 \text{ m}^3/\text{s} = \boxed{311 \text{ L/s}} \quad \text{Post development flow} \quad \text{vs} \quad \boxed{132 \text{ L/s}} \quad \text{Pre development flow}$$

$$Q_{10yr} = 0.85 \cdot 113.48 \cdot 1.39 / 360 = 0.372 \text{ m}^3/\text{s} = \boxed{372 \text{ L/s}} \quad \boxed{163 \text{ L/s}}$$

Source:

Concentration Time Formulas. Notwithstanding the inherent complexities, calculations of concentration time continue to be part of the routine practice of engineering hydrology. Concentration time is a key ingredient in the rational method (Chapter 4) and other methods used to calculate the runoff response of small watersheds. Formulas vary, but most relate concentration time to suitable slope, length, rainfall, and roughness parameters [54]. A well-known formula relating concentration time to slope and length parameters is the Kirpich formula [31], applicable to small agricultural watersheds with drainage areas of less than 80 ha (200 ac). In SI units, the Kirpich formula is

$$t_c = \frac{0.06628L^{0.77}}{S^{0.385}} \quad (2-61)$$

in which t_c = concentration time in hours; L = length of the principal watercourse, from outlet to divide, in kilometers; and S = slope between maximum and minimum elevation (S_1 slope), in meters per meter.

In U.S. customary units, with t_c in minutes, L in feet, and slope in feet per foot, the coefficient of Eq. 2-61 is 0.0078.

Another formula for estimating concentration time is that of Hathaway [19]:

$$t_c = \frac{0.606(Ln)^{0.467}}{S^{0.234}} \quad (2-62)$$

in which n is a roughness factor and all other terms are the same as in Eq. 2-61, expressed in SI units. Applicable values of n are given in Table 2-7.

TABLE 2-7 VALUES OF ROUGHNESS FACTOR n FOR USE IN EQUATION 2-62 [9]

Type of Surface	Value of n
Smooth impervious	0.02
Smooth bare-picked soil	0.10
Poor grass, row crops or moderately rough bare soil	0.20
Pasture	0.40
Deciduous timber land	0.60
Coniferous timber land, or deciduous timber land with deep litter or grass	0.80

Actual estimates of concentration time using empirical formulas are bound to vary. Therefore, reasonable care should be exercised when choosing an appropriate formula.

DRAFT