

**Ujjain Underground Sewerage Scheme-Sewer Network Design 1/3**

SL	Starting Node	Ending Node	Chainage	Intial Population 2020	Initial Ultimate Population (Pi)	Contributory Population (Pc)	Total Ultimate population (Pu) 2050	Dry Weather Flow in LPS	Infiltration in LPS	Total Ultimate Flow in LPS	Peak Factor for Q20 (Initial Flow)	Peak Factor for Q50 (Ultimate Flow)	Qp20 (Initial Flow)	Qp50 (Ultimate Flow)	Type of Pipe	Pipe Dia (in m)
1	JM-3	MH-43	50	478	1809	0	1809	2.26	0.0116	2.272	3	3	1.794	6.817	DWC NP3	0.8
2	MH-43	MH-42	93.8	419	1584	1809	3393	4.24	0.0116	4.253	3	3	1.571	12.758	DWC NP3	0.8
3	MH-42	MH-41	142.99	471	1779	3393	5172	6.46	0.0116	6.477	3	3	1.764	19.430	DWC NP3	0.8
4	MH-41	MH-40	217.84	716	2707	5172	7879	9.85	0.0116	9.861	3	3	2.685	29.582	DWC NP3	0.8
5	MH-40	MH-39	335.19	1123	4245	7879	12124	15.15	0.0116	15.166	3	3	4.209	45.499	DWC NP3	0.8
6	MH-39	MH-38	370.61	339	1281	12124	13405	16.76	0.0116	16.768	3	3	1.271	50.304	DWC NP3	0.8
7	MH-38	MH-37	414.3	418	1580	13405	14985	18.73	0.0116	18.743	3	3	1.567	56.230	DWC NP3	0.8
8	MH-37	MH-36	454.63	386	1459	14985	16444	20.56	0.0116	20.567	3	3	1.447	61.700	DWC NP3	0.8
9	MH-36	MH-35	567.45	1079	4081	16444	20525	25.66	0.0116	25.668	3	2.5	4.047	64.169	DWC NP3	0.8
10	MH-35	MH-34	623.78	539	2037	20525	22562	28.20	0.0116	28.214	3	2.5	2.021	70.536	DWC NP3	0.8
11	MH-34	MH-33	731.51	1030	3897	22562	26459	33.07	0.0116	33.085	3	2.5	3.864	82.713	DWC NP3	0.8
12	MH-33	MH-32	823.57	881	3330	26459	29789	37.24	0.0116	37.247	3	2.5	3.302	93.119	DWC NP3	0.8
13	MH-32	MH-31	886.42	601	2273	29789	32062	40.08	0.0116	40.089	3	2.5	2.254	100.223	DWC NP3	0.8
14	MH-31	MH-30	960.83	712	2691	32062	34753	43.44	0.0116	43.453	3	2.5	2.669	108.633	DWC NP3	0.8
15	MH-30	MH-29	1065.82	1004	3798	34753	38551	48.19	0.0116	48.200	3	2.5	3.766	120.500	DWC NP3	0.8
16	MH-29	MH-28	1186.45	1154	4363	38551	42914	53.64	0.0116	53.654	3	2.5	4.327	134.136	DWC NP3	0.8
17	MH-28	MH-27	1260.82	711	2690	42914	45604	57.01	0.0116	57.017	3	2.5	2.668	142.542	DWC NP3	0.8
18	MH-27	MH-26	1378.2	1123	4246	45604	49850	62.31	0.0116	62.324	3	2.5	4.210	155.809	DWC NP3	0.8
19	MH-26	MH-25	1552.85	1671	6317	49850	56167	70.21	0.0116	70.220	3	2.25	6.265	157.995	DWC NP3	0.8
20	MH-25	MH-24	1657.94	1005	3801	56167	59968	74.96	0.0116	74.972	3	2.25	3.770	168.686	DWC NP3	0.8
21	MH-24	MH-23	1810.85	1463	5531	59968	65499	81.87	0.0116	81.885	3	2.25	5.485	184.241	DWC NP3	0.8
22	MH-23	MH-22	2087.69	2648	10013	65499	75512	94.39	0.0116	94.402	3	2.25	9.930	212.404	DWC NP3	0.8
23	MH-22	MH-21	2212.86	1197	4527	75512	80040	100.05	0.0116	100.061	3	2.25	4.490	225.137	DWC NP3	0.8
24	MH-21	MH-20	2317.07	997	3769	80040	83809	104.76	0.0116	104.773	3	2.25	3.738	235.738	DWC NP3	0.8
25	MH-20	MH-19	2406.19	852	3223	83809	87032	108.79	0.0116	108.802	3	2.25	3.197	244.804	DWC NP3	0.8
26	MH-19	MH-18	2499.91	896	3390	87032	90422	113.03	0.0116	113.039	3	2.25	3.362	254.338	DWC NP3	0.8
27	MH-18	MH-17	2583.86	803	3036	90422	93459	116.82	0.0116	116.835	3	2.25	3.011	262.879	DWC NP3	0.8
28	MH-17	MH-16	2634.98	489	1849	93459	95308	119.13	0.0116	119.146	3	2.25	1.834	268.079	DWC NP3	0.8
29	MH-16	MH-15	2715	765	2894	95308	98202	122.75	0.0116	122.764	3	2.25	2.870	276.219	DWC NP3	0.8
30	MH-15	MH-14	2772.64	551	2085	98202	100287	125.36	0.0116	125.370	3	2.25	2.068	282.083	DWC NP3	0.8
31	MH-14	MH-13	2839.49	639	2418	100287	102705	128.38	0.0116	128.393	3	2.25	2.398	288.883	DWC NP3	0.8
32	MH-13	MH-12	2903.38	611	2311	102705	105016	131.27	0.0116	131.281	3	2.25	2.292	295.383	DWC NP3	0.8
33	MH-12	MH-11	3039.08	1298	4908	105016	109924	137.41	0.0116	137.417	3	2.25	4.868	309.187	DWC NP3	0.8
34	MH-11	MH-10	3081.69	408	1541	109924	111465	139.33	0.0116	139.343	3	2.25	1.528	313.522	DWC NP3	0.8
35	MH-10	MH-9	3142.52	582	2200	111465	113666	142.08	0.0116	142.093	3	2.25	2.182	319.710	DWC NP3	0.8
36	MH-9	MH-8	3193.92	492	1859	113666	115525	144.41	0.0116	144.417	3	2.25	1.844	324.939	DWC NP3	0.8
37	MH-8	MH-7	3255.97	594	2244	115525	117769	147.21	0.0116	147.223	3	2.25	2.226	331.251	DWC NP3	0.8
38	MH-7	MH-6	3327.3	682	2580	117769	120349	150.44	0.0116	150.448	3	2.25	2.559	338.508	DWC NP3	0.8
39	MH-6	MH-5	3352.59	242	915	120349	121264	151.58	0.0116	151.591	3	2.25	0.907	341.080	DWC NP3	0.8
40	MH-5	MH-4	3408.24	532	2013	121264	123277	154.10	0.0116	154.107	3	2.25	1.996	346.742	DWC NP3	0.8

**Ujjain Underground Sewerage Scheme-Sewer Network Design 2/3**

SL	Starting Node	Ending Node	Qfull by Manning's Formula in LPS	Q20/Qfull	Q50/Qfull	Vfull(Vf) by Manning's formula	V20/Vf	V50/Vf	V20 Actual	V50 Actual	Depth ratio corresponding to calculated discharge ratio (d / D) for designed year 50	Remarks
1	JM-3	MH-43	922.94	0.002	0.007	1.678	0.257	0.401	0.43	0.67	0.05	d/D ratio and V50 been very small may be ignored since downstream velocity arriving is quite sartisfactory
2	MH-43	MH-42	652.62	0.002	0.020	1.187	0.257	0.401	0.30	0.48	0.05	
3	MH-42	MH-41	922.94	0.002	0.021	1.678	0.257	0.401	0.43	0.67	0.05	
4	MH-41	MH-40	1130.36	0.002	0.026	2.055	0.257	0.517	0.53	1.06	0.05	
5	MH-40	MH-39	922.94	0.005	0.049	1.678	0.257	0.401	0.43	0.67	0.05	
6	MH-39	MH-38	922.94	0.001	0.055	1.678	0.257	0.615	0.43	1.03	0.05	
7	MH-38	MH-37	565.18	0.003	0.099	1.028	0.257	0.701	0.26	0.72	0.05	
8	MH-37	MH-36	565.18	0.003	0.109	1.028	0.257	0.701	0.26	0.72	0.05	
9	MH-36	MH-35	565.18	0.007	0.114	1.028	0.401	0.701	0.41	0.72	0.10	
10	MH-35	MH-34	565.18	0.004	0.125	1.028	0.257	0.701	0.26	0.72	0.05	
11	MH-34	MH-33	565.18	0.007	0.146	1.028	0.401	0.776	0.41	0.80	0.10	
12	MH-33	MH-32	565.18	0.006	0.165	1.028	0.401	0.776	0.41	0.80	0.10	
13	MH-32	MH-31	922.94	0.002	0.109	1.678	0.257	0.701	0.43	1.18	0.05	
14	MH-31	MH-30	922.94	0.003	0.118	1.678	0.257	0.701	0.43	1.18	0.05	
15	MH-30	MH-29	565.18	0.007	0.213	1.028	0.401	0.822	0.41	0.84	0.10	
16	MH-29	MH-28	565.18	0.008	0.237	1.028	0.401	0.822	0.41	0.84	0.10	
17	MH-28	MH-27	565.18	0.005	0.252	1.028	0.257	0.843	0.26	0.87	0.05	
18	MH-27	MH-26	565.18	0.007	0.276	1.028	0.401	0.902	0.41	0.93	0.10	
19	MH-26	MH-25	565.18	0.011	0.280	1.028	0.401	0.902	0.41	0.93	0.10	
20	MH-25	MH-24	922.94	0.004	0.183	1.678	0.257	0.776	0.43	1.30	0.05	
21	MH-24	MH-23	922.94	0.006	0.200	1.678	0.401	0.822	0.67	1.38	0.10	
22	MH-23	MH-22	922.94	0.011	0.230	1.678	0.401	0.822	0.67	1.38	0.10	
23	MH-22	MH-21	922.94	0.005	0.244	1.678	0.257	0.843	0.43	1.41	0.05	
24	MH-21	MH-20	1598.58	0.002	0.147	2.907	0.257	0.776	0.75	2.26	0.05	
25	MH-20	MH-19	1598.58	0.002	0.153	2.907	0.257	0.776	0.75	2.26	0.05	
26	MH-19	MH-18	1598.58	0.002	0.159	2.907	0.257	0.776	0.75	2.26	0.05	
27	MH-18	MH-17	1598.58	0.002	0.164	2.907	0.257	0.776	0.75	2.26	0.05	
28	MH-17	MH-16	1598.58	0.001	0.168	2.907	0.257	0.776	0.75	2.26	0.05	
29	MH-16	MH-15	1598.58	0.002	0.173	2.907	0.257	0.776	0.75	2.26	0.05	
30	MH-15	MH-14	1598.58	0.001	0.176	2.907	0.257	0.776	0.75	2.26	0.05	
31	MH-14	MH-13	1598.58	0.002	0.181	2.907	0.257	0.776	0.75	2.26	0.05	
32	MH-13	MH-12	1598.58	0.001	0.185	2.907	0.257	0.776	0.75	2.26	0.05	
33	MH-12	MH-11	1598.58	0.003	0.193	2.907	0.257	0.776	0.75	2.26	0.05	
34	MH-11	MH-10	1598.58	0.001	0.196	2.907	0.257	0.776	0.75	2.26	0.05	
35	MH-10	MH-9	1598.58	0.001	0.200	2.907	0.257	0.822	0.75	2.39	0.05	
36	MH-9	MH-8	1598.58	0.001	0.203	2.907	0.257	0.822	0.75	2.39	0.05	
37	MH-8	MH-7	1598.58	0.001	0.207	2.907	0.257	0.822	0.75	2.39	0.05	
38	MH-7	MH-6	565.18	0.005	0.599	1.028	0.257	1.072	0.26	1.10	0.05	
39	MH-6	MH-5	565.18	0.002	0.603	1.028	0.257	1.072	0.26	1.10	0.05	
40	MH-5	MH-4	565.18	0.004	0.614	1.028	0.257	1.072	0.26	1.10	0.05	

**Ujjain Underground Sewerage Scheme-Sewer Network Design 3/3**

SL	Node	G.L	Slope Available	Provided slope	Invert level	Pipe Dia (in m)	Thickness	Crown level	Excavation level	Depth of Excavation	Difference between invert level and Excavation level	Difference between GL and Crown level	Depth of Manhole
1	JM-3	497.703	0.0050	0.0033	496.203	0.8	0.05	497.053	495.953	1.750	0.250	0.650	1.500
2	MH-43	497.452	0.0032	0.0017	496.130	0.8	0.05	496.980	495.880	1.572	0.250	0.472	1.322
3	MH-42	497.314	0.0008	0.0033	495.966	0.8	0.05	496.816	495.716	1.598	0.250	0.498	1.348
4	MH-41	497.353	0.0027	0.0050	495.592	0.8	0.05	496.442	495.342	2.011	0.250	0.911	1.761
5	MH-40	497.152	0.0006	0.0033	495.201	0.8	0.05	496.051	494.951	2.201	0.250	1.101	1.951
6	MH-39	497.22	0.0001	0.0033	495.083	0.8	0.05	495.933	494.833	2.387	0.250	1.287	2.137
7	MH-38	497.217	0.0032	0.0013	495.028	0.8	0.05	495.878	494.778	2.439	0.250	1.339	2.189
8	MH-37	497.356	0.0001	0.0013	494.978	0.8	0.05	495.828	494.728	2.628	0.250	1.528	2.378
9	MH-36	497.351	0.0006	0.0013	494.837	0.8	0.05	495.687	494.587	2.765	0.250	1.665	2.515
10	MH-35	497.417	0.0058	0.0013	494.766	0.8	0.05	495.616	494.516	2.901	0.250	1.801	2.651
11	MH-34	497.092	0.0033	0.0013	494.631	0.8	0.05	495.481	494.381	2.711	0.250	1.611	2.461
12	MH-33	496.741	0.0056	0.0013	494.516	0.8	0.05	495.366	494.266	2.475	0.250	1.375	2.225
13	MH-32	496.222	0.0112	0.0033	494.307	0.8	0.05	495.157	494.057	2.165	0.250	1.065	1.915
14	MH-31	495.515	0.0001	0.0033	494.059	0.8	0.05	494.909	493.809	1.706	0.250	0.606	1.456
15	MH-30	495.511	0.0151	0.0013	493.928	0.8	0.05	494.778	493.678	1.833	0.250	0.733	1.583
16	MH-29	497.092	0.0132	0.0013	493.777	0.8	0.05	494.627	493.527	3.565	0.250	2.465	3.315
17	MH-28	498.69	0.0059	0.0013	493.684	0.8	0.05	494.534	493.434	5.256	0.250	4.156	5.006
18	MH-27	499.13	0.0213	0.0013	493.537	0.8	0.05	494.387	493.287	5.843	0.250	4.743	5.593
19	MH-26	496.627	0.0110	0.0013	493.319	0.8	0.05	494.169	493.069	3.558	0.250	2.458	3.308
20	MH-25	494.711	0.0098	0.0033	492.968	0.8	0.05	493.818	492.718	1.993	0.250	0.893	1.743
21	MH-24	493.676	0.0033	0.0033	492.459	0.8	0.05	493.309	492.109	1.567	0.350	0.367	1.217
22	MH-23	493.165	0.0022	0.0033	491.536	0.8	0.05	492.386	491.186	1.979	0.350	0.779	1.629
23	MH-22	492.556	0.0002	0.0033	491.119	0.8	0.05	491.969	490.769	1.787	0.350	0.587	1.437
24	MH-21	492.528	0.0002	0.0100	490.077	0.8	0.05	490.927	489.727	2.801	0.350	1.601	2.451
25	MH-20	492.553	0.0006	0.0100	489.185	0.8	0.05	490.035	488.835	3.718	0.350	2.518	3.368
26	MH-19	492.503	0.0012	0.0100	488.248	0.8	0.05	489.098	487.898	4.605	0.350	3.405	4.255
27	MH-18	492.387	0.0056	0.0100	487.409	0.8	0.05	488.259	487.059	5.328	0.350	4.128	4.978
28	MH-17	491.913	0.0086	0.0100	486.898	0.8	0.05	487.748	486.548	5.365	0.350	4.165	5.015
29	MH-16	491.474	0.0335	0.0100	486.097	0.8	0.05	486.947	485.747	5.727	0.350	4.527	5.377
30	MH-15	488.79	0.0052	0.0100	485.521	0.8	0.05	486.371	485.171	3.619	0.350	2.419	3.269
31	MH-14	489.091	0.0348	0.0100	484.852	0.8	0.05	485.702	484.502	4.589	0.350	3.389	4.239
32	MH-13	491.415	0.0178	0.0100	484.214	0.8	0.05	485.064	483.864	7.551	0.350	6.351	7.201
33	MH-12	490.279	0.0145	0.0100	482.857	0.8	0.05	483.707	482.507	7.772	0.350	6.572	7.422
34	MH-11	488.305	0.0695	0.0100	482.430	0.8	0.05	483.280	482.080	6.225	0.350	5.025	5.875
35	MH-10	485.343	0.0164	0.0100	481.822	0.8	0.05	482.672	481.472	3.871	0.350	2.671	3.521
36	MH-9	484.346	0.0429	0.0100	481.308	0.8	0.05	482.158	480.958	3.388	0.350	2.188	3.038
37	MH-8	482.141	0.0239	0.0100	480.688	0.8	0.05	481.538	480.338	1.803	0.350	0.603	1.453
38	MH-7	483.623	0.0033	0.0013	480.598	0.8	0.05	481.448	480.248	3.375	0.350	2.175	3.025
39	MH-6	483.857	0.0382	0.0013	480.567	0.8	0.05	481.417	480.217	3.640	0.350	2.440	3.290
40	MH-5	482.891	0.0088	0.0013	480.497	0.8	0.05	481.347	480.147	2.744	0.350	1.544	2.394

**Ujjain Underground Sewerage Scheme-Sewer Network Design 1/3**

SL	Starting Node	Ending Node	Chainage	Intial Population 2020	Initial Ultimate Population (Pi)	Contributory Population (Pc)	Total Ultimate population (Pu) 2050	Dry Weather Flow in LPS	Infiltration in LPS	Total Ultimate Flow in LPS	Peak Factor for Q20 (Initial Flow)	Peak Factor for Q50 (Ultimate Flow)	Qp20 (Initial Flow)	Qp50 (Ultimate Flow)	Type of Pipe	Pipe Dia (in m)
41	MH-4	MH-3	3463.79	531	2009	123277	125286	156.61	0.0116	156.619	3	2.25	1.993	352.393	DWC NP3	0.8
42	MH-3	MH-2	3518.74	526	1988	125286	127273	159.09	0.0116	159.103	3	2.25	1.971	357.983	DWC NP3	0.8
43	MH-2	MH-1	3551.01	309	1167	127273	128441	160.55	0.0116	160.562	3	2.25	1.158	361.265	DWC NP3	0.8
44	MH-1	JM-2	3584.97	325	1228	128441	129669	162.09	0.0116	162.098	3	2.25	1.218	364.720	DWC NP3	0.8

**Ujjain Underground Sewerage Scheme-Sewer Network Design 2/3**

SL	Starting Node	Ending Node	Qfull by Manning's Formula in LPS	Q20/Qfull	Q50/Qfull	Vfull(Vf) by Manning's formula	V20/Vf	V50/Vf	V20 Actual	V50 Actual	Depth ratio corresponding to calculated discharge ratio (d / D) for designed year 50	Remarks
41	MH-4	MH-3	565.18	0.004	0.624	1.028	0.257	1.072	0.26	1.10	0.05	
42	MH-3	MH-2	652.62	0.003	0.549	1.187	0.257	1.039	0.30	1.23	0.05	
43	MH-2	MH-1	565.18	0.002	0.639	1.028	0.257	1.072	0.26	1.10	0.05	
44	MH-1	JM-2	565.18	0.002	0.645	1.028	0.257	1.072	0.26	1.10	0.05	

**Ujjain Underground Sewerage Scheme-Sewer Network Design 3/3**

SL	Node	G.L	Slope Available	Provided slope	Invert level	Pipe Dia (in m)	Thickness	Crown level	Excavation level	Depth of Excavation	Difference between invert level and Excavation level	Difference between GL and Crown level	Depth of Manhole
41	MH-4	482.4	0.0135	0.0013	480.428	0.8	0.05	481.278	480.078	2.322	0.350	1.122	1.972
42	MH-3	481.65	0.0073	0.0017	480.336	0.8	0.05	481.186	479.986	1.664	0.350	0.464	1.314
43	MH-2	481.25	0.0124	0.0013	480.296	0.8	0.05	481.146	479.946	1.304	0.350	0.104	0.954
44	MH-1	481.65	0.0118	0.0013	480.254	0.8	0.05	481.104	479.904	1.746	0.350	0.546	1.396