Appendix 8.2 Capacity Performance of Existing Sewers in Ultimate Year (Baseline Condition)

Upstream Node (Ref: Appendix 8.3)	Link Suffix	Downstream Node (Ref: Appendix 8.3)	Pipe Length (m)	Pipe Diameter (mm)	Upstream Ground Level (mPD)	Downstream Ground Level (mPD)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Freeboard (m)	Peak Flow (m3/s)	Velocity (m/s)	Conduit Full Capacity (m3/s)	Peak Flow / Design Capacity (%)	Adequate Capacity?
392_42	1	392_45	14	250	135.79	134.66	134.33	133.64	1.428	0.00161	0.443	0.12	1%	Yes
392_45	1	392_48	11	250	134.66	133.9	132.96	132.8	1.664	0.00161	0.363	0.065	2%	Yes
392_48	1	392_51	9	250	133.9	133.68	132.44	132.15	1.427	0.00161	0.416	0.097	2%	Yes
392_51	1	392_54	8	250	133.68	133.12	131.84	131.58	1.807	0.00161	0.417	0.098	2%	Yes
392_54	1	392_57	7	250	133.12	132.68	131.35	131.18	1.736	0.00161	0.398	0.084	2%	Yes
392_57	1	392_60	5	250	132.68	144.09	130.82	130.7	1.826	0.00161	0.397	0.084	2%	Yes
392_6	1	392_9	11	250	144.09	132.02	143.23	143.04	0.824	0.00161	0.375	0.071	2%	Yes
392_60	1	392_63	16	250	132.02	130.35	130.42	129.33	1.569	0.00161	0.462	0.141	1%	Yes
392_63	1	392_66	8	250	130.35	129.38	128.75	128.53	1.566	0.00161	0.406	0.09	2%	Yes
392_66	1	392_69	7	250	129.38	129	128.4	127.7	0.95	0.00161	0.484	0.171	1%	Yes
392_69	1	392_72	19	250	129	126.34	127.7	125.54	1.27	0.00161	0.49	0.183	1%	Yes
392_72	1	392_75	24	250	126.34	123.53	125.24	122.78	1.07	0.00161	0.485	0.173	1%	Yes
392_75	1	392_78	18	250	123.53	121.68	122.27	120.58	1.23	0.00161	0.48	0.166	1%	Yes
392_78	1	392_81	15	250	121.68	119.75	120.21	118.87	1.44	0.00161	0.478	0.162	1%	Yes
392_81	1	392_84	14	250	119.75	117.97	118.85	117.27	0.87	0.00161	0.49	0.182	1%	Yes
392_84	1	392_87	6	250	117.97	117.61	117.12	116.92	0.817	0.00161	0.419	0.099	2%	Yes
392_87	1	392_90	5	250	117.61	144.61	116.73	116.61	0.846	0.00161	0.397	0.084	2%	Yes
392_9	1	392_12	21	250	144.61	117.29	143.04	142.93	1.53	0.00161	0.32	0.039	4%	Yes
392_90	1	392_93	5	250	117.29	116.95	116.54	116.25	0.719	0.00161	0.453	0.13	1%	Yes
392_93	1	392_96	5	250	116.95	116.55	116.05	115.8	0.868	0.00161	0.444	0.121	1%	Yes
392_96	1	392_99	20	250	116.55	114.38	115.48	113.68	1.04	0.00161	0.478	0.162	1%	Yes
392_99	1	392_102	24	250	114.38	4.48	113.28	110.85	1.07	0.00161	0.484	0.172	1%	Yes
4_102	1	4_105	53	1050	4.48	4.35	1.52	1.44	2.452	0.43869	1.056	0.948	46%	Yes
4_105	1	4_108	51	1050	4.35	4.25	1.44	1.37	2.398	0.43868	1.047	0.904	49%	Yes
4_108	1	4_111	58	1050	4.25	4.21	1.37	1.32	2.374	0.43868	1.062	0.716	61%	Yes
4_111	1	4_114	45	1050	4.21	3.97	1.32	1.25	2.448	0.43868	1.269	0.963	46%	Yes
4_114	1	4_117	16	1650	3.97	3.97	0.85	0.76	2.745	0.51832	1.42	6.034	9%	Yes
4_117	1	4_120	26	1650	3.97	3.98	0.76	0.62	2.794	0.51832	1.226	5.904	9%	Yes
4_120	1	4_123	60	1650	3.98	3.99	0.62	0.55	2.851	0.51832	0.923	2.745	19%	Yes
4_123	1	4_126	60	1350	3.99	3.85	0.55	0.44	2.916	0.51832	1.009	2.029	26%	Yes
4_126	1	4_129	98	1350	3.85	3.85	0.44	0.31	2.831	0.56392	0.961	1.725	33%	Yes
4_129	1	4_132	10	1350	3.85	3.81	0.31	0.3	2.912	0.57472	0.88	1.497	38%	Yes
4_132	1	4_135	34	1350	3.81	3.98	0.3	0.26	2.879	0.59852	0.912	1.624	37%	Yes
4_135	1	4_138	53	1350	3.98	3.98	0.26	0.2	3.074	0.61626	0.911	1.593	39%	Yes
4_138	1	4_141	31	1350	3.98	3.98	0.2	0.16	3.112	0.62196	0.881	1.701	37%	Yes
4_141	1	4_144	34	1350	3.98	3.98	0.16	0.12	3.132	0.63087	0.86	1.624	39%	Yes
4_144	1	4_147	13	1350	3.98	3.98	0.12	0.05	3.152	0.64338	0.846	3.48	18%	Yes

Appendix 8.2 Capacity Performance of Existing Sewers in Ultimate Year (Baseline Condition)

Upstream Node (Ref: Appendix 8.3)	Link Suffix	Downstream Node (Ref: Appendix 8.3)	Pipe Length (m)	Pipe Diameter (mm)	Upstream Ground Level (mPD)	Downstream Ground Level (mPD)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Freeboard (m)	Peak Flow (m3/s)	Velocity (m/s)	Conduit Full Capacity (m3/s)	Peak Flow / Design Capacity (%)	Adequate Capacity?
4_147	1	2_261	26	1350	3.98	23.45	0.05	0.04	3.16	1.26231	1.501	0.927	136%	See Note 1
4_27	1	4_30	35	450	23.45	20.53	21.64	18.23	1.682	0.1255	3.384	0.81	15%	Yes
4_30	1	4_33	38	450	20.53	18.78	18.23	15.83	2.157	0.12971	2.98	0.652	20%	Yes
4_33	1	4_36	23	450	18.78	15.2	15.24	12.93	3.409	0.13525	3.512	0.822	16%	Yes
4_36	1	4_39	30	450	15.2	12.84	12.93	10.59	2.131	0.13525	3.238	0.725	19%	Yes
4_39	1	4_42	30	450	12.84	11.36	10.59	8.85	2.089	0.15715	3.092	0.625	25%	Yes
4_42	1	4_45	32	450	11.36	10.09	8.85	7.4	2.339	0.15715	2.845	0.552	28%	Yes
4_45	1	4_48	37	450	10.09	8.32	7.4	6.14	2.496	0.17402	2.661	0.479	36%	Yes
4_48	1	4_51	42	450	8.32	6.66	6.14	4.6	1.99	0.17402	2.731	0.497	35%	Yes
4_51	1	4_54	33	450	6.66	5.86	4.6	3.82	1.842	0.17965	2.36	0.399	45%	Yes
4_54	1	4_57	43	600	5.86	5.6	3.82	3.38	1.798	0.17965	1.683	0.563	32%	Yes
4_57	1	4_60	5	675	5.6	5.49	3.38	3.33	1.94	0.25798	1.84	0.76	34%	Yes
4_60	1	4_63	36	675	5.49	5.76	3.33	2.9	1.891	0.25798	1.944	0.831	31%	Yes
4_63	1	4_66	39	675	5.76	5.62	2.9	2.61	2.552	0.25798	1.62	0.655	39%	Yes
4_66	1	4_69	8	450	5.62	5.62	2.61	2.52	2.617	0.15232	1.101	0.275	55%	Yes
4_66	2	4_69	8	450	5.62	5.62	2.61	2.52	2.617	0.15232	1.101	0.275	55%	Yes
4_66	3	4_69	8	450	5.62	5.57	2.61	2.52	2.617	0.15232	1.101	0.275	55%	Yes
4_69	1	4_72	38	900	5.57	5.44	2.52	2.35	2.626	0.45695	1.553	1.088	42%	Yes
4_72	1	4_75	19	900	5.44	5.92	2.35	2.29	2.627	0.45695	1.388	0.914	50%	Yes
4_75	1	4_78	28	900	5.92	5.53	2.29	2.2	3.161	0.45695	1.364	0.922	50%	Yes
4_78	1	4_81	38	900	5.53	5.13	2.2	2.07	2.842	0.45695	1.299	0.951	48%	Yes
4_81	1	4_84	29	900	5.13	5.06	2.07	2.02	2.513	0.47661	1.188	0.675	71%	Yes
4_84	1	4_87	34	900	5.06	4.93	2.02	1.97	2.505	0.47661	1.211	0.623	77%	Yes
4_87	1	4_90	27	900	4.93	4.93	1.95	1.93	2.455	0.50381	1.318	0.441	114%	See Note 1
4_90	1	4_93	47	900	4.93	4.82	1.9	1.76	2.55	0.5038	1.462	0.887	57%	Yes
4_93	1	4_96	45	1000	4.82	4.67	1.63	1.6	2.6	0.5038	1.045	0.553	91%	Yes
4_96	1	4_99	11	1050	4.67	4.61	1.62	1.62	2.522	0.53215	1.22	0	-	See Note 2
4_99	1	4_102	56	1050	4.61	N/A	1.62	1.52	2.496	0.43869	1.097	1.032	43%	Yes

Note 1: No capacity constraint as the freeboards at both upstream and downstream manholes are adequate (i.e. >1m) in accordance with Sewerage Manual Part 1 Section 5.1.1.

Note 2: For the pipe between manholes ref. 4_96 and 4_99, the theoretical conduit full capacity is zero because of horizontal gradient of the pipe according to the information shown in recc drawings. Based on the hydraulic model simulation, the pipe is still adequate to convey the flow of 0.53m3/s without any surcharge due to the hydraulic head available upstream. The freeboards at both upstream and downstream manholes are also adequate (i.e. >1m) in accordance with Sewerage Manual Part 1 Section 5.1.1.

Appendix 8.2 Capacity Performance of Existing Sewers in Ultimate Year (with Project Condition)

Upstream Node (Ref: Appendix 8.3)	Link Suffix	Downstream Node (Ref: Appendix 8.3)	Pipe Length (m)	Pipe Diameter (mm)	Upstream Ground Level (mPD)	Downstream Ground Level (mPD)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Freeboard (m)	Peak Flow (m3/s)	Velocity (m/s)	Conduit Full Capacity (m3/s)	Peak Flow / Design Capacity (%)	Adequate Capacity?
392_42	1	392_45	14	250	135.79	134.66	134.33	133.64	1.428	0.00631	0.443	0.12	5%	Yes
392_45	1	392_48	11	250	134.66	133.9	132.96	132.8	1.664	0.00631	0.363	0.065	10%	Yes
392_48	1	392_51	9	250	133.9	133.68	132.44	132.15	1.427	0.00631	0.416	0.097	7%	Yes
392_51	1	392_54	8	250	133.68	133.12	131.84	131.58	1.807	0.00631	0.417	0.098	6%	Yes
392_54	1	392_57	7	250	133.12	132.68	131.35	131.18	1.736	0.00631	0.398	0.084	8%	Yes
392_57	1	392_60	5	250	132.68	144.09	130.82	130.7	1.826	0.00631	0.397	0.084	8%	Yes
392_6	1	392_9	11	250	144.09	132.02	143.23	143.04	0.824	0.00631	0.375	0.071	9%	Yes
392_60	1	392_63	16	250	132.02	130.35	130.42	129.33	1.569	0.00631	0.462	0.141	4%	Yes
392_63	1	392_66	8	250	130.35	129.38	128.75	128.53	1.566	0.00631	0.406	0.09	7%	Yes
392_66	1	392_69	7	250	129.38	129	128.4	127.7	0.95	0.00631	0.484	0.171	4%	Yes
392_69	1	392_72	19	250	129	126.34	127.7	125.54	1.27	0.00631	0.49	0.183	3%	Yes
392_72	1	392_75	24	250	126.34	123.53	125.24	122.78	1.07	0.00631	0.485	0.173	4%	Yes
392_75	1	392_78	18	250	123.53	121.68	122.27	120.58	1.23	0.00631	0.48	0.166	4%	Yes
392_78	1	392_81	15	250	121.68	119.75	120.21	118.87	1.44	0.00631	0.478	0.162	4%	Yes
392_81	1	392_84	14	250	119.75	117.97	118.85	117.27	0.87	0.00631	0.49	0.182	3%	Yes
392_84	1	392_87	6	250	117.97	117.61	117.12	116.92	0.817	0.00631	0.419	0.099	6%	Yes
392_87	1	392_90	5	250	117.61	144.61	116.73	116.61	0.846	0.00631	0.397	0.084	8%	Yes
392_9	1	392_12	21	250	144.61	117.29	143.04	142.93	1.53	0.00631	0.32	0.039	16%	Yes
392_90	1	392_93	5	250	117.29	116.95	116.54	116.25	0.719	0.00631	0.453	0.13	5%	Yes
392_93	1	392_96	5	250	116.95	116.55	116.05	115.8	0.868	0.00631	0.444	0.121	5%	Yes
392_96	1	392_99	20	250	116.55	114.38	115.48	113.68	1.04	0.00631	0.478	0.162	4%	Yes
392_99	1	392_102	24	250	114.38	4.48	113.28	110.85	1.07	0.00631	0.484	0.172	4%	Yes
4_102	1	4_105	53	1050	4.48	4.35	1.52	1.44	2.452	0.44339	1.056	0.948	47%	Yes
4_105	1	4_108	51	1050	4.35	4.25	1.44	1.37	2.398	0.44338	1.047	0.904	49%	Yes
4_108	1	4_111	58	1050	4.25	4.21	1.37	1.32	2.374	0.44338	1.062	0.716	62%	Yes
4_111	1	4_114	45	1050	4.21	3.97	1.32	1.25	2.448	0.44338	1.269	0.963	46%	Yes
4_114	1	4_117	16	1650	3.97	3.97	0.85	0.76	2.745	0.52302	1.42	6.034	9%	Yes
4_117	1	4_120	26	1650	3.97	3.98	0.76	0.62	2.794	0.52302	1.226	5.904	9%	Yes
4_120	1	4_123	60	1650	3.98	3.99	0.62	0.55	2.851	0.52302	0.923	2.745	19%	Yes
4_123	1	4_126	60	1350	3.99	3.85	0.55	0.44	2.916	0.52302	1.009	2.029	26%	Yes
4_126	1	4_129	98	1350	3.85	3.85	0.44	0.31	2.831	0.56862	0.961	1.725	33%	Yes
4_129	1	4_132	10	1350	3.85	3.81	0.31	0.3	2.912	0.57942	0.88	1.497	39%	Yes
4_132	1	4_135	34	1350	3.81	3.98	0.3	0.26	2.879	0.60322	0.912	1.624	37%	Yes
4_135	1	4_138	53	1350	3.98	3.98	0.26	0.2	3.074	0.62096	0.911	1.593	39%	Yes
4_138	1	4_141	31	1350	3.98	3.98	0.2	0.16	3.112	0.62666	0.881	1.701	37%	Yes
4_141	1	4_144	34	1350	3.98	3.98	0.16	0.12	3.132	0.63557	0.86	1.624	39%	Yes
4_144	1	4_147	13	1350	3.98	3.98	0.12	0.05	3.152	0.64808	0.846	3.48	19%	Yes

Project flow, Q = 0.0047 m3/s

Appendix 8.2 Capacity Performance of Existing Sewers in Ultimate Year (with Project Condition)

Upstream Node (Ref: Appendix 8.3)	Link Suffix	Downstream Node (Ref: Appendix 8.3)	Pipe Length (m)	Pipe Diameter (mm)	Upstream Ground Level (mPD)	Downstream Ground Level (mPD)	Upstream Invert Level (mPD)	Downstream Invert Level (mPD)	Freeboard (m)	Peak Flow (m3/s)	Velocity (m/s)	Conduit Full Capacity (m3/s)	Peak Flow / Design Capacity (%)	Adequate Capacity?
4_147	1	2_261	26	1350	3.98	23.45	0.05	0.04	3.16	1.26701	1.501	0.927	137%	See Note 1
4_27	1	4_30	35	450	23.45	20.53	21.64	18.23	1.682	0.1302	3.384	0.81	16%	Yes
4_30	1	4_33	38	450	20.53	18.78	18.23	15.83	2.157	0.13441	2.98	0.652	21%	Yes
4_33	1	4_36	23	450	18.78	15.2	15.24	12.93	3.409	0.13995	3.512	0.822	17%	Yes
4_36	1	4_39	30	450	15.2	12.84	12.93	10.59	2.131	0.13995	3.238	0.725	19%	Yes
4_39	1	4_42	30	450	12.84	11.36	10.59	8.85	2.089	0.16185	3.092	0.625	26%	Yes
4_42	1	4_45	32	450	11.36	10.09	8.85	7.4	2.339	0.16185	2.845	0.552	29%	Yes
4_45	1	4_48	37	450	10.09	8.32	7.4	6.14	2.496	0.17872	2.661	0.479	37%	Yes
4_48	1	4_51	42	450	8.32	6.66	6.14	4.6	1.99	0.17872	2.731	0.497	36%	Yes
4_51	1	4_54	33	450	6.66	5.86	4.6	3.82	1.842	0.18435	2.36	0.399	46%	Yes
4_54	1	4_57	43	600	5.86	5.6	3.82	3.38	1.798	0.18435	1.683	0.563	33%	Yes
4_57	1	4_60	5	675	5.6	5.49	3.38	3.33	1.94	0.26268	1.84	0.76	35%	Yes
4_60	1	4_63	36	675	5.49	5.76	3.33	2.9	1.891	0.26268	1.944	0.831	32%	Yes
4_63	1	4_66	39	675	5.76	5.62	2.9	2.61	2.552	0.26268	1.62	0.655	40%	Yes
4_66	1	4_69	8	450	5.62	5.62	2.61	2.52	2.617	0.15702	1.101	0.275	57%	Yes
4_66	2	4_69	8	450	5.62	5.62	2.61	2.52	2.617	0.15702	1.101	0.275	57%	Yes
4_66	3	4_69	8	450	5.62	5.57	2.61	2.52	2.617	0.15702	1.101	0.275	57%	Yes
4_69	1	4_72	38	900	5.57	5.44	2.52	2.35	2.626	0.46165	1.553	1.088	42%	Yes
4_72	1	4_75	19	900	5.44	5.92	2.35	2.29	2.627	0.46165	1.388	0.914	51%	Yes
4_75	1	4_78	28	900	5.92	5.53	2.29	2.2	3.161	0.46165	1.364	0.922	50%	Yes
4_78	1	4_81	38	900	5.53	5.13	2.2	2.07	2.842	0.46165	1.299	0.951	49%	Yes
4_81	1	4_84	29	900	5.13	5.06	2.07	2.02	2.513	0.48131	1.188	0.675	71%	Yes
4_84	1	4_87	34	900	5.06	4.93	2.02	1.97	2.505	0.48131	1.211	0.623	77%	Yes
4_87	1	4_90	27	900	4.93	4.93	1.95	1.93	2.455	0.50851	1.318	0.441	115%	See Note 1
4_90	1	4_93	47	900	4.93	4.82	1.9	1.76	2.55	0.5085	1.462	0.887	57%	Yes
4_93	1	4_96	45	1000	4.82	4.67	1.63	1.6	2.6	0.5085	1.045	0.553	92%	Yes
4_96	1	4_99	11	1050	4.67	4.61	1.62	1.62	2.522	0.53685	1.22	0	-	See Note 2
4_99	1	4_102	56	1050	4.61	N/A	1.62	1.52	2.496	0.44339	1.097	1.032	43%	Yes

Note 1: No capacity constraint as the freeboards at both upstream and downstream manholes are adequate (i.e. >1m) in accordance with Sewerage Manual Part 1 Section 5.1.1. Small Project effluent flow of only 0.0047 m3/s would have negligible effect on the freeboards.

Note 2: For the pipe between manholes ref. 4_96 and 4_99, the theoretical conduit full capacity is zero because of horizontal gradient of the pipe according to the information shown in reco drawings. Based on the hydraulic model simulation, the pipe is still adequate to convey the flow of 0.53m3/s without any surcharge due to the hydraulic head available upstream. The freeboards at both upstream and downstream manholes are also adequate (i.e. >1m) in accordance with Sewerage Manual Part 1 Section 5.1.1.

Project flow, Q = 0.0047 m3/s