RECORDS & FLOW METERING EVALUATION
CLARKS SUMMIT STATE HOSPITAL STP

NEWTON TOWNSHIP, LACKAWANNA COUNTY, PA

NPDES #PA0029432

Bureau of Clean Water

June 2016

Introduction:
Clarks Summit State Hospital (CSSH,) a public psychiatric treatment hospital operated under the auspices of the Pennsylvania Department of Human Services (DHS,) owns and operates a high-rate trickling filter wastewater treatment facility located in Newton Township, Lackawanna County, north of Scranton. The facility treats wastewater and sewage generated by the state hospital and also from two public schools nearby. Treated effluent is discharged to Falls Creek in watershed 4-G, located in the Susquehanna River Basin.

Pennsylvania Department of Environmental Protection's (DEP) wastewater technical assistance program (TA) has provided consulting services to the facility operators in the past, including development and revisions to a pre-existing Excel workbook used to record historical production and treatment data for CSSH's potable water and wastewater treatment operations. The coding for the workbook was last updated in March of 2015.

Since WWTAP's most recent work at CSSH, personnel changes occurred at the facility, whereby the records were inherited by a new clerk who had never worked with it before. Christopher Meredick, the plant operator who was most knowlegeable of the record keeping, experienced a job-related accident and has been on indefinite leave for some time, meaning that his guidance on the documents was unavailable to either the new clerk or to the assistant operator. As a result, at the beginning of a new record-keeping year, an updated template of the records spreadsheet had not been used; rather, the previous year's record was re-saved and zeroed-out for use in 2016.

Unbeknownst to the new staff, during the first quarter of 2015, the facility owner and operator replaced the effluent flow totalizer with a newer model, one which no longer required use of a multiplier in the daily flow calculation. DEP staff had modified the spreadsheet so that after March 11, 2015, the calculation of effluent flow was based on a direct-read flow totalizer. Because the multiplier formula had remained in the records spreadsheet being used at the facility, flows reported between January 1 and March 11, 2016, would have been incorrect by a factor of 10. Thus, a flow totalizer calculation for 0.431 MGD would have been erroneously recorded as 4.310 MGD, etc. Jeremy Miller, DEP's water quality specialist for the Northeast Regional Office (NERO) in Wilkes-Barre, noted the disparate flow records during routine review of the facility's discharge monitoring reports (DMR) and, in an email to the CSSH manager, requested an explanation of the records.

Field Review and Narrative:
On Friday, June 3, 2016, Mr. Neville of the TA program visited the facility to review the flow records, meeting with the assistant operator David Visbisky, his manager Thomas Carachilo, and records clerk Amie Santarsiero who works with the spreadsheet developed with Mr. Meredick.

The charts seen below compare the flow totalizer output for the first quarter of 2016, before and after correcting the effluent record for the erroneous flow multiplier factor:

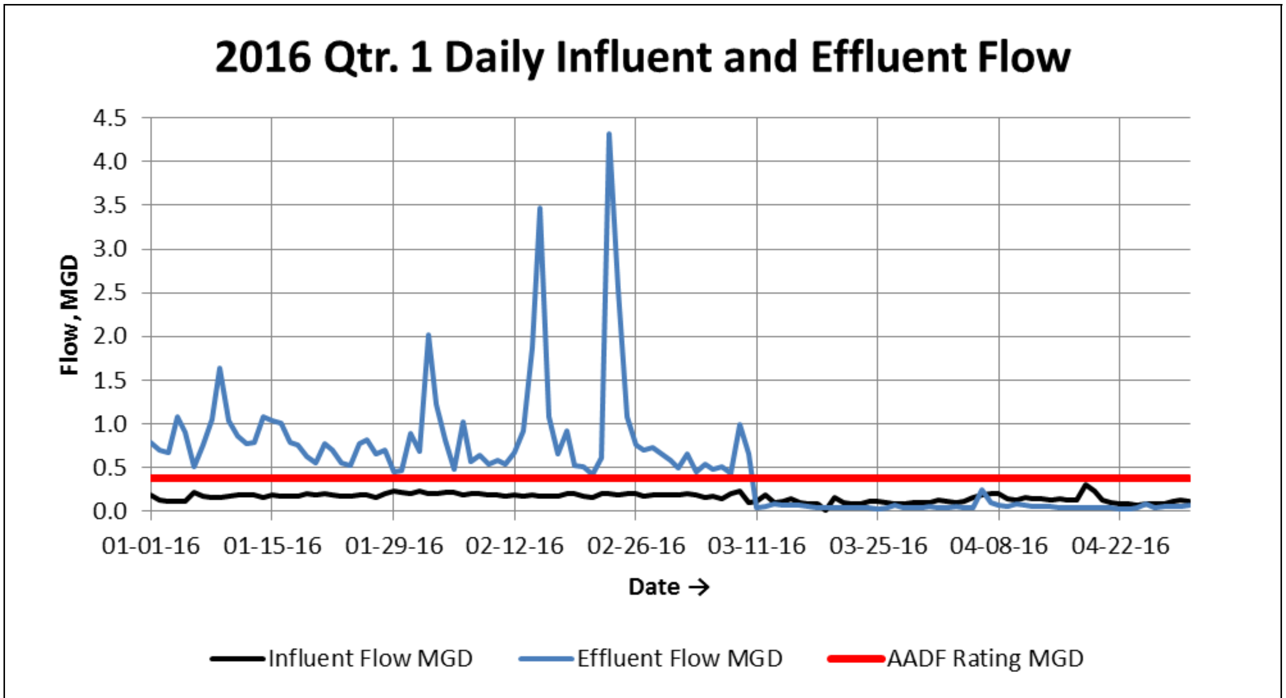

Figure 1: Flow Totalizer records reported in eDMR, CSSH-STP

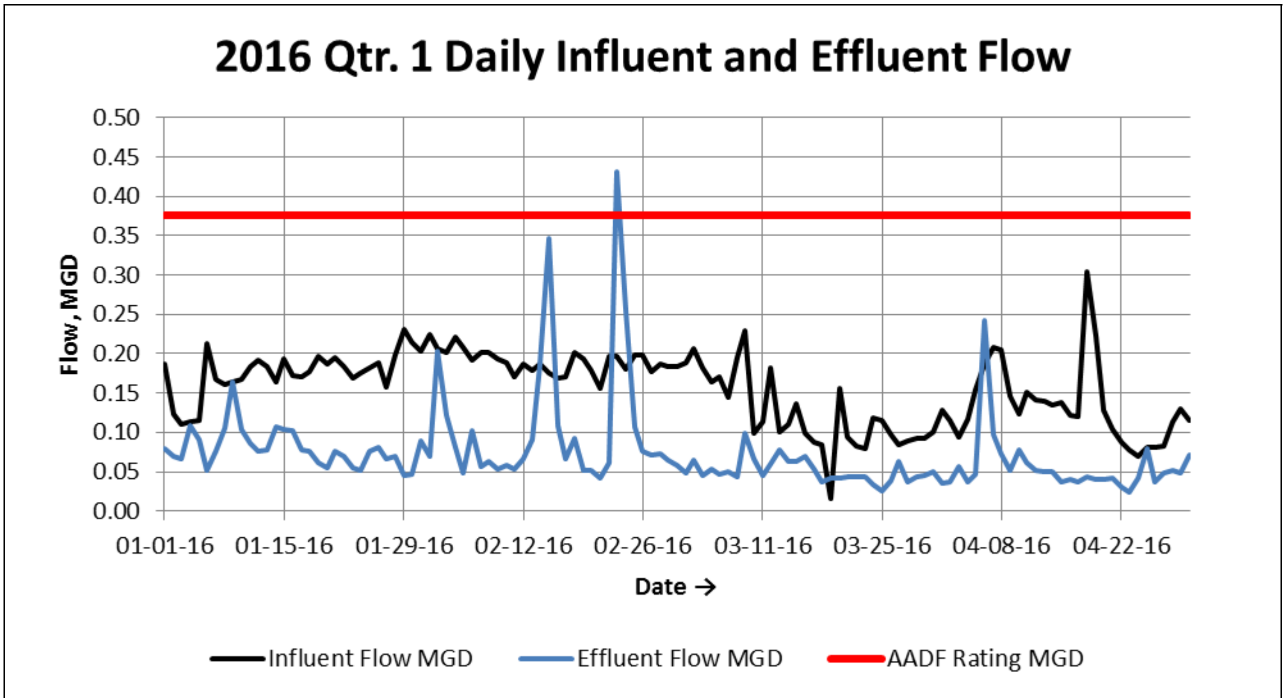

Figure 2: Post-correction Flow Totalizer records, CSSH-STP

After correcting the records spreadsheet, TA staff completed DMR Supplemental Forms for effluent and for influent/process control and sent these to CSSH for inclusion in their amended DMR for the first quarter. The corrected Excel workbook was returned to Ms. Santarsiero.

The multiplier error was easy to fix, but the outcome of the visit raised additonal questions about the accuracy and precision of the ultrasonic flow metering devices in use at the facility. When the spreadsheet was first developed, DEP's TA staff had the wrong impression that the raw wastewater ultrasonic flowmeter at the head of the plant was recording a combined flow that included influent wastewater and trickle filter recycle water. This was because the apparent differences in recorded flow at the influent and effluent locations appeared to represent an internal trickling filter recycle flow of 100%. In fact, the flow meter is upstream of the point where recycle is reintroduced to the treatment process. Mr. Neville and others believed that by subtracting the effluent flow from the (believed to be) "inflow + recycle," the recycle flow could be isolated and managed as a way to achieve better process control.

The influent flow meter's ultrasonic head records raw wastewater flow through a Parshall flume. This influent flow is comprised of wastewater from two collection system lines that converge upstream of the facility's pre-treatment bar rack and comminutor. The effluent flow meter has its ultrasonic head located in a quiescent zone in a corner of a buffer tank at the outlet of two equal disinfection/contact tanks where hypchlorite solution is employed as a disinfectant. The buffer tank as a V-notch weir located at its outfall, below which the effluent water is sulfonated to deactivate any chlorine residual. The ultrasonic head for the effluent flow meter measures flow based on changes in the surface level of the buffer tank.

Both flow meters send electronic signals to flow totalizers located in the wastewater facility support building, office/lab area. The older influent flow totalizer requires a multiplication factor of 10 to obtain a daily volume. The effluent flow totalizer is direct-read, meaning that no multiplier is necessary. Both flow meters and totalizers were recalibrated annually in February.

In reviewing the flow metrics for 2015 and 2016, TA staff noted that the two flow measurements were disparate, raising the question of why does the facility appear to receive twice as much raw wastewater as it discharges as treated effluent. This question is not merely academic, as it affects loading calculations for the both treatment and downstream watershed. The flow records are presented below, depicting flow totalizer outputs for the period January 1, 2015, through April 30, 2016.

The two flow measurements track one another most of the time, with effluent flow being a total average 50% of recorded influent flow. On days where significant inflow and infiltration occurs, due to heavy or prolonged rain events, the influent and effluent flows approach being approximately equal. This suggests that the calibration is accurate at the high end of its range. The standard deviation for inflow is that 67% of all readings fall within ±0.056 MGD of the average, 0.156 MGD; and for the effluent, this value is ±0.053 MGD to the average, 0.071 MGD. This suggests that the effluent metrics are less precise.

What is of concern is the evident disparity between a recorded average influent of 0.156 MGD and a recorded average effluent of 0.071 MGD. What happens to over half the volume of influent that it vanishes in process, so that only half the influent flow is discharged as effluent?

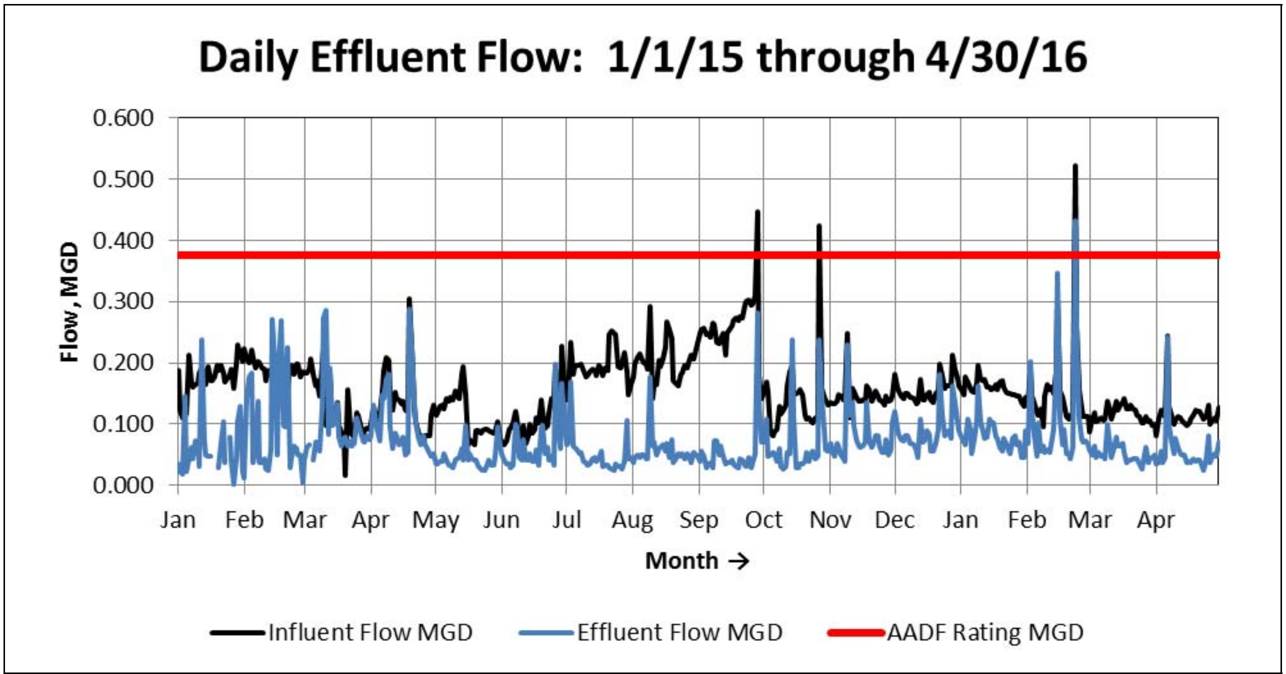

Figure 3: Influent and Effluent Flow Totalizer records, CSSH-STP

Clearly, this water is not percolating to the ground through bottomless tanks, nor is it being visibly diverted or bypassed to some mystery bypass pipe. Further examination of the flow metering equipment may provide some answers. A Parshall flume is considered a time-tested method of channelling flow for measurement. The effluent buffer tank with its V-notch weir is more of a mystery:

- Is the calibration range on this buffer tank outfall sufficient to accurately measure flow?
- Is it possible to measure effluent flow through the full height of the weir in order to establish a calibration range that covers more than one or two inches of water level?
- Are there surface disturbances in this tank which may lead to inaccurate ultrasonic measurements of effluent flow?
- Are there other factors which may interfere with flow metering, such as failure of cable-shielding?

Likewise, is the flow measurement of the raw wastewater through the Parshall flume by the ultrasonic head the unreliable factor in this difference of measurements?

During the past three years, the media in the trickling filters was entirely replaced. Any structural problems with the filter tanks would have been evident at that time, and none were reported.

Therefore, based on the foregoing evidence, it appears that additional study must be performed by vendors proficient in flow metering equipment, to determine if a disparity truly exists and what remedies may suffice to more accurately measure and record flows at this treatment facility.

This will be important, because if one were to use the measured influent numbers to calculate effluent loading to the receiving stream, the quantities would, on average, double, meaning twice the ammonia-nitrogen, twice the CBOD, twice the nitrite-nitrate, etcetera.

Recordskeeping and Reporting:

Clarks Summit State Hospital is treated as a non-municipal discharger, since it serves only the adjacent state hospital and two nearby public school buildings. The facility uses eDMR for its reporting and apparently submits only the effluent test results performed by independent laboratory and a monthly facility report (regional supplemental document.) The facility does not regularly employ all of the supplemental reporting documentation that is widely in use at most municipal facilities, and going forward, it may prove useful if more information is tracked and provided.

The records spreadsheet DEP TA provided closely mimics the Supplemental DMR form 3800-FM-BPNPSM0435, “Daily Effluent Monitoring.” However, this spreadsheet is a process monitoring tool that includes information on drinking water production and other details unrelated to wastewater effluent quality and loadings. Working with CSSH staff, DEP TA will continue to improve upon this tool.

For reporting purposes, it is recommended that the facility staff supplement their monthly eDMR with submission of the completed form 3800-FM-BPNPSM0435 for its effluent flow, concentration, and loading.

Other supplemental sheets may prove useful; for example, although the facility does not regulary transfer waste sludge off site for further treatment (ref. “Monthly Facility Report” form,) it would be useful were they to report not only volume (e.g. “4,000 gallons transferred to Wyoming Valley Authority”) but a percent total solids per shipment, or even the standard calculations and records employed in form 3800-FM-BPNPSM0438, “Sewage Sludge / Biosolids Production and Disposal.” And since the facility apparently has no Municipal Wasteload Management (Chapter 94) Report requirement, personnel should employ form 3800-FM-BPNPSM0436, “Influent and Process Control,” (with modification) in order for the regulator to gauge raw wastewater loading and evaluate treatment processes based on widely available models.

The current NPDES permit has been undergoing its periodic renewal process. This would be a good time to begin monitoring and reporting additional useful treatment parameters in order to provide for better long-term process control at the facility.

Corrected Flow Data for January through April, 2016

DEP staff evaluated the records spreadsheet at CSSH and removed the erroneous multiplier from the effluent flow calculations. Notwithstanding the discussion here pertaining to which flow meter is more reliable, following are the monthly updated monthly flow records for January through April 2016:

Jan 2016 CSSH-STP	Influent Flow	Effluent Flow	Influent of Effluent
Q diff	MGD	MGD	Percent
Sum	4.902	2.466	199%
Max	0.197	0.163	120%
Min	0.130	0.045	287%
Avg	0.158	0.080	199%
StdDev	0.013	0.024	n/a

Feb 2016 CSSH-STP	Influent Flow	Effluent Flow	Influent of Effluent
Q diff	MGD	MGD	Percent
Sum	4.594	3.154	146%
Max	0.523	0.432	121%
Min	0.096	0.042	225%
Avg	0.158	0.109	146%
StdDev	0.081	0.091	n/a

Mar 2016 CSSH-STP	Influent Flow	Effluent Flow	Influent of Effluent
Q diff	MGD	MGD	Percent
Sum	3.586	1.598	224%
Max	0.142	0.099	144%
Min	0.087	0.026	338%
Avg	0.116	0.052	224%
StdDev	0.014	0.014	n/a

Apr 2016 CSSH-STP	Influent Flow	Effluent Flow	Influent of Effluent
Q diff	MGD	MGD	Percent
Sum	3.469	1.674	207%
Max	0.245	0.242	101%
Min	0.066	0.024	276%
Avg	0.116	0.056	207%
StdDev	0.026	0.038	n/a

The data sets for each month demonstrate the disparity between raw wastewater influent and finished effluent, with the difference shown as “percent influent of effluent.” For this long-established facility, given that recycle flow does not return to the head of the facility but enters downstream of the Parshall flume, one would expect that the percent influent of effluent to be within a credible range of 90% to 110%, where the difference is a result of time-of-measurement and detention time of the treatment process.

Conclusion:

This review has solved the initial question of why the reported effluent quantitites for January through March 2016 had such a wide, even unbelievable, range: A multiplacation factor applied to the effluent flow calculation in January-March 2015 was erroneously brought forward into 2016.

What is ultimately more interesting is that measured raw influent is approximately 200% of measured effluent, and there are no apparent bypasses or recycle flows that remain unaccounted for.

It appears that further study or consultation with the flow metrics calibration vendor may reveal instrument-based or calibration-based disparities, or that the effluent buffer tank may be too large to yield a wider range of calibrated flow, causing the effluent flow calibration to be accurate within a limited range but unreliable outside of that range.

DEP TA staff recommend that further study by the permittee's calibration services vendor or by the consulting engineer consider which of the two flow meters is more accurate, and that treatment facility staff then base effluent loading on the flow measurement that is more accurate. Plant staff should also assure that their eDMR submittals include the department's standard supplemental forms, in order that data records may over time become more thorough and so provide accurate information for use by permit writers, enforcement staff, and consulting engineers.

Please note: This evaluation did not consider any permit effluent concentration or loading excursions (especially, ammonia-nitrogen,) which have already been addressed by the permittee in routine eDMR submittals. Were the influent flow totalizer records employed in the calculation of effluent loadings, those loading excursions would be approximately double that of the DMR records.

Appendix 1: Adjusted Forms 3800-FM-BPNPSM035 for Clarks Summit State Hospital

The following pages cover the first quarter of calendar year 2016. Without a determination of the validity of either flow totalizer pending further investigation, these records were prepared using the corrected effluent flow values as reported by the direct-read effluent flow totalizer. The loading values are lower by a factor of 10 for the period between January 1 and March 11.

Were the influent flow meter values used in the loading calculations, the loadings would be approximately double what had been reported in these adjusted forms.

3800-FM-BPNPSM0435 3/2012

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DEPARTMENT OF ENVIRONMENTAL PROTECTION

SUPPLEMENTAL REPORT
DAILY EFFLUENT MONITORING

Facility Name: **Clarks Summit State Hospital**
Municipality: **Newton Township** County: **Lackawanna**
Watershed: **4-G (Falls Creek)**
Laboratories: **Micro Bac**

Month: **1** (select number) Year: **2016**
Permit No.: **PA0029432** Outfall: **001**
Renewal application due **180 days** prior to expiration.
This permit will expire on: **February 28, 2014**

Parameter			Flow	Fecal Coliform	pH	TSS	NH3-N	TRC	Dissolved Oxygen	CBOD5	NO2-N + NO3-N	BOD5	TSS	NH3-N
Stage			1	1	1	1	1	1	1	1	1	RI	RI	RI
Week	Day	Date	MGD	CFU/100 ml	S.U.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	Fri	1/1/16	0.079		7.3			0.0	9.5					
	Sat	1/2/16	0.07											
1	Sun	1/3/16	0.066											
	Mon	1/4/16	0.108		7.46			0.0	12.08					
	Tue	1/5/16	0.090											
	Wed	1/6/16	0.050		7.51	16.5	13.4	0.0	12.9	108.0	2.5	147.0	73.0	18.7
	Thu	1/7/16	0.075	230.0										
	Fri	1/8/16	0.105		7.38			0.0	12.5					
	Sat	1/9/16	0.163											
2	Sun	1/10/16	0.103											
	Mon	1/11/16	0.086		7.2			0.0	11.5					
	Tue	1/12/16	0.076											
	Wed	1/13/16	0.078		7.34	5.5	5.94	0.0	12.8	13.0	4.87			
	Thu	1/14/16	0.107	10.0										
	Fri	1/15/16	0.103		7.41			0.0	11.76					
	Sat	1/16/16	0.101											
3	Sun	1/17/16	0.078											
	Mon	1/18/16	0.075		7.34			0.0	11.78					
	Tue	1/19/16	0.062											
	Wed	1/20/16	0.055		7.41			0.0	11.5					
	Thu	1/21/16	0.076			14.1	13.3			31.0	2.97	188.0	216.0	21.3
	Fri	1/22/16	0.069	1040.0	6.84			0.0	12.16					
	Sat	1/23/16	0.054											
4	Sun	1/24/16	0.051											
	Mon	1/25/16	0.076		7.44			0.0	13.64					
	Tue	1/26/16	0.080											
	Wed	1/27/16	0.066		7.51	8.1	10.3	0.0	11.26	4.0	5.14			
	Thu	1/28/16	0.069	110.0										
	Fri	1/29/16	0.045		7.54			0.0	11.15					
	Sat	1/30/16	0.045											
5	Sun	1/31/16	0.089											

Statistics for DMR	Flow	Fecal Coliform	pH	TSS	NH3-N	TRC	Dissolved Oxygen	CBOD5	NO2-N + NO3-N	BOD5	TSS	NH3-N
Daily Minimum (Conc.):		10	6.84	5.5	5.94	0	9.5	4	2.5	147	73	18.7
Daily Maximum (Conc):		1040	7.54	16.5	13.4	0	13.64	108	5.14	188	216	21.3
Max Avg Weekly (Conc.):				16.5	13.4		12.49	108.0	5.14	188	216	21.3
Avg Monthly (Conc.):				11.1	10.7	#NUM!	11.89	39.0	3.87	168	145	20
Geometric Mean (Conc.):		127										
Max Avg Weekly (Load):	0.094			8.9	8		9	45.0	3	119	137	14
Avg Monthly (Load):	0.079			6.0	5.9	#NUM!	8	18.8	2	90	84	11
Total Monthly (Load):	2.45			184.9	182.5		236	583.9	69	2797	2594	330
Daily Minimum (Load):	0.045			3.6	4	#NUM!	4	2.2	1	61	30	8
Daily Maximum (Load):	0.163			8.9	8	#NUM!	11	45.0	3	119	137	14

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

Prepared By: ______________________ License No.: ______________________
Title: ______________________ Date: ______________________

Average Weekly Statistics	Flow	Fecal Coliform	pH	TSS	NH3-N	TRC	Dissolved Oxygen	CBOD5	NO2-N + NO3-N	BOD5	TSS	NH3-N
Week 1 (Conc):				16.5	13.4		12.49	108.0	2.5	147	73	18.7
Week 2 (Conc):				5.5	5.94		12.02	13.0	4.87			
Week 3 (Conc):				14.1	13.3		11.81	31.0	2.97	188	216	21.3
Week 4 (Conc):				8.1	10.3		12.02	4.0	5.14			
Week 5 (Conc):												
Week 1 (Load):	0.094			6.9	6		9	45.0	1	61	30	8
Week 2 (Load):	0.093			3.6	4		9	8.5	3			
Week 3 (Load):	0.067			8.9	8		7	19.6	2	119	137	14
Week 4 (Load):	0.062			4.5	6		6	2.2	3			
Week 5 (Load):												

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3800-FM-BPNPSM0435 3/2012

SUPPLEMENTAL REPORT
DAILY EFFLUENT MONITORING

Facility Name: **Clarks Summit State Hospital STP**
Municipality: **Newton Township** County: **Lackawanna**
Watershed: **4-G (Falls Creek)**
Laboratories: **Micro Bac**

Month: **2** (select number) Year: **2016**
Permit No.: **PA0029432** Outfall: **001**
Renewal application due **180 days** prior to expiration.
This permit will expire on: **February 28, 2014**

		Parameter	Flow		Fecal Coliform		pH		TSS		NH3-N		TRC		Dissolved Oxygen		CBOD5		NO2-N + NO3-N		BOD5		TSS		NH3-N						
		Stage	1		1		1		1		1		1		1		1		1		RI		RI		RI						
Week	Day	Date	MGD	Q	CFU/100 ml	Q	S.U.	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q		Q		Q	
1	Sun	1/31/16	0.089																												
	Mon	2/1/16	0.068				7.46						0.0		9.75																
	Tue	2/2/16	0.202																												
	Wed	2/3/16	0.122				7.48		9.5		5.28		0.0		11.29		10.0		6.65		142.0		40.0		8.86						
	Thu	2/4/16	0.081		103.0																										
	Fri	2/5/16	0.048				7.5						0.0		10.51																
	Sat	2/6/16	0.102																												
2	Sun	2/7/16	0.056																												
	Mon	2/8/16	0.063				7.39						0.0		11.29																
	Tue	2/9/16	0.053																												
	Wed	2/10/16	0.058						5.0		5.44						10.0		8.0												
	Thu	2/11/16	0.053		41.0																										
	Fri	2/12/16	0.066																												
	Sat	2/13/16	0.091																												
3	Sun	2/14/16	0.187																												
	Mon	2/15/16	0.346				7.43						0.0		11.94																
	Tue	2/16/16	0.108																												
	Wed	2/17/16	0.065				7.32						0.0		10.76																
	Thu	2/18/16	0.091						11.0		1.72						9.0		3.36		163.0		163.0		14.5						
	Fri	2/19/16	0.052		1670.0		7.69						0.0		13.45																
	Sat	2/20/16	0.050																												
4	Sun	2/21/16	0.042																												
	Mon	2/22/16	0.061				7.05						0.0		10.58																
	Tue	2/23/16	0.431																												
	Wed	2/24/16	0.255				7.25		7.5		2.63		0.0		10.97		3.0		5.8												
	Thu	2/25/16	0.107		5700.0																										
	Fri	2/26/16	0.075				7.22						0.0		11.82																
	Sat	2/27/16	0.070																												
5	Sun	2/28/16	0.073																												
	Mon	2/29/16	0.065				7.22						0.0		10.4																
Statistics for DMR																															
		Daily Minimum (Conc.):			**41**		**7.05**		**5**		**1.72**		**0**		**9.75**		**3**		**3.36**		**142**		**40**		**8.86**						
		Daily Maximum (Conc):			**5700**		**7.69**		**11**		**5.44**		**0**		**13.45**		**10**		**8**		**163**		**163**		**14.5**						
		Max Avg Weekly (Conc.):							**11.0**		**5.44**				**12.05**		**10.0**		**8**		**163**		**163**		**14.5**						
		Avg Monthly (Conc.):							**8.3**		**3.8**		**#NUM!**		**11.16**		**8.0**		**5.95**		**153**		**102**		**11.68**						
		Geometric Mean (Conc.):			**448**																										
		Max Avg Weekly (Load):	**0.149**						**16.0**		**6**				**15**		**10.2**		**12**		**144**		**124**		**11**						
		Avg Monthly (Load):	**0.108**						**9.1**		**3.7**		**#NUM!**		**10**		**7.1**		**6**		**134**		**82**		**10**						
		Total Monthly (Load):	**3.141**						**263.8**		**108.0**				**303**		**204.6**		**185**		**3889**		**2384**		**290**						
		Daily Minimum (Load):	**0.042**						**2.4**		**1**		**#NUM!**		**4**		**4.8**		**3**		**124**		**41**		**9**						
		Daily Maximum (Load):	**0.431**						**16.0**		**6**		**#NUM!**		**34**		**10.2**		**12**		**144**		**124**		**11**						

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

Prepared By: ______________________ License No.: ______________________
Title: ______________________ Date: ______________________

Average Weekly Statistics																												
Week 1 (Conc):							9.5		5.28				10.52		10.0		6.65		142		40		8.86					
Week 2 (Conc):							5.0		5.44				11.29		10.0		8											
Week 3 (Conc):							11.0		1.72				12.05		9.0		3.36		163		163		14.5					
Week 4 (Conc):							7.5		2.63				11.12		3.0		5.8											
Week 5 (Conc):																												
Week 1 (Load):	0.102						9.7		5				7		10.2		7		144		41		9					
Week 2 (Load):	0.063						2.4		3				6		4.8		4											
Week 3 (Load):	0.128						8.3		1				15		6.8		3		124		124		11					
Week 4 (Load):	0.149						16.0		6				12		6.4		12											
Week 5 (Load):																												

3800-FM-BPNPSM0435 3/2012

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SUPPLEMENTAL REPORT
DAILY EFFLUENT MONITORING

Facility Name: **Clarks Summit State Hospital STP** Month: **3** (select number) Year: **2016**
Municipality: **Newton Township** County: **Lackawanna** Permit No.: **PA0029432** Outfall: **001**
Watershed: **4-G (Falls Creek)** Renewal application due **180 days** prior to expiration.
Laboratories: **Micro Bac** This permit will expire on: **February 28, 2014**

Parameter			Flow		Fecal Coliform		pH		TSS		NH3-N		TRC		Dissolved Oxygen		CBOD5		NO2-N + NO3-N		BOD5		TSS		NH3-N						
Stage			1		1		1		1		1		1		1		1		1		RI		RI		RI						
Week	Day	Date	MGD	Q	CFU/100 ml	Q	S.U.	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q		Q		Q	
1	Sun	2/28/16	0.073										0.01																		
	Mon	2/29/16	0.065				7.22						0.01		10.4																
	Tue	3/1/16	0.058										0.01																		
	Wed	3/2/16	0.049				7.48		10.5		3.31		0.01		10.24		11.0		4.86		141.0		164.0		15.8						
	Thu	3/3/16	0.065		6.0								0.01																		
	Fri	3/4/16	0.046				7.43						0.01		11.12																
	Sat	3/5/16	0.054										0.01																		
2	Sun	3/6/16	0.047										0.01																		
	Mon	3/7/16	0.050				7.52						0.01		10.68																
	Tue	3/8/16	0.044										0.01																		
	Wed	3/9/16	0.099				7.3		5.5		3.89		0.01		9.32		9.0		3.29												
	Thu	3/10/16	0.066		4.0								0.01																		
	Fri	3/11/16	0.045				7.32						0.01		9.12																
	Sat	3/12/16	0.060										0.01																		
3	Sun	3/13/16	0.078										0.01																		
	Mon	3/14/16	0.063				7.47						0.01		9.25																
	Tue	3/15/16	0.063										0.01																		
	Wed	3/16/16	0.069				7.35		10.0		4.14		0.01		8.61		8.0		3.36		220.0		168.0		15.3						
	Thu	3/17/16	0.054		39.0								0.01																		
	Fri	3/18/16	0.037				7.66						0.01		9.11																
	Sat	3/19/16	0.042										0.01																		
4	Sun	3/20/16	0.042										0.01																		
	Mon	3/21/16	0.043				7.4						0.01		10.5																
	Tue	3/22/16	0.044										0.01																		
	Wed	3/23/16	0.044				7.56		10.0		4.45		0.01		10.29		10.0		5.99												
	Thu	3/24/16	0.034		5.0								0.01																		
	Fri	3/25/16	0.026				7.48						0.01		8.38																
	Sat	3/26/16	0.038										0.01																		
5	Sun	3/27/16	0.063										0.01																		
	Mon	3/28/16	0.038				7.53						0.01		9.94																
	Tue	3/29/16	0.043										0.01																		
	Wed	3/30/16	0.045				7.37		24.0		2.76		0.01		10.43		11.0		4.57		134.0		135.0		16.9						
	Thu	3/31/16	0.050		260.0								0.01																		
	Fri	4/1/16	0.036				7.61						0.01		7.49																
	Sat	4/2/16	0.037										0.01																		
Statistics for DMR																															
Daily Minimum (Conc.):					**4**		**7.3**		**5.5**		**2.76**		**0.01**		**8.38**		**8**		**3.29**		**134**		**135**		**15.3**						
Daily Maximum (Conc):					**260**		**7.66**		**24**		**4.45**		**0.01**		**11.12**		**11**		**5.99**		**220**		**168**		**16.9**						
Max Avg Weekly (Conc.):									**24.0**		**4.45**		**0.01**		**10.59**		**11.0**		**5.99**		**220**		**168**		**16.9**						
Avg Monthly (Conc.):									**12.0**		**3.7**		**0.01**		**9.77**		**9.8**		**4.41**		**165**		**156**		**16**						
Geometric Mean (Conc.):					**16**																										
Max Avg Weekly (Load):			**0.058735**						**9.0**		**3**		**0.005**		**5**		**7.4**		**3**		**127**		**97**		**9**						
Avg Monthly (Load):			**0.051548**						**5.4**		**1.9**		**0.004**		**4**		**4.9**		**2**		**78**		**71**		**7**						
Total Monthly (Load):			**1.598001**						**168.7**		**59.5**		**0.1**		**126**		**150.5**		**65**		**2421**		**2212**		**223**						
Daily Minimum (Load):			**0.025797**						**3.7**		**1**		**0.002**		**2**		**3.7**		**2**		**50**		**51**		**6**						
Daily Maximum (Load):			**0.098948**						**9.0**		**3**		**0.008**		**8**		**7.4**		**3**		**127**		**97**		**9**						

I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

Prepared By: ______________________ License No.: ______________________
Title: ______________________ Date: ______________________

Average Weekly Statistics																													
Week 1 (Conc):							10.5		3.31		0.01		10.59		11.0		4.86		141		164		15.8						
Week 2 (Conc):							5.5		3.89		0.01		9.71		9.0		3.29												
Week 3 (Conc):							10.0		4.14		0.01		8.99		8.0		3.36		220		168		15.3						
Week 4 (Conc):							10.0		4.45		0.01		9.72		10.0		5.99												
Week 5 (Conc):							24.0		2.76		0.01		9.29		11.0		4.57		134		135		16.9						
Week 1 (Load):	0.058486						4.3		1		0.005		5		4.5		2		57		67		6						
Week 2 (Load):	0.058735						4.5		3		0.005		5		7.4		3												
Week 3 (Load):	0.05803						5.8		2		0.005		4		4.6		2		127		97		9						
Week 4 (Load):	0.038824						3.7		2		0.003		3		3.7		2												
Week 5 (Load):	0.044379						9.0		1		0.004		3		4.1		2		50		51		6						

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

3800-FM-BPNPSM0435 3/2012

SUPPLEMENTAL REPORT
DAILY EFFLUENT MONITORING

Facility Name: **DHS Clarks Summit State Hospital STP**
Municipality: **Newton Township** County: **Lackawanna**
Watershed: **4-G (Falls Creek)**
Laboratories: **Micro Bac**

Month: **4** (select number) Year: **2016**
Permit No.: **PA0029432** Outfall: **001**
Renewal application due **180 days** prior to expiration.
This permit will expire on: **February 28, 2014**

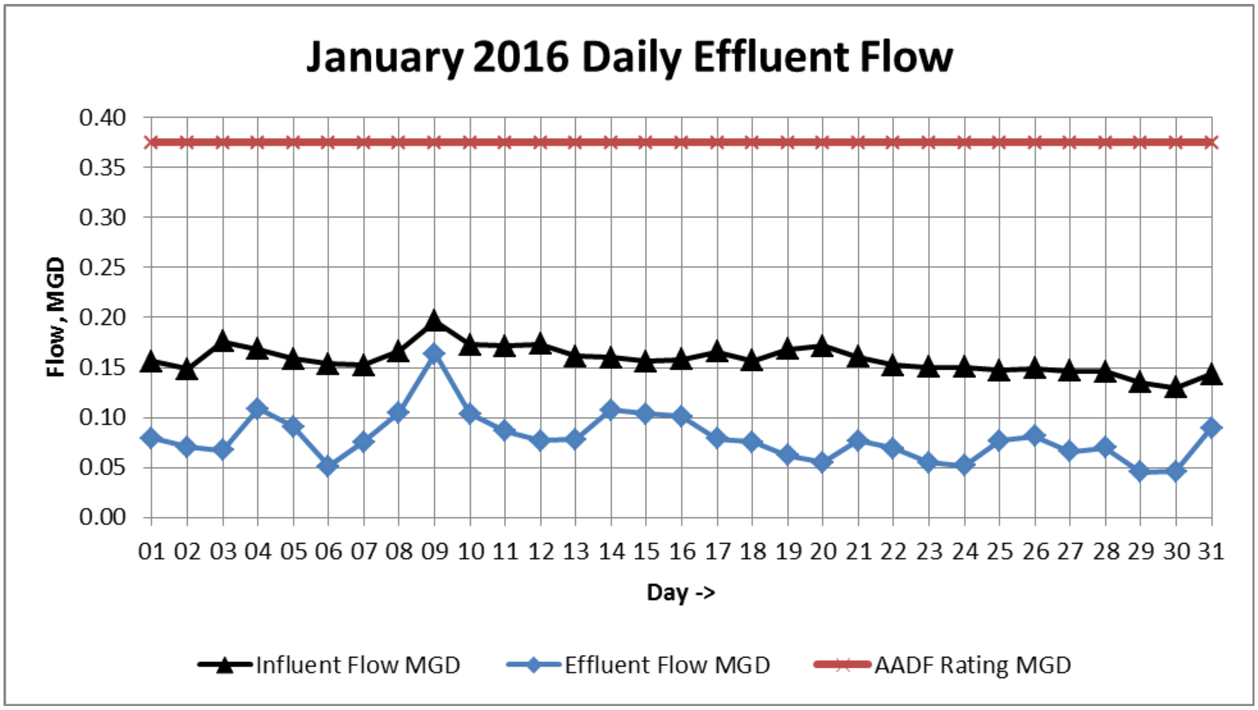
	Parameter		Flow		Fecal Coliform		pH		TSS		NH3-N		TRC		Dissolved Oxygen		CBOD5		NO2-N + NO3-N		BOD5		TSS		NH3-N						
	Stage		1		1		1		1		1		1		1		1		1		RI		RI		RI						
Week	Day	Date	MGD	Q	CFU/100 ml	Q	S.U.	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q	mg/L	Q		Q		Q	
	Fri	4/1/16	0.035				7.61								7.49																
	Sat	4/2/16	0.036																												
1	Sun	4/3/16	0.056																												
	Mon	4/4/16	0.036				7.73								10.43																
	Tue	4/5/16	0.046																												
	Wed	4/6/16	0.241				7.88		21.0		2.79				11.07		15.0		6.23												
	Thu	4/7/16	0.097																												
	Fri	4/8/16	0.072	<	2.0		7.69								10.6																
	Sat	4/9/16	0.051																												
2	Sun	4/10/16	0.077																												
	Mon	4/11/16	0.061				7.61								10.07																
	Tue	4/12/16	0.051																												
	Wed	4/13/16	0.049				7.68		7.0		2.71				9.8		11.0		4.46		235.0		144.0		20.1						
	Thu	4/14/16	0.050																												
	Fri	4/15/16	0.037	<	1.0		7.52								9.4																
	Sat	4/16/16	0.039																												
3	Sun	4/17/16	0.037																												
	Mon	4/18/16	0.043				7.82								8.63																
	Tue	4/19/16	0.039																												
	Wed	4/20/16	0.040				7.85		7.0		2.68				9.58		6.0		5.16												
	Thu	4/21/16	0.041		1.0																										
	Fri	4/22/16	0.030				7.89								9.01																
	Sat	4/23/16	0.023																												
4	Sun	4/24/16	0.041																												
	Mon	4/25/16	0.080				7.87								9.41																
	Tue	4/26/16	0.036																												
	Wed	4/27/16	0.047				7.84		5.0		1.37				9.03		3.0		5.74		780.0		150.0		25.4						
	Thu	4/28/16	0.050	<	1.0																										
	Fri	4/29/16	0.047				7.72								9.73																
	Sat	4/30/16	0.071																												
5																															
Statistics for DMR																															
Daily Minimum (Conc.):				<	1		7.52		5		1.37				7.49		3		4.46		235		144		20.1						
Daily Maximum (Conc):				<	2		7.89		21		2.79				11.07		15		6.23		780		150		25.4						
Max Avg Weekly (Conc.):									21.0		2.79				10.7		15.0		6.23		780		150		25.4						
Avg Monthly (Conc.):									10.0		2.4				9.56		8.8		5.4		508		147		22.8						
Geometric Mean (Conc.):				<	1																										
Max Avg Weekly (Load):			0.086						42.2		6				11		30.1		13		306		59		10						
Avg Monthly (Load):			0.055						12.3		2.0				5		9.5		5		201		59		9						
Total Monthly (Load):			1.659						370.2		61.1				157		283.7		137		6027		1765		273						
Daily Minimum (Load):			0.023						2.0		0.5				2		1.2		2		96		59		8						
Daily Maximum (Load):			0.241						42.2		6				22		30.1		13		306		59		10						

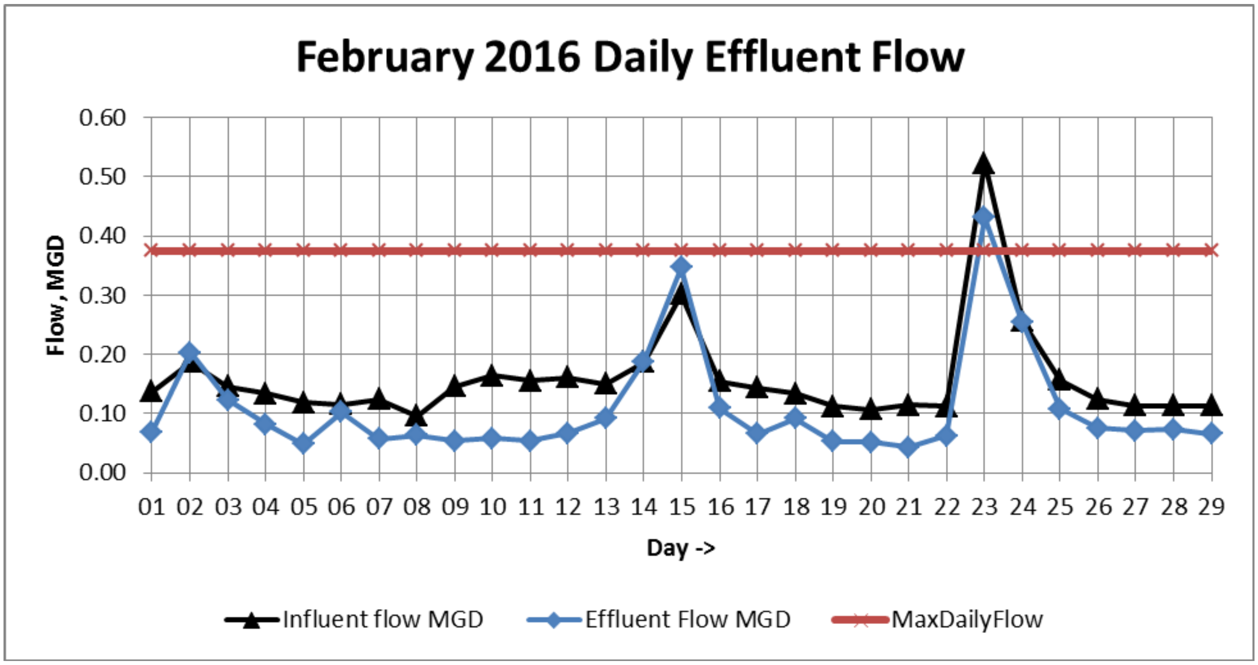
I certify under penalty of law that this document was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. See 18 Pa. C.S. § 4904 (relating to unsworn falsification).

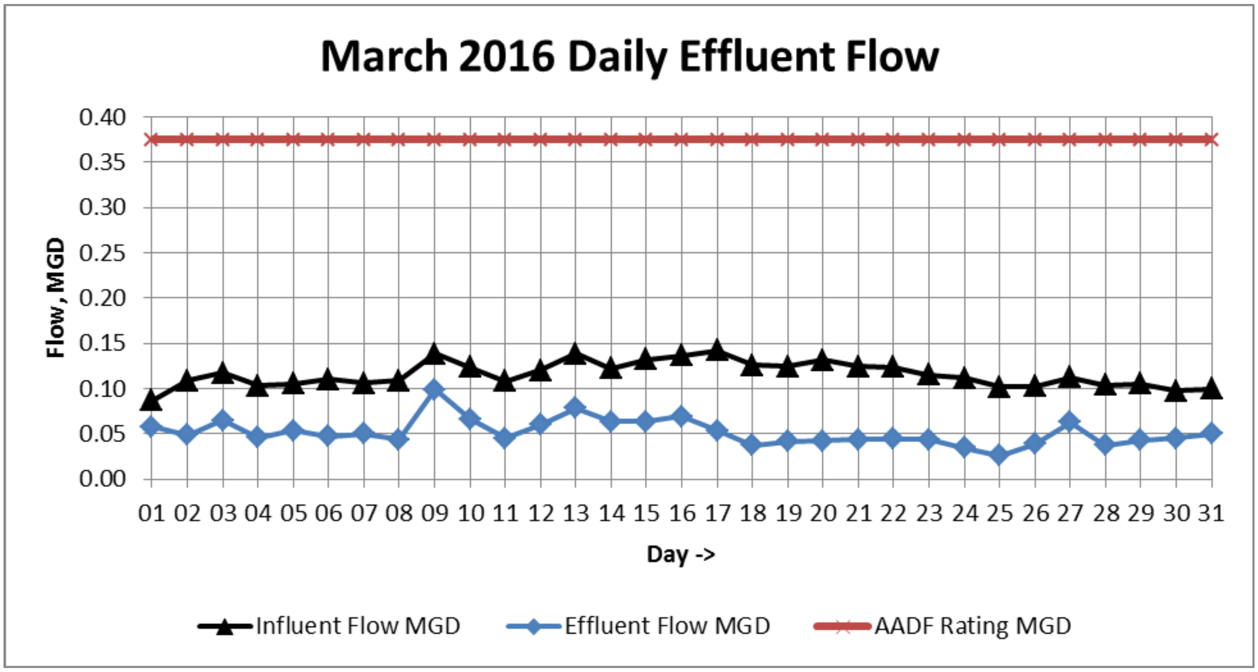
Prepared By: ______________________ License No.: ______________________
Title: ______________________ Date: ______________________

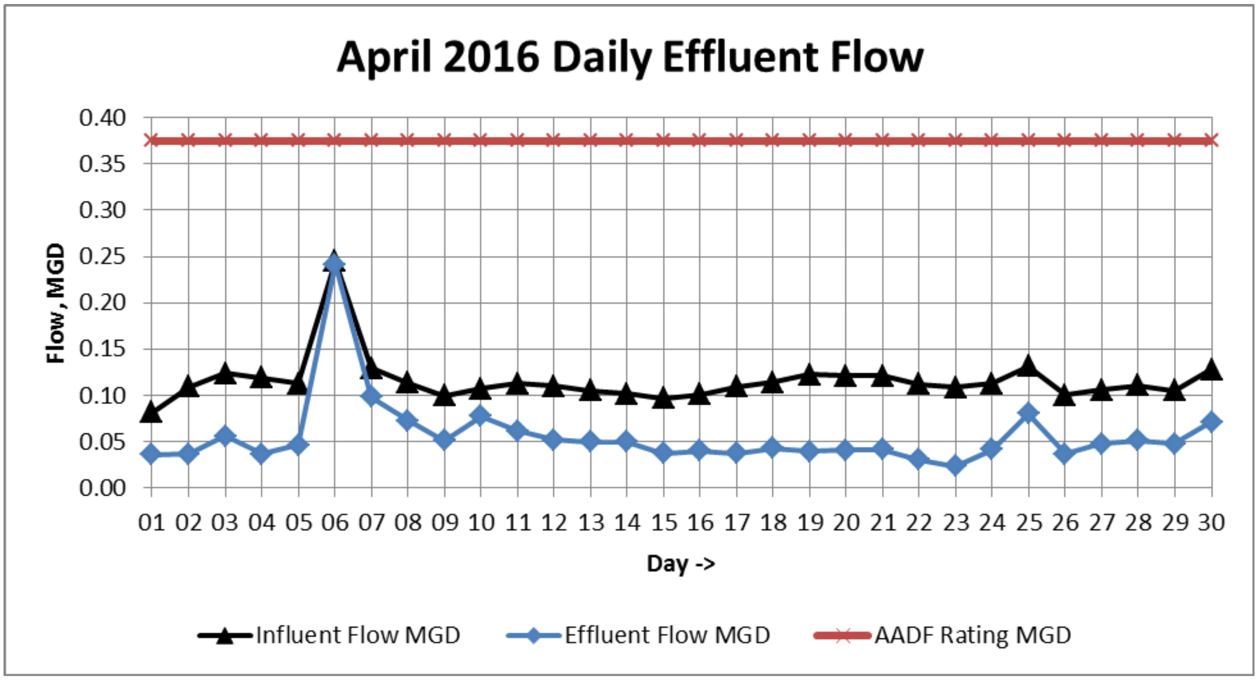
Average Weekly Statistics																													
Week 1 (Conc):		<					21.0		2.79				10.7		15.0		6.23												
Week 2 (Conc):		<					7.0		2.71				9.76		11.0		4.46		235		144		20.1						
Week 3 (Conc):							7.0		2.68				9.07		6.0		5.16												
Week 4 (Conc):		<					5.0		1.37				9.39		3.0		5.74		780		150		25.4						
Week 5 (Conc):																													
Week 1 (Load):	0.086	<					42.2		6				11		30.1		13												
Week 2 (Load):	0.052	<					2.9		1				4		4.5		2		96		59		8						
Week 3 (Load):	0.036						2.3		0.9				3		2.0		2												
Week 4 (Load):	0.053	<					2.0		0.5				5		1.2		2		306		59		10						
Week 5 (Load):																													

Appendix 2: 2016 Inflow / Effluent Comparisons









In the graph for February 2016 flows, a peak flow occurred on or about February 23, when there was heavy rainfall event of 1.6 in. and air temperature as high as 65 deg.-F. This corresponds to a peak inflow of 0.523 MGD and an effluent of 0.431 MGD. At high flows, the amount of error between influent and effluent flow metering decreases considerably. This may be an artifact of the calibration method.