

## **Metropolitan Council Environmental Services**



### **Procedure for determining if excessive Inflow/Infiltration (I/I) is being conveyed to the MDS**

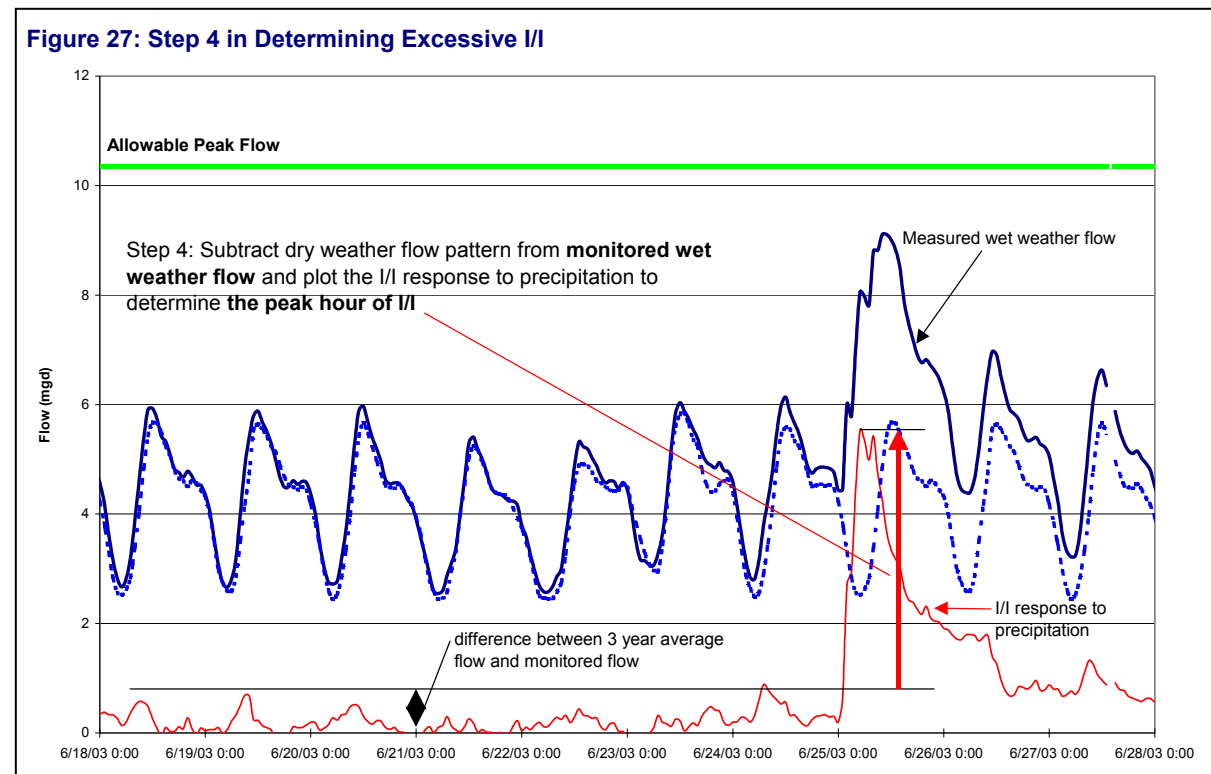
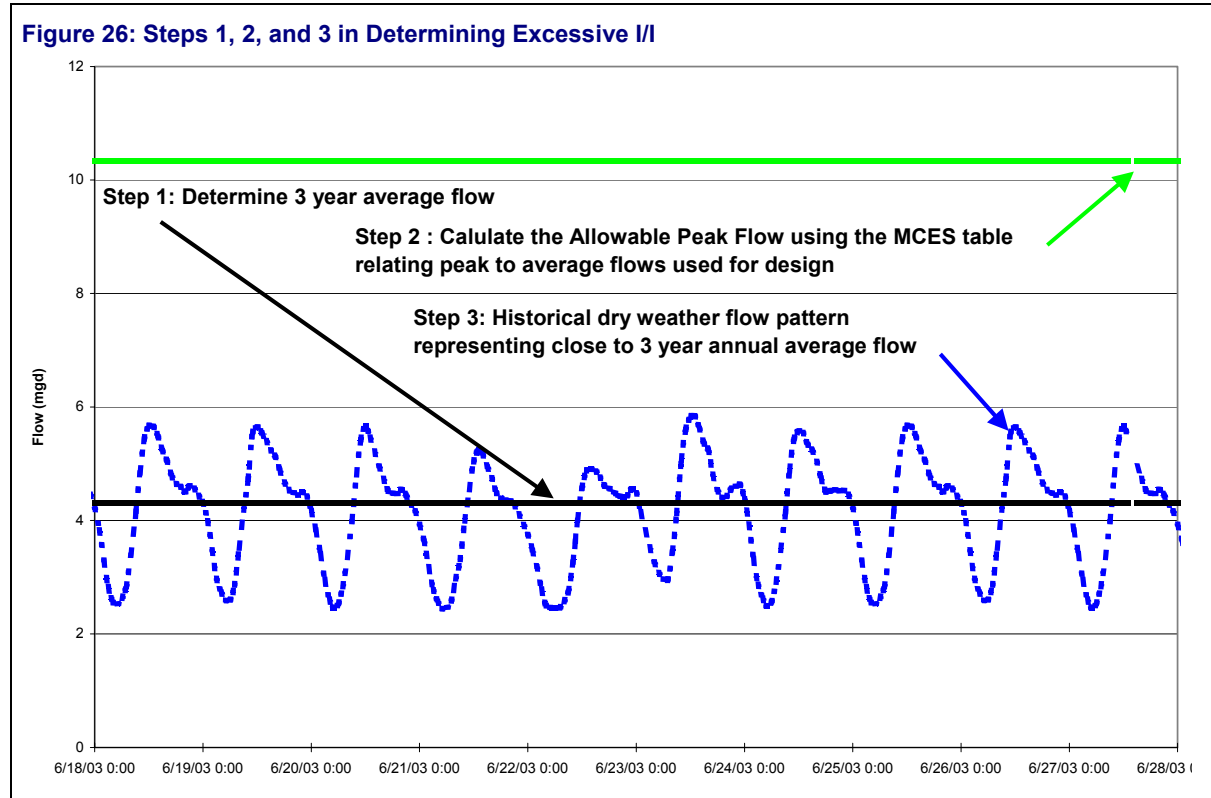
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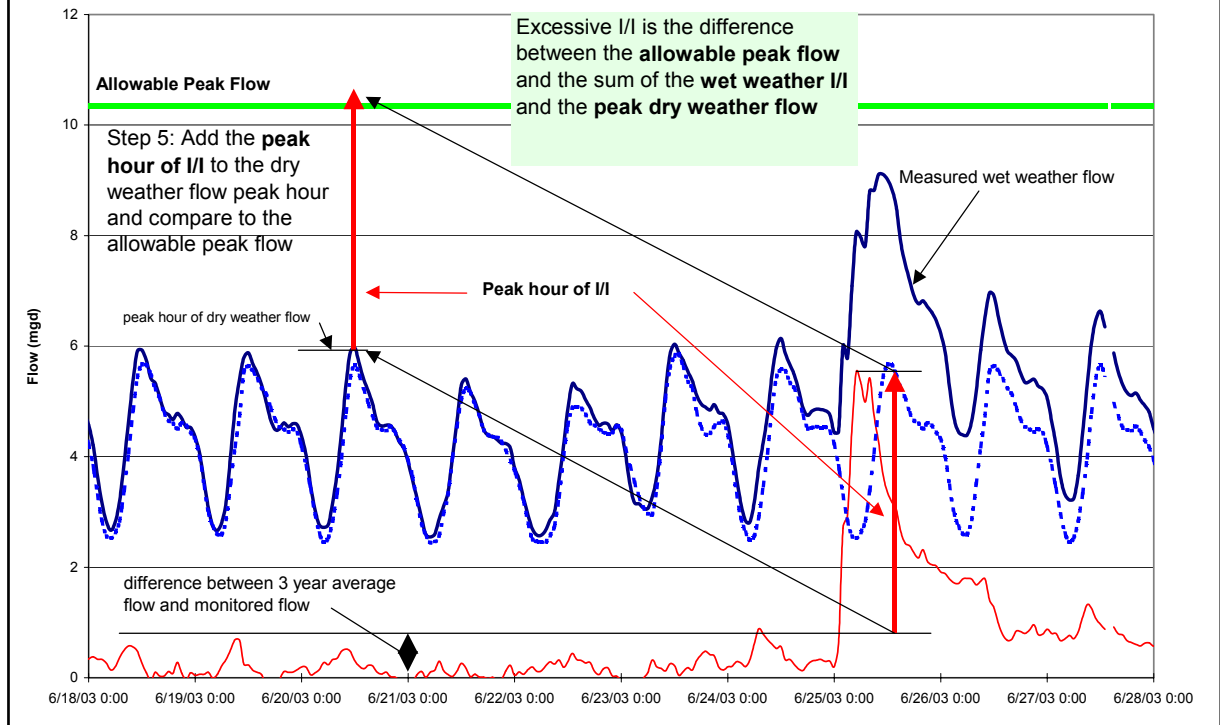
**The procedure used by MCES to determine if the I/I from a tributary area is excessive is as follows.**

1. The average flow for the city is based on an average of the past three years of historical flow records and it will be updated annually.
2. The acceptable peak hour flow is calculated using the MCES table that relates peak to average ratios to average flow. The appropriate peak to average ratio is multiplied times the three-year average flow to calculate the acceptable peak hour flow.
3. A representative dry weather flow pattern is selected from recent historical data. The average flow during this period is close to the average flow for the past three years.
4. The I/I component of the wet weather flow is determined by subtracting the dry weather flow for the corresponding hour and day of the week.
5. The I/I component of wet weather flow is added to the peak hour flow rate of the typical dry weather flow pattern to determine if the resulting peak flow is greater than the peak calculated in step 2. If the resulting peak flow is greater, the I/I is excessive.

The following three graphs in Figures 26, 27, and 28, illustrate the five steps used to determine excessive I/I.



**Figure 28: Step 5 in Determining Excessive I/I**



## Communities with Excessive I/I

MCES has analyzed the last three years of flow records for each community to identify tributary areas with excessive I/I. For each area, the average flow was determined and a representative dry weather period was selected. For most areas, the representative period selected is the first week of April in 2001. The allowable peak hour flow, based on the MCES peak to average ratio, was determined for each average flow. Peak I/I flow rates were identified by evaluating the flow records during and after significant rainfalls in the vicinity of the area under evaluation. The I/I component of flow was determined by subtracting the representative dry weather flow pattern from the wet weather flow pattern and the maximum I/I flow rate was established. Flow information for communities with peak I/I rates that could cause peak hour flow exceeding the acceptable value is listed in Table 8, on the following pages.

Added information, in the form of hydrographs by metered service area, can be found in the supplement to this document. Cities may request the information on the meters in their service areas.

**Table 8: Community Flow Information (page 1 of 4)**

**NOTE:** in the column headed Step 5, N.M = Not Meaningful: little discernible response to rainfall and M.D. = Missing Data: flow data during rain event are missing or data are suspect.

Step in I/I Determination Procedure		Step 1		Step 2	Step 3	Step 4	Step 5
Community	Metershed	3yr Avg Flow (mgd)	Design P/A Ratio	Allowable Peak Hour Flow (mgd)	Dry Weather Peak Hour Flow (mgd)	Metered Peak Hour /l (mgd)	Resulting Peak Hour Flow (mgd)
Andover	218	1.26	3	3.78	2.13	N.M.	N.M
Anoka	303-(302+304)	2.24	2.8	6.27	3.50	2.00	5.50
Apple Valley	643	1.66	2.9	4.80	2.46	N.M.	N.M.
Apple Valley	644	1.13	3.1	3.51	2.16	M.D.	N.M.
Apple Valley	644A	0.17	3.9	0.66	0.28	N.M.	N.M.
Apple Valley	648	0.69	3.3	2.28	1.19	N.M.	N.M.
Arden Hills	51+52	0.56	3.4	1.89	0.83	2.30	3.13
Arden Hills	54	0.22	3.8	0.84	0.40	0.95	1.35
Arden Hills	59	0.34	3.6	1.23	0.64	2.60	3.24
Bayport	609	0.56	3.4	1.91	0.88	1.40	2.28
Birchwood	028A	0.09	4	0.36	0.32	<.10	<.42
Blaine	207	0.32	3.6	1.16	0.60	0.45	1.05
Blaine	216	2.85	2.7	7.70	4.11	1.90	6.01
Bloomington	500A	9.69	2.1	20.34	14.10	6.50	20.60
Brooklyn Center	110	1.09	3.1	3.36	1.61	1.20	2.81
Brooklyn Center	112	1.61	2.9	4.66	2.30	1.75	4.05
Brooklyn Park	221-(223+224+228+230+232)	5.12	2.3	11.77	7.68	7.00	14.68
Burnsville	501A-(405+406+644+630)	5.81	2.3	13.36	7.66	N.M.	N.M.
Centerville	210	0.28	3.7	1.03	0.44	0.62	1.06
Champlin	230-303	1.74	2.9	5.05	2.67	2.50	5.17
Chanhassen	413-439	1.85	2.9	5.37	2.70	2.60	5.30
Chanhassen	419	0.17	3.9	0.68	0.27	0.15	0.42
Chaska	443A	2.20	2.8	6.15	3.30	>4	>7.3
Circle Pines	205-(206+207+211)	0.38	3.6	1.37	0.79	M.D.	N.M.
Columbia Heights	106	0.30	3.6	1.08	0.50	>2.0	>2.5
Columbia Heights	107	0.32	3.6	1.16	0.88	>2.0	>2.88
Columbia Heights	108	0.96	3.2	3.08	1.63	M.D.	N.M.
Coon Rapids	215-(216+218)	6.07	2.3	13.96	7.50	2.50	10.00
Cottage Grove	600A	1.96	2.8	5.49	3.39	1.10	4.49
Crystal	113	2.38	2.7	6.42	3.53	5.50	9.03
Deephaven	424	0.53	3.4	1.79	1.19	1.10	2.29
Eagan	503+503A	6.45	2.2	14.19	8.84	3.80	12.64
Eden Prairie	(409+409A+414)-(410+411+412+413)	4.94	2.4	11.84	7.40	7.00	14.40
Edina	127	1.55	2.9	4.51	1.85	>2.5	>4.35
Edina	129	4.31	2.4	10.34	5.84	5.00	10.84
Edina	128	0.37	3.6	1.33	0.58	M.D.	N.M.

**Table 8: Community Flow Information (page 2 of 4)**

Step in I/I Determination Procedure		Step 1		Step 2	Step 3	Step 4	Step 5
Community	Metershed	3yr Avg Flow (mgd)	Design P/A Ratio	Allowable Peak Hour Flow (mgd)	Dry Weather Peak Hour Flow (mgd)	Metered Peak Hour /l (mgd)	Resulting Peak Hour Flow (mgd)
Excelsior	417	0.24	3.8	0.90	0.33	1.00	1.33
Excelsior	417A	0.08	4	0.33	0.13	0.33	0.46
Falcon Heights	47	0.23	3.8	0.88	0.37	M.D.	N.M.
Farmington	647-646	0.88	3.2	2.83	1.20	N.M.	N.M.
Farmington	642	0.26	3.7	0.96	0.41	N.M.	N.M.
Forest Lake	43	1.66	2.9	4.80	2.32	5.00	7.32
Fridley	109-108	1.43	3	4.30	2.10	3.40	5.50
Fridley	SA2 formula	4.04	2.5	10.10	6.46	M.D.	N.M.
Golden Valley	117-120	3.22	2.6	8.38	4.32	>15	>19.32
Greenwood	416	0.07	4	0.27	0.10	0.18	0.28
Hastings	602	1.66	2.9	4.81	2.52	<.10	<2.62
Hopkins	123-126	1.77	2.9	5.12	2.43	3.10	5.53
Hopkins	122	0.09	4	0.35	0.17	0.55	0.72
Hugo	41-(43+220)	0.25	3.7	0.93	0.45	M.D.	N.M.
Inver Grove Hts	605-(603+604)	2.15	2.8	6.01	3.27	1.90	5.17
Lakeville	643-(641+642)+643+644+648)	1.98	2.8	5.54	3.20	N.M.	N.M.
Lakeville	646	1.76	2.9	5.09	2.71	N.M.	N.M.
Lauderdale	103	0.11	4	0.46	0.24	0.95	1.19
Lexington	206	0.30	3.7	1.10	0.50	2.00	2.50
Lilydale	61	0.07	4	0.28	0.15	0.40	0.55
Lino Lakes	211	0.44	3.5	1.53	0.75	0.80	1.55
Lino Lakes	219	0.46	3.5	1.62	0.71	0.40	1.11
Lino Lakes	220-210	0.12	4	0.46	0.31	0.20	0.51
Little Canada	(35+35A)-(36+48)	1.81	2.9	5.26	2.43	2.90	5.33
Long Lake	430-(431+434)	0.29	3.7	1.08	0.51	1.80	2.31
Mahtomedi	029A	0.57	3.4	1.95	0.82	0.80	1.62
Maplewood	(4)-(19)	0.21	3.8	0.78	0.38	0.20	0.58
Maplewood	5	0.25	3.7	0.93	0.46	>0.7	>1.16
Maplewood	7	0.15	3.9	0.57	0.23	0.40	0.63
Maplewood	7A	0.70	3.3	2.31	0.99	1.80	2.79
Maplewood	8	0.34	3.6	1.22	0.50	0.85	1.35
Maplewood	11	0.70	3.3	2.32	0.96	1.80	2.76
Maplewood	15A	0.21	3.8	0.80	0.47	M.D.	N.M.
Maplewood	16	0.34	3.6	1.22	0.49	1.00	1.49
Maplewood	25A-(26+38)	0.38	3.6	1.37	0.60	2.30	2.90
Maple Grove	224	1.19	3.1	3.68	1.92	>9.5	>11.42
Maple Grove	228	1.63	2.9	4.72	2.10	4.00	6.10
Maple Grove	232	2.76	2.7	7.46	4.03	7.00	11.03
Maple Plain	433	0.36	3.6	1.31	0.76	>.9	>1.66
Medicine Lake	119	0.04	4	0.18	0.08	0.50	0.58
Medina	229	0.24	3.7	0.90	0.32	0.90	1.22
Medina	434-433	0.10	4	0.41	0.34	0.35	0.69

**Table 8: Community Flow Information (page 3 of 4)**

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Community	Metershed	3yr Avg Flow (mgd)	Design P/A Ratio	Allowable Peak Hour Flow (mgd)	Dry Weather Peak Hour Flow (mgd)	Metered Peak Hour /l (mgd)	Resulting Peak Hour Flow (mgd)
Mendota	62	0.02	4	0.07	0.06	0.10	0.16
Mendota Hts	(63A+63B)-	1.62	2.9	4.69	2.26	3.00	5.26
	(100A+100B)						
	-(110+112+113						
	+114+115+116						
Minneapolis-NW	+117+118+132)	33.00	1.8	59.40	42.80	>100.00	>142.8
	(101A+101B)-						
Minneapolis-SW	(121+127+130)	18.60	1.8	33.48	23.40	45.00	68.40
	(102A+102B						
	+131A+131B)						
	-(103+104+105						
	+106+107						
	+109+111						
Minneapolis-E	+200A+200B)	15.00	1.9	28.50	23.10	25.00	48.10
Minnetonka	410	4.59	2.4	11.01	6.90	11.00	17.90
Minnetonka	411	0.49	3.5	1.71	1.25	0.90	2.15
	412-(414+415						
Minnetonka	+424+437)	1.84	2.9	5.33	3.69	>8.00	>11.69
Minnetonka Beach	421	0.07	4	0.28	0.25	0.55	0.80
Mound	423-422	1.24	3	3.73	1.87	3.40	5.27
Moundsview	202	0.16	3.9	0.64	0.30	0.10	0.40
Moundsview	203	0.72	3.3	2.38	0.86	1.50	2.36
Moundsview	208	0.34	3.6	1.22	0.58	0.55	1.13
Moundsview	212	0.20	3.8	0.75	0.39	0.25	0.64
New Brighton	201-59	2.27	2.8	6.34	2.92	>5.1	>8.02
New Hope	114	2.33	2.7	6.29	3.40	9.50	12.90
Newport	603	0.33	3.6	1.20	0.51	0.70	1.21
No. St. Paul	10	1.39	3	4.18	1.80	2.80	4.60
Oakdale	21	2.63	2.7	7.09	3.81	3.30	7.11
Oak Park Heights	607-609	0.53	3.4	1.80	0.74	0.70	1.44
Orono	435-(421+430)	0.56	3.4	1.92	0.90	2.00	2.90
Orono	431	0.08	4	0.31	0.12	>.50	>.62
Osseo	223	0.22	3.8	0.82	0.31	0.90	1.21
Plymouth	118-(119+229)	7.74	2.2	17.04	10.96	>14.00	>24.96
Prior Lake	404	1.82	2.9	5.26	2.88	2.00	4.88
Ramsey	302	0.39	3.6	1.40	0.71	0.35	1.06
Ramsey	304	(new					0.00
Richfield	130-(128+129)	3.63	2.5	9.08	5.19	1.50	6.69
Robbinsdale	116	0.30	3.7	1.09	0.47	0.35	0.82
Robbinsdale	115	1.11	3.1	3.45	1.67	1.10	2.77
Rosemount	641	0.32	3.6	1.16	0.62	<.10	<.72
Rosemount	645	0.73	3.3	2.41	1.23	<.10	<1.33
	46-(49+50+51						
	+52+54+55						
Roseville	+55A)	4.34	2.4	10.43	6.80	>11	>17.8

**Table 8: Community Flow Information (page 4 of 4)**

Step in I/I Determination Procedure		Step 1		Step 2	Step 3	Step 4	Step 5
Community	Metershed	3yr Avg Flow (mgd)	Design P/A Ratio	Allowable Peak Hour Flow (mgd)	Dry Weather Peak Hour Flow (mgd)	Metered Peak Hour /l (mgd)	Resulting Peak Hour Flow (mgd)
Savage	405	0.27	3.7	0.98	0.47	<.10	<.57
Savage	406	1.69	2.9	4.90	3.61	<.10	<3.71
Shakopee	(402A+402B) -(404+443A)	2.75	2.7	7.43	4.88	1.00	5.88
Shoreview	49	0.12	4	0.47	0.19	1.40	1.59
Shoreview	50	0.14	3.9	0.53	0.24	0.40	0.64
Shoreview	48	1.71	2.9	4.96	2.22	2.40	4.62
Shoreview	204 -(205+208+219)	1.05	3.1	3.26	1.80	0.80	2.60
Shorewood	415 -(416+417+417A +419+420)	0.91	3.2	2.90	1.31	>3.00	>4.31
So. St. Paul	601-605	3.78	2.5	9.44	5.94	10.50	16.44
Spring Lake Park	214	0.76	3.3	2.51	1.16	0.40	1.56
Spring Park	422	0.30	3.6	1.09	0.46	0.40	0.86
St. Anthony	55	0.33	3.6	1.19	0.50	0.90	1.40
St. Anthony	55A	0.08	4	0.33	0.075	>.90	>.97
St. Anthony	104	0.45	3.5	1.59	0.52	2.30	2.82
St. Anthony	105	0.03	4	0.12	0.038	0.17	0.21
St. Bonifacius	436	0.24	3.7	0.90	0.41	0.15	0.56
St. Louis Park	120	2.92	2.6	7.58	3.95	3.80	7.75
St. Louis Park	121-122	2.05	2.8	5.74	2.93	2.80	5.73
St. Louis Park	126	0.02	4	0.07	0.03	0.015	0.04
St. Louis Park	132-123	1.18	3.1	3.67	1.77	3.70	5.47
St Paul		33.00	1.8	59.40	45.00	165.00	210.00
St Paul Park	604	0.53	3.4	1.79	0.69	<.10	<.79
Stillwater	606	2.32	2.7	6.27	3.63	4.20	7.83
Tonka Bay	420	0.25	3.7	0.93	0.36	0.60	0.96
Vadnais Hghts	36-39	0.98	3.2	3.13	1.34	2.50	3.84
Vadnais Hghts	38	0.19	3.9	0.73	0.34	1.60	1.94
Waconia	452A+452B	0.75	3.3	2.47	1.25	2.10	3.35
Wayzata	437-435	0.67	3.3	2.21	1.06	2.00	3.06
West St. Paul	56	0.15	3.9	0.59	0.26	1.10	1.36
West St. Paul	57	0.35	3.6	1.26	0.56	1.20	1.76
West St. Paul	58	1.69	2.9	4.89	2.38	5.60	7.98
White Bear Lake	26 -(27+28A+29A)	2.87	2.7	7.75	3.95	3.00	6.95
White Bear	27	0.09	4	0.37	0.15	0.80	0.95
White Bear	39-41	0.90	3.2	2.89	1.40	2.30	3.70
Woodbury	17-21	2.28	2.8	6.38	3.18	2.00	5.18
Woodbury	18	2.16	2.8	6.04	3.22	2.00	5.22
Woodbury	19	0.17	3.9	0.64	0.24	<.10	<.34