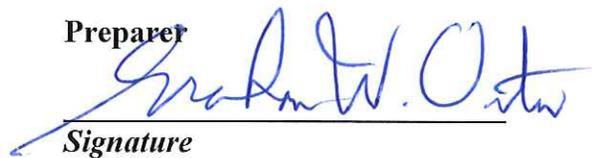


**Year of 2015 Chapter 94 Annual Report
Buckingham Township
Cold Spring WWTP
Bucks County**

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**Prepared for:
Buckingham Township
Cold Spring Wastewater treatment Plant
PO Box 413
Buckingham, PA 18912
Address of wastewater treatment facility:
15 Redfield Drive, 3999 Durham Road and 5385 Long Lane
All in Doylestown, PA 18902**

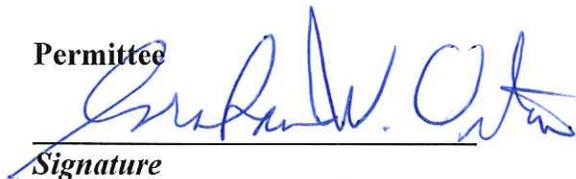
Preparer



Signature

**Graham W. Orton
Buckingham Township**

Permittee



Signature

**Graham W. Orton
Buckingham Township**

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INTRODUCTION

The Cold Spring WWTP serves several of the Cold Spring area developments. The service area is all in Buckingham Township and the Township is the sole owner/operator.

The Cold Spring Plant was originally built in 1993 and was expanded in 1995, 1996 & 2000. The plant consists of 4 sequential treatment lagoons and two sprayfields. The Township is in the process of getting a permit to transfer about 23,000 gpd of treated wastewater to an additional spray area at the Fieldstone WWTP site.

HYDRAULIC AND ORGANIC LOADINGS

Line graphs and data tables showing 5-year past and projected Hydraulic and Organic loading are inserted between pages 9 and 10.

The permitted and constructed capacities of the Cold Spring WWTP:

Annual Average (AA) Capacity Permitted = 253,307 gpd

Hydraulic Design & Constructed Capacity varies by the function:

297,225 gpd treatment, 238,000 storage & 253,300 spray

irrigation. Winter precipitation into the lagoons was not

considered in the original design, thus the < 253,300 gpd of storage

Organic Capacity Permitted = 624 lb/day

Organic Design & Constructed Capacity = 850 lb/day

Hydraulic Loading:

- a. The calendar year's AA flow is less than the permitted and constructed AA capacity. The meter calibration is attached.
- b. There were seven years out of the past 14 where the 3-month consecutive average flow exceeded the hydraulic design capacity of the WWTP, 4 of the 7 by a small amount (<6,000 gpd). The major contributor was higher than normal groundwater in the early to late spring and the back-to-back major storms in August & September, 2011 – hurricanes Irene and Lee.
- c. A final CAP and CMP has been submitted to the Department and Act 537 planning for the expansion onto the Feeney tract adjacent to the Fieldstone WWTP has been submitted to DEP. Design of the expansion facilities is underway.
- d. A very basic High Flow Maintenance Plan (HFMP) has been implemented for the Cold Spring WWTP. This is a lagoon treatment plant which is not affected by short duration rain events. The HFMP was fine tuned in response to the major rainfalls in August and September of 2011. The Township trucked 576,500 gallons to its Buckingham Village WWTP. An emergency

interconnection to the Bucks County Water and Sewer Authority's Landisville Road interceptor was constructed and 10,618,190 gallons were transferred through May of 2012. Lagoon status is carefully monitored and predicted. Updated spreadsheets are submitted with the monthly DMR's. A copy of the most recent spreadsheet is attached. The plant has entered freeboard in several years and the Township has purchased a suitable property on which to gain more hydraulic capacity (the Feeney tract next to the Fieldstone WWTP). The current short-term HFMP plan, excluding anything like the 2011-2012 emergency, would be to transfer treated wastewater to the Buckingham Village Plant by truck. Excess transfer to the Lojeski Lagoon and spray irrigating in less than optimal weather and ground conditions to zones 1-7 before the lagoons started to overflow is a highly unlikely scenario that could occur as a last resort. This would prevent erosion of the lagoon external sidewalls and the flow would enter the surface via stormwater paths. Most of the flow would be captured in the poorly drained area between the Lojeski lagoon and the District Justice office.

- e. Table 1 below, in the DEP recommended format, provides tabular data of the historic 5-year hydraulic loading.

Table 1						
Hydraulic Loading (MGD)						Rainfall (inches)
Month	2011	2012	2013	2014	2015	2015
January	0.2069	0.2350	0.2259	0.2473	0.2156	
February	0.2468	0.2087	0.2190	0.2579	0.2056	
March	0.3040	0.2070	0.2304	0.2581	0.2797	
April	0.2788	0.2058	0.2237	0.2647	0.2235	
May	0.2487	0.2133	0.2225	0.2680	0.2031	
June	0.2068	0.2113	0.2606	0.2217	0.2022	
July	0.1918	0.1905	0.2090	0.1869	0.1844	
August	0.2314	0.1972	0.1999	0.1877	0.1847	
September	0.3068	0.2026	0.2053	0.1911	0.1849	
October	0.2447	0.2051	0.1991	0.1917	0.1902	
November	0.2536	0.2084	0.2049	0.2010	0.1959	
December	0.2493	0.2280	0.2412	0.2243	0.2113	
Annual Average (AA)	0.2475	0.2094	0.2201	0.2250	0.2068	
3 Month Max. Average	0.2772	0.2169	0.2356	0.2636	0.2354	
Ratio (3 Month Max to AA ratio)	1.12	1.04	1.07	1.17	1.14	
5-Year Average Hydraulic Ratio = 1.11						

Organic loading of the Cold Spring WWTP:

- f. Organic loadings at the Cold Spring WWTP were calculated from a single grab sample per month from 1-1-2010 through September, 2011 and two grab samples per month from October 2011 through December, 2015. The loading is coming from 100% domestic connections and, over a statistically significant (no less than three) number of samples, the loading average should not vary by more than 20 to 30% but we added another sample event per month to get into a more comfortable statistical zone for shorter terms. After October 1, 2011 organic loading data have been calculated using the flow on the day the sample was collected as much as was possible.
- g. A minimum of three consecutive month grab samples will generate statistically significant values but a single grab sample will not. Keeping that in mind, the 3-month and 1-month average peak loadings have not exceeded the WWTP's design organic loading since the 2-per month sampling began. As discussed with DEP-SERO we will be organically re-rating the plant to its constructed capacity as part of our CAP.
- h. A lagoon treatment plant works on the principal of very long retention times and very low MLSS concentrations. It is, therefore, able to assimilate and treat wide conventional organic loading variations that might occur. Although we believe that long-term grab sampling with averaging has been adequate to typify the WWTP's loading, we now take more samples and have changed the way we calculate to the DEP-preferred instantaneous (single day) method.
- i. Based on the historical method of measuring organic loading, there is no existing or projected organic overload condition. The WWTP is designed to treat a loading of 135% of the permitted amount. This is further addressed in the CAP submitted in March of 2011 with a proposal to re-rate the plant's capacity to that which was constructed.
- j. Sampling frequency, recommended as follows:

Recommended Sampling Frequency for Influent BOD ₅	
Annual Average Capacity	Minimum Sampling Frequency
> 1.0 MGD	Once per week
0.050 to 1.0 MGD	Twice per month
<0.050 MGD	Once per month

- k. Type of sample taken – see above – once-per-month grab samples tested for CBOD₅ and two per month since October of 2011.
- l. The influent BOD₅ sample is taken from the influent pump station's forcemain. This station takes the flow from 100% of the connections.
- m. There is no septage hauled into this plant
- n. 2015 Influent loadings are calculated using the sample single or two day's average flow for twice monthly samples. Table 2 below, shows the calendar year's organic loading sampling data (note that flow is prorated so it may not agree with DMR reported flows):

Table 2				
Organic Loading Sampling Data				
	A	B	C = A x B x 8.34	
Date of sample	BOD5 (mg/l)	Flow (MGD) – on sample day	Daily BOD5 (lbs/day)	Monthly Average (lbs/day)
1/8/15	245	0.2091	427	
1/15/15	384	0.2064	661	544
2/4/15	222	0.2091	387	
2/11/15	220	0.2017	370	379
3/5/15	300	0.2575	644	
3/12/15	252	0.3199	672	658
04/2/15	189	0.2343	369	
4/8/15	198	0.2147	355	362
5/6/15	256	0.2080	444	
5/13/15	196	0.1988	325	385
6/3/15	403	0.2063	693	
6/10/15	300	0.2063	516	605
07/1/15	279	0.1896	441	
7/9/15	406	0.1878	636	539
8/5/15	165	0.1753	241	
8/12/15	260	0.1939	420	331
9/3/15	314	0.1722	451	
9/9/15	285	0.1814	431	441
10/1/15	145	0.2000	242	
10/8/15	288	0.1903	457	350
11/5/15	397	0.1742	577	
11/12/15	304	0.1808	458	518
12/2/15	312	0.1971	513	
12/10/15	311	0.1777	461	487
Year 2015 ave	277			467

Table 3 below shows the Cold Spring WWTP's historic 5-year organic loading data:

Table 3					
Organic Loading					
(lbs/day)					
Month	2011	2012	2013	2014	2015
January	561	505	470	563	544
February	581	520	541	488	379
March	525	411	518	537	658
April	357	490	355	468	362
May	454	501	321	230	385
June	216	451	424	428	605
July	375	378	355	278	539
August	496	497	217	598	331
September	494	450	315	452	441
October	406	447	360	286	350
November	467	329	450	301	518
December	552	523	419	498	487
Annual Average	457	459	395	427	467
Ratio (Max Month to Annual Average Ratio)*	1.27	1.14	1.37	1.40	1.41
5-Year Average Organic Ratio = 1.32					

*While the hydraulic loading “peaking factor” is determined using the 3-Month-Max to AA ratio, the organic loading “peaking factor” is determined using the Maximum Month (i.e., the single highest monthly average in the calendar year) to AA ratio. The SERO-method 5-year average of the one month peak ratio is expected to stabilize between 1.2 and 1.5

5-YEAR HYDRAULIC AND ORGANIC LOADING PROJECTIONS

- b. The Department has requested that flow projections be determined using a “5-year adjusted annual average flow,” rather than a 5-year average or current calendar year AA flow. The guidance provided in the SERO template gives similar predictions for the Cold Spring WWTP to those we have made in the past using our original method, which method is quite similar to the SERO approach once a baseline average is computed. In our original method used to project annual averages, new EDUs are counted as if they were added mid-year. The 2016 base average flow is calculated using the average of the past 5 years. To that we add ½ of the 2015 new EDUs (225 gpd/EDU) and ½ of the EDUs expected to be added in 2016. We use the same method for the 3-month peak except we add the full expected peak EDU (263 gpd/peak EDU), rather than ½ the EDU for only that year’s expected new EDUs. The graph is prepared showing this

method as well as the DEP method. As expected, the difference between the two sets of predictions is small and the old method is less conservative than the DEP method. Eventually we will switch to using just the DEP method once we are sure both methods reach essentially the same projection over several years.

- c. Average annual organic loading for the enclosed graphs is calculated the same way as hydraulic loading – 5-year average generates the 2016 base and this is compared to the DEP SERO method.
- d. To project organic loading, we use 4 people (higher than the census data of 2.7 people) per EDU x 0.17 pounds of BOD₅ per person per day.
- e. Neither the 5-year annual average hydraulic nor organic loading is projected to exceed the Cold Spring WWTP as permitted and constructed. The 3-month peak hydraulic load is projected to exceed the permitted amount. The Township has submitted a CAP which provides further explanation as well as proposed expansions and new permitting. The time frame for the improvements will depend mainly on the permitting and Act 537 process. Barring unforeseen circumstances, construction will probably be completed in 2017. The Township submitted a 537 plan amendment in 2013 which was approved. Design of the expansion is nearing completion and is expected to be permitted in 2016. No additional EDU's are proposed other than those already reserved through site acquisition agreements as shown on the attached development status spreadsheet.
- f. Table 4 lists the organic projections we calculated using the SERO-recommended method. Our historic method yielded an average of 470 lb/day in 2020 and a three-month peak average of 552 lb/day in 2020. The SERO method predicted 459 average and 639 1-month peak in 2019. Only the SERO method predicts loadings slightly above the permitted but not the constructed amount. Re-rating will provide the required cushion.

Table 4		
Organic Loading Projections		
Year	Annual Average BOD₅ Loading Projections¹ (lbs/day)	Maximum Monthly BOD₅ Loading Projections² (lbs/day)
2016	472	623
2017	484	639
2018	485	640
2019	492	649
2020	499	659

¹AA projections = (Current report year's AA loadings) + (loadings from proposed EDUs)

²Max Month projections = (AA projection) x (5-year Average Organic Ratio)

Calculating the Five-Year Adjusted Annual Average For Chapter 94 Flow Projections

- A. Determine the new flow in million gallons per day (MGD), which corresponds to the new EDUs connected for each calendar year:

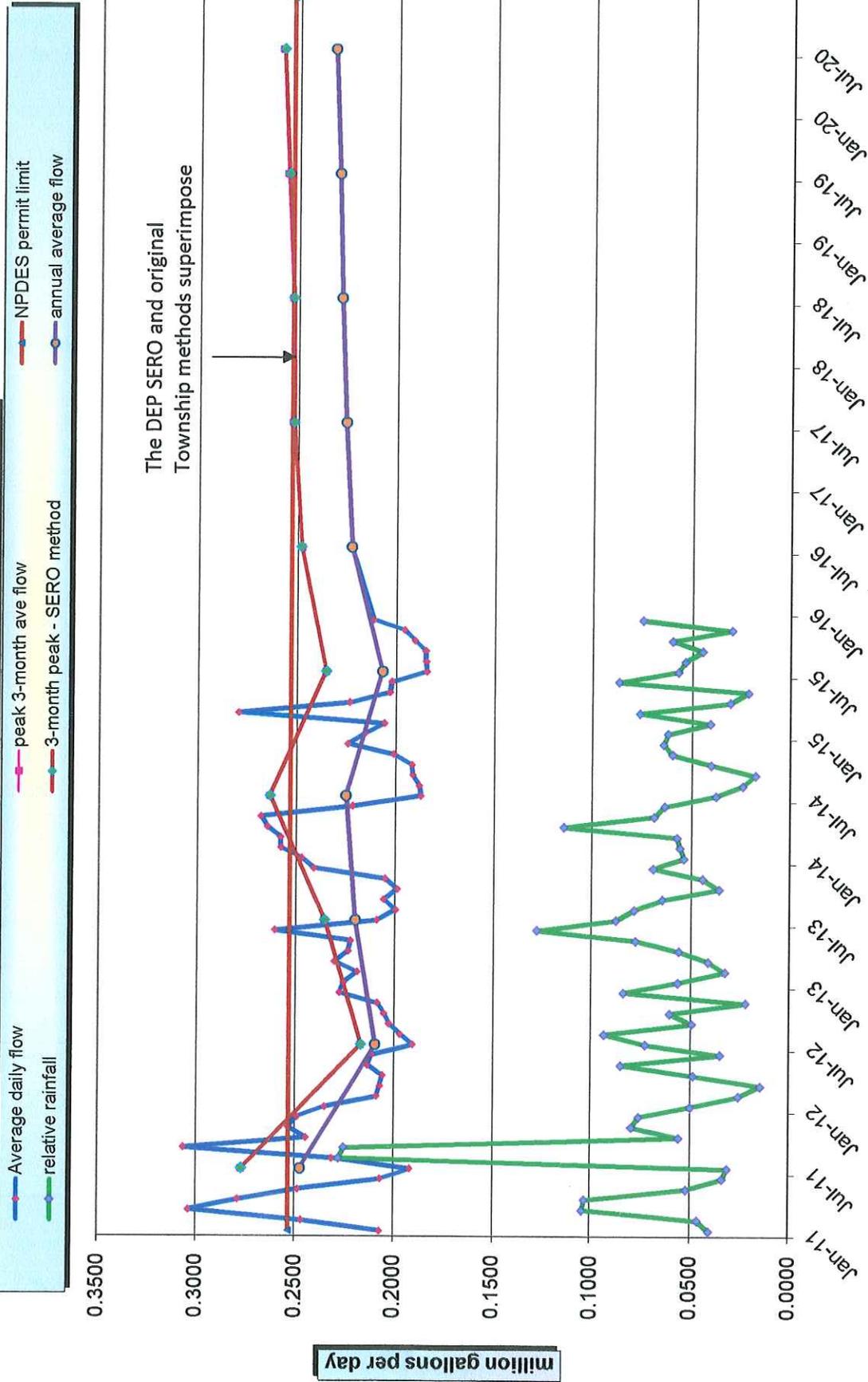
Table 5			
Year	# of EDUs connected	gpd/EDU	New Flow (MGD)
2011	3	250	0.000750
2012	0	250	0
2013	0	250	0
2014	0	250	0
2015	0	250	0

- B. Adjust each calendar year by adding the flows from new connections to the annual average flow for each of the previous calendar years.

Table 6								
Year	AA Flow in MGD	All projects connected (provide flows approved in planning modules or exemptions in MGD—include any connected projects that did not require planning)					Adjusted AA Flow	
		2011	2012	2013	2014	2015		
2011	0.2475		0	0.2475	0	0	.2254	
2012	0.2094			0.2094	0	0	.2475	
2013	0.2201			0.2201	0	0	.2094	
2014	0.2250			0.2250		0	.2201	
2015	0.2068			0.2068			.2250	
Total	1.1088						Total	1.1088
5 Yr Avg	0.2218						5 Yr Adj Avg	0.2218

- C. Calculating the five-year flow projections, starting with the five-year adjusted annual average flow. Each year's projections is based on the estimated number of new connections that will connect in each calendar year. The flow from EDUs expected to possibly connect in 2016 were added to the five-year adjusted annual average calculated above. Each year's projected annual average flow was then multiplied by the five-year average 1.11 hydraulic ratio (or peaking factor) to determine projected 3-month maximum flow. The SERO method and our original method using a base 250gpd EDU predict 3-month peak flows in 2020 to be 258,400 gpd and 258,900 gpd respectively, a < 1% difference.

Cold Spring WWTP Hydraulic Loading Graph



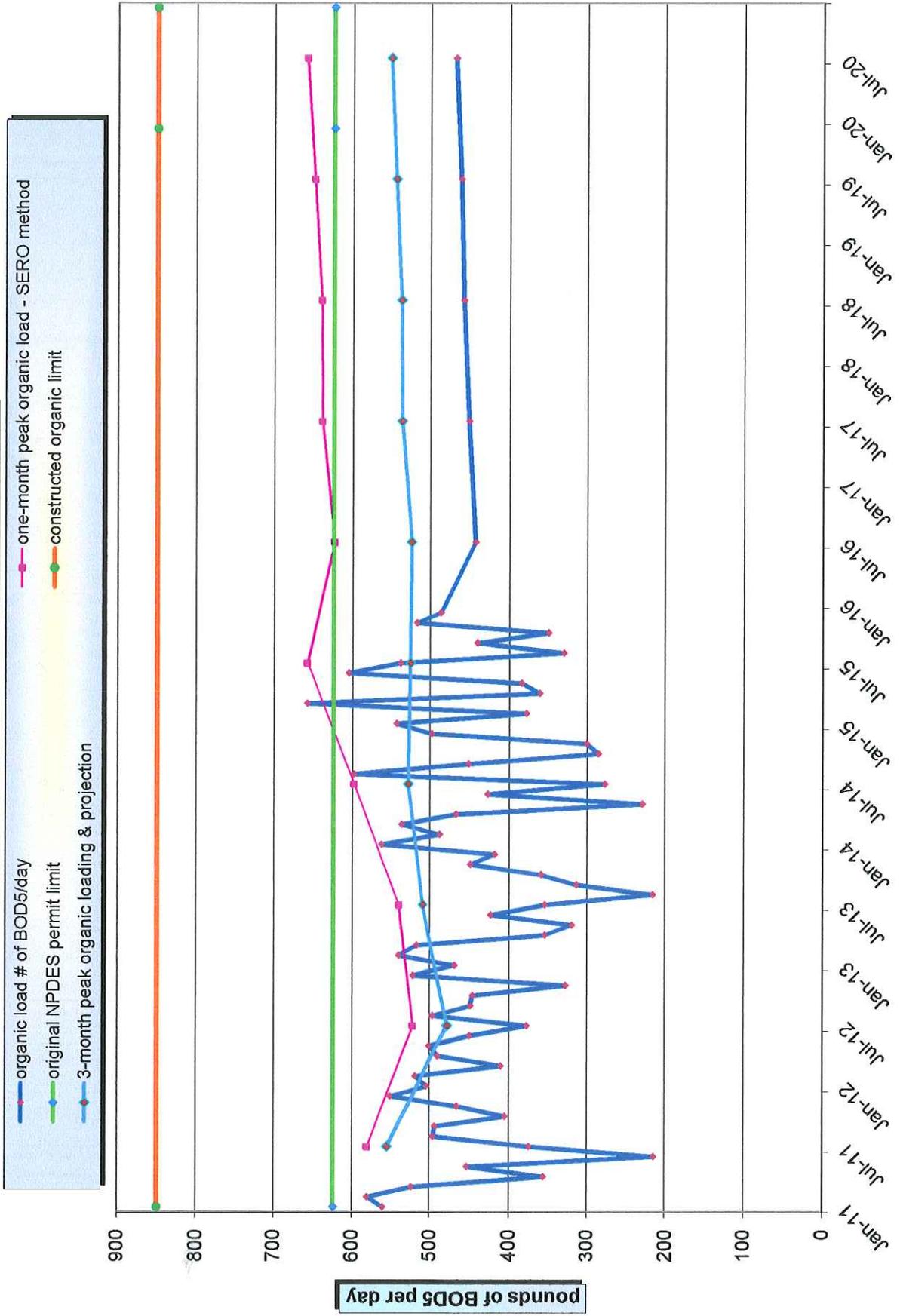
Cold Spring WWTP Hydraulic Loading

month	flow MGD	annual ave flow	3 month peak flow MGD	3 month peak SERO method	ratio 3-mo peak to average	ratio 1-mo peak to average	flow limit MGD	rainfall	relative rainfall	Comments	connected EDUs	Remaining committed EDUs	total EDUs
Jan-11	0.2069						0.2533	2.71	0.04				
Feb-11	0.2468							3.10	0.05				
Mar-11	0.3040							6.95	0.10				
Apr-11	0.2788							6.87	0.10	max 10 year 3-peak ratio			
May-11	0.2487							3.48	0.05	1,1981			
Jun-11	0.2068							2.26	0.03	Connection of Peppleman Church connection	1	46	
Jul-11	0.1918	0.2475	0.2772	0.2772	1.1200	1.2398		2.10	0.03	max 10 year 1-peak ratio	2	44	
Aug-11	0.2314							15.02	0.23				
Sep-11	0.3068							3.73	0.06	1,4641			
Oct-11	0.2447							5.31	0.08	this is when PS 13 had major leak			
Nov-11	0.2536							5.08	0.08				
Dec-11	0.2483							3.34	0.05		1,198	44	1,242
Jan-12	0.2350							1.72	0.03				
Feb-12	0.2087							0.96	0.01				
Mar-12	0.2070							3.26	0.05				
Apr-12	0.2058							5.70	0.09				
May-12	0.2133							2.35	0.04				
Jun-12	0.2113							4.86	0.07				
Jul-12	0.1905	0.2094	0.2169	0.2169	1.0358	1.1222		6.24	0.09	no new connections in 2012			
Aug-12	0.1972							3.30	0.05				
Sep-12	0.2026							4.04	0.06				
Oct-12	0.2051							1.48	0.02				
Nov-12	0.2084							5.61	0.08				
Dec-12	0.2280							3.78	0.06		1,198	44	1,242
Jan-13	0.2259							2.20	0.03				
Feb-13	0.2190							2.76	0.04				
Mar-13	0.2304							3.74	0.06				
Apr-13	0.2237							5.21	0.08				
May-13	0.2225							8.54	0.13				
Jun-13	0.2606							5.88	0.09				
Jul-13	0.2090	0.2201	0.2356	0.2356	1.0703	1.1839		5.26	0.08	no new connections in 2013			
Aug-13	0.1889							4.31	0.06				
Sep-13	0.2053							2.40	0.04				
Oct-13	0.1991							2.96	0.04				
Nov-13	0.2049							4.64	0.07				
Dec-13	0.2412							3.99	0.05		1,198	44	1,242
Jan-14	0.2473							3.73	0.06				
Feb-14	0.2579							3.84	0.06				
Mar-14	0.2581							7.66	0.11				
Apr-14	0.2647							4.61	0.07				
May-14	0.2680							4.25	0.06				
Jun-14	0.2217							2.52	0.04				
Jul-14	0.1869	0.2250	0.2636	0.2636	1.1714	1.1909		1.62	0.02	no new connections in 2014			
Aug-14	0.1877							1.18	0.02				
Sep-14	0.1911							2.69	0.04				
Oct-14	0.1917							3.99	0.06				
Nov-14	0.2010							4.29	0.06				
Dec-14	0.2243							4.14	0.06				
Jan-15	0.2156							2.73	0.04		1,198	44	1,242
Feb-15	0.2056							5.10	0.08				
Mar-15	0.2797							2.06	0.03				
Apr-15	0.2235							1.42	0.02				
May-15	0.2031							5.82	0.09				
Jun-15	0.2022							3.81	0.06	no new connections in 2015			
Jul-15	0.1844	0.2068	0.2354	0.2354	1.1387	1.3528		3.58	0.05				
Aug-15	0.1847							2.99	0.04				
Sep-15	0.1849							4.00	0.06				
Oct-15	0.1902							2.01	0.03				
Nov-15	0.1959							5.00	0.08		1,198	44	1,242
Dec-15	0.2113												
Jan-16													

Cold Spring WWTP Hydraulic Loading

Table III-1													
month	flow MGD	annual ave flow	3 month peak flow MGD	3 month peak SERO method	ratio 3-mo peak to average	ratio 1-mo peak to average	flow limit MGD	rainfall	relative rainfall	Comments	connected EDUs	Remaining committed EDUs	total EDUs
Feb-16													
Mar-16													
Apr-16													
May-16													
Jun-16													
Jul-16	0.2228	0.2228	0.2480	0.2484	1.1072	1.2179				ave is 5-year ave + new EDU's 0.2218			
Aug-16										Church connection average add'l EDU = 250gpd peak add'l EDU = 280gpd	8	36	
Sep-16													
Oct-16													
Nov-16													
Dec-16													
Jan-17													
Feb-17													
Mar-17													
Apr-17													
May-17													
Jun-17													
Jul-17	0.2260	0.2260	0.2530	0.2525	1.1047	1.2135				Connection of last CS Hunt? Derstine Properties? Rachwal Properties?	3 2 13	33 31 18	
Aug-17													
Sep-17													
Oct-17													
Nov-17													
Dec-17													
Jan-18											1,224	18	1,242
Feb-18													
Mar-18													
Apr-18													
May-18													
Jun-18													
Jul-18	0.2284	0.2284	0.2533	0.2529	1.1185	1.2318				1 emergency EDU?	1		
Aug-18													
Sep-18													
Oct-18													
Nov-18													
Dec-18													
Jan-19											1,225	18	1,243
Feb-19													
Mar-19													
Apr-19													
May-19													
Jun-19													
Jul-19	0.2298	0.2298	0.2561	0.2566	1.1281	1.2414				Rachwal Properties?	10	8	
Aug-19													
Sep-19													
Oct-19													
Nov-19													
Dec-19													
Jan-20													
Feb-20											1,235	8	1,243
Mar-20													
Apr-20													
May-20													
Jun-20													
Jul-20	0.2323	0.2323	0.2589	0.2584	1.1194	1.2515				Rachwal Properties? all reserved connected	10	-2	
Aug-20													
Sep-20													
Oct-20													
Nov-20													
Dec-20											0.2533	0	1,245

Cold Spring WWTP Organic Loading Graph



Cold Spring WWTP Organic Loading

Table III-2						
month	organic load # BOD/day	3 month peak # BOD/day	1 month peak # BOD/day	organic limit # BOD/day	constructed organic limit	Comments
Jan-11	561			624	850	
Feb-11	581					
Mar-11	525					5-year average
Apr-11	357					502
May-11	454					
Jun-11	216					
Jul-11	375	556	581			added 3 EDUs @ pop. 4 x 0.17lb/person
Aug-11	496					
Sep-11	494					ave 2011
Oct-11	406					457.00
Nov-11	467					
Dec-11	552					
Jan-12	505					using SERO calculated loading
Feb-12	520					
Mar-12	411					5-year average
Apr-12	490					488
May-12	501					
Jun-12	451					
Jul-12	378	479	523			added 0 EDUs @ pop. 4 x 0.17lb/person
Aug-12	497					
Sep-12	450					ave 2012
Oct-12	447					458.50
Nov-12	329					
Dec-12	523					
Jan-13	470					
Feb-13	541					
Mar-13	518					5-year average
Apr-13	355					466
May-13	321					
Jun-13	424					
Jul-13	355	510	541			added 0 EDUs @ pop. 4 x 0.17lb/person
Aug-13	217					
Sep-13	315					ave 2013
Oct-13	360					395.42
Nov-13	450					
Dec-13	419					
Jan-14	563					
Feb-14	488					
Mar-14	537					5-year average
Apr-14	468					436
May-14	230					
Jun-14	428					
Jul-14	278	529	598			added 0 EDUs @ pop. 4 x 0.17lb/person
Aug-14	598					
Sep-14	452					ave 2014
Oct-14	286					427.25
Nov-14	301					
Dec-14	498					
Jan-15	544					
Feb-15	379					
Mar-15	658					5-year average
Apr-15	362					441
May-15	385					
Jun-15	605					
Jul-15	539	527	658			added 0 EDUs @ pop. 4 x 0.17lb/person
Aug-15	331					
Sep-15	441					ave 2015
Oct-15	350					466.58
Nov-15	518					
Dec-15	487					
Jan-16						
Feb-16						
Mar-16						
Apr-16						

Cold Spring WWTP Organic Loading

Table III-2						
month	organic load # BOD/day	3 month peak # BOD/day	1 month peak # BOD/day	organic limit # BOD/day	constructed organic limit	Comments
May-16						ave & 3-month peak is 5-year average + added load using DEP calculated base for 2015 = x 1. then add current yr eDUs
Jun-16						
Jul-16	444	526	623			add 8 EDUs @ pop. 4 x 0.17lb/person average is 5-year average + added load
Aug-16						
Sep-16						
Oct-16						
Nov-16						
Dec-16						
Jan-17						
Feb-17						
Mar-17						
Apr-17						
May-17						
Jun-17						
Jul-17	453	538	639			add 18 EDUs @ pop. 4 x 0.17lb/person
Aug-17						
Sep-17						
Oct-17						
Nov-17						
Dec-17						
Jan-18						
Feb-18						
Mar-18						
Apr-18						
May-18						
Jun-18						
Jul-18	459	538	640			1 EDU in 2018
Aug-18						
Sep-18						
Oct-18						
Nov-18						
Dec-18						
Jan-19						
Feb-19						
Mar-19						
Apr-19						
May-19						
Jun-19						
Jul-19	463	545	649			10 EDU's in 2019
Aug-19						
Sep-19						
Oct-19						
Nov-19						
Dec-19				624	850	
Jan-20						
Feb-20						
Mar-20						
Apr-20						
May-20						
Jun-20						
Jul-20	470	552	659			10 EDU's in 2020
Aug-20						
Sep-20						
Oct-20						
Nov-20						
Dec-20				624	850	

Table 7					
Adjusted Projections					
Year	Previous Year's Annual Average Flow ¹	New EDUs	Increased Flow ² (MGD)	Projected Annual Average Flow ³ (MGD)	Projected Max 3-Month Flow ⁴ (MGD)
2016	0.2218	8	0.0020	0.2230	0.2484
2017	0.2230	18	0.0045	0.2275	0.2525
2018	0.2275	1	0.00025	0.2278	0.2529
2019	0.2278	10	0.0025	0.2303	0.2556
2020	0.2303	10	0.0025	0.2328	0.2584

¹ The first year's projection (2015 in this example) starts with the 5-year adjusted annual average that was calculated in A through B, above.

² Increased Flow = (New EDUs x gpd/EDU figure*)/1,000,000 (*250 gpd/EDU)

³ Projected Annual Average Flow = Previous Year's AA Flow + Increased flow

⁴ Projected Max 3-Month = Projected Annual Avg. Flow x 5-year average hydraulic ratio as calculated in table 1.

D. Considerations on projection figures:

All future connections to the Cold Spring WWTP are shown in the 5-year planning window – a total of 44 to 47 possible new EDU's (pending final reconciliation). With the exception of one or two emergency connections, no other connections could be made before the plant is expanded beyond what is being proposed in the CAP. I & I is not a major problem in this system with a 3-month peak multiplier of 1.11. However, the timing of I & I is critical and occurs when the groundwater elevations are believed to be above the sewers in some areas of Cold Spring (see attached graphs showing flow vs rain and flow vs groundwater elevation). The correlation of higher flow to high groundwater appears to be at least as pronounced than to precipitation.

As part of the Cold Spring WWTP CAP, the Township is proposing an expansion of the Fieldstone treated effluent facilities (irrigation) so that 23,000 +/- gpd Cold Spring treated wastewater may be transferred to the Fieldstone system.

SEWER EXTENSIONS

- a. There were no sewer extensions in 2015.
- b. There were no sewer extensions approved or exempted in the past year in accordance with the PA Sewage Facilities Act (35 P.S. §§ 750.1—750.20)

- and Chapter 71 (relating to administration of the sewage facilities program), but not yet constructed;
- c. There are three known proposed projects in the Cold Spring area that would require public sewers but they are in the preliminary planning stages with no activity in the past several years until very recently. They are in areas designated for on-lot facilities but are reviewing their options under Act 537. If connection to Township-owned facilities were to be approved by the Township Board of Supervisors, capacity expansions would be required.

PROGRAM FOR SANITARY SEWER MONITORING, MAINTENANCE, AND REPAIR

- a. Monitoring – none except manholes are spot checked
- b. Maintenance -none
- c. Repair - none
- d. Rehabilitation - none
- e. Routine and special activities - none
- f. Personnel and equipment used – three certified wastewater operators inspect
- g. Sampling frequency - none
- h. Quality assurance - none
- i. Data analyses - none
- j. Infiltration/inflow (I/I) monitoring – none except at PS 13.
- k. Maintenance and control of combined sewer regulators during the past year: not applicable

The sewer system is relatively new – constructed between 1993 and 2000. I & I, being relatively low, is not the primary reason the Township is proposing additional spray irrigation and storage capacity. The Cold Spring System has several deep sewers that are, at times of the year, lower than the groundwater table. As such, allowable leakage, which would be system-wide in these deeper sewer areas, contributes extra flow during the same period that storage is actively being used up. A 5-year average/peak flow ratio of 1.11 and most recent year ratio of 1.14 do not yet warrant sub-basin studies prior to provision of adequate storage and disposal capacity for the winter months.

CONDITION OF THE SEWER SYSTEM

- l. Bypassing - none
- m. Combined sewer overflows – not applicable
- n. Sanitary sewer overflows – none
- o. Excessive infiltration – none
- p. Other system problems - none

Discussion of available existing and future capacity.

- q. The age of the sewer system is 15 to 22 years
- r. 100% PVC pipe is used

- s. All sewer capacities were analyzed for peaking during the design and permitting stages.
- t. No repairs or rehabilitations are needed

Discuss any portions of the sewer system in which surcharging occurs:

- u. There is no known system surcharging
- v. There were no SSOs during the report year.
- w. Dry weather flows are monitored at the head of the plant. The system is nearly 100% gravity.
- x. All sewers were designed with very high peak-conveyance capacity and there is relatively low I & I in this system.

SEWAGE PUMPING STATIONS

- y. "Maximum pump rate" is the permitted hydraulic design capacity of the station, which excludes the capacity of the backup pump.
- z. "Present maximum flows" are estimated - peak instantaneous flow data is not available for the single pump station. The station was designed to handle peaks as dictated by DEP design criteria with only one pump in service. The second pump is redundant but may also operate in tandem ("lag") with the lead pump if the lead pump is partly blocked or in extreme high flow conditions. Because of the desire to keep the 2-hour fill time for the station, the lag pump is set to start at a point far below where it would need to come on to pump extra in order to keep the station from potentially overflowing. Partly blocked pumps evidence themselves when pumping hours are analyzed and are immediately serviced. If both pumps at a pump station fail, the station is designed to hold at least two hours of flow with no pumping. The Township's pump stations are all listed with Sanders Power Equipment who can supply the correct temporary pump within an hour or two from notification of the need. Gary's Septic, Norbill Disposal and occasionally Clemens hauling are on-call and available to provide transient emergency hauling if the station is completely out of service. Response time has been adequate to avoid station overflows in nearly every imaginable situation, including multiple stations being completely out of service.
- aa. PS 13 will have a generator and flow meter installed in 2016 under a master contract covering 6 pump stations.

Table 8						
Pump Station						
Pump Station Name	Number of Pumps	Permitted Capacities		Present Flows		Projected Flows
		AA Permitted Capacity (gpd)	Hydraulic Design Capacity (w/o backup pump) (gpm)	Annual Average Flows (gpd) 2015	Peak 3-Day Flow (gpm) 2015	2-Year Projected Maximum¹ Flow (gpd)
PS No. 13	2	144,000	100	3,821	6	8,927

¹ 0 new projected 225 gpd connections were added to the peak 2011 flow of 8,927 gpd for PS 13. The 2011 peak did not occur during either Irene or Lee storms. 2015 peak was 5,737 gpd.

INDUSTRIAL WASTES

There are no industrial wastes or significant users

CORRECTIVE ACTION PLAN

The Act 537 submission prior to the Corrective Action Plan was submitted for DEP approval and design of the proposed facilities is underway. Any new connections from the reserved list would be reported to DEP in the annual report.

CALIBRATION REPORTS

Calibration of the Cold Spring Influent meter was completed in November of 2015 and the report is attached after page 13.

TRIBUTARY MUNICIPALITY REPORTS

Not applicable

ATTACHMENTS

Meter Calibration reports

Pump Station #13 graph showing 5-year history.

Connection status update to 12-2015, with historical flow tracking

WWTP influent flow vs groundwater elevation and vs precipitation

Lagoon Tracking Spreadsheet as of the end of February, 2015

ESSEX SERVICE CORPORATION
82 DOE RUN DRIVE
HOLLAND, PA 18966
T/A TREATMENT INSTRUMENTATION SPECIALIST

FIELD SERVICE REPORT

November 24-25,28 2015

Township of Buckingham
P.O. Box 413
Buckingham, PA 18912

Attention: Graham Orton

Trip required for verification of calibration of influent flow meter located at Cold Springs WWTP.

influent Flow Meter

1. Endress Hauser model ProMag P; Serial No. 3800ED16000.

a. Calibration 0 - 2000 gpm. Primary Element 8" Mag Meter.

The following parameters are programmed as follows:

Forward - Normal, 0 Return Off, System dampening 5 seconds, Integration 16.7 MS, Low cutoff 15 gpm, Empty pipe detection OFF, Failsafe Low. K-Factor = 1.0621

Unit checked and calibrated at the following:

As found settings:

0% in - out = 4.01 Madc

50% in - out = 12.01 Madc

100% in - out = 20.01 Madc

Adjusted settings:

None

None

None

Note: All units checked and calibrated in accordance with manufacturers' specifications as set forth in their instruction manuals.

Next calibration due December 2016.

If you have any questions or comments please feel free to call.

ESSEX SERVICE CORPORATION



William K. Weissman

ESSEX SERVICE CORPORATION
82 DOE RUN DRIVE
HOLLAND, PA 18966
T/A TREATMENT INSTRUMENTATION SPECIALIST

FIELD SERVICE REPORT

November 24-25,28 2015

Township of Buckingham
P.O. Box 413
Buckingham, PA 18912

Attention: Graham Orton

Trip required installation of effluent flow meter located at Cold Springs WWTP.

Effluent Flow Meter Lojeski

1. Endress & Hauser Ptomag 50 SN#4850388
 - a. Calibration 0 - 2000 gpm.
 - b. Cal Factor 1.111400
 - c. Diameter 8.0"
 - d. Total X1000

Unit checked and calibrated at the following:

As found settings:

0% in - out = 4.00 Madc

50% in - out = 12.00 Madc

100% in - out = 20.00 Madc

Adjusted settings:

None

None

None

Note: All units checked and calibrated in accordance with manufacturers' specifications as set forth in their instruction manuals.

Next calibration due December 2016.

If you have any questions or comments please feel free to call.

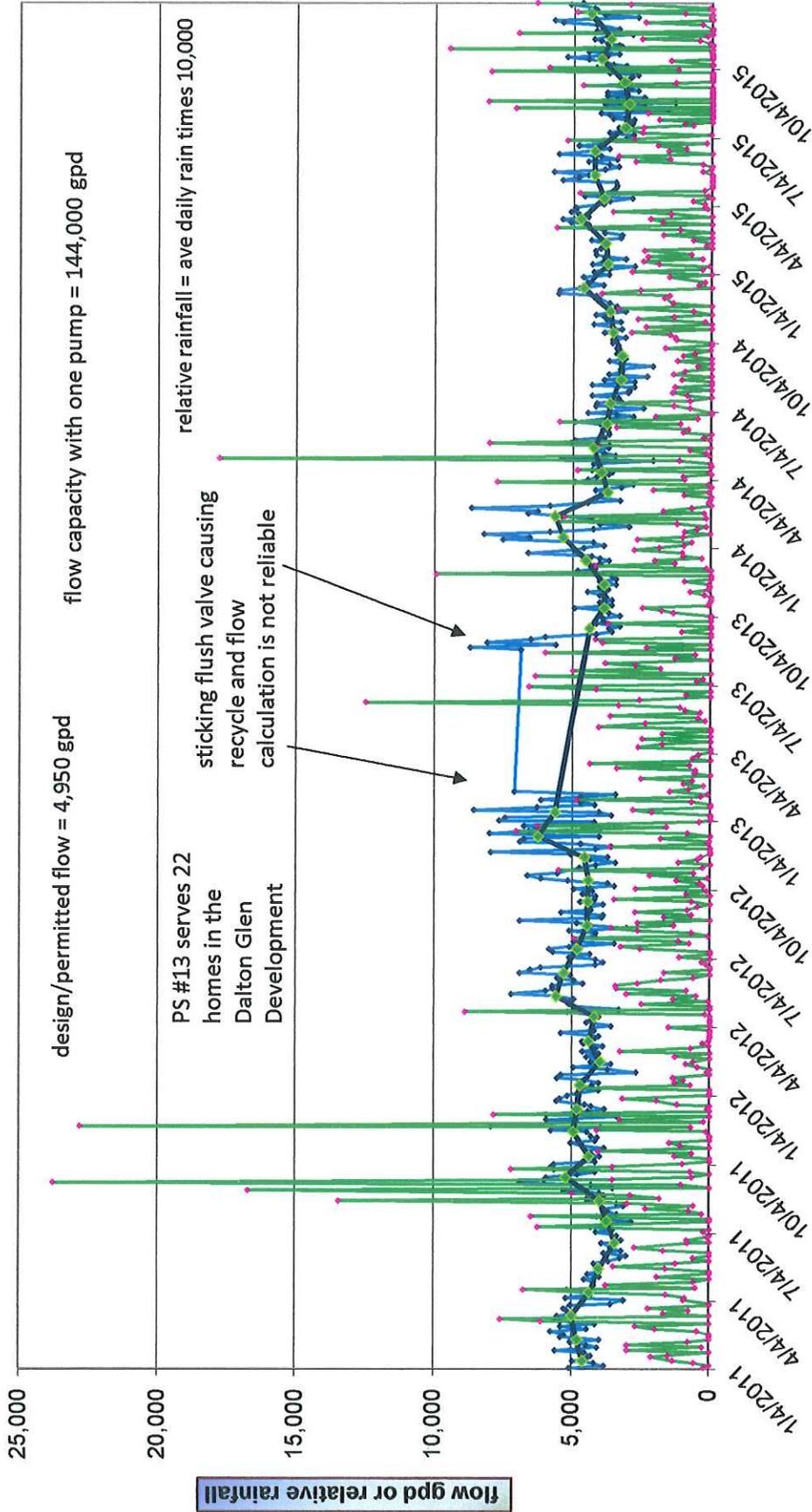
ESSEX SERVICE CORPORATION



William K. Weissman

PS #13 flow by hour meter vs precipitation

—●— pump station 13 gallons per day
 —●— relative rainfall
 —●— month average daily flow



Cold Spring WWTP Development Status with Flows

	Actual Flow	Act. gpd/EDU	Remaining Capacity lagoons gpd	Remaining Capacity storage gpd	Remaining Capacity spray gpd
Average 2001	200,533	167	96,692	37,467	52,767
Average 2002	210,400	176	86,825	27,600	42,900
Average 2003	237,933	199	59,292	67	15,367
Average 2004	224,158	188	73,067	13,842	29,142
Average 2005	225,467	189	71,758	12,533	27,833
Average 2006	225,233	188	71,992	12,767	28,067
Average 2007	224,217	188	73,008	13,783	29,083
Average 2008	228,383	191	68,842	9,617	24,917
Average 2009	230,133	193	67,092	7,867	23,167
Average 2010	224,642	188	72,583	13,358	28,658
Average 2011	249,283	209	47,942	(11,283)	4,017
Average 2012	249,283	175	87,817	28,592	43,892
Average 2013	220,125	184	77,100	17,875	33,175
Average 2014	225,000	188	72,192	12,967	28,267
Average 2015	206,758	173	90,467	31,242	46,542
Development name	EDU's	EDU's			
status 12/31/14	approved	occupied			
Barness - Nanlyn Farms	669	669			
Central Bucks School	8	8			
Cornell	10	10			
Toll - Buckingham Woods	74	74			
Toll - Cold Spring Hunt to CSWWTP only	251	250	7 EDUs go to BCWSA/Chalfont WWTP, development fully built & no EDU reservation for Yarrowshuk found		
Summerlea (Greenburg)	32	32			
Barness - Dalton Glen	75	75	request for an emergency connection of 5321 Long La. Revealed that this was lot # 76 of Dalton Glen but with a working OLDS - per CVC plan		
Barness Commercial	16	16			
Midway Fire Co. Substation	1	1			
The Oaks at Buckingham	60	60			
Rachwal Properties	33	0	3 more found in agreement to make 33 EDUs		
Peppelman (reserved) = 1st savings bank	1	1	connected in 2011 - 1 EDU retire other		
Derstine (reserved)	2	0			
Our Lady of Guadeloupe Church	10	2			
Total	1,242	1,198			
	reserved	connected		all connections + reserved	existing connections
Total gal/day at 2002-15 ave EDU - 15 years	233,034	224,778	Total gal/day at past 5-year ave EDU	234,234	225,936
Total gal/day at 225 gpd/EDU	279,450	269,550	Total gal/day at 225 gpd/EDU	279,450	269,550
Constructed Capacity:					
Lagoon Treatment	297,225				
Lagoon Storage	238,000	recalculated in 1-11			
Spray	253,300				

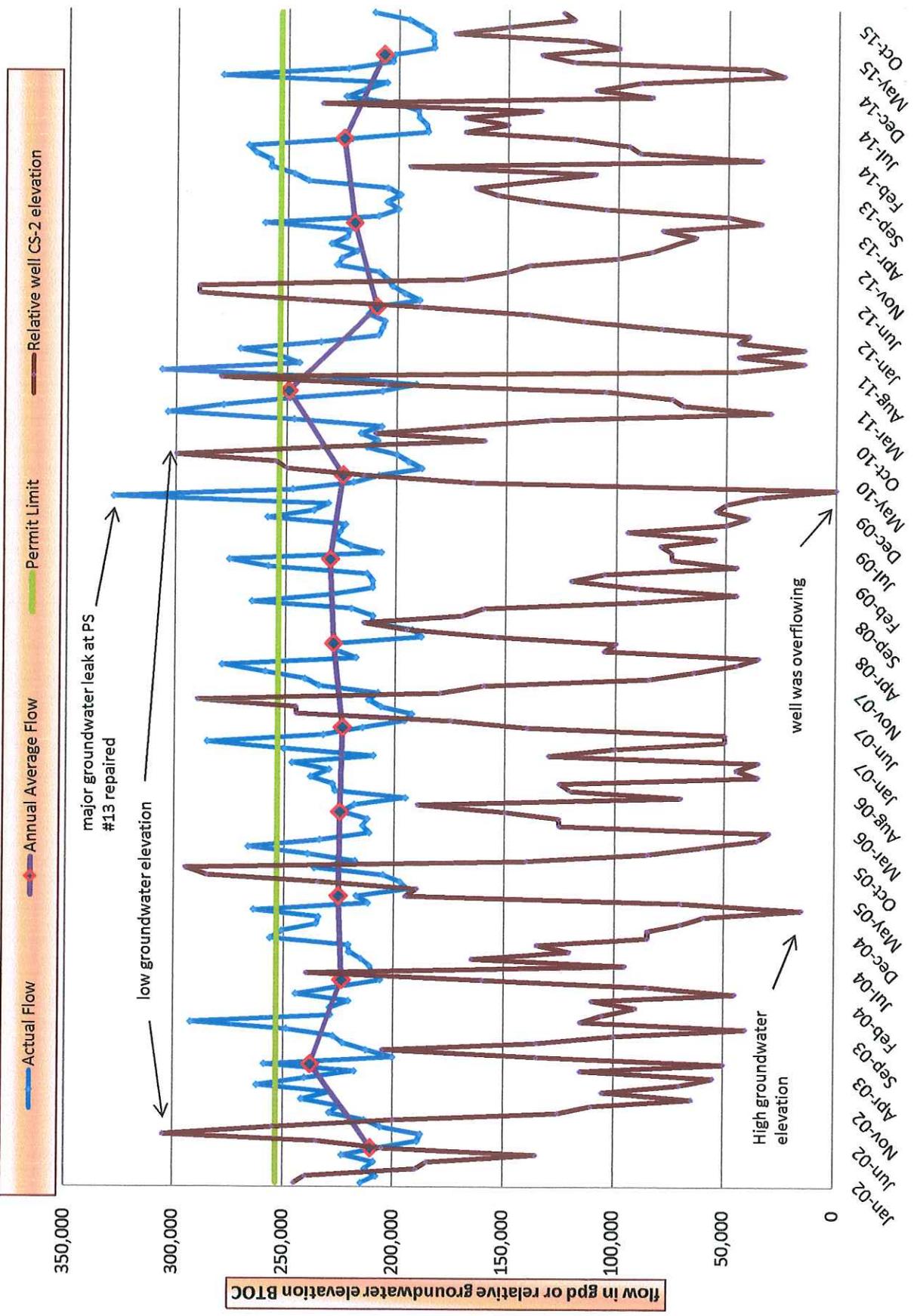
Cold Spring WWTP flow status 2002-15

Month	Actual Flow	Annual net after transfer Average flow 23,000 gpd	Annual Average flow	3-month peak Nov-Apr only	Base flow avg each month September 214,457	Ave. gpd/EDU	Remaining Capacity		WOM Unit	total rainfall bwwap	relative rainfall	total rainfall bwwap	relative rainfall	diff	CS-5 waste from site by m3/mo	CS-2 waste relative
							ligonors gpd	storage gpd								
Jan-02	214,300					180	52,275	39,400	33,300	11,923	3,07	11,923	3,07	11,923	0.00	48
Feb-02	214,300					174	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Mar-02	213,100					174	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Apr-02	208,700					175	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
May-02	222,400					182	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jun-02	207,000	187,400	210,400			173	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jul-02	189,400					169	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-02	197,800					167	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-02	205,800					172	50,125	45,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Oct-02	225,300					179	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Nov-02	224,500					188	54,725	49,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Dec-02	241,700		231,300			202	56,225	51,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jan-03	229,800					219	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Feb-03	297,000					201	56,225	51,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Mar-03	245,400					183	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Apr-03	218,700					182	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
May-03	230,300		237,833			182	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jun-03	200,400					188	54,725	49,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jul-03	212,700					172	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-03	223,400					181	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-03	249,900					208	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Oct-03	249,900					245	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Nov-03	252,400					245	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Dec-03	230,300					182	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jan-04	230,300					182	52,275	47,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Feb-04	244,700					205	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Mar-04	225,900					188	54,725	49,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Apr-04	206,100	201,168	224,166			172	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
May-04	205,800					177	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jun-04	211,000					177	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jul-04	216,200					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-04	210,200					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-04	211,200					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Oct-04	209,300					214	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Nov-04	269,300					210	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Dec-04	251,100			247,887		210	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jan-05	236,800					197	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Feb-05	234,800					198	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Mar-05	295,700					221	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Apr-05	211,800	201,467	226,467			177	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
May-05	214,300					182	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jun-05	187,400					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jul-05	187,400					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-05	187,400					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-05	205,800					172	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Oct-05	208,600					199	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Nov-05	218,200					183	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Dec-05	238,700					221	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Jan-06	208,400					220	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Feb-06	211,600					177	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Mar-06	211,600					177	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Apr-06	214,300					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
May-06	214,300					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jun-06	214,300					179	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jul-06	224,800					189	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-06	218,900					183	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-06	195,100					183	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Oct-06	227,400					202	56,225	51,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Nov-06	235,800					202	56,225	51,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Dec-06	230,100					183	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jan-07	246,900					207	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Feb-07	208,600					178	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Mar-07	260,800					210	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Apr-07	266,100					209	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
May-07	232,800					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jun-07	187,400					184	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jul-07	187,400					184	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-07	187,400					184	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-07	208,600					173	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Oct-07	208,600					183	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Nov-07	212,200					207	58,225	53,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Dec-07	208,600					178	47,625	43,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jan-08	236,100					210	60,225	55,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Feb-08	241,300					207	56,225	51,000		3,07	7,710	3,07	7,710	0.00	48	24,000
Mar-08	232,800					186	52,275	47,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Apr-08	216,200					183	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
May-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jun-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jul-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Aug-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Sep-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Oct-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Nov-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Dec-08	227,400					180	50,125	45,000		2,96	6,895	2,96	6,895	0.00	48	24,000
Jan-09	228,300					180	50,125	45,000		2,96						

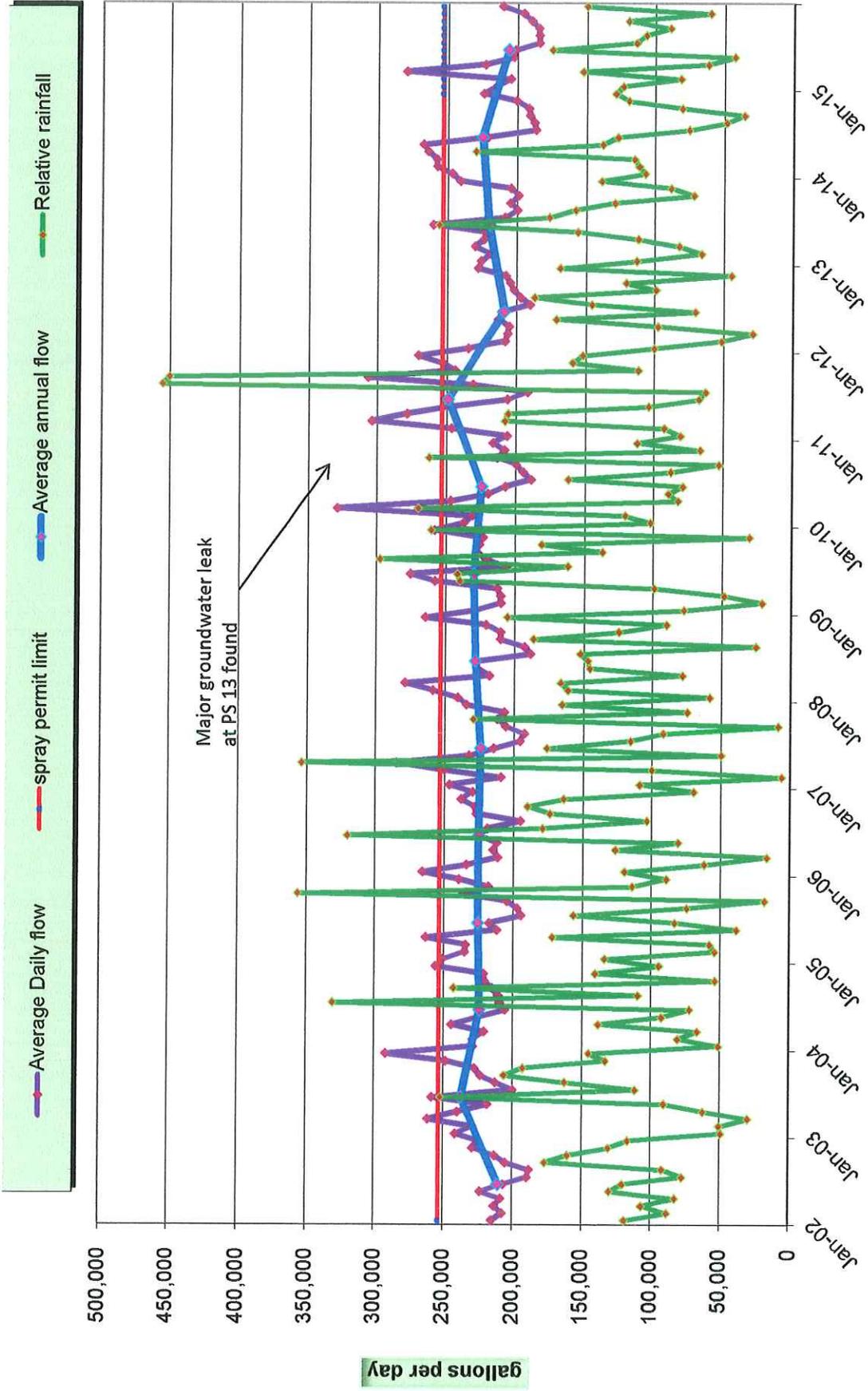
Cold Spring WWTP flow status 2002-15

Month	Actual Flow	Annual net fiber transfer 23,000 gpd	Annual Average flow 230,133	3-month peak ne-av only	base flow avr each month	Acc. gpd/d/du	Remaining Capacity isagons gpd	Remaining Capacity storage gpd	Remaining Capacity spray gpd	WQH unit	total rainfall	relative rainfall	total rainfall	relative rainfall	diff	CS-2 peak elevation from site by rise month	CS-2 relative
Jan-09	275,800					231	17,425	(37,650)	(22,530)		8,07	247,100	763	278,900	0.44	15	75000
Jan-10	230,100					173	58,625	40,800	187,000		3,38	187,000	4,92	144,800	0.67	16	75000
Feb-10	228,800					173	58,625	40,800	187,000		3,38	187,000	4,92	144,800	0.67	16	75000
Mar-10	227,800					181	59,425	41,200	190,000		3,47	190,000	5,08	145,000	0.68	17	80000
Apr-10	228,000					181	59,425	41,200	190,000		3,47	190,000	5,08	145,000	0.68	17	80000
May-10	223,800					188	61,225	42,000	200,000		3,56	188,000	5,24	145,000	0.72	18	85000
Jun-10	223,800					197	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jul-10	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Aug-10	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Sep-10	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Oct-10	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Nov-10	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Dec-10	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jan-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Feb-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Mar-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Apr-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
May-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jun-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jul-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Aug-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Sep-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Oct-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Nov-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Dec-11	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jan-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Feb-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Mar-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Apr-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
May-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jun-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jul-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Aug-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Sep-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Oct-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Nov-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Dec-12	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jan-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Feb-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Mar-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Apr-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
May-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jun-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jul-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Aug-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Sep-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Oct-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Nov-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Dec-13	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jan-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Feb-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Mar-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Apr-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
May-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jun-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jul-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Aug-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Sep-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Oct-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Nov-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Dec-14	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jan-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Feb-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Mar-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Apr-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
May-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jun-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Jul-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Aug-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Sep-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Oct-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Nov-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Dec-15	228,800					218	71,225	44,500	200,000		3,71	200,000	5,44	145,000	0.75	19	90000
Average	228,270	205,222	205,222	248,287	218,000	218	71,225	44,500	200,000	218,000	3,71	200,000	5,44	145,000	0.75	19	90000

Cold Spring WWTP Flow vs Groundwater Elevation



Cold Spring WWTP Flow vs Rainfall



Cold Spring Wastewater prediction tool combo worksheet

column A	yellow is estimated	this shading indicates there could be a problem with the elevation shots			offsite disposal	extra irrigation	hauling	blue = current month actual	column J	ave bias for 2014-5 prediction
2010-15 calcs	gallons out design with zone 8 at 0.5 design flow	gallons in est or actual	gallons of evaporation	gallons of rain or snow	possible with 78,000 gpd to BCWSA full month			gal left to spray - orange zero indicates <0 was calculated	starting december, 2014, this color assumes no external transfer and is bias adjusted	
predictions are now based on 2014 experience modified as noted. Days listed are actual	green = data based on hard meter reads rather than pic meter	red background = actual exceeded estimated for month	red background = actual exceeded estimated for month	red background = actual exceeded estimated for month	yellow indicates offsite transfer needed to keep below top of berms	blue zero means incorporated with effluent = current month actual		light green = actual volumes by elev. shots with transit	ugly green = what we would have predicted using the master spreadsheet and hard off. meter reads	
blue = actual for all zones	blue = actual	blue = actual	blue = actual	blue = actual	blue = current month actual		blue = current month actual			multiplier of actual to predicted
Oct '11 - 28 days	11,254,500	7,586,212	911,916	1,645,334	0	0	0	20,896,435		0.961
Nov '11 - 27 days	8,346,350	7,608,588	693,360	2,269,328	0	0	162,500	17,961,565		
Dec '11 - 26 days	6,214,200	8,403,503	505,274	2,150,758	0	0	414,000	17,102,551	18,475,321	0.926
Jan '12 - 21 days	4,924,700	7,285,711	530,740	1,401,940	946,480	0	0	20,523,337		
Feb '12 - 20 days	4,141,600	6,053,189	519,779	723,851	2,276,250	0	0	22,328,061	22,809,069	0.979
Mar '12 - 25 days	5,470,800	6,416,111	1,407,516	409,768	2,478,950	0	0	19,636,086		
Apr '12 - 28 days	10,183,800	6,175,304	1,995,840	1,391,549	2,484,830	0	0	11,881,741	12,538,469	0.948
May '12 - 22 days	10,703,100	6,612,300	1,732,765	2,452,378	2,431,680	0	0	6,078,875		
June '12 - 23 days	10,782,100	6,338,950	1,995,753	1,019,227	0	0	0	659,199		
July '12 - 11 days	4,595,100	5,905,850	2,078,379	2,075,883	0	0	0	1,967,453	1,967,453	
Aug '12 - 22 days	6,564,000	6,113,200	1,649,191	2,669,738	0	0	0	2,537,200	2,537,200	
Sept '12 - 23 days	5,838,400	6,078,300	1,167,793	1,430,038	0	0	0	3,039,345	3,039,345	
Oct '12 - 15 days	5,280,800	6,356,834	866,037	1,725,397	0	0	0	4,974,739	4,974,739	
Nov '12 - 16 days	4,984,600	6,250,680	632,772	615,687	0	0	0	6,223,734	6,223,734	
Dec '12 - 21 days	4,307,800	7,066,790	473,518	2,422,221	0	0	0	10,931,427	10,931,427	
Jan '13 - 21 days	3,896,700	7,002,400	497,921	1,606,832	0	0	0	15,146,037	15,146,037	
Feb '13 - 15 days	2,307,700	6,131,658	503,076	913,129	0	0	0	19,380,049	19,380,049	
Mar '13 - 25 days	4,588,100	7,141,554	726,636	1,185,627	0	0	0	22,392,494	22,392,494	
Apr '13 - 25 days	8,868,900	6,711,388	1,427,316	1,475,746	0	0	0	17,369,529	20,283,412	0.856
May '13 - 25 days	10,098,700	6,898,020	1,919,004	2,169,465	0	0	0	14,419,310	14,419,310	
June '13 - 19 days	7,528,900	7,819,326	2,310,985	3,414,305	0	0	0	15,813,057	15,813,057	
July '13 - 19 days	11,473,300	6,477,754	2,223,981	2,367,036	0	0	0	11,187,995	10,960,565	1.021
Aug '13 - 24 days	11,134,500	6,195,698	2,151,404	2,222,518	0	0	0	6,320,307	6,320,307	
Sept '13 - 20 days	10,632,700	6,158,900	1,187,888	1,780,495	0	0	0	2,439,114	2,439,114	
Oct '13 - 22 days	8,334,500	6,173,118	842,307	999,452	0	0	0	434,877	434,877	
Nov '13 - 25 days	4,096,400	6,147,610	619,308	1,225,131	0	0	0	3,091,910	3,091,910	
Dec '13 - 8 days	1,797,600	7,485,630	491,189	1,957,312	0	0	0	10,246,063	10,246,063	
Jan '14 - 4 days	396,400	7,666,620	520,642	1,574,608	0	0	0	18,570,249	18,570,249	
Feb '14 - 0 days	0	7,221,050	259,622	1,606,839	0	0	0	27,138,516	27,138,516	
Mar '14 - 17 days	3,652,196	8,002,200	412,011	1,643,236	0	0	0	32,719,744	32,719,744	
Apr '14 - 24 days	9,560,400	7,941,800	1,471,284	3,128,332	0	0	0	32,758,193	32,758,193	
May '14 - 24 days	10,135,800	8,306,700	2,019,174	1,868,883	0	0	0	30,778,801	30,778,801	
June '14 - 24 days	11,768,500	6,650,277	2,394,540	1,781,546	0	0	0	23,756,539	25,047,584	0.948
July '14 - 23 days	10,026,100	5,794,510	2,367,798	1,116,998	0	0	0	18,274,150	18,274,150	
Aug '14 - 23 days	10,267,700	5,817,530	1,807,025	659,362	0	0	0	12,290,025	12,676,317	0.970
Sept '14 - 19 days	9,043,300	5,733,287	1,280,947	524,178	0	0	0	7,304,822	8,223,244	0.888
Oct '14 - 22 days	10,426,600	5,943,210	885,527	1,028,538	0	0	0	2,964,443	3,847,777	
Nov '14 - 18 days	4,459,800	6,029,378	616,758	1,671,303	0	0	0	6,476,721	5,544,566	1.159
Dec '14 - 21 days	4,039,800	6,951,955	483,290	1,857,488	0	0	0	10,763,074	10,339,495	
Jan '15 - 3 days	465,200	6,683,960	517,792	1,781,563	0	0	0	18,245,606	17,527,552	
Feb '15 - 0 days	0	5,757,955	104,915	1,137,773	0	0	0	25,036,419	24,051,114	
lagoons ice covered										
Mar '15 - 12 days	2,113,300	8,672,145	398,538	2,036,310	0	0	0	30,762,994	32,233,036	0.926
Apr '15 - 27 days	9,444,000	6,705,440	1,472,868	807,030	0	0	0	27,358,596	26,281,901	
May '15 - 21 days	10,532,200	6,296,430	1,930,185	578,242	0	0	0	21,770,882	20,914,092	
June '15 - 23 days										
corrected evap on 8/4/15	11,523,700	6,065,030	2,216,071	2,400,338	0	0	0	16,496,480	15,847,262	
July '15 - 18 days	9,576,500	5,717,712	2,192,510	1,635,958	0	0	0	12,081,140	11,605,688	
Aug '15 - 24 days	11,993,000	5,725,400	1,724,760	1,492,418	0	0	0	5,581,198	5,301,551	
Sept '15 - 19 days	7,179,500	5,547,285	1,220,662	1,158,540	0	0	0	3,680,383	3,886,882	0.947
Oct '15 - 13 days ave	5,035,900	5,897,400	876,034	1,654,655	0	0	0	5,320,504	5,111,116	
Nov '15 - 26 days	5,534,900	5,877,050	628,080	815,361	0	0	0	5,849,935	5,619,711	
Dec '15 - 22 days	4,068,900	6,548,934	490,692	2,068,579	0	0	0	9,907,856	9,517,934	
Jan '16 - 8 days	1,854,300	6,790,810	505,587	1,646,335	0	0	0	15,985,114	15,356,022	
Feb '16 - 0 days	0	7,691,100	529,149	1,451,846	0	0	0	24,598,911	23,630,824	
March '16 - based on 2015 & ppl 10yr ave	2,113,300	8,672,145	398,538	1,626,578	0	0	0	32,385,796	31,111,257	
April '16 - based on 2015 & ppl 10yr ave	9,444,000	6,705,440	1,472,868	2,021,782	0	0	0	30,196,150	29,007,784	
May '16 - based on 2015 & ppl 10yr ave	10,532,200	6,296,430	1,930,185	1,576,657	0	0	0	25,606,853	24,589,098	
			total offsite needed in 2015	freeboard	total to BCWSA 2012		total hauled	top of berm		
			0	27,301,000	10,618,190		576,500	37,200,000		

There is an apparent bias in actual elevations versus predictions that may be related to rainfall being absorbed on lagoon sidewalls, surveying imprecision and varying evaporation rates. At end of February, 2016 we were above the average left to spray for the past 10 years by 9% and 15% above the median. March, 2016 through April 2016 prediction is matched to 2014 experience. February 2016 effluent flow was zero. Precipitation is a ten-year average. After August, 2014, adding a new prediction in bright green that multiplies the usual prediction by the average % the actual is to the prediction (currently 96.1%). Next scheduled lagoon elevation shots planned for April 1, 2016.