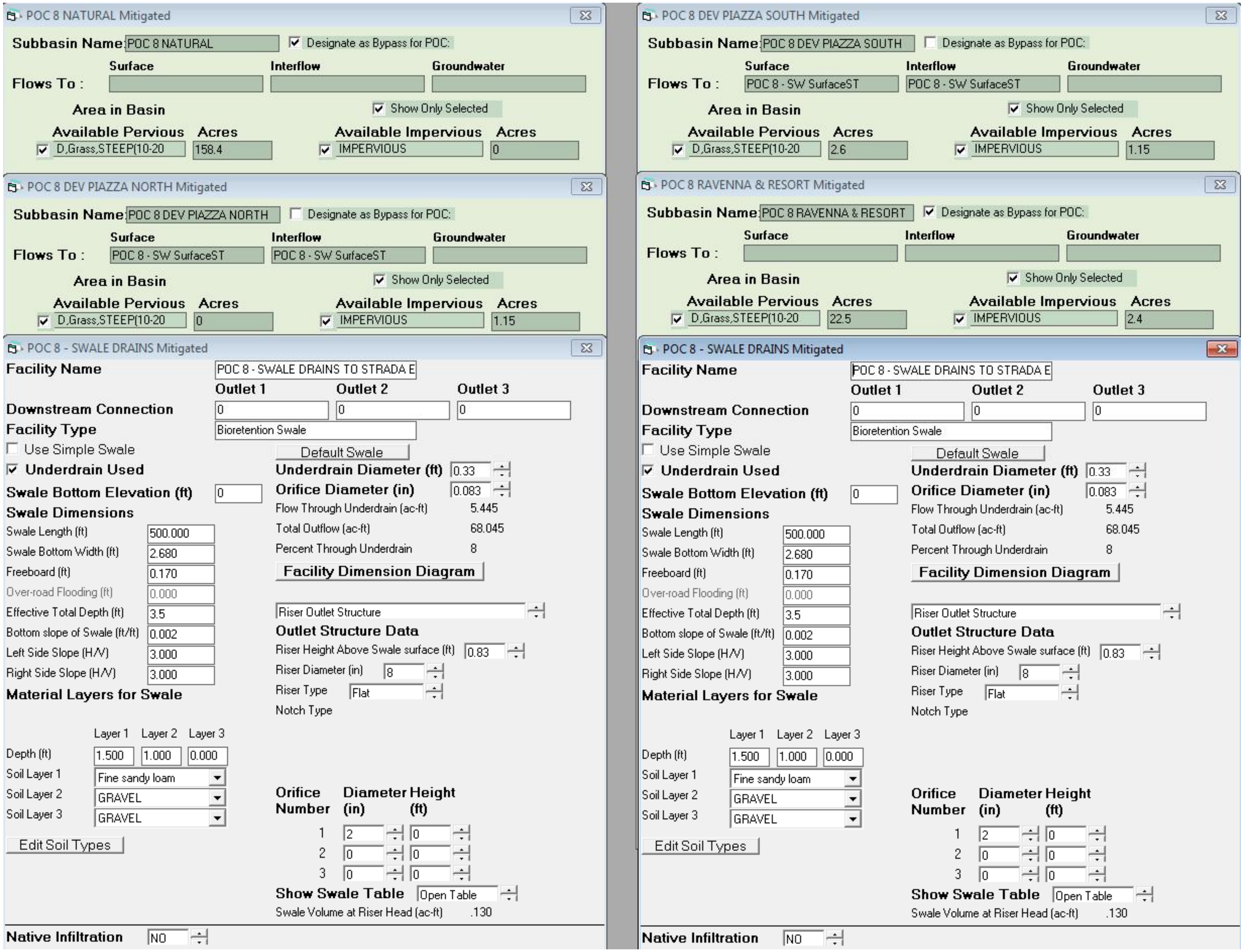


POC 8 NATURAL Mitigated

Subbasin Name: POC 8 NATURAL — [x] Designate as Bypass for POC:

Flows To :	Surface	Interflow	Groundwater

Area in Basin — [x] Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
[x] D,Grass,STEEP(10-20	158.4	[x] IMPERVIOUS	0

POC 8 DEV PIAZZA NORTH Mitigated

Subbasin Name: POC 8 DEV PIAZZA NORTH — [ ] Designate as Bypass for POC:

Flows To :	Surface	Interflow	Groundwater
	POC 8 - SW SurfaceST	POC 8 - SW SurfaceST	

Area in Basin — [x] Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
[x] D,Grass,STEEP(10-20	0	[x] IMPERVIOUS	1.15

POC 8 - SWALE DRAINS Mitigated

Facility Name: POC 8 - SWALE DRAINS TO STRADA E

	Outlet 1	Outlet 2	Outlet 3
Downstream Connection	0	0	0

Facility Type: Bioretention Swale

[ ] Use Simple Swale — Default Swale

[x] Underdrain Used — Underdrain Diameter (ft) 0.33

Swale Bottom Elevation (ft) 0 — Orifice Diameter (in) 0.083

Flow Through Underdrain (ac-ft) 5.445

Total Outflow (ac-ft) 68.045

Percent Through Underdrain 8

Facility Dimension Diagram

Swale Dimensions

Swale Length (ft)	500.000
Swale Bottom Width (ft)	2.680
Freeboard (ft)	0.170
Over-road Flooding (ft)	0.000
Effective Total Depth (ft)	3.5
Bottom slope of Swale (ft/ft)	0.002
Left Side Slope (H/V)	3.000
Right Side Slope (H/V)	3.000

Riser Outlet Structure

Outlet Structure Data

Riser Height Above Swale surface (ft) 0.83

Riser Diameter (in) 8

Riser Type Flat

Notch Type

Material Layers for Swale

	Layer 1	Layer 2	Layer 3
Depth (ft)	1.500	1.000	0.000

Soil Layer 1: Fine sandy loam

Soil Layer 2: GRAVEL

Soil Layer 3: GRAVEL

Edit Soil Types

Orifice Number	Diameter (in)	Height (ft)
1	2	0
2	0	0
3	0	0

Show Swale Table: Open Table

Swale Volume at Riser Head (ac-ft) .130

Native Infiltration: NO

POC 8 DEV PIAZZA SOUTH Mitigated

Subbasin Name: POC 8 DEV PIAZZA SOUTH — [ ] Designate as Bypass for POC:

Flows To :	Surface	Interflow	Groundwater
	POC 8 - SW SurfaceST	POC 8 - SW SurfaceST	

Area in Basin — [x] Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
[x] D,Grass,STEEP(10-20	2.6	[x] IMPERVIOUS	1.15

POC 8 RAVENNA & RESORT Mitigated

Subbasin Name: POC 8 RAVENNA & RESORT — [x] Designate as Bypass for POC:

Flows To :	Surface	Interflow	Groundwater

Area in Basin — [x] Show Only Selected

Available Pervious	Acres	Available Impervious	Acres
[x] D,Grass,STEEP(10-20	22.5	[x] IMPERVIOUS	2.4

POC 8 - SWALE DRAINS Mitigated

Facility Name: POC 8 - SWALE DRAINS TO STRADA E

	Outlet 1	Outlet 2	Outlet 3
Downstream Connection	0	0	0

Facility Type: Bioretention Swale

[ ] Use Simple Swale — Default Swale

[x] Underdrain Used — Underdrain Diameter (ft) 0.33

Swale Bottom Elevation (ft) 0 — Orifice Diameter (in) 0.083

Flow Through Underdrain (ac-ft) 5.445

Total Outflow (ac-ft) 68.045

Percent Through Underdrain 8

Facility Dimension Diagram

Swale Dimensions

Swale Length (ft)	500.000
Swale Bottom Width (ft)	2.680
Freeboard (ft)	0.170
Over-road Flooding (ft)	0.000
Effective Total Depth (ft)	3.5
Bottom slope of Swale (ft/ft)	0.002
Left Side Slope (H/V)	3.000
Right Side Slope (H/V)	3.000

Riser Outlet Structure

Outlet Structure Data

Riser Height Above Swale surface (ft) 0.83

Riser Diameter (in) 8

Riser Type Flat

Notch Type

Material Layers for Swale

	Layer 1	Layer 2	Layer 3
Depth (ft)	1.500	1.000	0.000

Soil Layer 1: Fine sandy loam

Soil Layer 2: GRAVEL

Soil Layer 3: GRAVEL

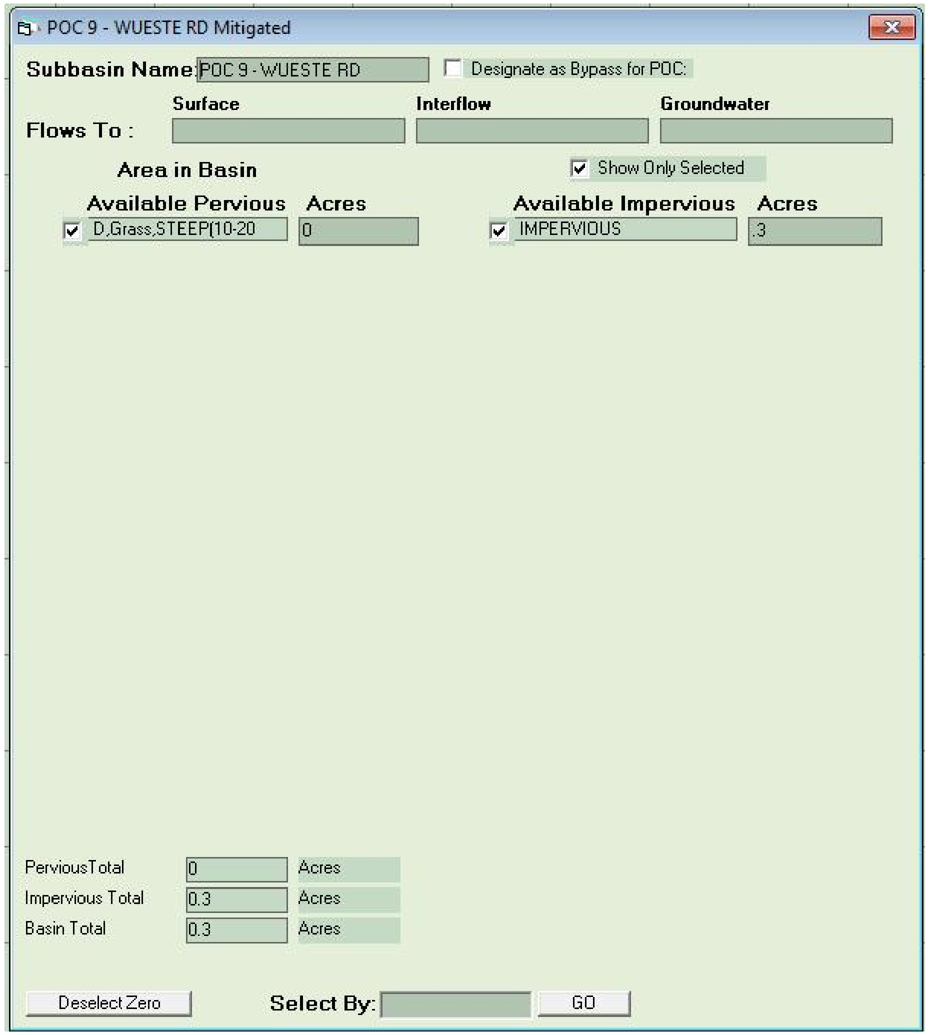
Edit Soil Types

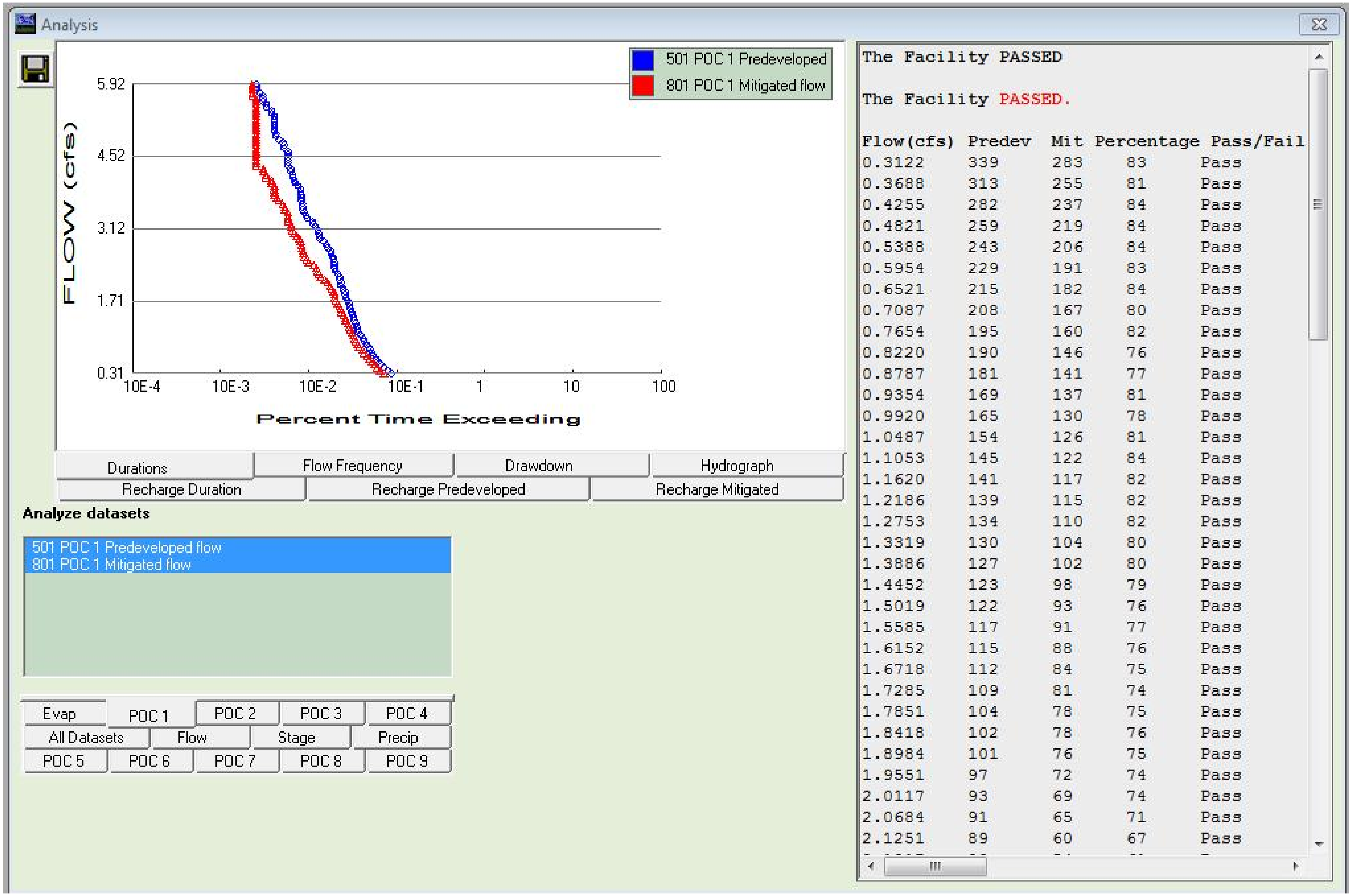
Orifice Number	Diameter (in)	Height (ft)
1	2	0
2	0	0
3	0	0

Show Swale Table: Open Table

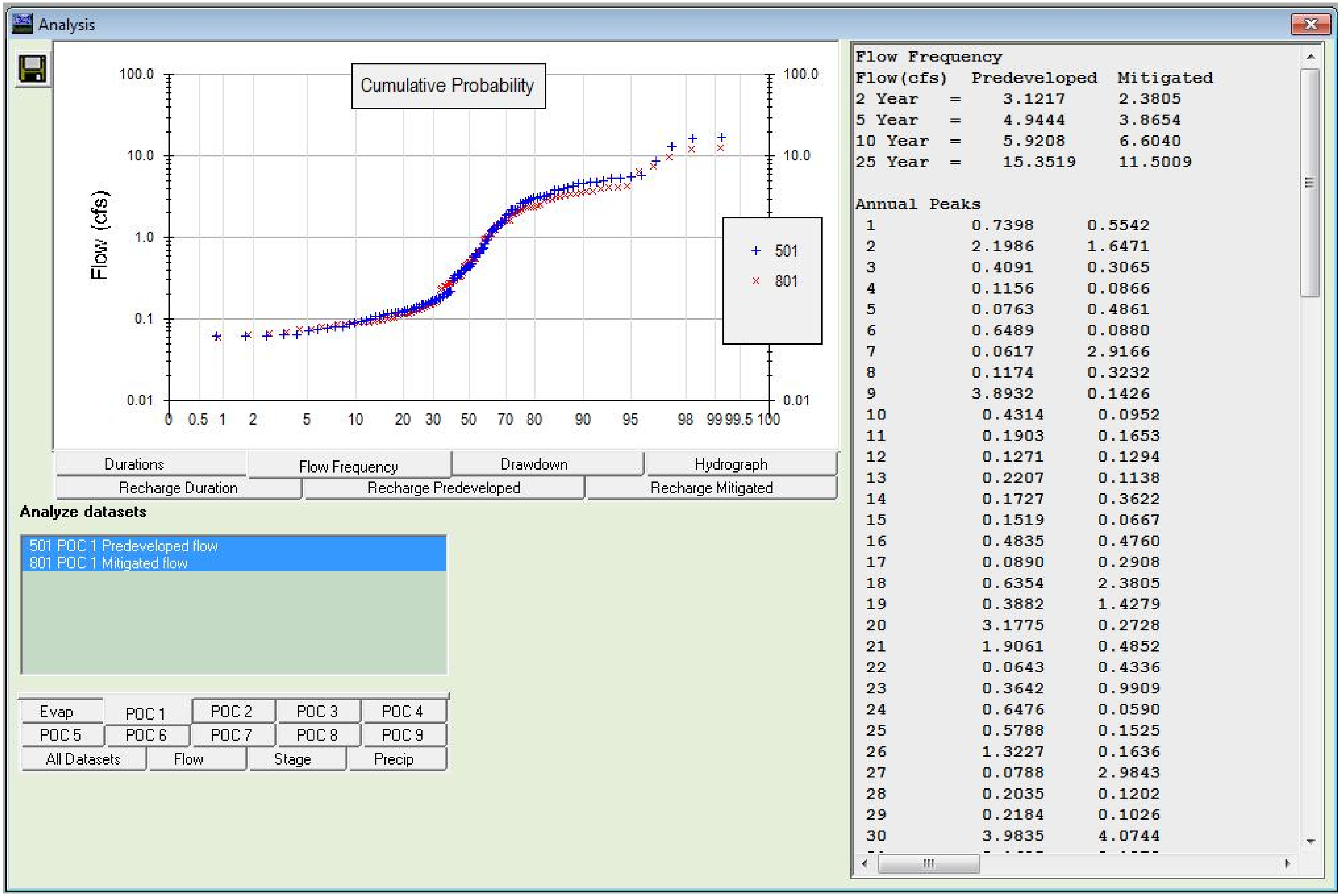
Swale Volume at Riser Head (ac-ft) .130

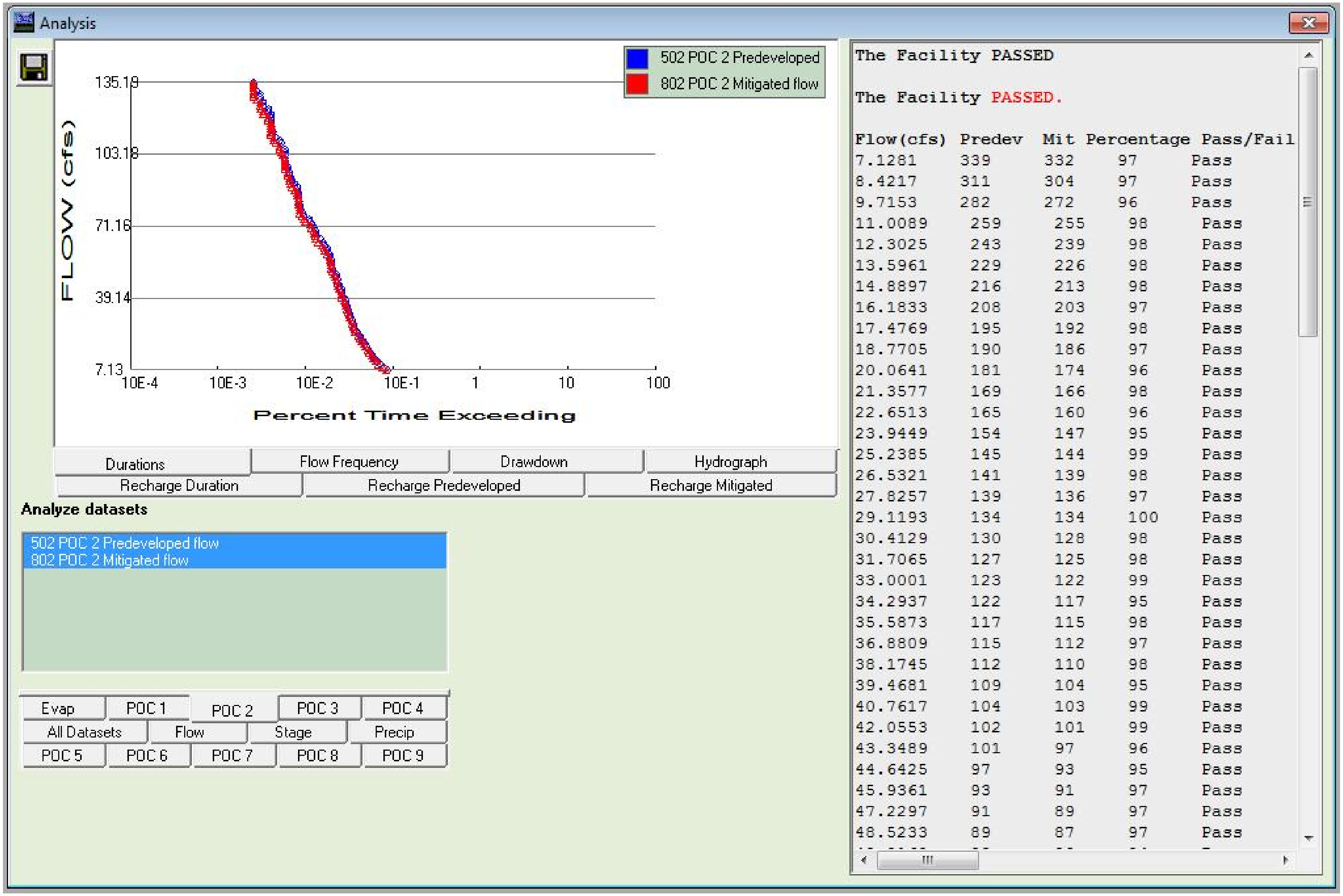
Native Infiltration: NO


POC 9 - WUESTE RD Mitigated
Subbasin Name: POC 9 - WUESTE RD
Designate as Bypass for POC:
Surface
Interflow
Groundwater
Flows To :
Area in Basin
Show Only Selected
Available Pervious
Acres
D,Grass,STEEP(10-20
0
Available Impervious
Acres
IMPERVIOUS
.3
PerviousTotal
0
Acres
Impervious Total
0.3
Acres
Basin Total
0.3
Acres
Deselect Zero
Select By:
GO

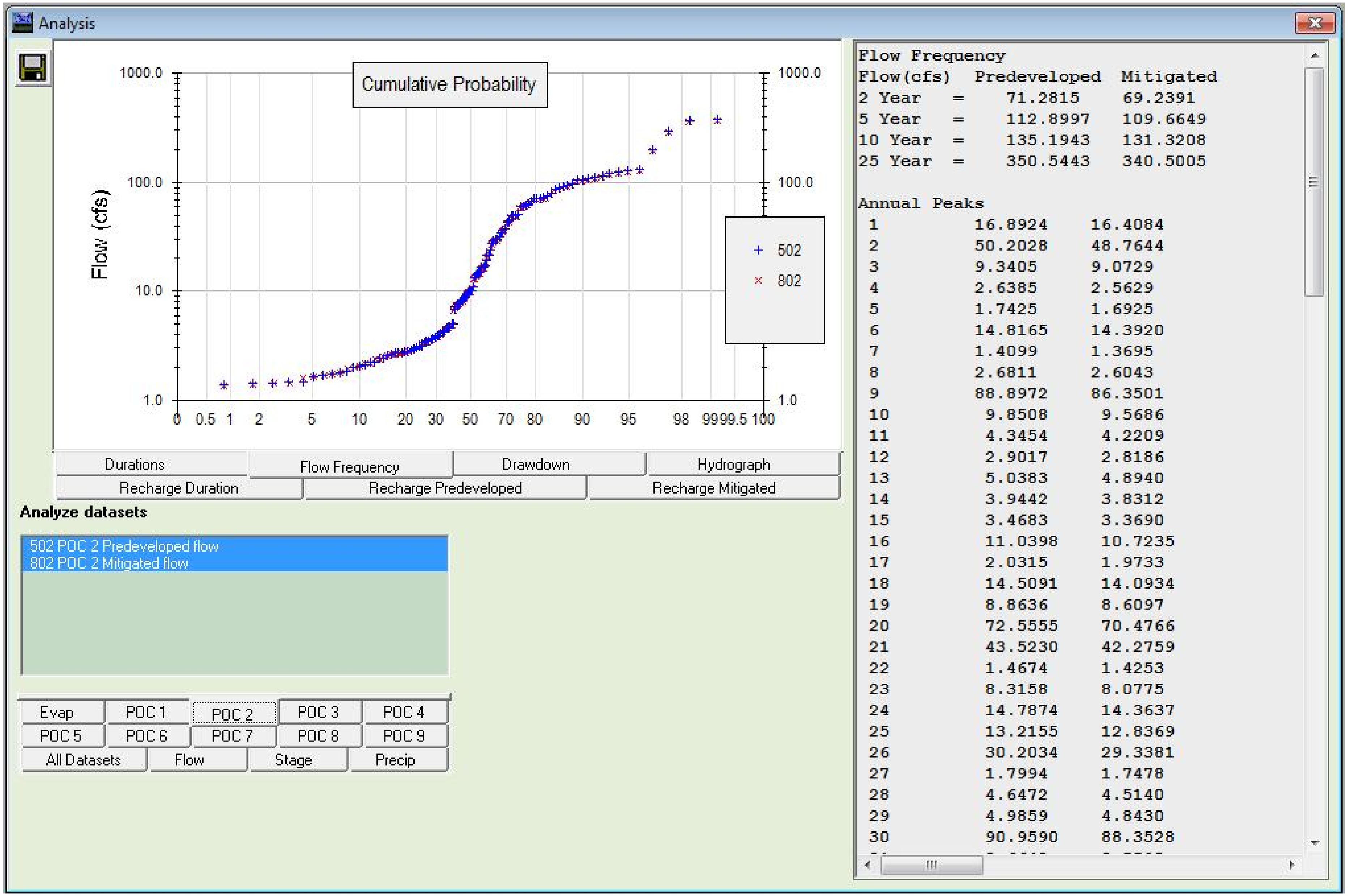


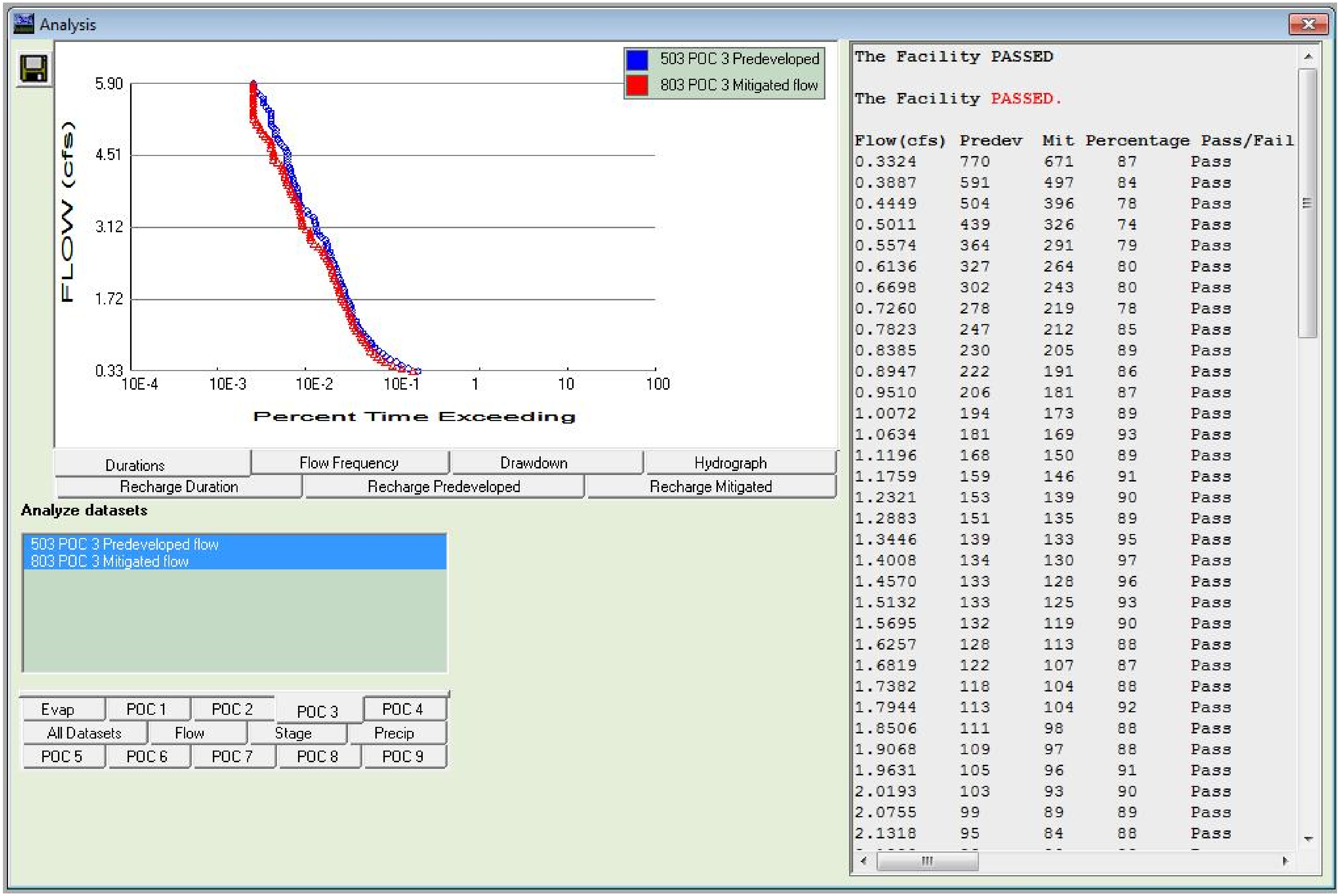
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.3122	339	283	83	Pass
0.3688	313	255	81	Pass
0.4255	282	237	84	Pass
0.4821	259	219	84	Pass
0.5388	243	206	84	Pass
0.5954	229	191	83	Pass
0.6521	215	182	84	Pass
0.7087	208	167	80	Pass
0.7654	195	160	82	Pass
0.8220	190	146	76	Pass
0.8787	181	141	77	Pass
0.9354	169	137	81	Pass
0.9920	165	130	78	Pass
1.0487	154	126	81	Pass
1.1053	145	122	84	Pass
1.1620	141	117	82	Pass
1.2186	139	115	82	Pass
1.2753	134	110	82	Pass
1.3319	130	104	80	Pass
1.3886	127	102	80	Pass
1.4452	123	98	79	Pass
1.5019	122	93	76	Pass
1.5585	117	91	77	Pass
1.6152	115	88	76	Pass
1.6718	112	84	75	Pass
1.7285	109	81	74	Pass
1.7851	104	78	75	Pass
1.8418	102	78	76	Pass
1.8984	101	76	75	Pass
1.9551	97	72	74	Pass
2.0117	93	69	74	Pass
2.0684	91	65	71	Pass
2.1251	89	60	67	Pass

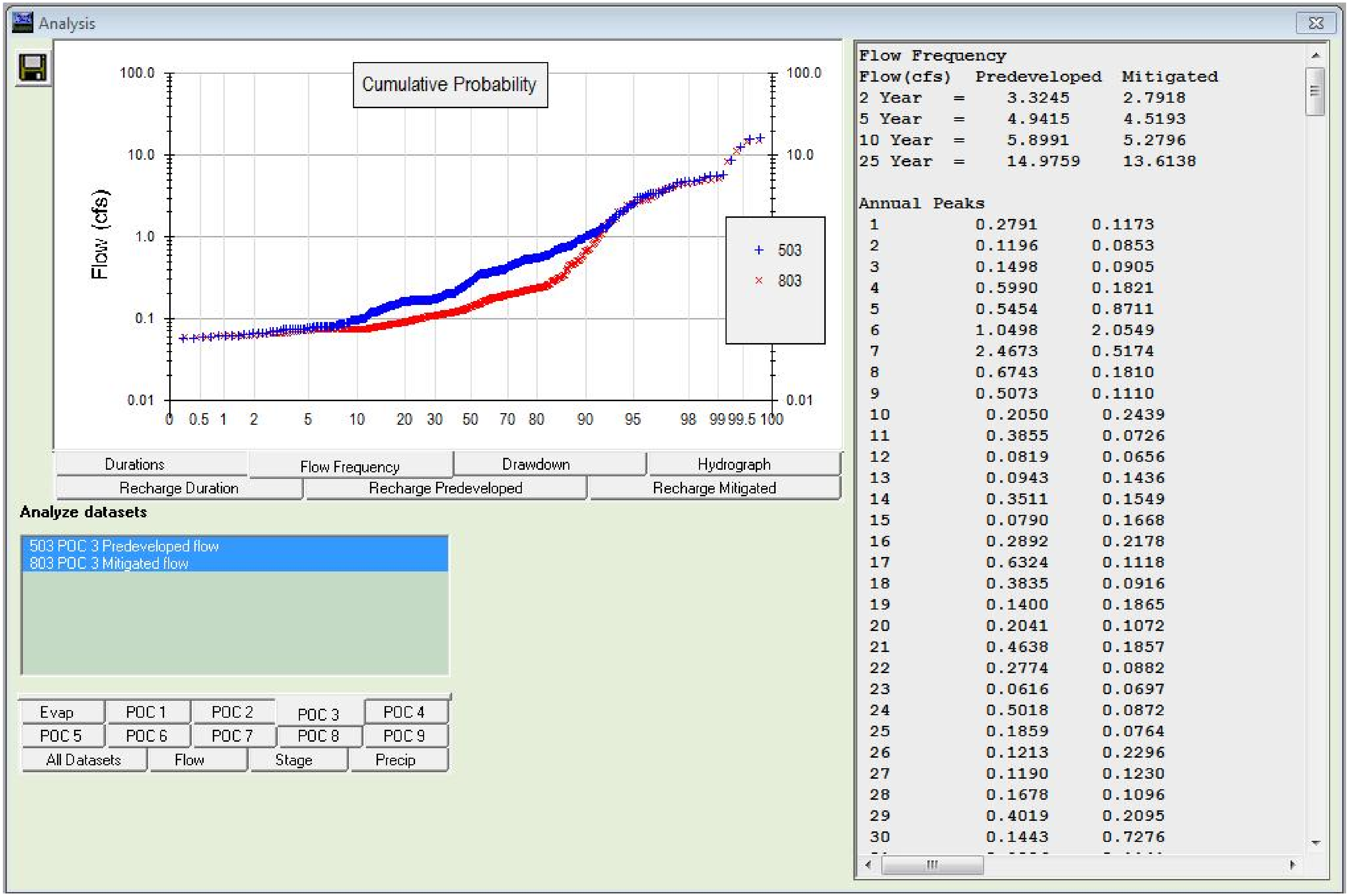

Analysis
Cumulative Probability
Flow (cfs)
100.0
10.0
1.0
0.1
0.01
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
501
801
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
501 POC 1 Predeveloped flow
801 POC 1 Mitigated flow
Evap
POC 1
POC 2
POC 3
POC 4
POC 5
POC 6
POC 7
POC 8
POC 9
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 3.1217 2.3805
5 Year = 4.9444 3.8654
10 Year = 5.9208 6.6040
25 Year = 15.3519 11.5009
Annual Peaks
1 0.7398 0.5542
2 2.1986 1.6471
3 0.4091 0.3065
4 0.1156 0.0866
5 0.0763 0.4861
6 0.6489 0.0880
7 0.0617 2.9166
8 0.1174 0.3232
9 3.8932 0.1426
10 0.4314 0.0952
11 0.1903 0.1653
12 0.1271 0.1294
13 0.2207 0.1138
14 0.1727 0.3622
15 0.1519 0.0667
16 0.4835 0.4760
17 0.0890 0.2908
18 0.6354 2.3805
19 0.3882 1.4279
20 3.1775 0.2728
21 1.9061 0.4852
22 0.0643 0.4336
23 0.3642 0.9909
24 0.6476 0.0590
25 0.5788 0.1525
26 1.3227 0.1636
27 0.0788 2.9843
28 0.2035 0.1202
29 0.2184 0.1026
30 3.9835 4.0744

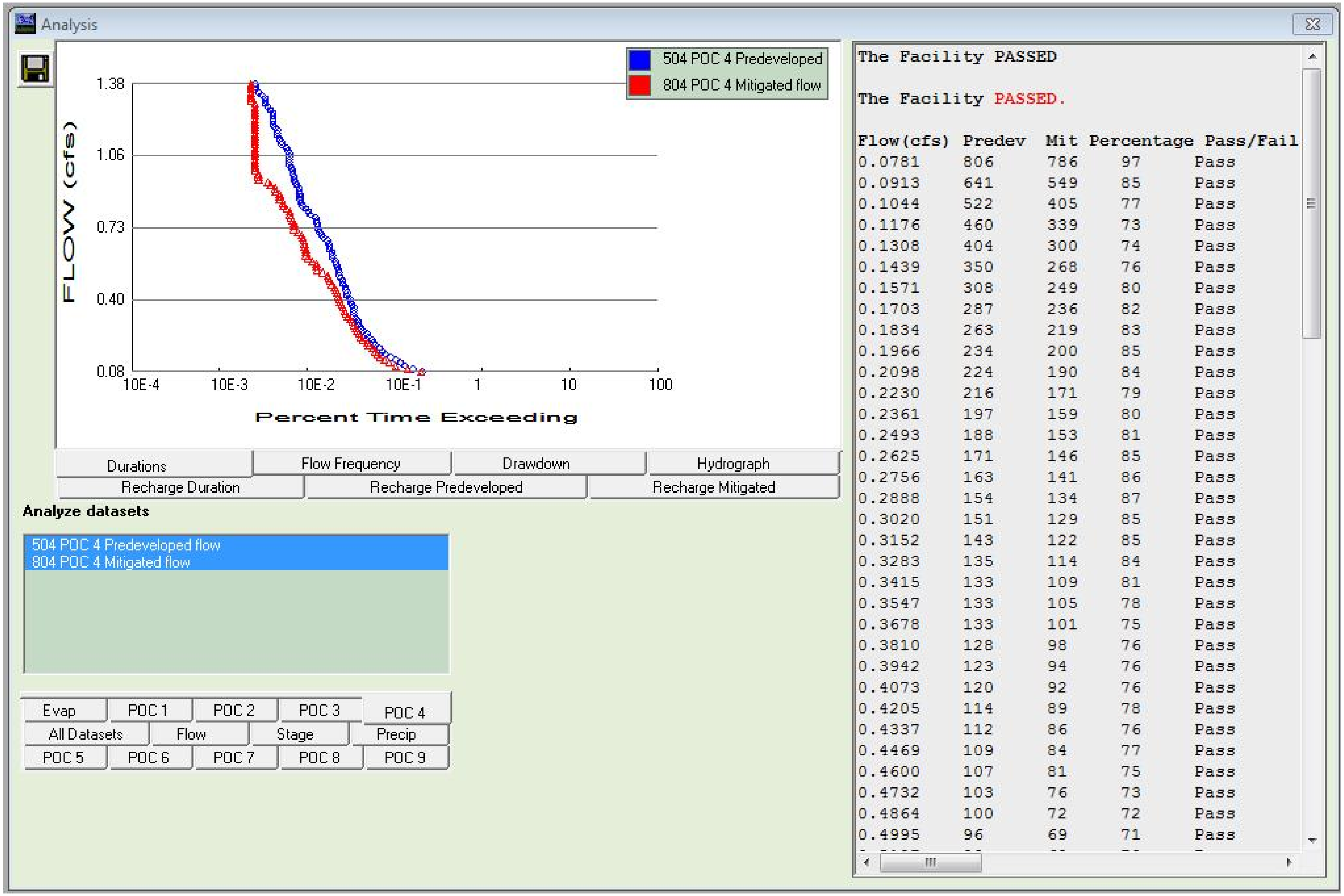


Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
7.1281	339	332	97	Pass
8.4217	311	304	97	Pass
9.7153	282	272	96	Pass
11.0089	259	255	98	Pass
12.3025	243	239	98	Pass
13.5961	229	226	98	Pass
14.8897	216	213	98	Pass
16.1833	208	203	97	Pass
17.4769	195	192	98	Pass
18.7705	190	186	97	Pass
20.0641	181	174	96	Pass
21.3577	169	166	98	Pass
22.6513	165	160	96	Pass
23.9449	154	147	95	Pass
25.2385	145	144	99	Pass
26.5321	141	139	98	Pass
27.8257	139	136	97	Pass
29.1193	134	134	100	Pass
30.4129	130	128	98	Pass
31.7065	127	125	98	Pass
33.0001	123	122	99	Pass
34.2937	122	117	95	Pass
35.5873	117	115	98	Pass
36.8809	115	112	97	Pass
38.1745	112	110	98	Pass
39.4681	109	104	95	Pass
40.7617	104	103	99	Pass
42.0553	102	101	99	Pass
43.3489	101	97	96	Pass
44.6425	97	93	95	Pass
45.9361	93	91	97	Pass
47.2297	91	89	97	Pass
48.5233	89	87	97	Pass

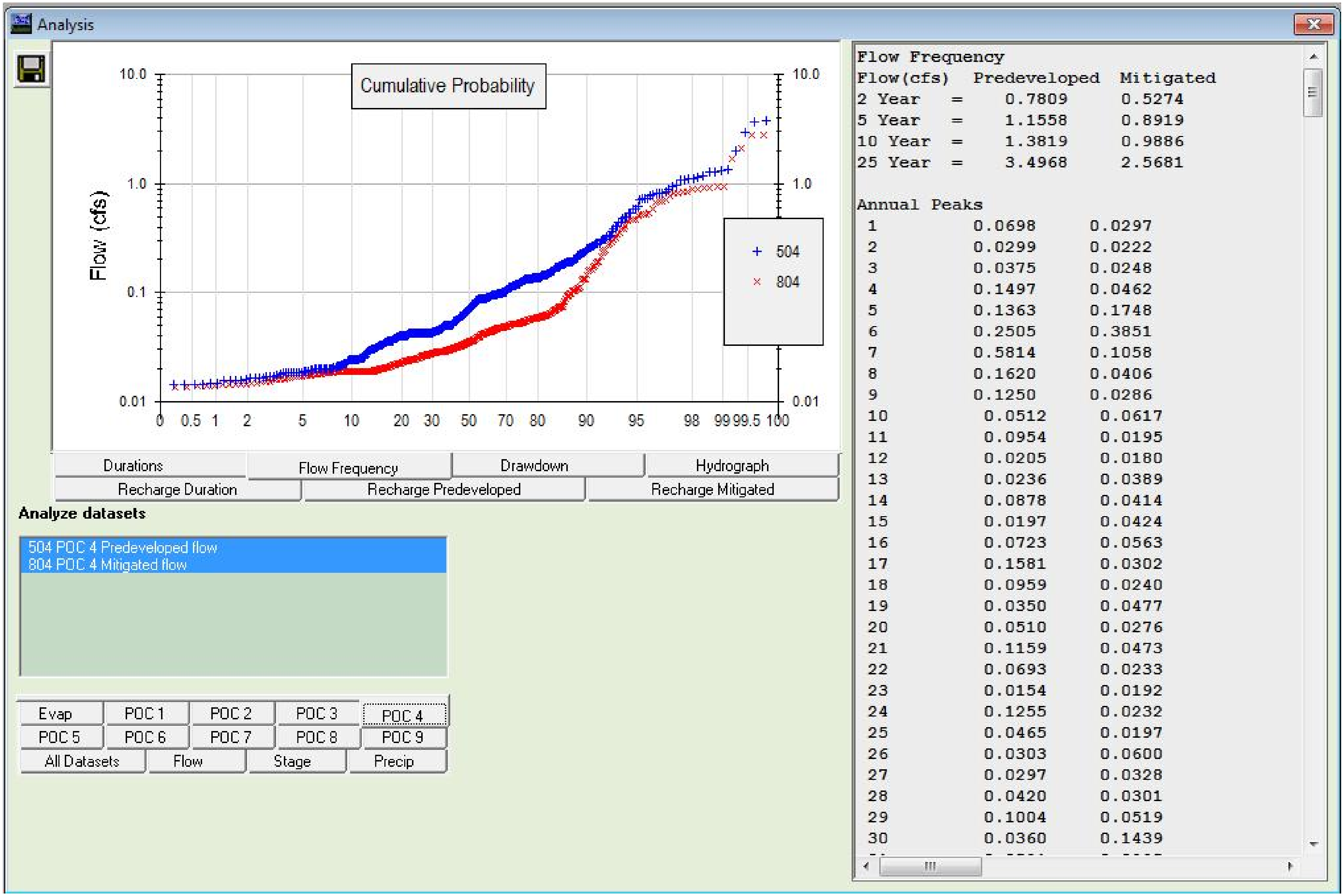

Analysis
Cumulative Probability
Flow (cfs)
1000.0
100.0
10.0
1.0
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 9999.5 100
502
802
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
502 POC 2 Predeveloped flow
802 POC 2 Mitigated flow
Evap
POC 1
POC 2
POC 3
POC 4
POC 5
POC 6
POC 7
POC 8
POC 9
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 71.2815 69.2391
5 Year = 112.8997 109.6649
10 Year = 135.1943 131.3208
25 Year = 350.5443 340.5005
Annual Peaks
1 16.8924 16.4084
2 50.2028 48.7644
3 9.3405 9.0729
4 2.6385 2.5629
5 1.7425 1.6925
6 14.8165 14.3920
7 1.4099 1.3695
8 2.6811 2.6043
9 88.8972 86.3501
10 9.8508 9.5686
11 4.3454 4.2209
12 2.9017 2.8186
13 5.0383 4.8940
14 3.9442 3.8312
15 3.4683 3.3690
16 11.0398 10.7235
17 2.0315 1.9733
18 14.5091 14.0934
19 8.8636 8.6097
20 72.5555 70.4766
21 43.5230 42.2759
22 1.4674 1.4253
23 8.3158 8.0775
24 14.7874 14.3637
25 13.2155 12.8369
26 30.2034 29.3381
27 1.7994 1.7478
28 4.6472 4.5140
29 4.9859 4.8430
30 90.9590 88.3528


Analysis
503 POC 3 Predeveloped
803 POC 3 Mitigated flow
FLOW (cfs)
5.90
4.51
3.12
1.72
0.33
10E-4
10E-3
10E-2
10E-1
1
10
100
Percent Time Exceeding
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
503 POC 3 Predeveloped flow
803 POC 3 Mitigated flow
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
POC 5
POC 6
POC 7
POC 8
POC 9
The Facility PASSED
The Facility PASSED.
Flow(cfs) Predev Mit Percentage Pass/Fail
0.3324 770 671 87 Pass
0.3887 591 497 84 Pass
0.4449 504 396 78 Pass
0.5011 439 326 74 Pass
0.5574 364 291 79 Pass
0.6136 327 264 80 Pass
0.6698 302 243 80 Pass
0.7260 278 219 78 Pass
0.7823 247 212 85 Pass
0.8385 230 205 89 Pass
0.8947 222 191 86 Pass
0.9510 206 181 87 Pass
1.0072 194 173 89 Pass
1.0634 181 169 93 Pass
1.1196 168 150 89 Pass
1.1759 159 146 91 Pass
1.2321 153 139 90 Pass
1.2883 151 135 89 Pass
1.3446 139 133 95 Pass
1.4008 134 130 97 Pass
1.4570 133 128 96 Pass
1.5132 133 125 93 Pass
1.5695 132 119 90 Pass
1.6257 128 113 88 Pass
1.6819 122 107 87 Pass
1.7382 118 104 88 Pass
1.7944 113 104 92 Pass
1.8506 111 98 88 Pass
1.9068 109 97 88 Pass
1.9631 105 96 91 Pass
2.0193 103 93 90 Pass
2.0755 99 89 89 Pass
2.1318 95 84 88 Pass

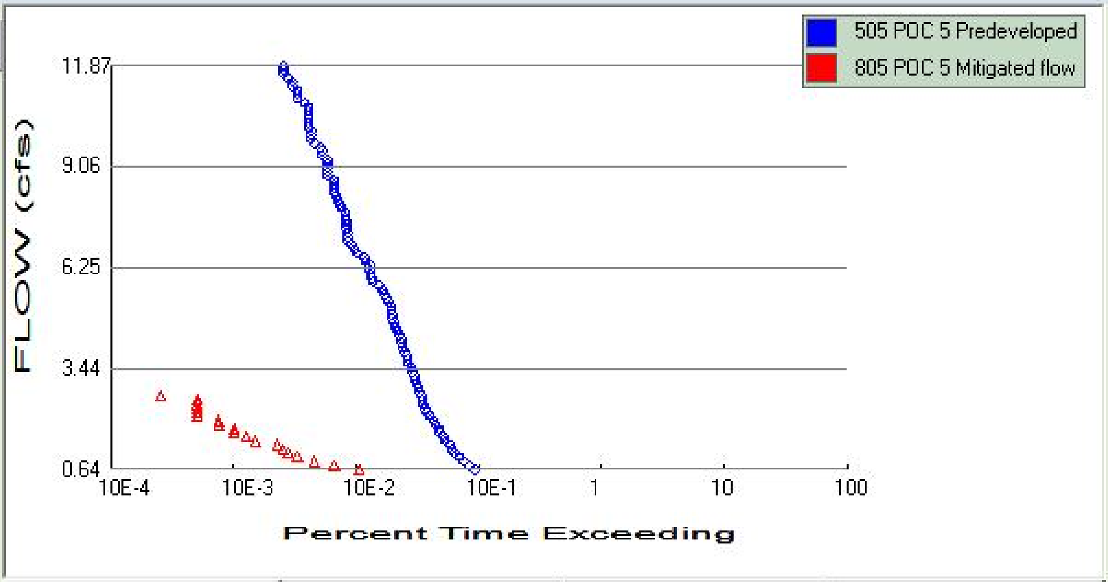

Analysis
Cumulative Probability
Flow (cfs)
100.0
10.0
1.0
0.1
0.01
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
503
803
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
503 POC 3 Predeveloped flow
803 POC 3 Mitigated flow
Evap
POC 1
POC 2
POC 3
POC 4
POC 5
POC 6
POC 7
POC 8
POC 9
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 3.3245 2.7918
5 Year = 4.9415 4.5193
10 Year = 5.8991 5.2796
25 Year = 14.9759 13.6138
Annual Peaks
1 0.2791 0.1173
2 0.1196 0.0853
3 0.1498 0.0905
4 0.5990 0.1821
5 0.5454 0.8711
6 1.0498 2.0549
7 2.4673 0.5174
8 0.6743 0.1810
9 0.5073 0.1110
10 0.2050 0.2439
11 0.3855 0.0726
12 0.0819 0.0656
13 0.0943 0.1436
14 0.3511 0.1549
15 0.0790 0.1668
16 0.2892 0.2178
17 0.6324 0.1118
18 0.3835 0.0916
19 0.1400 0.1865
20 0.2041 0.1072
21 0.4638 0.1857
22 0.2774 0.0882
23 0.0616 0.0697
24 0.5018 0.0872
25 0.1859 0.0764
26 0.1213 0.2296
27 0.1190 0.1230
28 0.1678 0.1096
29 0.4019 0.2095
30 0.1443 0.7276



Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0781	806	786	97	Pass
0.0913	641	549	85	Pass
0.1044	522	405	77	Pass
0.1176	460	339	73	Pass
0.1308	404	300	74	Pass
0.1439	350	268	76	Pass
0.1571	308	249	80	Pass
0.1703	287	236	82	Pass
0.1834	263	219	83	Pass
0.1966	234	200	85	Pass
0.2098	224	190	84	Pass
0.2230	216	171	79	Pass
0.2361	197	159	80	Pass
0.2493	188	153	81	Pass
0.2625	171	146	85	Pass
0.2756	163	141	86	Pass
0.2888	154	134	87	Pass
0.3020	151	129	85	Pass
0.3152	143	122	85	Pass
0.3283	135	114	84	Pass
0.3415	133	109	81	Pass
0.3547	133	105	78	Pass
0.3678	133	101	75	Pass
0.3810	128	98	76	Pass
0.3942	123	94	76	Pass
0.4073	120	92	76	Pass
0.4205	114	89	78	Pass
0.4337	112	86	76	Pass
0.4469	109	84	77	Pass
0.4600	107	81	75	Pass
0.4732	103	76	73	Pass
0.4864	100	72	72	Pass
0.4995	96	69	71	Pass


Analysis
Cumulative Probability
Flow (cfs)
10.0
1.0
0.1
0.01
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
504
804
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
504 POC 4 Predeveloped flow
804 POC 4 Mitigated flow
Evap
POC 1
POC 2
POC 3
POC 4
POC 5
POC 6
POC 7
POC 8
POC 9
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 0.7809 0.5274
5 Year = 1.1558 0.8919
10 Year = 1.3819 0.9886
25 Year = 3.4968 2.5681
Annual Peaks
1 0.0698 0.0297
2 0.0299 0.0222
3 0.0375 0.0248
4 0.1497 0.0462
5 0.1363 0.1748
6 0.2505 0.3851
7 0.5814 0.1058
8 0.1620 0.0406
9 0.1250 0.0286
10 0.0512 0.0617
11 0.0954 0.0195
12 0.0205 0.0180
13 0.0236 0.0389
14 0.0878 0.0414
15 0.0197 0.0424
16 0.0723 0.0563
17 0.1581 0.0302
18 0.0959 0.0240
19 0.0350 0.0477
20 0.0510 0.0276
21 0.1159 0.0473
22 0.0693 0.0233
23 0.0154 0.0192
24 0.1255 0.0232
25 0.0465 0.0197
26 0.0303 0.0600
27 0.0297 0.0328
28 0.0420 0.0301
29 0.1004 0.0519
30 0.0360 0.1439

Analysis



Durations | Flow Frequency | Drawdown | Hydrograph
Recharge Duration | Recharge Predeveloped | Recharge Mitigated

Analyze datasets

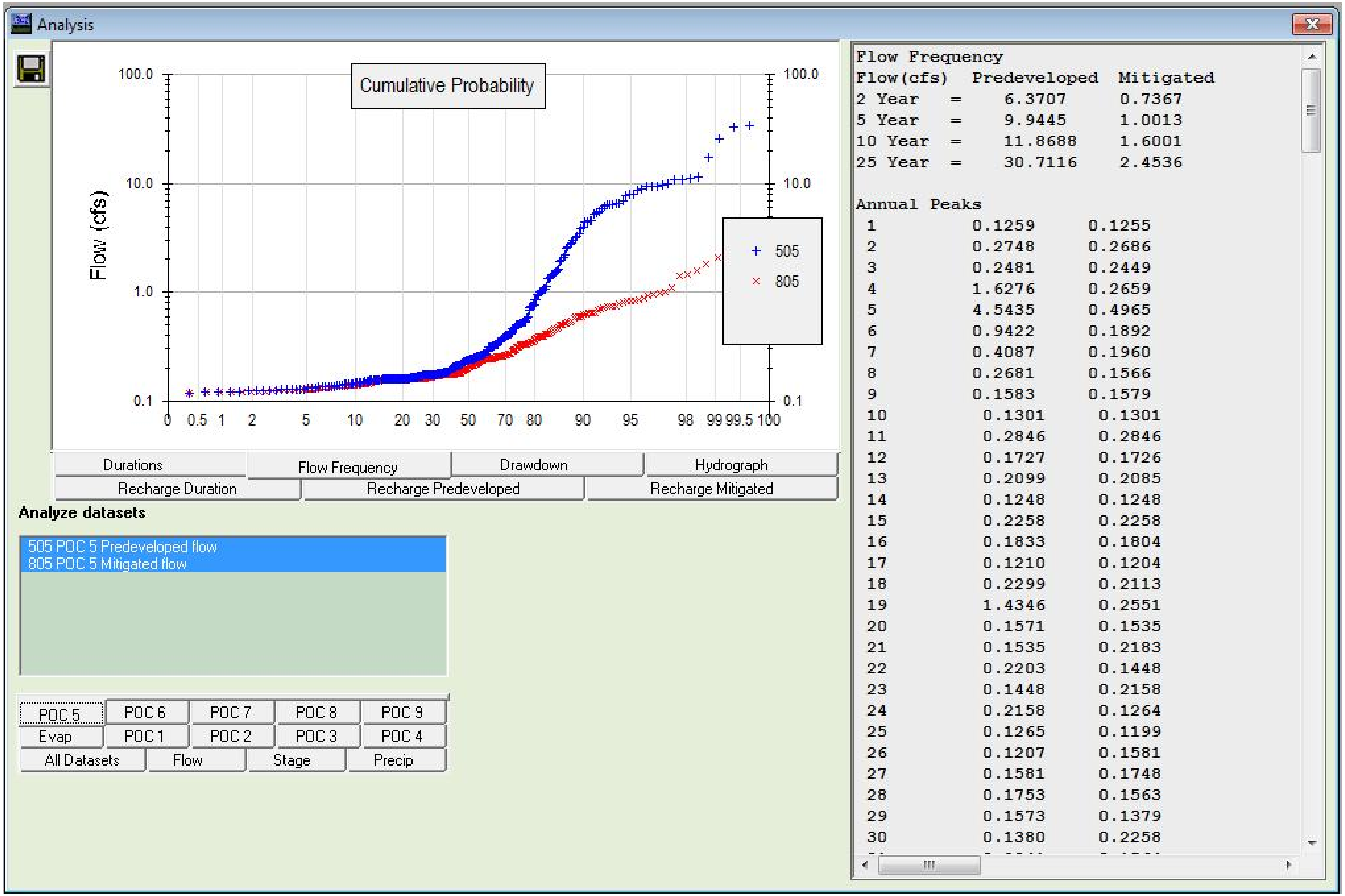
505 POC 5 Predeveloped flow
805 POC 5 Mitigated flow

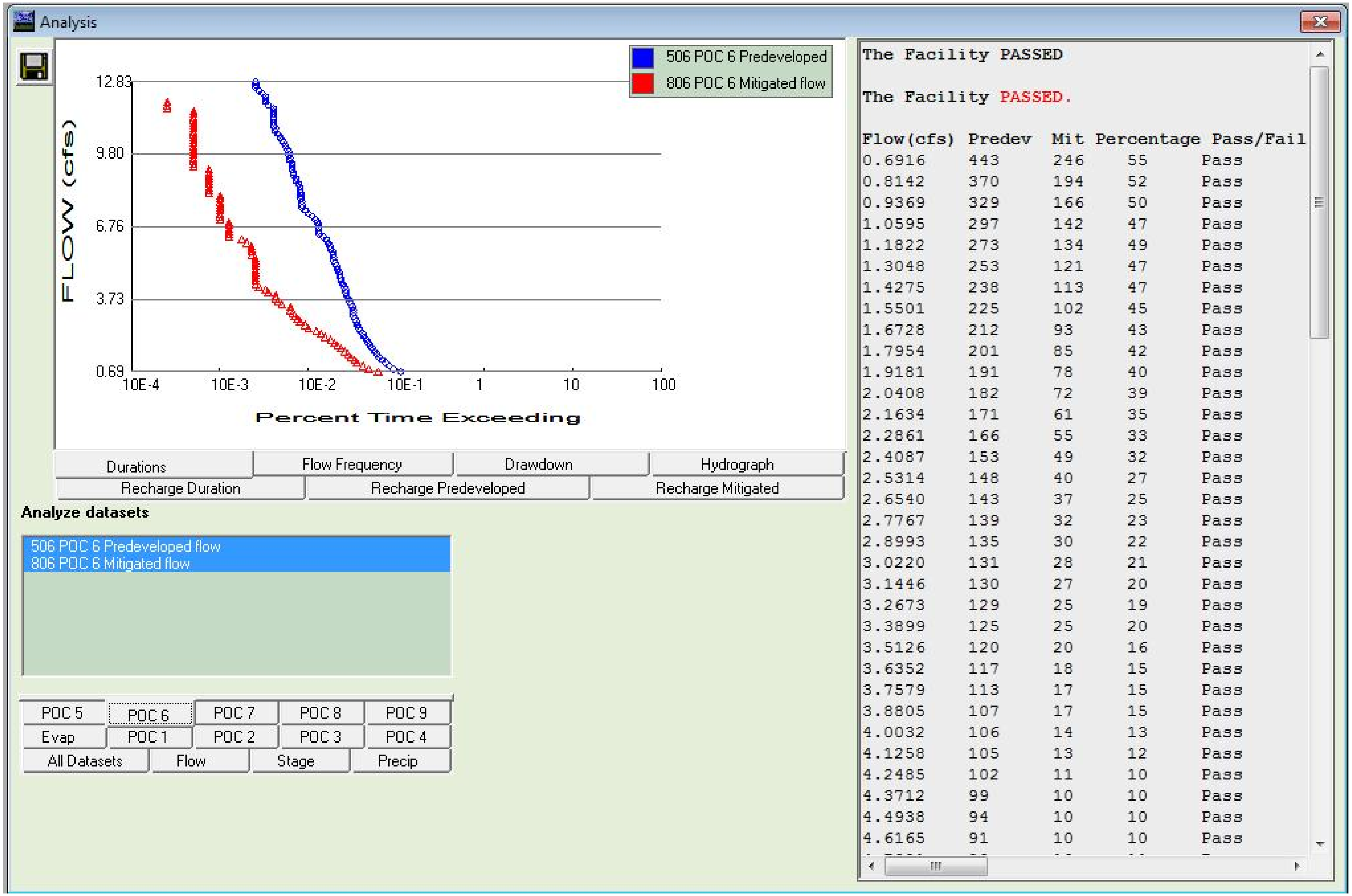
POC 5 | POC 6 | POC 7 | POC 8 | POC 9
Evap | POC 1 | POC 2 | POC 3 | POC 4
All Datasets | Flow | Stage | Precip

The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.6371	368	42	11	Pass
0.7505	327	26	7	Pass
0.8640	295	18	6	Pass
0.9774	273	13	4	Pass
1.0909	250	11	4	Pass
1.2043	238	10	4	Pass
1.3178	230	9	3	Pass
1.4312	213	6	2	Pass
1.5447	202	5	2	Pass
1.6581	190	4	2	Pass
1.7716	186	4	2	Pass
1.8850	175	3	1	Pass
1.9985	168	3	1	Pass
2.1119	157	2	1	Pass
2.2254	149	2	1	Pass
2.3388	144	2	1	Pass
2.4523	140	2	1	Pass
2.5657	137	2	1	Pass
2.6792	133	1	0	Pass
2.7926	129	0	0	Pass
2.9061	127	0	0	Pass
3.0195	124	0	0	Pass
3.1330	119	0	0	Pass
3.2465	116	0	0	Pass
3.3599	114	0	0	Pass
3.4734	111	0	0	Pass
3.5868	106	0	0	Pass
3.7003	104	0	0	Pass
3.8137	102	0	0	Pass
3.9272	98	0	0	Pass
4.0406	94	0	0	Pass
4.1541	92	0	0	Pass
4.2675	91	0	0	Pass

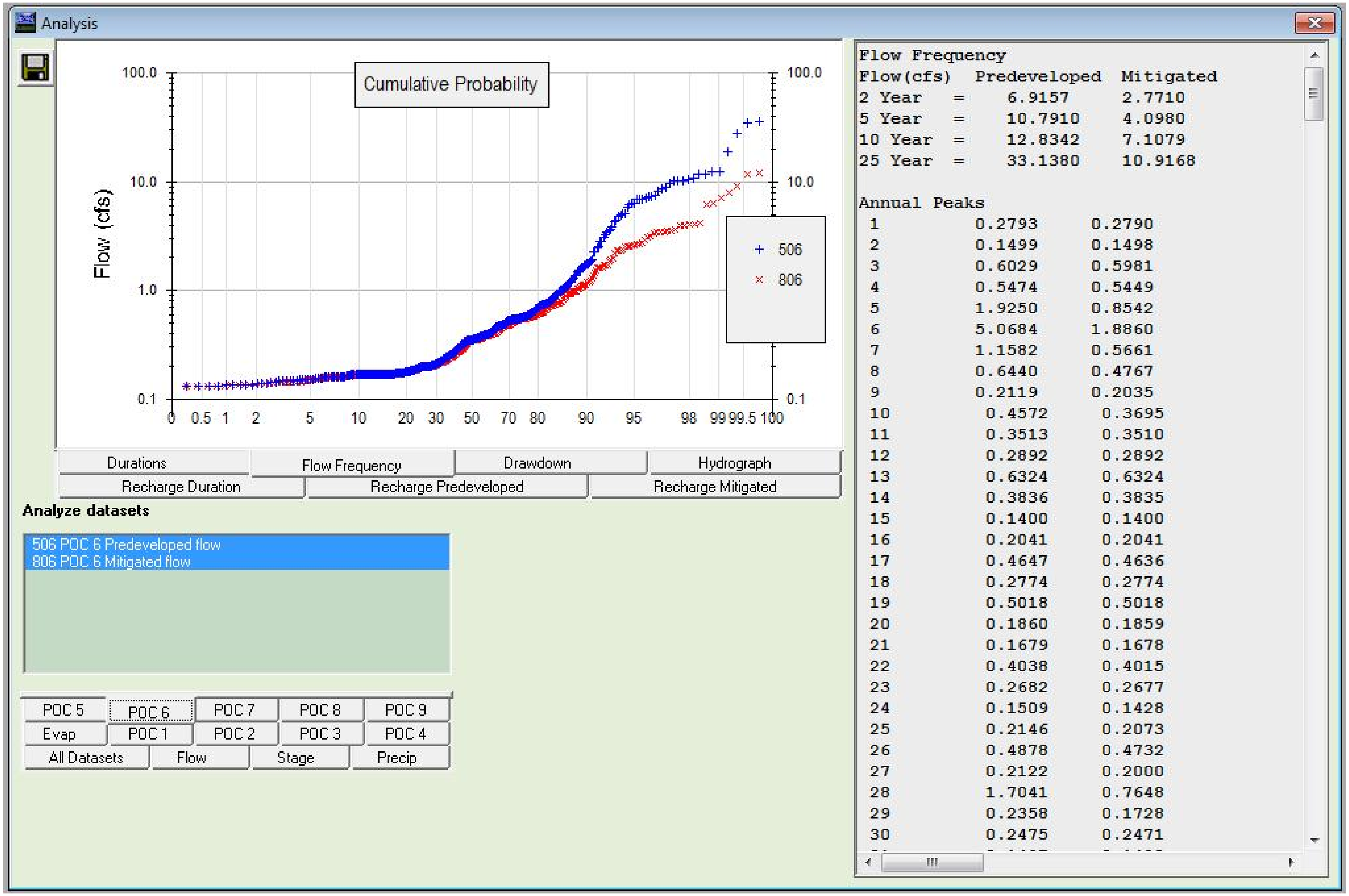

Analysis
Cumulative Probability
Flow (cfs)
100.0
10.0
1.0
0.1
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
505
805
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
505 POC 5 Predeveloped flow
805 POC 5 Mitigated flow
POC 5
POC 6
POC 7
POC 8
POC 9
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 6.3707 0.7367
5 Year = 9.9445 1.0013
10 Year = 11.8688 1.6001
25 Year = 30.7116 2.4536
Annual Peaks
1 0.1259 0.1255
2 0.2748 0.2686
3 0.2481 0.2449
4 1.6276 0.2659
5 4.5435 0.4965
6 0.9422 0.1892
7 0.4087 0.1960
8 0.2681 0.1566
9 0.1583 0.1579
10 0.1301 0.1301
11 0.2846 0.2846
12 0.1727 0.1726
13 0.2099 0.2085
14 0.1248 0.1248
15 0.2258 0.2258
16 0.1833 0.1804
17 0.1210 0.1204
18 0.2299 0.2113
19 1.4346 0.2551
20 0.1571 0.1535
21 0.1535 0.2183
22 0.2203 0.1448
23 0.1448 0.2158
24 0.2158 0.1264
25 0.1265 0.1199
26 0.1207 0.1581
27 0.1581 0.1748
28 0.1753 0.1563
29 0.1573 0.1379
30 0.1380 0.2258

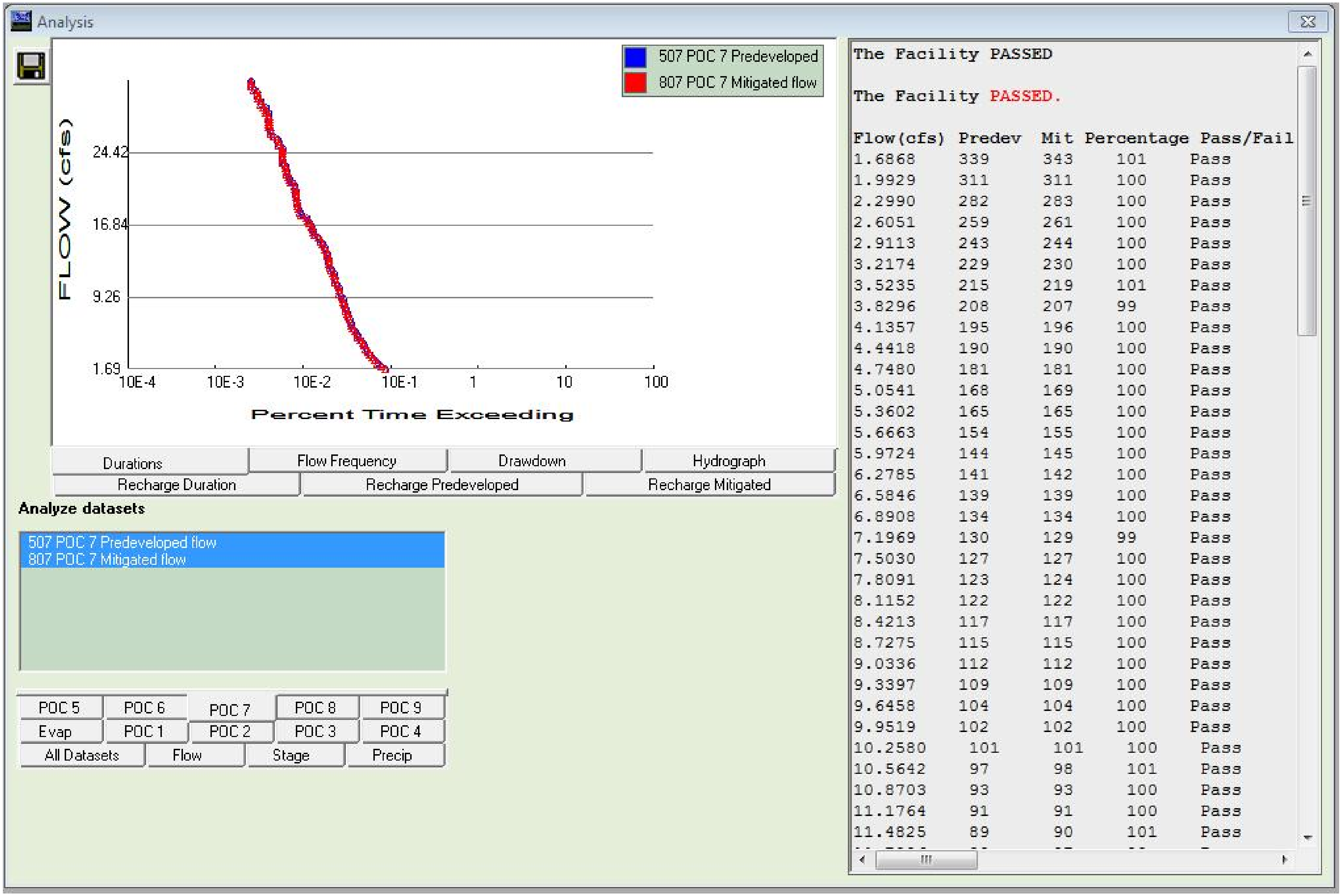


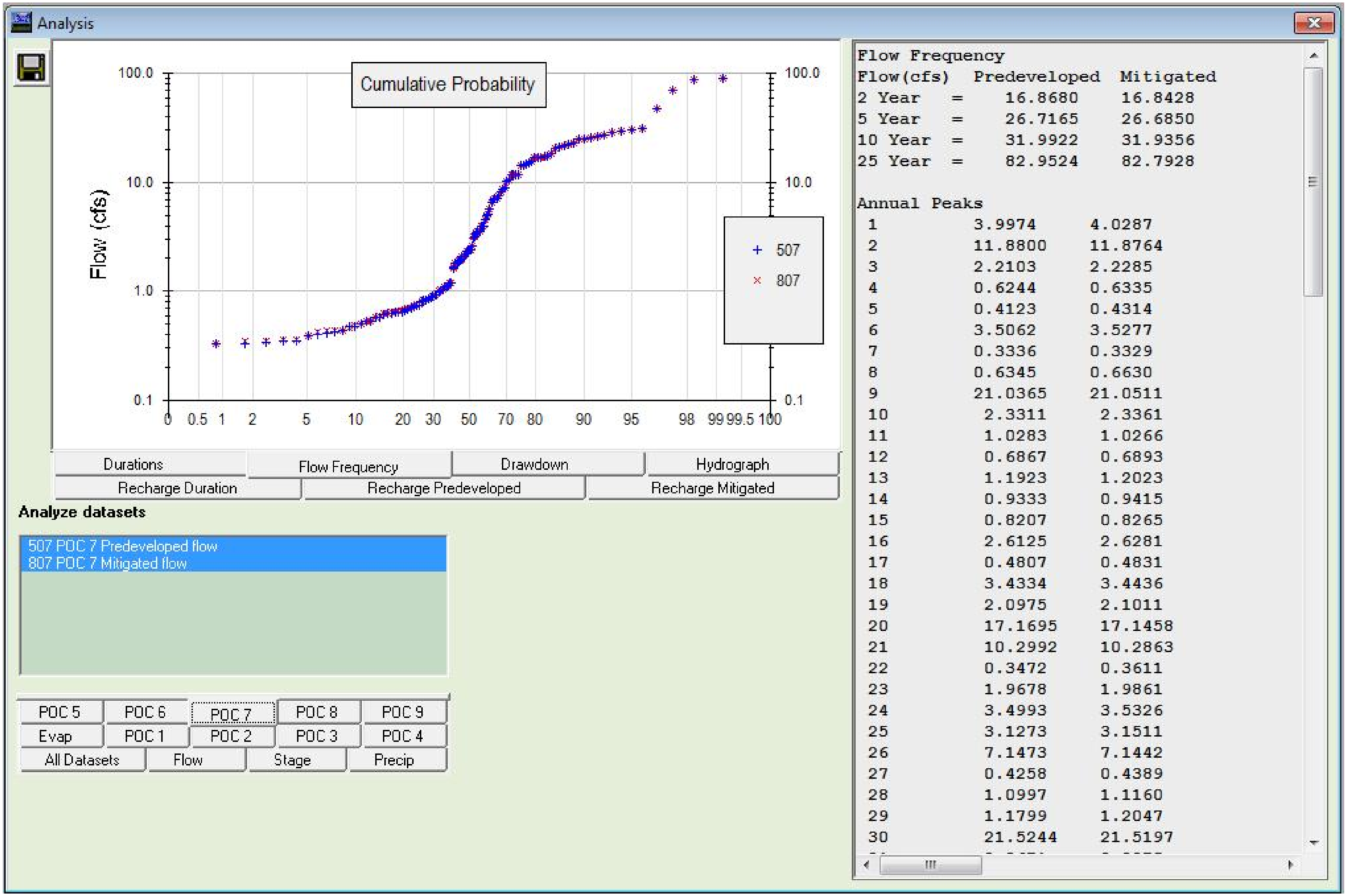
The Facility PASSED

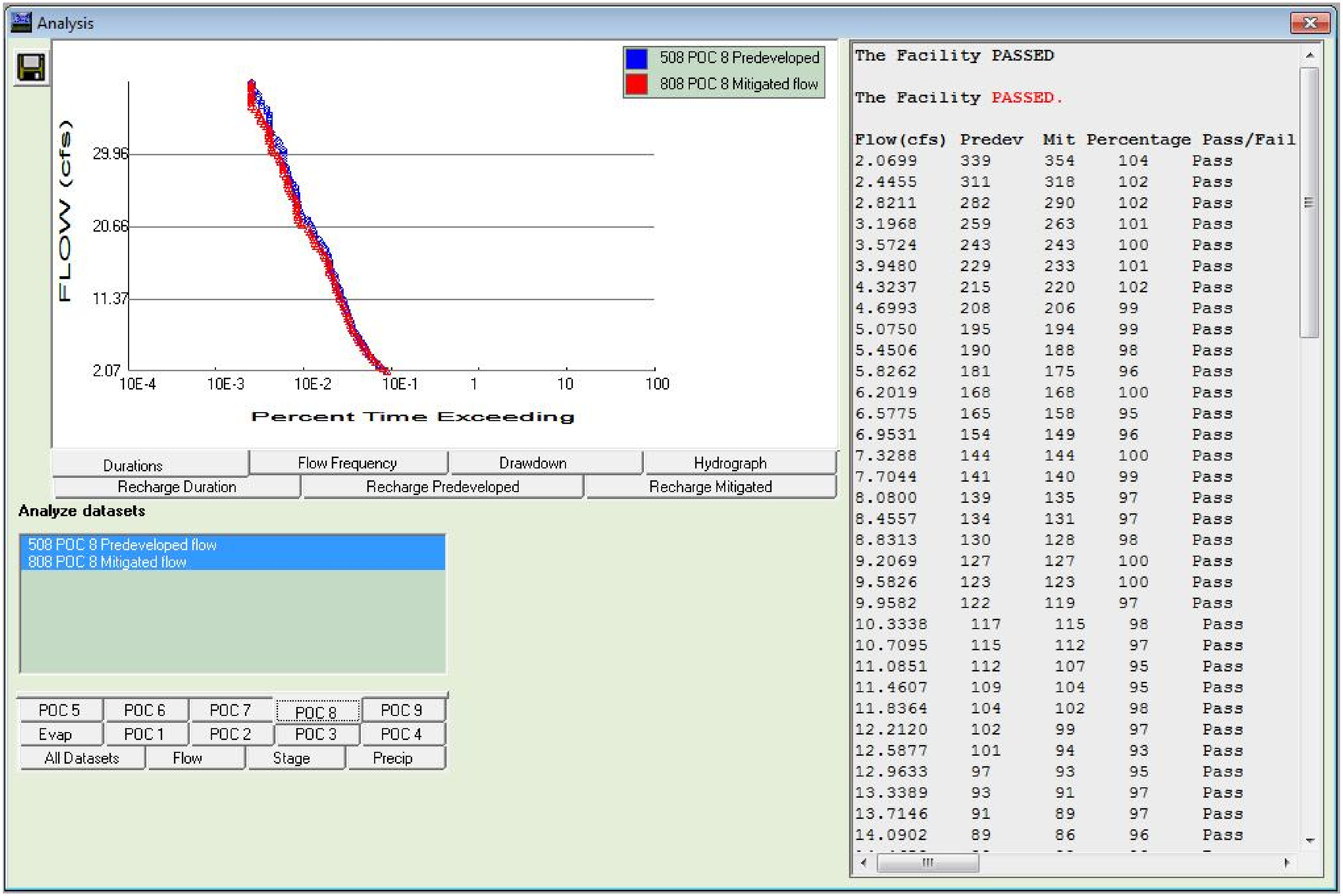
The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.6916	443	246	55	Pass
0.8142	370	194	52	Pass
0.9369	329	166	50	Pass
1.0595	297	142	47	Pass
1.1822	273	134	49	Pass
1.3048	253	121	47	Pass
1.4275	238	113	47	Pass
1.5501	225	102	45	Pass
1.6728	212	93	43	Pass
1.7954	201	85	42	Pass
1.9181	191	78	40	Pass
2.0408	182	72	39	Pass
2.1634	171	61	35	Pass
2.2861	166	55	33	Pass
2.4087	153	49	32	Pass
2.5314	148	40	27	Pass
2.6540	143	37	25	Pass
2.7767	139	32	23	Pass
2.8993	135	30	22	Pass
3.0220	131	28	21	Pass
3.1446	130	27	20	Pass
3.2673	129	25	19	Pass
3.3899	125	25	20	Pass
3.5126	120	20	16	Pass
3.6352	117	18	15	Pass
3.7579	113	17	15	Pass
3.8805	107	17	15	Pass
4.0032	106	14	13	Pass
4.1258	105	13	12	Pass
4.2485	102	11	10	Pass
4.3712	99	10	10	Pass
4.4938	94	10	10	Pass
4.6165	91	10	10	Pass


Analysis
Cumulative Probability
Flow (cfs)
100.0
10.0
1.0
0.1
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
506
806
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
506 POC 6 Predeveloped flow
806 POC 6 Mitigated flow
POC 5
POC 6
POC 7
POC 8
POC 9
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 6.9157 2.7710
5 Year = 10.7910 4.0980
10 Year = 12.8342 7.1079
25 Year = 33.1380 10.9168
Annual Peaks
1 0.2793 0.2790
2 0.1499 0.1498
3 0.6029 0.5981
4 0.5474 0.5449
5 1.9250 0.8542
6 5.0684 1.8860
7 1.1582 0.5661
8 0.6440 0.4767
9 0.2119 0.2035
10 0.4572 0.3695
11 0.3513 0.3510
12 0.2892 0.2892
13 0.6324 0.6324
14 0.3836 0.3835
15 0.1400 0.1400
16 0.2041 0.2041
17 0.4647 0.4636
18 0.2774 0.2774
19 0.5018 0.5018
20 0.1860 0.1859
21 0.1679 0.1678
22 0.4038 0.4015
23 0.2682 0.2677
24 0.1509 0.1428
25 0.2146 0.2073
26 0.4878 0.4732
27 0.2122 0.2000
28 1.7041 0.7648
29 0.2358 0.1728
30 0.2475 0.2471


Analysis
507 POC 7 Predeveloped
807 POC 7 Mitigated flow
FLOW (cfs)
24.42
16.84
9.26
1.69
10E-4
10E-3
10E-2
10E-1
1
10
100
Percent Time Exceeding
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
507 POC 7 Predeveloped flow
807 POC 7 Mitigated flow
POC 5
POC 6
POC 7
POC 8
POC 9
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
The Facility PASSED
The Facility PASSED.
Flow(cfs) Predev Mit Percentage Pass/Fail
1.6868 339 343 101 Pass
1.9929 311 311 100 Pass
2.2990 282 283 100 Pass
2.6051 259 261 100 Pass
2.9113 243 244 100 Pass
3.2174 229 230 100 Pass
3.5235 215 219 101 Pass
3.8296 208 207 99 Pass
4.1357 195 196 100 Pass
4.4418 190 190 100 Pass
4.7480 181 181 100 Pass
5.0541 168 169 100 Pass
5.3602 165 165 100 Pass
5.6663 154 155 100 Pass
5.9724 144 145 100 Pass
6.2785 141 142 100 Pass
6.5846 139 139 100 Pass
6.8908 134 134 100 Pass
7.1969 130 129 99 Pass
7.5030 127 127 100 Pass
7.8091 123 124 100 Pass
8.1152 122 122 100 Pass
8.4213 117 117 100 Pass
8.7275 115 115 100 Pass
9.0336 112 112 100 Pass
9.3397 109 109 100 Pass
9.6458 104 104 100 Pass
9.9519 102 102 100 Pass
10.2580 101 101 100 Pass
10.5642 97 98 101 Pass
10.8703 93 93 100 Pass
11.1764 91 91 100 Pass
11.4825 89 90 101 Pass

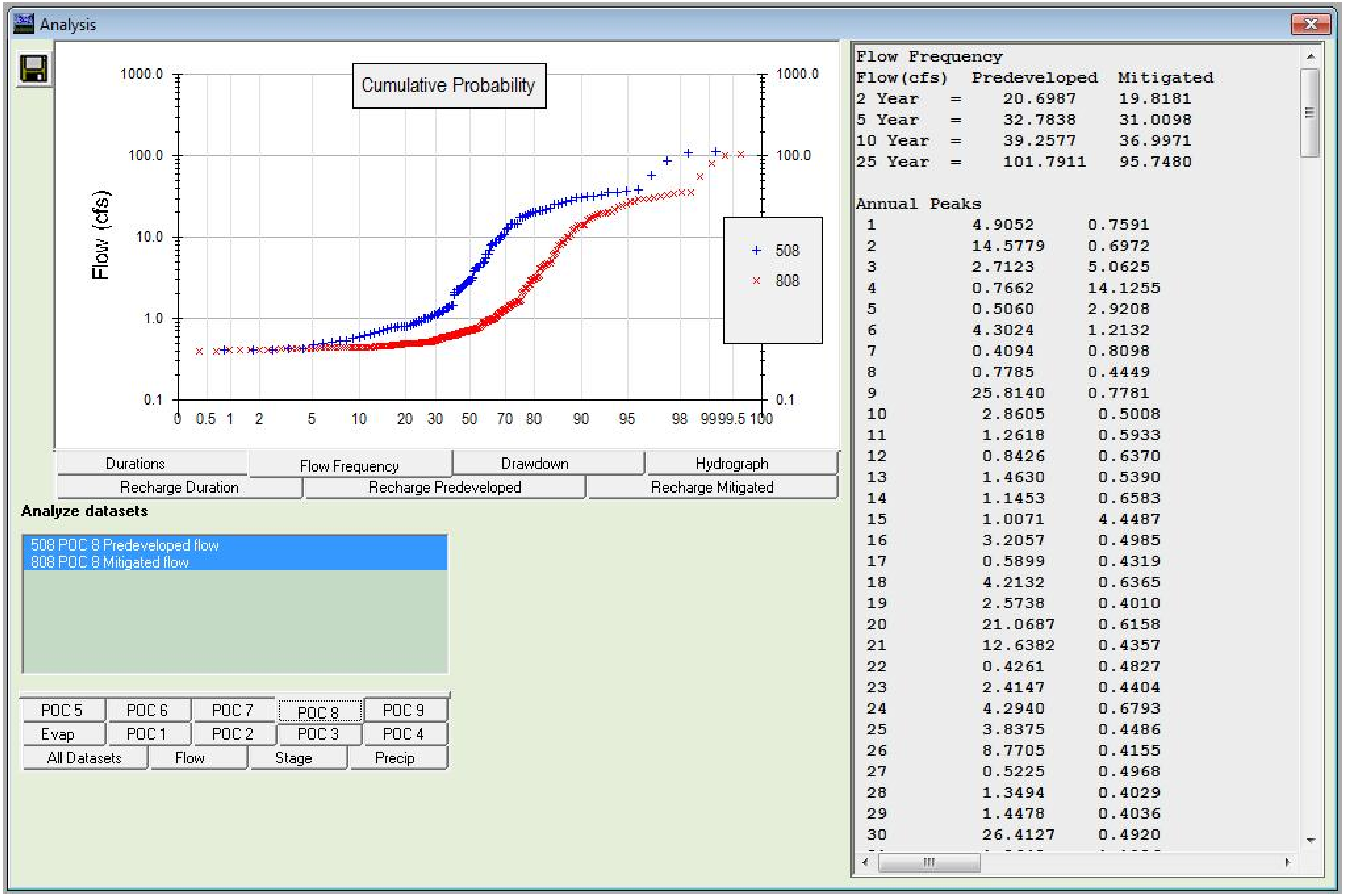

Analysis
Cumulative Probability
Flow (cfs)
100.0
10.0
1.0
0.1
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
507
807
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
507 POC 7 Predeveloped flow
807 POC 7 Mitigated flow
POC 5
POC 6
POC 7
POC 8
POC 9
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 16.8680 16.8428
5 Year = 26.7165 26.6850
10 Year = 31.9922 31.9356
25 Year = 82.9524 82.7928
Annual Peaks
1 3.9974 4.0287
2 11.8800 11.8764
3 2.2103 2.2285
4 0.6244 0.6335
5 0.4123 0.4314
6 3.5062 3.5277
7 0.3336 0.3329
8 0.6345 0.6630
9 21.0365 21.0511
10 2.3311 2.3361
11 1.0283 1.0266
12 0.6867 0.6893
13 1.1923 1.2023
14 0.9333 0.9415
15 0.8207 0.8265
16 2.6125 2.6281
17 0.4807 0.4831
18 3.4334 3.4436
19 2.0975 2.1011
20 17.1695 17.1458
21 10.2992 10.2863
22 0.3472 0.3611
23 1.9678 1.9861
24 3.4993 3.5326
25 3.1273 3.1511
26 7.1473 7.1442
27 0.4258 0.4389
28 1.0997 1.1160
29 1.1799 1.2047
30 21.5244 21.5197

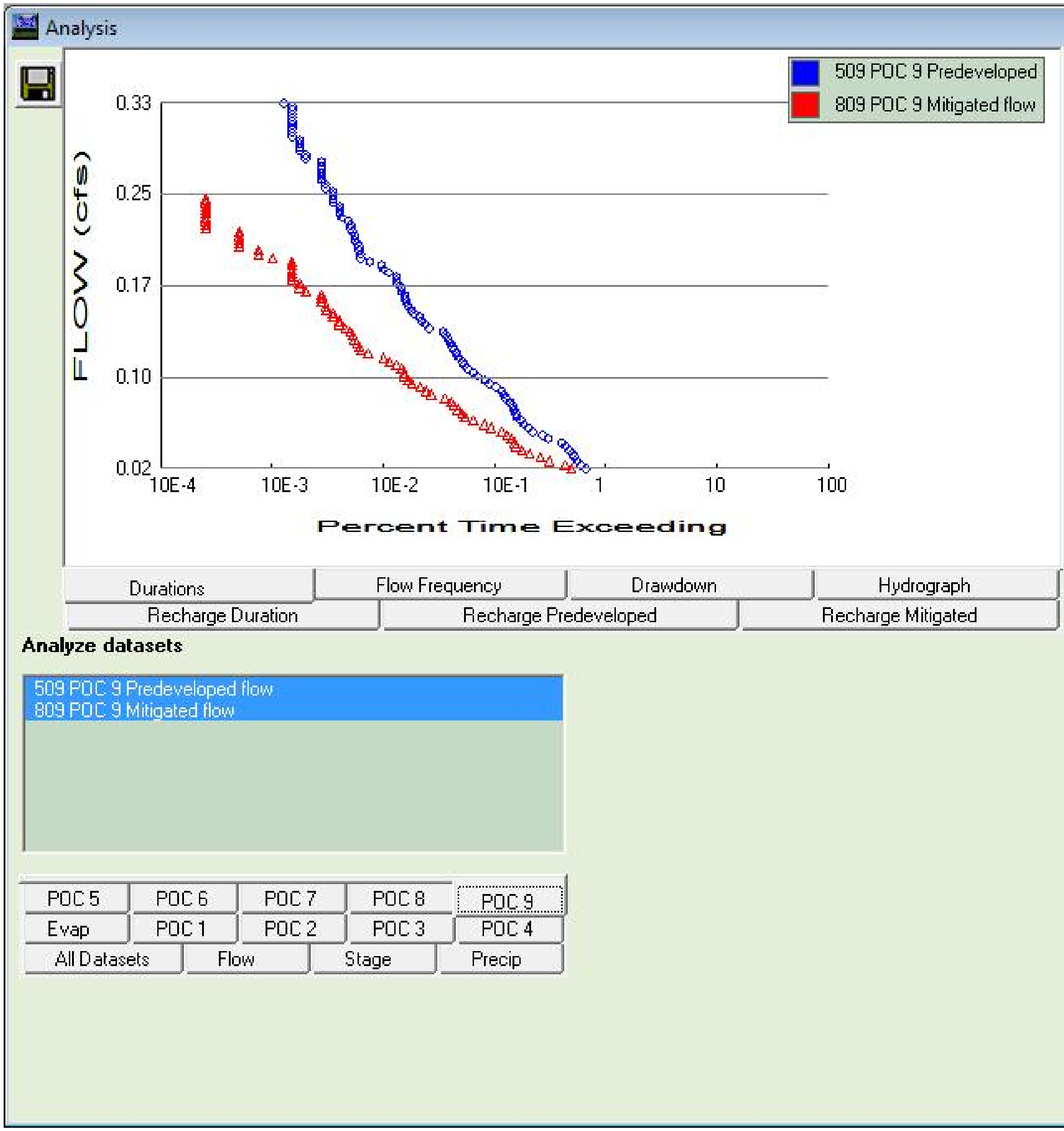


The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
2.0699	339	354	104	Pass
2.4455	311	318	102	Pass
2.8211	282	290	102	Pass
3.1968	259	263	101	Pass
3.5724	243	243	100	Pass
3.9480	229	233	101	Pass
4.3237	215	220	102	Pass
4.6993	208	206	99	Pass
5.0750	195	194	99	Pass
5.4506	190	188	98	Pass
5.8262	181	175	96	Pass
6.2019	168	168	100	Pass
6.5775	165	158	95	Pass
6.9531	154	149	96	Pass
7.3288	144	144	100	Pass
7.7044	141	140	99	Pass
8.0800	139	135	97	Pass
8.4557	134	131	97	Pass
8.8313	130	128	98	Pass
9.2069	127	127	100	Pass
9.5826	123	123	100	Pass
9.9582	122	119	97	Pass
10.3338	117	115	98	Pass
10.7095	115	112	97	Pass
11.0851	112	107	95	Pass
11.4607	109	104	95	Pass
11.8364	104	102	98	Pass
12.2120	102	99	97	Pass
12.5877	101	94	93	Pass
12.9633	97	93	95	Pass
13.3389	93	91	97	Pass
13.7146	91	89	97	Pass
14.0902	89	86	96	Pass

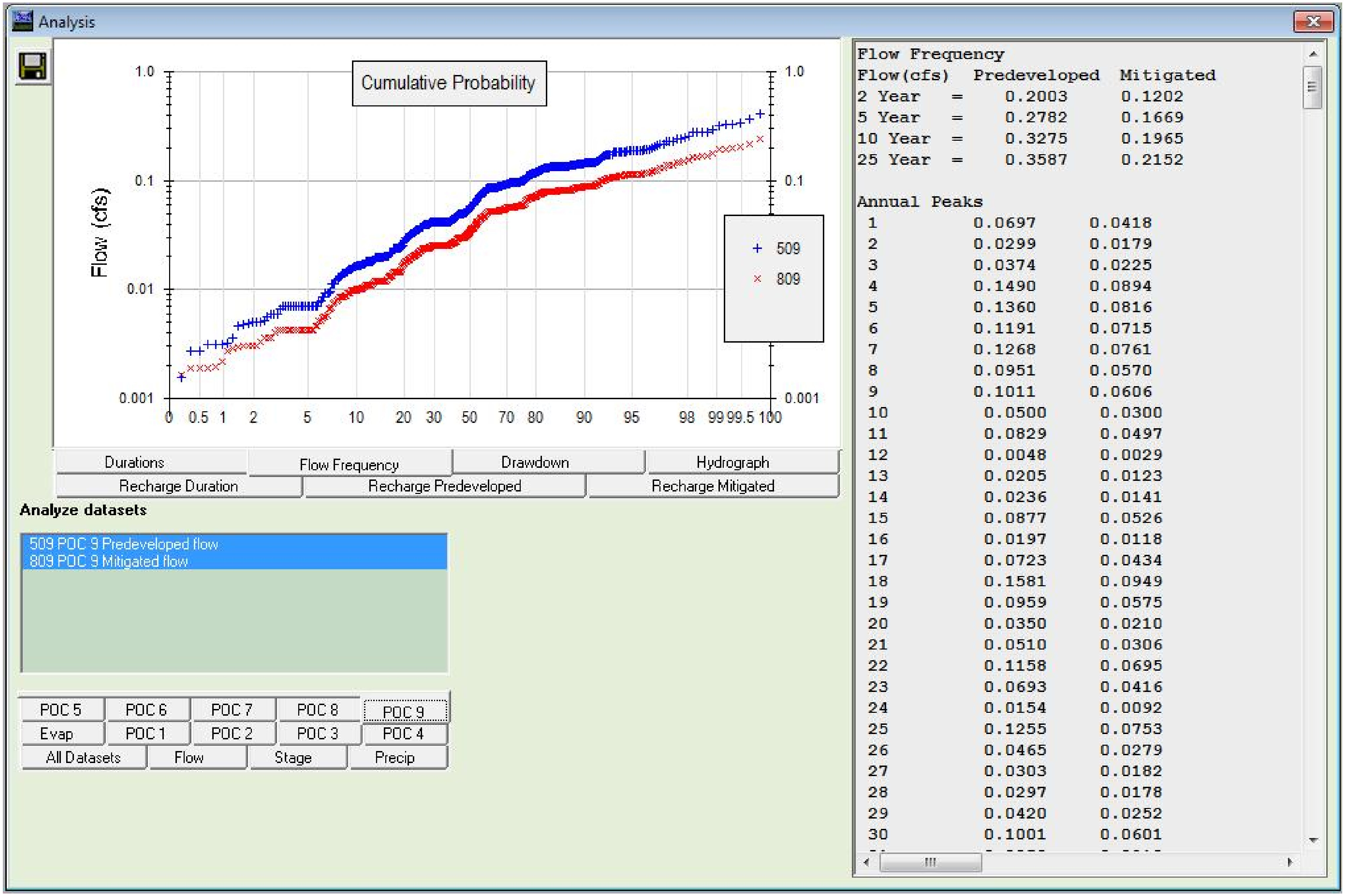

Analysis
Cumulative Probability
Flow (cfs)
1000.0
100.0
10.0
1.0
0.1
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
508
808
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
508 POC 8 Predeveloped flow
808 POC 8 Mitigated flow
POC 5
POC 6
POC 7
POC 8
POC 9
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 20.6987 19.8181
5 Year = 32.7838 31.0098
10 Year = 39.2577 36.9971
25 Year = 101.7911 95.7480
Annual Peaks
1 4.9052 0.7591
2 14.5779 0.6972
3 2.7123 5.0625
4 0.7662 14.1255
5 0.5060 2.9208
6 4.3024 1.2132
7 0.4094 0.8098
8 0.7785 0.4449
9 25.8140 0.7781
10 2.8605 0.5008
11 1.2618 0.5933
12 0.8426 0.6370
13 1.4630 0.5390
14 1.1453 0.6583
15 1.0071 4.4487
16 3.2057 0.4985
17 0.5899 0.4319
18 4.2132 0.6365
19 2.5738 0.4010
20 21.0687 0.6158
21 12.6382 0.4357
22 0.4261 0.4827
23 2.4147 0.4404
24 4.2940 0.6793
25 3.8375 0.4486
26 8.7705 0.4155
27 0.5225 0.4968
28 1.3494 0.4029
29 1.4478 0.4036
30 26.4127 0.4920



The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0200	2606	1930	74	Pass
0.0231	2352	1712	72	Pass
0.0262	2184	1235	56	Pass
0.0293	2079	1023	49	Pass
0.0325	1981	818	41	Pass
0.0356	1853	701	37	Pass
0.0387	1736	623	35	Pass
0.0418	1595	595	37	Pass
0.0449	1212	559	46	Pass
0.0480	1063	515	48	Pass
0.0511	872	456	52	Pass
0.0542	799	368	46	Pass
0.0573	732	319	43	Pass
0.0604	678	255	37	Pass
0.0635	628	215	34	Pass
0.0666	608	202	33	Pass
0.0697	592	185	31	Pass
0.0728	569	170	29	Pass
0.0759	542	160	29	Pass
0.0790	502	141	28	Pass
0.0821	485	107	22	Pass
0.0852	456	96	21	Pass
0.0883	403	85	21	Pass
0.0915	351	72	20	Pass
0.0946	325	66	20	Pass
0.0977	277	62	22	Pass
0.1008	255	61	23	Pass
0.1039	225	58	25	Pass
0.1070	213	52	24	Pass
0.1101	202	45	22	Pass
0.1132	188	40	21	Pass
0.1163	180	29	16	Pass
0.1194	172	25	14	Pass


Analysis
Cumulative Probability
Flow (cfs)
1.0
0.1
0.01
0.001
0 0.5 1 2 5 10 20 30 50 70 80 90 95 98 99 99.5 100
509
809
Durations
Flow Frequency
Drawdown
Hydrograph
Recharge Duration
Recharge Predeveloped
Recharge Mitigated
Analyze datasets
509 POC 9 Predeveloped flow
809 POC 9 Mitigated flow
POC 5
POC 6
POC 7
POC 8
POC 9
Evap
POC 1
POC 2
POC 3
POC 4
All Datasets
Flow
Stage
Precip
Flow Frequency
Flow(cfs) Predeveloped Mitigated
2 Year = 0.2003 0.1202
5 Year = 0.2782 0.1669
10 Year = 0.3275 0.1965
25 Year = 0.3587 0.2152
Annual Peaks
1 0.0697 0.0418
2 0.0299 0.0179
3 0.0374 0.0225
4 0.1490 0.0894
5 0.1360 0.0816
6 0.1191 0.0715
7 0.1268 0.0761
8 0.0951 0.0570
9 0.1011 0.0606
10 0.0500 0.0300
11 0.0829 0.0497
12 0.0048 0.0029
13 0.0205 0.0123
14 0.0236 0.0141
15 0.0877 0.0526
16 0.0197 0.0118
17 0.0723 0.0434
18 0.1581 0.0949
19 0.0959 0.0575
20 0.0350 0.0210
21 0.0510 0.0306
22 0.1158 0.0695
23 0.0693 0.0416
24 0.0154 0.0092
25 0.1255 0.0753
26 0.0465 0.0279
27 0.0303 0.0182
28 0.0297 0.0178
29 0.0420 0.0252
30 0.1001 0.0601

Roadside Bioretention Areas Stage Storage

Stage Storage POC 3					
Bottom Width (ft)=		3	Bottom Length(ft)=		900
Depth (ft)	Area (ft^2)	Area (ac)	Elevation	Volume (ft^3)	Volume (ac-ft)
0.0	2700	0.06	0.0	0	0.00
0.1	3240	0.07	0.1	297	0.01
0.2	3780	0.09	0.2	648	0.01
0.3	4320	0.10	0.3	1053	0.02
0.4	4860	0.11	0.4	1512	0.03
0.5	5400	0.12	0.5	2025	0.05
0.6	5940	0.14	0.6	2592	0.06
0.7	6480	0.15	0.7	3213	0.07
0.8	7020	0.16	0.8	3888	0.09
0.9	7560	0.17	0.9	4617	0.11
1.0	8100	0.19	1.0	5400	0.12
Stage Storage POC 4					
Bottom Width (ft)=		3	Bottom Length(ft)=		300
Depth (ft)	Area (ft^2)	Area (ac)	Elevation	Volume (ft^3)	Volume (ac-ft)
0.0	900	0.02	0.0	0	0.00
0.1	1080	0.02	0.1	99	0.00
0.2	1260	0.03	0.2	216	0.00
0.3	1440	0.03	0.3	351	0.01
0.4	1620	0.04	0.4	504	0.01
0.5	1800	0.04	0.5	675	0.02
0.6	1980	0.05	0.6	864	0.02
0.7	2160	0.05	0.7	1071	0.02
0.8	2340	0.05	0.8	1296	0.03
0.9	2520	0.06	0.9	1539	0.04
1.0	2700	0.06	1.0	1800	0.04
Stage Storage POC 7					
Bottom Width (ft)=		2.68	Bottom Length(ft)=		500
Depth (ft)	Area (ft^2)	Area (ac)	Elevation	Volume (ft^3)	Volume (ac-ft)
0.0	1340	0.03	0.0	0	0.00
0.1	1640	0.04	0.1	149	0.00
0.2	1940	0.04	0.2	328	0.01
0.3	2240	0.05	0.3	537	0.01
0.4	2540	0.06	0.4	776	0.02
0.5	2840	0.07	0.5	1045	0.02
0.6	3140	0.07	0.6	1344	0.03
0.7	3440	0.08	0.7	1673	0.04
0.8	3740	0.09	0.8	2032	0.05
0.9	4040	0.09	0.9	2421	0.06
1.0	4340	0.10	1.0	2840	0.07
Stage Storage POC 8					
Bottom Width (ft)=		2.68	Bottom Length(ft)=		500
Depth (ft)	Area (ft^2)	Area (ac)	Elevation	Volume (ft^3)	Volume (ac-ft)
0.0	1340	0.03	0.0	0	0.00
0.1	1640	0.04	0.1	149	0.00
0.2	1940	0.04	0.2	328	0.01
0.3	2240	0.05	0.3	537	0.01
0.4	2540	0.06	0.4	776	0.02
0.5	2840	0.07	0.5	1045	0.02
0.6	3140	0.07	0.6	1344	0.03
0.7	3440	0.08	0.7	1673	0.04
0.8	3740	0.09	0.8	2032	0.05
0.9	4040	0.09	0.9	2421	0.06
1.0	4340	0.10	1.0	2840	0.07

Roadside Bioretention Areas Drawdown Calculations

POC 3

Elevation	Q (CFS)	DV (CF)	DT (HR)	Total T
0.0	0.027	297	3.10	24.65
0.1	0.030	351	3.29	21.55
0.2	0.036	405	3.16	18.26
0.3	0.044	459	2.89	15.10
0.4	0.055	513	2.59	12.20
0.5	0.068	567	2.31	9.61
0.6	0.083	621	2.08	7.30
0.7	0.099	675	1.89	5.22
0.8	0.117	729	1.73	3.33
0.9	0.136	783	1.60	1.60
1.0				

POC 4

Elevation	Q (CFS)	DV (CF)	DT (HR)	Total T
0.0	0.026	99	1.06	14.42
0.1	0.027	117	1.22	13.36
0.2	0.028	135	1.36	12.13
0.3	0.029	153	1.45	10.78
0.4	0.031	171	1.51	9.33
0.5	0.034	189	1.55	7.81
0.6	0.037	207	1.57	6.26
0.7	0.040	225	1.57	4.69
0.8	0.043	243	1.57	3.12
0.9	0.047	261	1.55	1.55
1.0				

POC 7

Elevation	Q (CFS)	DV (CF)	DT (HR)	Total T
0.0	0.026	149	1.59	21.24
0.1	0.027	179	1.86	19.65
0.2	0.028	209	2.06	17.79
0.3	0.030	239	2.19	15.73
0.4	0.033	269	2.26	13.55
0.5	0.036	299	2.29	11.28
0.6	0.040	329	2.29	8.99
0.7	0.044	359	2.27	6.70
0.8	0.048	389	2.24	4.43
0.9	0.053	419	2.20	2.20
1.0				

POC 8

Elevation	Q (CFS)	DV (CF)	DT (HR)	Total T
0.0	0.026	149	1.59	21.24
0.1	0.027	179	1.86	19.65
0.2	0.028	209	2.06	17.79
0.3	0.030	239	2.19	15.73
0.4	0.033	269	2.26	13.55
0.5	0.036	299	2.29	11.28
0.6	0.040	329	2.29	8.99
0.7	0.044	359	2.27	6.70
0.8	0.048	389	2.24	4.43
0.9	0.053	419	2.20	2.20
1.0				

ATTACHMENT I

Geomorphic Assessment

(Contact County staff immediately if you are planning to conduct a Geomorphic Assessment. A Geomorphic Assessment must be performed if the project is using a "Medium" low flow threshold of 0.3.Q_2 or a "High" low flow threshold of 0.5Q_2.)

-THIS ATTACHMENT IS NOT APPLICABLE-

ATTACHMENT J

HMP Exemption Documentation
(If applicable)

-<u>THIS ATTACHMENT IS NOT APPLICABLE</u>-

ATTACHMENT K

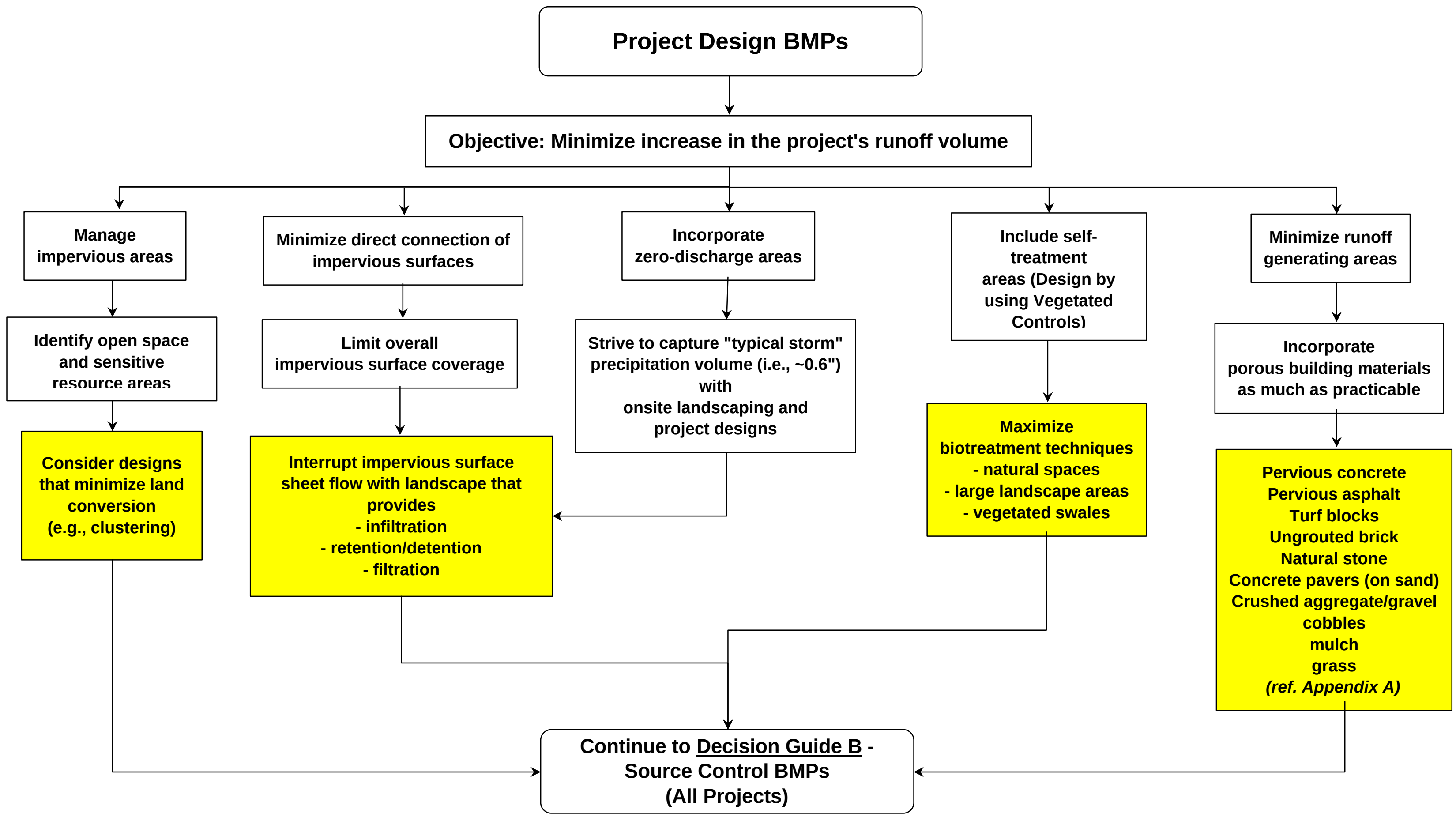
Addendum- City of San Diego Stormwater Protection Guidelines

Project Evaluation Worksheet **NOTE: WORK THROUGH ENTIRE WORKSHEET**				
STEP	**CRITERIA**	**YES ✓**	**NO ✓**	**GUIDANCE DIRECTION**
1.	Is your project in one of the following drinking water watersheds: ▪ Barrett Lake, **or** ▪ El Capitan Reservoir, **or** ▪ Lake Hodges, **or** ▪ Morena Reservoir, **or** ▪ Otay Reservoir, **or** ▪ San Vicente Reservoir, **or** ▪ Sutherland Reservoir.	X		If yes, go to Step 2. If no, the project is not subject to the City of San Diego Water Department Watershed Protection Guidelines; however, we recommend you go to Step 7 to check if SUSMP requirements pertain to you.
2.	Will your project provide substantial additional sources of polluted runoff? (Per CEQA* checklist Item VIII(e), if you checked boxes indicating "potentially significant impact" or "less than significant with mitigation incorporation" as a result of additional sources of polluted runoff).	X		If yes, go to Step 4. If no, go to Step 3.
3.	Will your project otherwise substantially degrade water quality? (Per CEQA* checklist Item VIII(f), if you checked boxes indicating "potentially significant impact" or "less than significant with mitigation incorporation").			If yes, go to Step 4. If no, go to Step 5.
4.				**PROJECT IS TIER 3.** Use Decision Guides A, B, C, and D and the Treatment BMP Technologies Matrix **AND** go to Step 9.

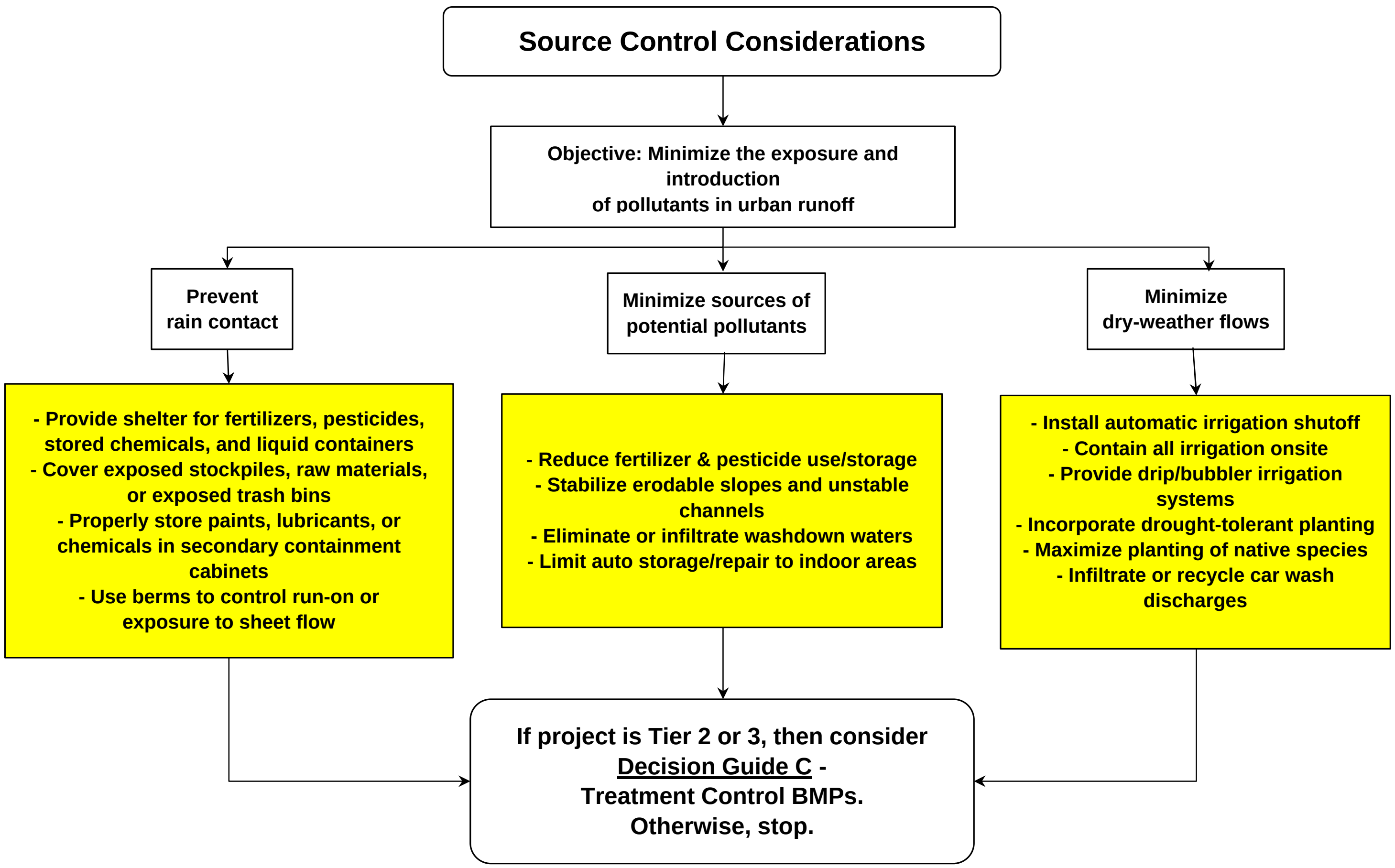
*If the project is in a jurisdiction where there are CEQA thresholds, use them. If not, please reference the 'Significance Determination Guidelines' for CEQA used by the City of San Diego, Development Services Department, Land Development Review Division, and Environmental Analysis Section.

Project Evaluation Worksheet NOTE: WORK THROUGH ENTIRE WORKSHEET				
STEP	**CRITICIA**	**YES ✓**	**NO ✓**	**GUIDANCE DIRECTION**
5.	Is your project: ▪ A residential project involving more than 10 units, **or** ▪ A commercial development involving more than 100,000 square feet of developed area, **or** ▪ An automotive repair shop, **or** ▪ A restaurant, **or** ▪ A hillside development greater than 5,000 square feet, **or** ▪ In the vicinity of an environmentally sensitive area (ESA), **or** ▪ Involving a parking lot greater than 5,000 square feet or more than 15 spaces, **or** ▪ Involving road or travel surfaces with a surface area of 5,000 square feet or more?			If yes, please check SUSMP requirements from the local municipality and we recommend you go to Step 7. If no, go to Step 6.
6.	Is runoff from your finished project likely to contain significant nutrients (nitrogen or phosphorous), or total organic carbon, or salts (total dissolved solids) or sediment that may impact reservoir water quality?			If yes, go to Step 7. If no, go to Step 8.
7.				**PROJECT IS TIER 2.** Use Decision Guides A, B, and C and the Treatment BMP Technologies Matrix. Compliance with applicable SUSMP requirements and other pertinent design standards is recommended. Go to Step 9.
8.				**PROJECT IS TIER 1.** Use Decision Guides A and B and go to Step 9.
9.	Attach this form and a list of selected BMPs to your project's first formal submittal to the Planning Department.			

Decision Guide A: Project Design BMPs
[Applicable to ALL Projects - Tier 1, Tier 2, and Tier 3]



Decision Guide B: Source Control BMPs
[Applicable to ALL Projects - Tier 1, Tier 2 and Tier 3]



Decision Guide C: Treatment Control BMPs
[Applicable to Tier 2 and Tier 3 Projects]

Condition	BMPs to Consider	BMPs to Avoid
High groundwater or poorly draining soils	Extended detention basins* Retention basins* Constructed wetlands	Porous pavement Infiltration trench Infiltration basin Dry wells
Drainage area larger than 10 acres	Treatment trains Extended detention basins Retention basins	Infiltration trench Infiltration basin Dry well Vortex separators Bioretention Grass channels
Drainage area smaller than 2 acres	Bioretention Swales Gravel-based wetland Grass channels Surface sand filters Vortex separators	Constructed wetlands Dry ponds
Impervious area less than 10% of the total project area	Surface or perimeter sand filters Detention systems Bioretention Grass channels	N/A
Impervous area greater than 10% of the total project area	Sand filters Dry wells Swales Filter strips Bioretention Infiltration Basin Trench Porous pavement	N/A
Vertical change across the project of 4 feet or more	Extended detention systems Sand filters Dry wells Bioretention Swales	N/A
Hydraulic head is less than 1 to 3 feet	Filter strips	Sand filters Media filters Gravel-based wetlands Grass channels Dry wells Infiltration systems
Sensitive groundwater area	Bioretention	Infiltration trench Infiltration basin Porous pavement Subsurface storage Grassed swales Constructed wetlands
Area sensitive to visual impact	Bioretention Filter strips Subsurface retention Vortex separators	N/A
None of the above	Filter strips Buffers Grass channels	N/A

↓

If Project is Tier 2, Consider the Treatment BMP Technologies Matrix to Compare Alternative BMP Options

↓

If Project is Tier 3, Consider the Treatment BMP Technologies Matrix and Decision Guide D

Note: Colors refer to categories of BMPs listed in the Treatment BMP Technologies Matrix.

N/A = Not Applicable

* - System should be designed to minimize infiltration

Decision Guide D: Pre-treatment and Post-Treatment BMPs

Additional Treatment-Train Recommendations for Tier 3 Projects

(Refer to Treatment BMP Technologies Matrix for Additional Considerations)

Pre-treatment and Post-treatment Considerations to Enhance Treatment Performance of BMPs at Large or Complex Project Sites

Condition	Potential Solution
Pre-treatment Considerations	
Hilly terrain or steep slopes that will concentrate runoff flow to the BMP.	Reduce incoming velocity to the BMP through pretreatment concepts, such as baffle boxes, gabions, check dams, rip rap, forebays.
Drainage from surrounding area may carry substantial amounts of debris (sticks, leaves, sediment) that could potentially clog or disrupt the BMP.	Provide up-front screening devices or sediment capturing concepts to pre-treat incoming flow, such as grates, flip-up bar screens, rip rap, forebays, and in certain situations, in-ground systems like hydrodynamic separators may be appropriate.
Native, undisturbed area may be subject to erosion that could cause unwanted sediment to be carried away with runoff. -OR- Developed areas may require multiple seasons to completely establish vegetation, which may result in unwanted erosion.	Provide up-front sediment-capturing concepts to slow incoming flow for sediment fallout or to block high sediment loads from entering the BMP, such as check dams, gabions, rip rap, forebays, meandering riparian water courses, and in certain situations, in-ground systems like hydrodynamic separators may be appropriate. Swales are not appropriate for high sediment loads.
Project area will likely contribute substantial amounts of dry-weather flow from single family homes (irrigation, car washing, washdown, etc.).	Integrate interconnected water courses through open spaces, and perhaps residences, to route dry-weather flows in ways that are beneficial to the environment without significant discharge to surrounding drinking water sources.

Post-treatment Considerations	
Project drains to sensitive or impaired receiving water (303(d)-listed) stream or water body	Additional post-treatment may be required by providing treatment-train concepts to reduce the target pollutants of concern, such as: - Bioretention basins or ponds (i.e., temporary/permanent water storage) - Infiltration techniques (i.e., runoff reduction) - Sand filters (post-treatment water quality "polishing")
Project or project area has limited space to accommodate BMPs that can provide adequate water volume capture/treatment.	Assess suitability for subregional or regional systems that can accommodate target storm volumes, such as: offline riparian corridors or vegetative buffer zones, or interconnected storage systems (e.g., ponds, gravel trenches, depressed landscape) over several acres.

ATTACHMENT L

Lower Otay Reservoir Salt and Nutrient Loading Correspondence

1. Dexter Wilson Engineering Memorandum for Otay Ranch Resort Urban Runoff dated January 26, 2012.
2. City of San Diego Memorandum dated February 13, 2012 in response to Dexter Wilson's Memorandum.
3. Dexter Wilson Engineering Memorandum dated February 23, 2015 updating and amending minor changes to previous Memorandum.

DEXTER WILSON ENGINEERING, INC.

DEXTER S. WILSON, P.E.
ANDREW M. OVEN, P.E.
STEPHEN M. NIELSEN, P.E.
DIANE H. SHAUGHNESSY, P.E.
NATALIE J. FRASCHETTI, P.E.

MEMORANDUM **605-827**

TO: **Sean Kilkenny, JPB Development**

FROM: **Stephen M. Nielsen, P.E., Dexter Wilson Engineering, Inc.** SMN

DATE: **January 26, 2012**

SUBJECT: **Otay Ranch Resort Urban Runoff**

The purpose of this memorandum is to provide an evaluation of the impact that development of the Otay Ranch Resort property will have on Lower Otay Reservoir as a result of urban runoff. The constituents used in the evaluation are salt loading expressed as total dissolved solids (TDS) and nutrient loading in the form of nitrogen and phosphate.

Methodology

The methodology used to evaluate salt and nutrient loading will be to provide a comparison of pre-development and post-development conditions. For each development condition the amount of salt and nutrients generated by the project will be estimated and expressed as a mass loading in pounds per year (lb/yr). Since the loadings will vary considerably from year to year based on local rainfall and runoff, the analysis performed is based on average annual conditions. Runoff quantities in the pre-development and post-development conditions were provided by Hunsaker and Associates based on storm water modeling software. Data and references used in this analysis have been attached as Appendix A.

Land Use

The attached exhibit provides the proposed land use layout for the project and identifies the area tributary to Lower Otay Reservoir. The total tributary area is approximately 2,491 acres.

Pre-Development Condition. In its current condition, the tributary area consists almost entirely of natural landscape that slopes to Lower Otay Reservoir. This natural landscape encompasses approximately 2,478 acres of the tributary area and the remaining 13 acres is existing Otay Lakes Road.

Post-Development Condition. In the post-development condition, the tributary area has been identified by the following four subareas:

1. **Natural area not tributary to a water quality basin.** This area includes the majority of the project (1,343 acres) and will involve natural open space that is allowed to drain to the reservoir as it does in the pre-development condition.

2. **Natural area tributary to a water quality basin.** This area includes 333 acres of natural open space that will drain to development areas and be collected in the project storm drain system.

3. **Developed area not tributary to a water quality basin.** This relatively small area (132 acres) consists of Otay Lakes Road and adjacent areas where the runoff will not be captured in a water quality basin, but instead will go through a biofiltration system. Approximately half of the ground surface in this area will be pervious and half will be non-pervious.

4. **Developed area tributary to a water quality basin.** Approximately 683 acres of the site will be developed where the runoff will be collected and conveyed to water quality basins. Approximately half of the ground surface in these areas are assumed to be pervious and half are non-pervious.

Salt Loading

For each of the four post-development land uses described above, the attached table provides a comparison of TDS loading in the pre-development and post-development conditions. For this analysis, the TDS loading for natural areas was assumed to be 200 mg/l based on the City of San Diego's memorandum dated December 2, 2011. For the developed areas, we consulted a number of sources and found a range of TDS loadings with a typical TDS loading of 800 mg/l.

The results of the analysis indicate that the full development of the project will increase runoff in an average year by 251.1 acre feet (AF). The increased salt in this runoff will be approximately 594,749 lb/yr. The increased runoff into the reservoir will, however, reduce the amount of water that needs to be imported and reduce the salt loading from imported water. In consideration of this and as shown in the attached table, the net effective increase in salt loading as a result of project development is approximately 253,787 lb/yr. To put this in perspective, this amount of salt represents about 0.4% of the amount of salt in the reservoir when the reservoir is full.

Nitrogen Loading

The attached table provides an evaluation of nitrogen loading in pre-development and post-development conditions. The analysis is similar to the salt loading evaluation except that the project best management practices (BMPs) for the developed areas will remove some of the nitrogen loading and prevent it from entering the reservoir. The nitrogen removal percentage for project BMPs was based on the City of San Diego Source Water Protection Guidelines (January 2004).

The nitrogen loading from natural open space areas was assumed to be zero. For developed areas, a nitrogen loading of 3.0 mg/l was assumed based on results from the EPA nationwide urban runoff program. To determine the nitrogen loading offset from imported water supplies, a loading rate of 0.3 mg/l was used based on the Otay Water District 2011 Consumer Confidence Report. The results of the analysis indicate that the increased nitrogen loading from project runoff will be 1,608 lb/yr. In consideration of the reduced nitrogen due to offset imported water supply, the net effective nitrogen loading as a result of project development is 1,403 lb/yr. This represents approximately 2.3 percent of the nitrogen that is present in the reservoir when full.

Phosphate Loading

The phosphate loading analysis is provided in the attached table and follows the same approach as the nitrogen loading calculations. The phosphate loading from natural areas was assumed to be zero. Phosphate loading from developed areas was assumed to be 0.15 mg/l based on the EPA nationwide urban runoff program. The amount of phosphate in the imported water supply is assumed to be negligible and therefore does not result in a reduction in the net effective phosphate loading. The estimated increased phosphate loading as a result of project development is 58 lb/yr.

Conclusion

The effect that urban runoff constituents will have on a source water reservoir depends not only on the nature and quantity of those constituents but also to a large degree on the operational scheme for the reservoir. In the case of Lower Otay Reservoir, water enters the reservoir from runoff and from imported water and all water leaving the reservoir (aside from minor evaporative losses) flows through the Lower Otay Water Filtration Plant and into the potable water transmission and distribution system. The result is that a substantial amount of the water in the reservoir is replaced on an annual basis and the reservoir water quality is closely tied to the quality of the water going into the reservoir. Therefore, no cumulative build-up of urban runoff constituents is expected to occur and cumulative effects are determined to be less than significant.

To determine whether the project's runoff would have an impact on the reservoir, this study utilized the City of San Diego Source Water Protection Guidelines as the guidance document. The project storm water system has been designed in accordance with these guidelines, including the appropriate BMPs to improve runoff water quality before it reaches the reservoir. As the reservoir is operated to prevent overflows, the water quality downstream of the dam is not impacted and, therefore, the evaluation of urban runoff from the project is limited to source water protection of Lower Otay Reservoir.

In an average year, the runoff from the project site at build-out will be mixed with imported water and natural runoff and will constitute less than one percent of the total water entering the reservoir. This study analyzed the effects Total Dissolved Solids (TDS or salt), nitrogen, and phosphate loading from the Project would have on the reservoir in the context of the Project's small contribution to the total water supply of the reservoir and based on the water quality of the reservoir's other sources of water. The City's Source Water Protection Guidelines establish a water quality objective of 500 mg/l for Total Dissolved Solids (TDS). This objective is currently not met at the Otay, Alvarado, or Miramar treatment plants. The City of San Diego 2010 Annual Drinking Water Quality Report for these facilities indicates an average TDS level ranging from 563 mg/l to 601 mg/l (Otay) for these facilities and establishes a secondary maximum contaminant level at 1,000 mg/l.

The impact of urban runoff from the project at build out is anticipated to increase average TDS levels at Lower Otay Reservoir from 601 mg/l to 603 mg/l during an average year. This increase is viewed as less than significant because it constitutes a 0.40% increase in the post project TDS level of the reservoir and would not require any changes to the operation of the Lower Otay Treatment Plant by the City. The post project TDS level of the reservoir also falls well below the secondary maximum contaminant level of 1,000 mg/l.

The Source Water Protection Guidelines also establish objectives for nitrogen and phosphate. These objectives are more stringent than drinking water limits and were established to minimize algae growth and related taste and odor issues associated with drinking water. The Source Water Protection Guidelines establish a nitrate limit of 10 mg/l in accordance with the Basin Plan and drinking water standards. Existing total nitrogen in the reservoir was measured at an average of 0.46 mg/l in 2010. This would be expected to increase to 0.47 mg/l with the addition of runoff from the project, approximately a 2% increase. This increase is viewed as less than significant because it falls well below the City's established nitrate limit of 10 mg/l and would not require any changes to the operation of the Lower Otay Treatment Plant by the City.

The Source Water Protection Guidelines establish an objective of 0.025 mg/l for total phosphorous in accordance with the Basin Plan. We were unable to find any recent data on phosphorous concentrations in the existing reservoir. If, however, the phosphate concentration in the reservoir is at the objective of 0.025 mg/l, the effect of additional phosphate added as a result of the Project will not raise the concentration in the reservoir to above 0.025 mg/l (rounded to the nearest thousandth). Thus, the impact would be negligible and would not require changes to the operation of the Lower Otay Treatment Plant.

In summary, the contribution to salt and nutrient loading from the Project is determined to be negligible and less than significant. No cumulative impacts would occur as the reservoir water is periodically and consistently removed and replaced with imported water and natural runoff and no changes to the operation of the Lower Otay Treatment Plant are required as a result of the Project.

SMN:ck

OTAY RANCH RESORT URBAN RUNOFF SALT LOADING CALCULATIONS

Post Development Area Description	Total Area, Acres	Pre-Development Condition					Post Development Condition				
		Type	Area	Avg. Year Runoff, AF	TDS Loading mg/l	TDS loading, lb.	Type	Area	Avg. Year Runoff, AF	TDS Loading mg/l	TDS loading, lb.
Natural Area not Tributary to WQ Basin	1,343	Natural	1,343	50.5	200	27,429	Natural	1,343	50.5	200	27,429
Natural Area Tributary to WQ Basin	333	Natural	333	12.5	200	6,789	Natural	333	12.5	200	6,789
Developed Area not Tributary to WQ Basin	132	Otay Lakes Road	13	7.9	800	17,164	Pervious	66	6.7	800	14,556
		Natural	119	4.5	200	2,444	Not Pervious	66	40.0	800	86,904
Developed Area Tributary to WQ Basin	683	Natural	683	25.7	200	13,959	Pervious	341.5	34.9	800	75,824
							Not Pervious	341.5	207.6	800	451,032
TOTAL	2,491		2,491	101.1		67,785		2,491	352.2		662,534
INCREASE									**251.1**		**594,749**
OFFSET IMPORTED WATER SUPPLY									**251.1**	500	**340,962**
NET EFFECTIVE INCREASE									**251.1**		**253,787**

Notes:

1. In an average year, the City imports approximately 32,000 AFY of water with an average TDS of 500 mg/l. This equates to 43,509,600 lb. Thus the effective salt added as a result of this development represents 0.6% of the salt contained in imported water each year.
2. The Lower Otay Reservoir has a volume of approximately 49,000 AF and an average TDS of 526 mg/l. This equates to 69,995,741 lb. Thus the effective salt added during an average year in the developed condition represents 0.4% of the salt contained in the reservoir when full.

OTAY RANCH RESORT URBAN RUNOFF NITROGEN LOADING CALCULATIONS

Post Development Area Description	Total Area, Acres	Pre-Development Condition					Post Development Condition								
		Type	Area	Avg. Year Runoff, AF	Nitrogen Loading mg/l	Nitrogen loading, lb.	Type	Area	Avg. Year Runoff, AF	Nitrogen Loading mg/l	Nitrogen loading, lb.	BMPs	Removal %	Removal lb.	Net Loading lb.
Natural Area not Tributary to WQ Basin	1,343	Natural	1,343	50.5	0	0	Natural	1,343	50.5	0	0	N/A	0	0	0
Natural Area Tributary to WQ Basin	333	Natural	333	12.5	0	0	Natural	333	12.5	0	0	Trash Screen	0	0	0
Developed Area not Tributary to WQ Basin	132	Otay Lakes Road	13	7.9	3	64	Pervious	66	6.7	3.0	55	Filterra Biofiltration	40	21.8	32.8
		Natural	119	4.5	0	0	Not Pervious	66	40.0	3.0	326	Filterra Biofiltration	40	130.4	195.5
Developed Area Tributary to WQ Basin	683	Natural	683	25.7	0	0	Pervious	341.5	34.9	3.0	284	Media filter/detention basin	13/16	76.5	207.8
							Not Pervious	341.5	207.6	3.0	1,691	Media filter/detention basin	13/16	455.3	1236.1
TOTAL	2,491		2,491	101.1		64		2,491	352.2		2,356			684	1,672
INCREASE									251.1						1,608
OFFSET IMPORTED WATER SUPPLY									251.1	0.3	205				
NET EFFECTIVE INCREASE									251.1						1,403

Note: The Lower Otay Reservoir has a voulume of approximately 49,000 AF and an average total nitorgen concentration of 0.46 mg/l. This equates to 61,213 lb. of nitrogen. Thus, the increased nitrogen loading represents approximately 2.3 % of the nitrogen contained in the reservoir when full.

OTAY RANCH RESORT URBAN RUNOFF PHOSPHATE LOADING CALCULATIONS

Post Development Area Description	Total Area, Acres	Pre-Development Condition					Post Development Condition								
		Type	Area	Avg. Year Runoff, AF	Phosphate Loading mg/l	Phosphate loading, lb.	Type	Area	Avg. Year Runoff, AF	Phosphate Loading mg/l	Phosphate loading, lb.	BMPs	Removal %	Removal lb.	Net Loading lb.
Natural Area not Tributary to WQ Basin	1,343	Natural	1,343	50.5	0	0	Natural	1,343	50.5	0	0	N/A	0	0	0
Natural Area Tributary to WQ Basin	333	Natural	333	12.5	0	0	Natural	333	12.5	0	0	Trash Screen	0	0	0
Developed Area not Tributary to WQ Basin	132	Otay Lakes Road	13	7.9	0.15	3	Pervious	66	6.7	0.15	2.7	Filterra Biofiltration	25	0.7	2.0
		Natural	119	4.5	0	0	Not Pervious	66	40.0	0.15	16.3	Filterra Biofiltration	25	4.1	12.2
Developed Area Tributary to WQ Basin	683	Natural	683	25.7	0	0	Pervious	341.5	34.9	0.15	14.2	Media filter/Detention basin	24/38	7.5	6.7
							Not Pervious	341.5	207.6	0.15	84.6	Media filter/Detention basin	24/38	44.7	39.8
TOTAL	2,491		2,491	101.1		3		2,491	352.2		118			57	61
INCREASE									251.1						58
OFFSET IMPORTED WATER SUPPLY									251.1	0	0				
NET EFFECTIVE INCREASE									251.1						58

APPENDIX A

REFERENCE DATA

December 2, 2011

Village 13
Unresolved Issue

Water Quality: Salt and Nutrient Loading to Otay Reservoir

The following discussion should be considered in the context of the entire project footprint of Village 13.

What is "salt" loading
In this context salt is a suite of elements and inorganic compounds [more correctly, ions and ionic compounds in aqueous solution]. Dominantly it is sodium and chloride; it is also calcium, magnesium, potassium, sulfate, and carbonate. It is commonly expressed as Total Dissolved Solid [TDS] and measured as Electrical Conductivity [EC]. TDS is a critical secondary drinking water standard.

Salt is almost perfectly conservative – it does not degrade or die off or otherwise "go away." Any salt added to a land area will ultimately find its way to surface water or groundwater.

Loading is not the same as concentration. Loading is mass per time [e.g. kilograms per year] while concentration is mass per volume [e.g. milligrams per liter]. Thus, a thousand gallons of salty water carries a much greater load of salt than one gallon of the water, even though the salt concentration is the same in both.

Pre-project salt load
The pre-project condition is a healthy natural landscape sloping to Otay Reservoirs. Rain falls on this natural landscape and water runs off to Otay Reservoirs [including water that percolates to shallow groundwater and migrates down slope to the surface water]. Both surface water runoff and shallow groundwater will reach the reservoir. This runoff carries with it an amount of salt derived from soil and vegetation. This quantity of salt is the pre-project salt load to the reservoirs. In the San Diego region, the concentration of salt in native runoff is generally about 200 mg/l. The salt load, on the other hand, will depend on the extent of land area and the amount of rainfall and runoff.

Full-project salt load
When Village 13 is fully built and occupied there will be project features and human activities that will add to the salt load and concentration from the project area to the reservoirs, and it is the salt load that matters. The additional salt comes from many sources.

- Village 13 will use imported water for irrigation and other outdoor uses. Imported water has a significant salt load.
- Landscaped areas and private yards will be fertilized, mulched, and otherwise amended. These products contain the elements and compounds that make up "salt."
- Detergents and other chemicals are used outdoors [car washing, cleaning the driveway, washing the windows].
- Pets [dogs, horses, cats] urinate and defecate on the ground; these wastes began as pet food brought into the area; the food has salt; and the salt passes through the animal.

In effect, these activities and features [plus many others, it all adds up] are a conveyor belt bringing additional salt to the project area. Very little of this salt leaves the project area except as carried by runoff or seepage to Otay Reservoirs. Eventually, nearly all the salt will end up in the reservoir.

How much salt is this? We don't know. This is the question that needs to be analyzed, assessed, and reported for the project: What is the salt load of the fully developed and occupied Village 13 development compared to the pre-project condition?

stall a pipe or trench over soil
ıway from the septic system,
ditches, empty lots, or surface

Water

ct to infiltration from surround-
l water is not contaminated and
receiving water. However, sep-
uit to surface waters for ground
her sources.

Sources

tants in runoff discharged from
:pend on the types of land use
by the storm sewer system. The
ypes of land uses are discussed

ercial Areas

l and commercial lands has been
ncluding the Nationwide Urban
program evaluated data collected
. in 22 of the 28 cities funded by
, 39 were completely or primarily
were mixed commercial and resi-
ı space in urban areas. The NURP
be considered background levels
ıtial and commercial land uses as
/ were not impacted by pollutant
', industrial activities, or illicit con-
d to be eliminated from the study
associated with these sources.
in the NURP study were analyzed
ıd three metals. A summary of the
is provided in Table 5.7.
lata is to compare annual pollutant
ıd residential areas with discharges
/iding secondary treatment. Such a
ıual loading basis: suspended solids
ıagnitude or more greater; chemical
is comparable in magnitude; and
ɔrder of magnitude less than annual
ıge treatment plants providing sec-
ʒ annual pollutant loadings, it is im-

TABLE 5.7: Water Quality Characteristics of Runoff from Residential and Commercial Areas

Constituent (1)	Average Residential or Commercial Site Concentration (2)	Weighted Mean Residential or Commercial Site Concentration (3)	NURP Recommendations for Load Estimates (4)
TSS	239 mg/l	180 mg/l	180–548 mg/l
BOD	12 mg/l	12 mg/l	12–19 mg/l
COD	94 mg/l	82 mg/l	82–178 mg/l
Total P	0.5 mg/l	0.42 mg/l	0.42–0.88 mg/l
Sol. P	0.15 mg/l	0.15 mg/l	0.15–0.28 mg/l
TKN	2.3 mg/l	1.9 mg/l	1.90–4.18 mg/l
NO2 + 3 − N	1.4 mg/l	0.86 mg/l	0.86–2.2 mg/l
Total Cu	53 ug/l	43 ug/l	43–118 ug/l
Total Pb	238 ug/l	182 ug/l	182–443 ug/l
Total Zn	353 ug/l	202 ug/l	202–633 ug/l

Developed from results of the nationwide urban runoff program (EPA 1983).

portant to recognize that discharges of runoff are highly intermittent, and short-term loadings associated with individual events could be high and may have shock loading effects on receiving waters.

Additionally, 121 samples at 61 sites were analyzed for 120 of the pollutants EPA classifies as priority pollutants. Heavy metals were by far the most prevalent priority pollutant found in the study, with 10 metals detected in discharges at frequencies of greater than 10%, and copper, lead, and zinc each found in at least 91% of the samples. Sixty-three of the 106 organics measured were detected, with concentrations of organic pollutants in discharges exceeding water quality criteria less frequently than with heavy metals. The NURP found fecal coliforms in runoff from residential and commercial lands at concentrations approaching dilute sewage at a number of sites. Seventeen sites analyzed fecal coliform levels, with fecal coliform counts in runoff typically in the tens of thousands per 100 ml during warm weather conditions (average NURP site concentrations were 27,000 counts/100 ml), with lower concentrations during colder weather (average NURP site values were 1,000 counts/100 ml for cold weather). Other pollutants were either not considered in the NURP study (e.g. oil and grease, floatables, chlorides, non-polar pesticides, asbestos, etc.) or were found less frequently.

When considering relatively large commercial and residential drainage basins, the most important factors influencing pollutant loadings are usually the degree of imperviousness and the amount of precipitation. The NURP concluded that, for general planning purposes, the concentrations of pollutants in runoff from different large residential

OWD CONSUMER CONFIDENCE REPORT

PARAMETER	UNITS	STATE OR FEDERAL MCL [MRDL]	PHG (MCLG) [MRDLG]	STATE DLR	RANGE AVERAGE	TWIN OAKS PLANT	HELIX PLANT	SKINNER PLANT	MAJOR SOURCES IN DRINKING WATER
PRIMARY STANDARDS--Mandatory Health-Related Standards									
CLARITY									
Combined Filter Effluent Turbidity	NTU	0.3	NA	NA	Highest	0.66	0.06	0.05	Soil runoff
	%	95 (a)			% < 0.3	99.97	100	100	
MICROBIOLOGICAL									
Total Coliform Bacteria (b)	%	5.0	0	NA	Distribution System-wide: Otay Distribution System=0.1%				Naturally present in the environment
E. coli	(c)	(c)	0	NA	Distribution System-wide: Otay Distribution System=0%				Human and animal fecal waste
INORGANIC CHEMICALS									
Aluminum (d)	ppb	1000	600	50	*Range*	ND	110 - 220	ND	Residue from water treatment process; natural deposits erosion
					Average	ND	163	ND	
Arsenic	ppb	10	0.004	2	*Range*	1.9	ND - 2.2	ND	Natural deposits erosion, glass and electronics production wastes
					Average	1.9	ND	ND	
Barium	ppb	1000	2000	100	*Range*	94	ND - 120	ND - 120	Oil and metal refineries discharge; natural deposits, erosion
					Average	94	ND	110	
Fluoride Treatment-related	ppm	2.0	1	0.1	*Control Range*	0.7 - 1.3			Water additive
					Optimal Level	0.8			
					OtayDistribution System Range: 0.5 - 0.9				
					OtayDistribution System Average: 0.7				
Nitrate (as N)	ppm	10	10	0.4	*Range*	ND - 0.61	0.22 - 0.33	ND	Runoff and leaching from fertilizer use; septic tank and sewage; natural deposits erosion
					Average	0.30	0.28	ND	
RADIOLOGICALS									
Gross Alpha Particle Activity	pCi/L	15	0	3	*Range*	ND - 9.2	NA	3.3 - 4.3	Erosion of natural deposits
					Average	3.8	NA	3.6	
Gross Beta Particle Activity (e)	pCi/L	50	0	4	*Range*	ND	NA	ND - 8.8	Decay of natural and man-made deposits
					Average	ND	NA	ND	
Uranium	pCi/L	20	0.43	1	*Range*	2.5 - 4.1	NA	2.3 - 2.7	Erosion of natural deposits
					Average	3.3	NA	2.5	
DISINFECTION BY-PRODUCTS, DISINFECTANT RESIDUALS, AND DISINFECTION BY-PRODUCTS PRECURSORS									
Total Trihalomethanes (TTHM)	ppb	Distribution System-wide:			Otay Distribution System Range = 27 - 79				By-product of drinking water chlorination
		80	NA	1	Highest RAA = 42				
Haloacetic Acids (five) (HAA5)	ppb	Distribution System-wide:			Otay Distribution System Range = 10 - 34				By-product of drinking water chlorination
		60	NA	1	Highest RAA = 19				
Total Chlorine Residual	ppm	Distribution System-wide:			Otay Distribution System Range = ND - 4.5				Drinking water disinfectant added for treatment
		[4.0] (f)	[4.0]	NA	Highest RAA = 2.5				
DBP Precursors Control (TOC)	ppm	TT	NA	0.30	*Range*	2.0 - 2.4	2.3 - 2.3	1.8 - 2.3	Various natural and man-made sources
					Average	2.2	2.3	2.1	
PRIMARY STANDARDS — LEAD AND COPPER RULE — SAMPLED AT HOME TAP IN 2008									
Copper (g)	ppm	NL=1.3	0.17	0.05	0 sites above NL out of 54 sampled				Internal corrosion of household pipes; erosion of natural deposits
					90th percentile=0.33				
Lead (g)	ppb	NL=15	2	5	0 sites above NL out of 54 sampled				Internal corrosion of household pipes; erosion of natural deposits
					90th percentile=2				

ABBREVIATIONS

- AI.........Aggressiveness Index
- DBP.......Disinfection By-Products
- DLR........Detection Limits for purposes of Reporting
- MCL.......Maximum Contaminant Level
- MCLG......Maximum Contaminant Level Goal
- MRDL......Maximum Residual Disinfectant Level
- MRDLG....Maximum Residual Disinfectant Level Goal
- N..........Nitrogen
- NA........Not Applicable
- ND........Not Detected
- NL.........Notification Level
- NTU.......Nephelometric Turbidity Units
- pCi/L.......picoCuries per Liter
- PHG.......Public Health Goal
- ppb........parts per billion or micrograms per liter (µg/L)
- ppm.......parts per million or milligrams per liter (mg/L)
- ppt.........parts per trillion or nanograms per liter (ng/L)
- RAA.......Running Annual Average
- TOC.......Total Organic Carbon
- TON.......Threshold Odor Number
- TT.........Treatment Technique
- µS/cm.....microSiemen per centimeter

DEFINITIONS

- **Maximum Contaminant Level (MCL):** The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.
- **Maximum Contaminant Level Goal (MCLG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.
- **Public Health Goal (PHG):** The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.
- **Maximum Residual Disinfectant Level (MRDL):** The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- **Maximum Residual Disinfectant Level Goal (MRDLG):** The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- **Treatment Technique (TT):** A required process intended to reduce the level of a contaminant in drinking water.

TABLE 6 - Additional Physical, Mineral, and Metal Characteristics

2010 BY WATER TREATMENT PLANT

	Alvarado Treatment Plant			Miramar Treatment Plant			Otay Treatment Plant			
ANALYTE	**MIN**	**AVG**	**MAX**	**MIN**	**AVG**	**MAX**	**MIN**	**AVG**	**MAX**	**Units**
Aggressive Index	12.0	12.4	12.7	11.9	12.3	12.7	11.6	12.4	13.1	---
Alkalinity - Total as $CaCO_3$	101	114	132	99	107	123	91	114	124	ppm
Ammonia as Nitrogen	0.39	0.59	0.82	0.13	0.56	0.97	< 0.03	0.36	0.65	ppm
Bicarbonate	123	139	161	120	130	150	110	138	151	ppm
Bromide	ND	ND	0.138	ND	ND	0.118	ND	ND	0.120	ppm
Calcium	47.2	57.8	68.0	49.2	60.5	74.8	51.2	58.0	70.4	ppm
Calcium Hardness	118	145	170	123	151	187	128	145	176	ppm
Carbonate	0	0	0	0	0	0	0	0	0	ppm
Cryptosporidium (untreated)	ND	ND	ND	ND	ND	ND	ND	ND	1 *	Oocysts / L
Geosmin	ND	ND	9.72	ND	ND	ND	ND	ND	ND	ppt
Giardia (untreated)	ND	ND	ND	ND	ND	ND	ND	ND	1	Cysts / L
Langlier Index	0.26	0.60	0.87	0.14	0.52	0.85	-0.22	0.60	1.27	---
Magnesium	19.4	23.0	26.6	19.9	22.9	27.1	20.6	25.6	30.0	ppm
MIB	ND	ND	ND	ND	ND	ND	ND	ND	8.0	ppt
Nitrite as Nitrogen	<400	<400	<400	<400	<400	<400	<400	<400	<400	ppb
Non-Carb_Hard	98	127	171	107	140	174	113	138	158	ppm
pH	7.94	8.23	8.49	7.86	8.16	8.37	7.53	8.23	8.87	pH
Potassium	4.02	4.44	5.12	3.78	4.27	5.01	3.81	4.80	5.69	ppm
Ryzner Aggressive Index	6.75	7.03	7.5	6.67	7.13	7.58	6.33	7.03	7.97	---
Silica	7.5	9.0	11.6	6.4	7.3	9.3	5.2	6.6	7.8	ppm
SUVA*	1.3	1.5	1.7	1.2	1.3	1.5	1.4	1.6	1.7	L/mg-m
Total Nitrogen	0.55	0.68	0.84	0.49	0.59	0.80	<0.16	0.46	0.74	ppm

* Results from untreated water

2004 SOURCE WATER PROTECTION GUIDELINES

BMPs	Pollutants of Concern for Source Water** – Percent Removal					Pollutants of Con	
	Total Nitrogen	Total Phosphorous	Total Dissolved Solids	Total Organic Carbon	Total Suspended Solids	Total Copper	Total Le
Perimeter Sand Filter (i.e., Delaware)	25% [e], 24% [g], 12.9% to 84.2% [y] Nitrate -55% [g], -674.2 to 66.8%% [y] TKN 44% [g], 0.0 to 90.4% [y] Ammonia N –100 to 75.6% [y] Nitrite N –236 to 92.9% [y]	56.3 to 91.8% [y], -14.3 to 91.8% [y] 50% [e], 44% [g] Ortho-Phosphate 21% [g], -10 to 93.9% [y], 16.7 to 92.9% [y]	NA	67% [l], -100 to 90% [y]	80% [e], 81% [g], 41.2 to 96.4% [y], 15.4 to 96.4% [y]	64% [g], 0 to 50% [r] Dissolved 64% [g]	85% [g] Dissolved 4
Surface Sand Filter (i.e., Austin)	21% [aa], 25% [e], 17% [g], 31% [r], 32% [r], 47% [r] Nitrate -71% [g] TKN 41% [g], 62% [r], 57% [r], 81% [r], 46% [aa] Nitrate + Nitrite -82% [r], -37% [r], -38% [r] Nitrate as Nitrogen 0% [aa]	61% [r], 50% [r], 65% [r], 33% [aa], 50% [e], 39% [g], 55% [g] Ortho-Phosphate 6% [g]	30% [r], -19% [r], 3% [r]	61% [r], 38% [r], 87% [r], 48% [aa]	80% [e], 90% [g], 87% [r], 70% [r], 86% [r], 70% [aa]	50% [g], 60% [r], 20% [r], 71% [r] Dissolved 6% [g]	87% [g], 80% [r], 79% [r], 45% Dissolved 3
Compost Filter System	Nitrate -34% [h]	41% [h], 4% [h], 40% [g]	NA	NA	95% [h], 85% [h]	Metals 61 to 88% [h], 44 to 75% [h]	Metals 61 to 44 to 75%
Media Filter ROAD	13% [g] Nitrate -7% [g] TKN 19% [g]	24% [g] Orthophosphate 9% [g]	NA	NA	40% [g], 92% [w], 43% [w]	67% [g], 65% [w], 33% [w] Dissolved 26% [g]	52% [g], 82% [w] Dissolved 2
Porous Pavement	65% [ee], 88% [kk]	60% [kk], 49% [ee] Ortho-Phosphate 26% [ee]	NA	NA	95% [kk], 73% [ee]	Metals 99% [kk]	Metals 99 73% [ee]
Infiltration Trench	60% [e], 60% [z]	60% [e], 60% [z], 55% [k]	NA	NA	80% [e]	75 to 80% [l]	75 to 80
Infiltration Basin	45 to 55% [l], 60 to 70% [l], 55 to 60% [l], 16.9 mg/L#[g] Nitrate 0.4 mg/L#[g] TKN 0.4 mg/L#[g]	50 to 55% [l], 65 to 75% [l], 60 to 70% [l] 1.1 mg/L#[g]	NA	NA	202 mg/L#[g], 75% [l], 99% [l], 90% [l]	0.002 mg/L#[g] Dissolved <0.001 mg/L#[g] Metals 75 to 80% [l], 95 to 99% [l], 85 to 90% [l]	<0.001 mg Dissolve <0.001 mg Metals 75 to 95 to 99% [l], 85

See Legend on page 3 of Matrix.

2004 SOURCE WATER PROTECTION GUIDELINES

	BMPs	Pollutants of Concern for Source Water** – Percent Removal: Total Nitrogen	Total Phosphorous	Total Dissolved Solids	Total Organic Carbon	Total Suspended Solids	Total Copper
DETENTION / SETTLING	Wet Vault / Tank	NA	30% [k]	NA	NA	NA	NA
DETENTION / SETTLING	Underground Detention	NA	20 to 40% [l]	NA	NA	60 to 80% [l]	NA
DETENTION / SETTLING	Dry Detention	NA	75% [k]	NA	NA	NA	NA
DETENTION / SETTLING	Dry Extended Basin / Dry Extended Detention Pond	25% [c] Nitrate+Nitrite 4% [c]	47% [c], 25% [k] Soluble -6% [c]	NA	NA	47% [c]	26% [‡c]
DETENTION / SETTLING	Wet Extended Basin / Pond / Retention Pond	33% [c], 31% [q] 30% [e], 39% [g] Nitrate Nitrogen 153% [d] TKN –28% [d], 27% [g] Nitrate 61% [g] Nitrate+Nitrite 43% [c], 24% [q]	51% [c], 48% [q] 50% [e], 5% [g] 45% [k], 65% [k], 30-90% [s] Dissolved Organic -47% [d] Soluble 66% [c], 52% [q]	6% [d]	NA	80% [c], 74% [d], 80% [e], 93% [g], 67% [q], 50 to 90% [s], 80 to 90% [s]	-40% [d], 98% [g] Dissolved 57% [g]
DETENTION / SETTLING	Unlined Extended Detention Basin	16% [g] Nitrate 15% [g] TKN 17% [g]	38% [g] Dissolved Ortho-Phosphate -8% [g] Particulate 41% [g]	NA	NA	69% [gs]	58% [g], 57% [q] Dissolved 5% [g] Particulate 73% [g]
DETENTION / SETTLING	Lined Extended Detention Basin	13% [g] Nitrate 8% [g] TKN 16% [g]	15% [g] Dissolved Ortho-Phosphate 10% [g] Particulate 58% [g]	NA	NA	40% [g]	27% [g] Dissolved 8% [g] Particulate 50% [g]
BIOFILTRATION	Detention w/ Swales	9% [b] Nitrate + Nitrite, Total -9% [b]	-87% [b]	-29% [b]	14% [b]	NA	NA
BIOFILTRATION	Extended Detention Wetland	NA	53% [m], 69% [n]	NA	NA	95% [m], 96% [n]	NA
BIOFILTRATION	Constructed Wetlands / Stormwater Wetlands	Nitrate Nitrogen (55 lb/yr[†], 34.1%)[ff] Nitrate, Nitrite Nitrogen (25 lb/yr[†], 15.4%)[ff] Nitrate+Nitrite 67% [c], 67% [q], 28% [qq], 30% [c], 21% [q] TKN (690 lb/yr[†], 63.6%)[ff]	49% [qq], 50% [o], (33 lb/yr[†], 39.6%)[ff] Soluble 35% [c], 39% [q], 49% [c], 51% [q]	NA	65% [o], 34% [gg]	41.3% [o], 67% [gg] 75% [c], 54% [q], (8,629 lb/yr[†], 41.3%)[ff]	51% [o], 40% [c], 39% [q], 41%
BIOFILTRATION	Gravel-Based Wetlands	30% [e]	40% [e]	NA	NA	80% [e]	NA
BIOFILTRATION	Bioretention / Bioinfiltration	TKN 68.6 to 80% [cc]	60% [e], 70 to 83% [h, cc], 30% [k]	NA	NA	80% [e], 90% [h, cc]	Metals 93 to 98% [h, cc]
BIOFILTRATION	Wet Swale	40% [e]	25% [e]	NA	NA	80% [e]	NA
BIOFILTRATION	Grass Channel	Nitrate 31.4% [i] Nitrate -25% [j]	4.5%l, 45% [j], 29% [l]	NA	NA	67.8% [i], 60% [j]	42 to 62% [l], 2 to 16% [j], 46 to 73% [j]
BIOFILTRATION	Grass Swale / Biofiltration Swale / Dry Swale	26% [g], 50% [e], 67% [h], 841% [q] Nitrate 11% [g], 66% [h], 38% [s] TKN 31% [g] Nitrate and Nitrite Nitrogen 31% [q]	8% [h], 57% [f], 34% [q] 50% [e], 15% [k], 9% [s] Dissolved 28% [f] Soluble 38% [q]	NA	NA	80% [e], 50% [g], 77% [h], 81% [s], 81% [q]	Dissolved 58% [f] 61% [g], 51% [s], 51% [q] Dissolved 50% [g]
BIOFILTRATION	Biofiltration Strip/ Filter Strip	12% [g], (2.68 mg/L[¶], 15%)[p] Nitrate -1% [g], (0.58 mg/L[¶], 13%)[p] TKN (2.10 mg/L[¶], 16%)[p], 16% [g]	(0.62 mg/L[¶], -52%)[p], 50% [k] Dissolved (0.46 mg/L[¶], –206%)[p]	NA	NA	74% [g,h]	84% [g], (0.009 mg/L[¶], 84%)[p] Dissolved 77% [g], (0.007 mg/L[¶], 77%)[p]

Note: See Legend on page 3 of Matrix.