

Areas to be filled in are highlighted in yellow

P_f 6 Peak Factor
I/l 300 gpd/in/mile 4.92E-06 cfs
n_f 0.010 Manning
k 1.485 Conversion Factor

Q_{full} Full Pipe Flow
Q_{cal} Calculated Flow - Based on Flow Height
Q_{needed} Required Flow (Q_{per-use}+Q_{inf})
Q_{inf} Flow needed for infiltration
Q_{per-use} Flow Needed Per Use
ΔQ Difference between Q_{needed} and Q_{cal}

V_{cal1} Velocity from the approximate flow depth
V_{cal2} Velocity based on the iterative flow depth
K_h Constant used to calculate the approximate flow depth Based on an approximation method presented by Esen (1993)
y Depth of flow
∅ Angle of partial flow based on flow depth
A Area of partial flow
P Wetted Perimeter
R_h Hydraulic Radius

Based on NHDES Table
Flow Per lot 450 gpd
Flow (cfs) 0.0007 cfs
Flow with Peaking Factor 0.0042 cfs

TABLE 1 - FULL FLOW AND APPROXIMATE PARTIAL FLOW CALCULATIONS

From	To	Length (ft)	Inverts		Slope (ft/ft)	Dia		Full Flow		K _h	∅ _{full} rad.	∅ rad.	y/Y	y ft	A sf	Add Lots	Partial Flow			V _{cal1} fps	Notes
			Out	In		(in)	(ft)	V _{full} fps	Q _{full} cfs								Q (cfs)				
																	Q _{per-use}	Q _{inf}	Q _{needed}		
SMH-01	SMH-02	296	44.10	39.60	0.015	6	0.50	4.58	0.90	0.012	1.530	1.530	0.14	0.070	0.017	6	0.025	0.009	0.034	2.04	
SMH-02	SMH-03	269	39.50	36.77	0.010	6	0.50	3.74	0.73	0.028	1.908	1.908	0.21	0.105	0.030	6	0.059	0.008	0.067	2.22	
SMH-03	SMH-04	296	36.60	33.60	0.010	8	0.67	4.53	1.58	0.020	1.738	1.738	0.18	0.118	0.042	5	0.088	0.012	0.099	2.38	SMH-10 tie into SMH-3
SMH-04	SMH-05	296	33.50	32.00	0.005	8	0.67	3.20	1.12	0.038	2.056	2.056	0.24	0.161	0.065	6	0.124	0.012	0.136	2.09	
SMH-05	SMH-06	156	31.90	31.10	0.005	8	0.67	3.22	1.12	0.043	2.123	2.123	0.26	0.171	0.071	3	0.149	0.006	0.155	2.19	
SMH-06	SMH-07	150	31.00	21.70	0.062	8	0.67	11.20	3.91	0.014	1.602	1.602	0.15	0.101	0.033	4	0.171	0.006	0.177	5.30	
SMH-07	SMH-08	193	21.20	13.35	0.041	8	0.67	9.07	3.17	0.018	1.706	1.706	0.17	0.114	0.040	0	0.177	0.008	0.185	4.65	
SMH-08	SMH-09	87	13.25	12.35	0.010	8	0.67	4.57	1.60	0.037	2.040	2.040	0.24	0.159	0.064	0	0.185	0.003	0.188	2.96	
SMH-09	Pump	43	11.14	10.69	0.010	8	0.67	4.60	1.61	0.037	2.041	2.041	0.24	0.159	0.064	0	0.188	0.002	0.190	2.98	SMH-24 ties into SMH 9
SMH-10	SMH-03	160	40.87	36.87	0.025	6	0.50	5.87	1.15	0.004	1.143	1.143	0.08	0.040	0.007	2	0.008	0.005	0.013	1.80	SMH-10 tie into SMH-3
SMH-20	SMH-21	293	35.65	26.75	0.030	6	0.50	6.47	1.27	0.004	1.189	1.189	0.09	0.043	0.008	2	0.008	0.009	0.017	2.08	
SMH-21	SMH-21A	72	26.65	23.80	0.040	6	0.50	7.38	1.45	0.008	1.381	1.381	0.11	0.057	0.012	4	0.034	0.002	0.036	2.88	
SMH-21A	SMH-22	72	23.70	20.90	0.039	8	0.67	8.87	3.10	0.006	1.276	1.276	0.10	0.066	0.018	4	0.053	0.003	0.055	3.12	
SMH-22	SMH-23	72	20.80	17.80	0.042	8	0.67	9.18	3.20	0.004	1.189	1.189	0.09	0.057	0.015	1	0.040	0.003	0.043	2.95	
SMH-23	SMH-09	170	17.70	12.28	0.032	8	0.67	8.03	2.80	0.006	1.272	1.272	0.10	0.065	0.018	0	0.043	0.007	0.050	2.82	
SMH-09	Pump	43	11.14	10.69	0.010	8	0.67	4.60	1.61	0.037	2.041	2.041	0.24	0.159	0.064	0	0.188	0.002	0.190	2.98	
																43					

TABLE 2 - PARTIAL FLOW CALCULATIONS

Solve with iterative y															
From	To	D ft	r ft	y* ft	∅ rad.	A sf	P ft	R _h	n/n _{full}	n	Q _{cal} cfs	Q _{needed} cfs		V _{cal2} fps	ΔQ*
SMH-01	SMH-02	0.50	0.25	0.074	1.577	0.018	0.3942	0.0457	1.249	0.012	0.0338	0.0338		1.88	0.0000
SMH-02	SMH-03	0.50	0.25	0.116	2.007	0.034	0.5017	0.0685	1.290	0.013	0.0668	0.0668		1.94	0.0000
SMH-03	SMH-04	0.67	0.33	0.128	1.811	0.047	0.6038	0.0773	1.275	0.013	0.0993	0.0993		2.13	0.0000
SMH-04	SMH-05	0.67	0.33	0.179	2.176	0.075	0.7254	0.1037	1.290	0.013	0.1361	0.1361		1.81	0.0000
SMH-05	SMH-06	0.67	0.33	0.190	2.254	0.082	0.7512	0.1093	1.290	0.013	0.1547	0.1547		1.88	0.0000
SMH-06	SMH-07	0.67	0.33	0.108	1.658	0.037	0.5525	0.0665	1.257	0.013	0.1773	0.1773		4.83	0.0000
SMH-07	SMH-08	0.67	0.33	0.123	1.775	0.044	0.5917	0.0747	1.271	0.013	0.1849	0.1849		4.18	0.0000
SMH-08	SMH-09	0.67	0.33	0.176	2.157	0.074	0.7190	0.1023	1.290	0.013	0.1884	0.1884		2.56	0.0000
SMH-09	Pump	0.67	0.33	0.176	2.159	0.074	0.7196	0.1024	1.290	0.013	0.1901	0.1901		2.58	0.0000
SMH-10	SMH-03	0.50	0.25	0.041	1.156	0.008	0.2891	0.0260	1.188	0.012	0.0131	0.0131		1.74	0.0000
SMH-20	SMH-21	0.50	0.25	0.044	1.207	0.009	0.3017	0.0282	1.200	0.012	0.0170	0.0170		2.00	0.0000
SMH-21	SMH-21A	0.50	0.25	0.060	1.414	0.013	0.3534	0.0377	1.232	0.012	0.0358	0.0358		2.69	0.0000
SMH-21A	SMH-22	0.67	0.33	0.068	1.302	0.019	0.4338	0.0432	1.221	0.012	0.0554	0.0554		2.95	0.0000
SMH-22	SMH-23	0.67	0.33	0.059	1.206	0.015	0.4021	0.0376	1.200	0.012	0.0429	0.0429		2.83	0.0000
SMH-23	SMH-09	0.67	0.33	0.068	1.298	0.019	0.4325	0.0430	1.221	0.012	0.0495	0.0495		2.66	0.0000
SMH-09	Pump	0.67	0.33	0.176	2.159	0.074	0.7196	0.1024	1.290	0.013	0.1901	0.1901		2.58	0.0000

* After Determining the approximate depth of flow, an iterative process is used (Use Solver).
Depth of flow is changed until $Q_{cal} = Q_{needed}$