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memorandum

Date: June 1, 2016

To: Brian Vick, Township Manager

cc: Jacob Rushlow, PE, OHM
Tom High, IA

From: Sherri Wright, PE, OHM

Re: Brighton Township – Additional Flow at WWTP
Monthly Operating Data Analysis

Data from December 1, 2015 through April 30, 2016 was provided by Infrastructure Alternatives (IA) for review by OHM in regards to the unexplained additional flow increase witnessed at the wastewater treatment plant.

The data was reviewed for average flow at the plant, as well as loadings and concentrations for BOD5. TSS, NH3-N and Total Phosphorus were also plotted in regards to loadings. Additionally, OHM reviewed the average concentrations and loadings for each wastewater characteristic prior to and after the January 9th, which is the date that flows began to increase.

A summary of those averages are shown in the below table.

	BOD5		Total Solids		Phosphorus		NH3-N	
	mg/l	ppd	mg/l	ppd	mg/l	ppd	mg/l	ppd
12/1/15 – 1/9/16	191	458	160	377	5.17	12.2	21	49.7
1/10/16 – 4/30/16	208	721	173	603	4.54	15.8	21.5	74.5

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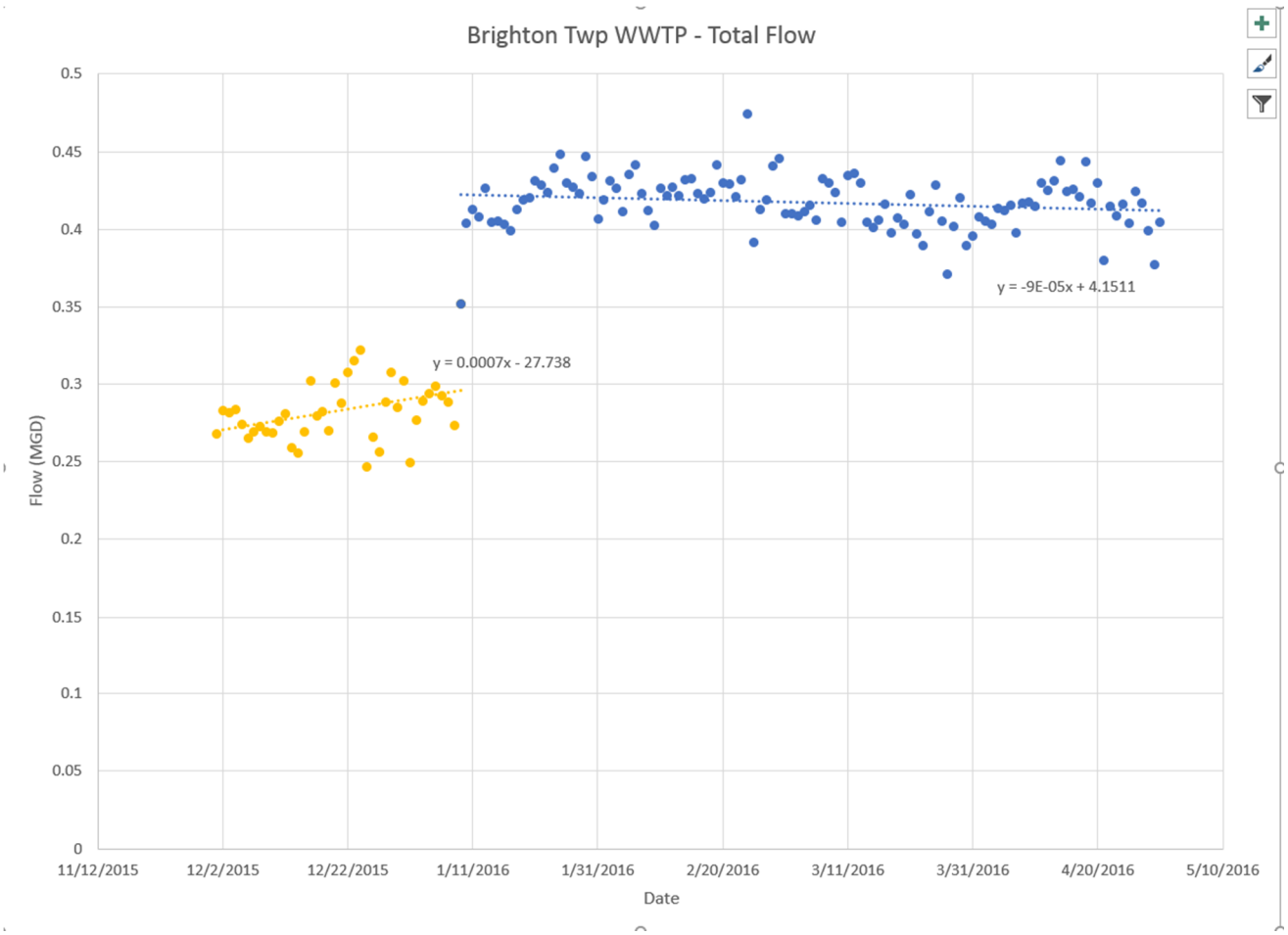
Flow Data – On or around January 9, 2016 metered flow at the WWTP increased from approximately 282,000 gallons per day (gpd) to 420,000 gpd, which represents an increase of 138,000 gpd (95 gallons per minute) or approximately 49%.

A plot of the average daily flow is shown below.



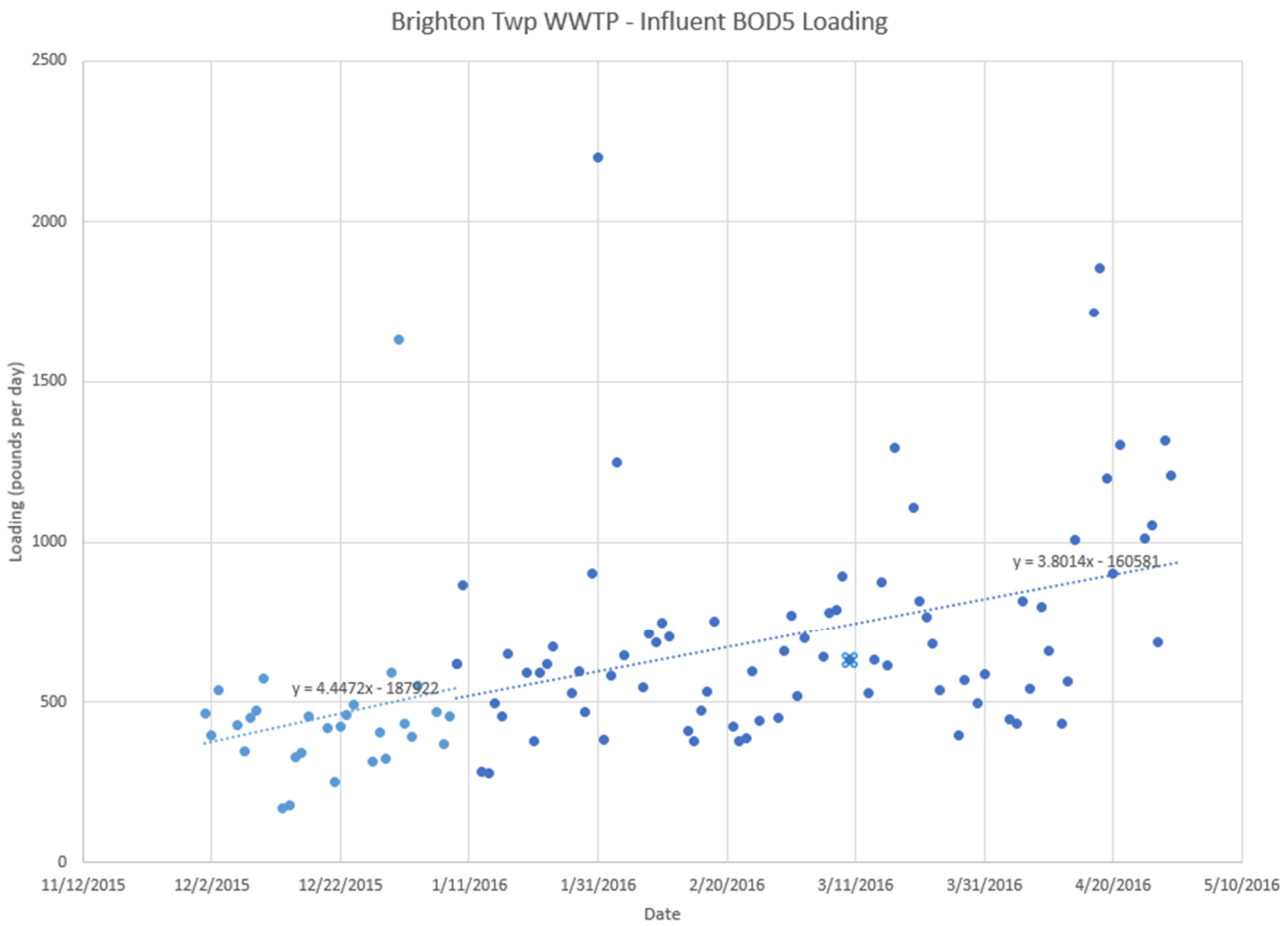
Several options were explored that could contribute to the additional flow. The existing parshall flume at the WWTP had its yearly recalibration. The date of this service was February 4, 2016 and was confirmed with IA and the service provider, so meter recalibration is not likely the cause. Another potential source would be additional service connections to the system. Per the Township, there are no known additional connections in the Township that were made on or around that time that would provide such an increase in flow.

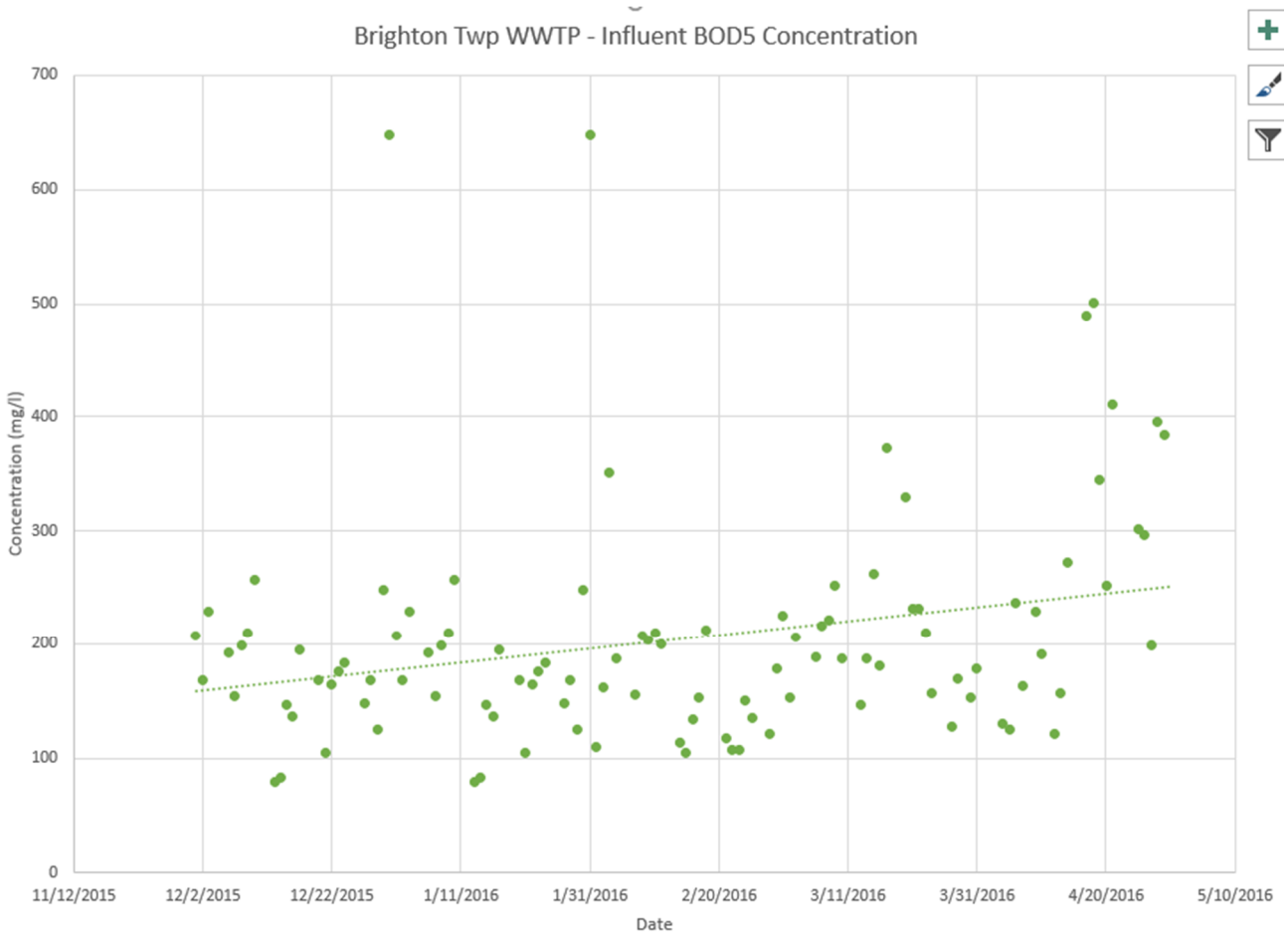
Since no sources of error can initially be found with the flow data, the loadings to the plant were examined.

BOD5 – BOD5 was plotted for both the loading to the WWTP and the concentration. BOD5 loading at the plant increased over the time frame from 458 pounds per day (ppd) to 721 ppd after January 9, 2016. Additionally, BOD5 concentrations were reviewed and prior to January 9, 2016 the average concentration was 191 mg/l, while after it was 208 mg/l.

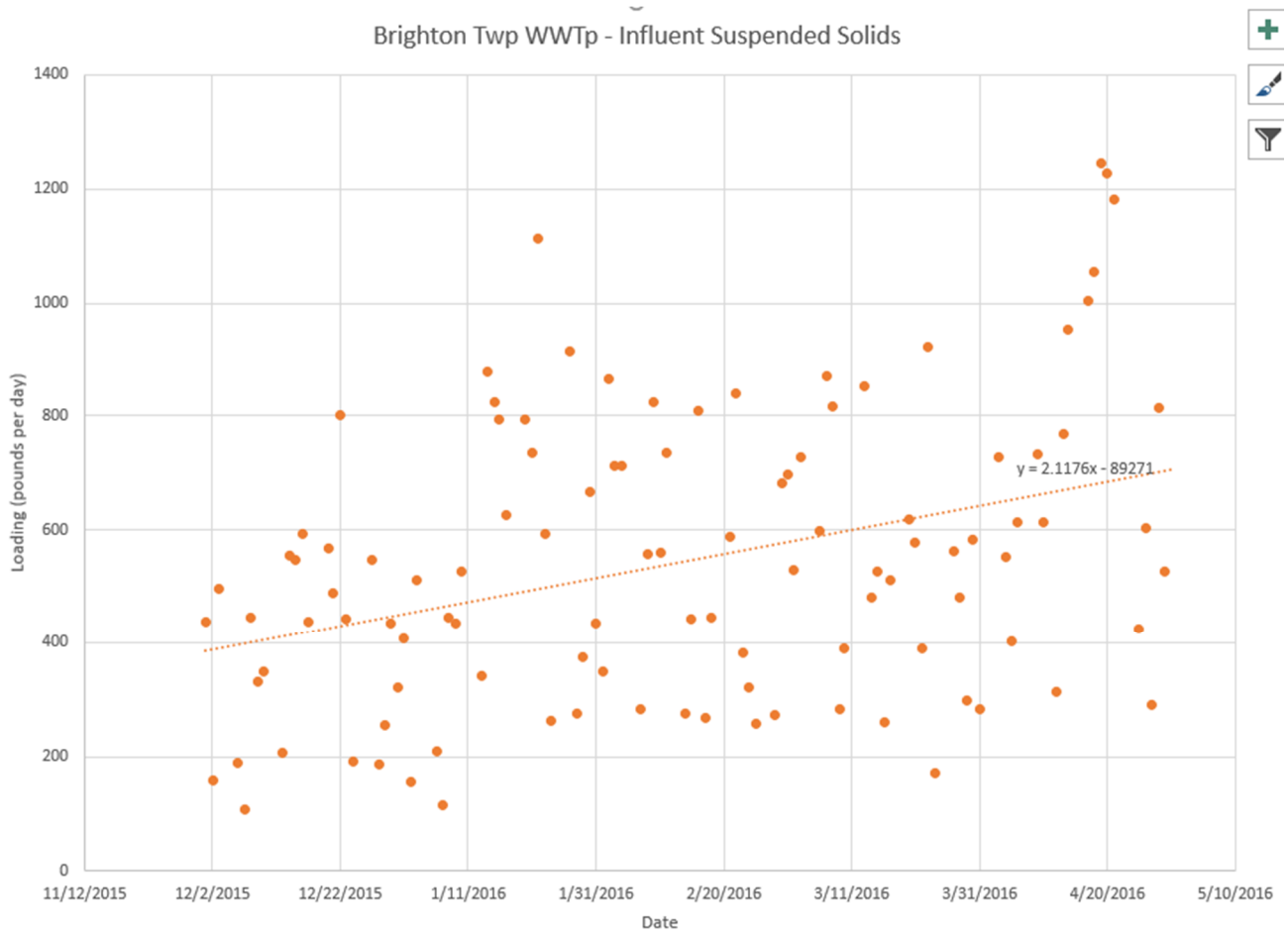
The data indicates that inflow and infiltration is not the major issue since loading rose to the WWTP, while concentration remained the same. If the additional average flow and concentration to the plant are used to calculate the loading (0.138 mgd x 208 mg/l x 8.34 = 240 ppd) the anticipated additional load to the plant

would be an average 240 pounds per day. If this is added to the 458 ppd that the WWTP experienced prior to January 9, 2016, 698 ppd would be calculated. This is fairly close to what the WWTP is experiencing (721 ppd) and supports that there not only is there additional flow coming to the plant but the additional flow is sanitary sewage in nature. It would be expected if inflow/infiltration (I/I) of clean ground water were the additional flow source that the influent concentrations would be less and diluted; which is not what the data indicates.




Brighton Twp WWTP - Influent BOD5 Concentration
Concentration (mg/l)
700
600
500
400
300
200
100
0
11/12/2015
12/2/2015
12/22/2015
1/11/2016
1/31/2016
2/20/2016
3/11/2016
3/31/2016
4/20/2016
5/10/2016
Date

Suspended Solids- SS loading at the WWTP has steadily increased over the time frame. Using the same calculation that was done for BOD5 for the time frame after the flow increase, the additional load at the plant is (0.138 mgd x 173 mg/l x 8.34 = 199 ppd). Adding 299 ppd to the average load prior to January 9th provides a loading of 576 ppd pounds per day. This calculated number is comparable to the experienced average loading of 603 ppd.

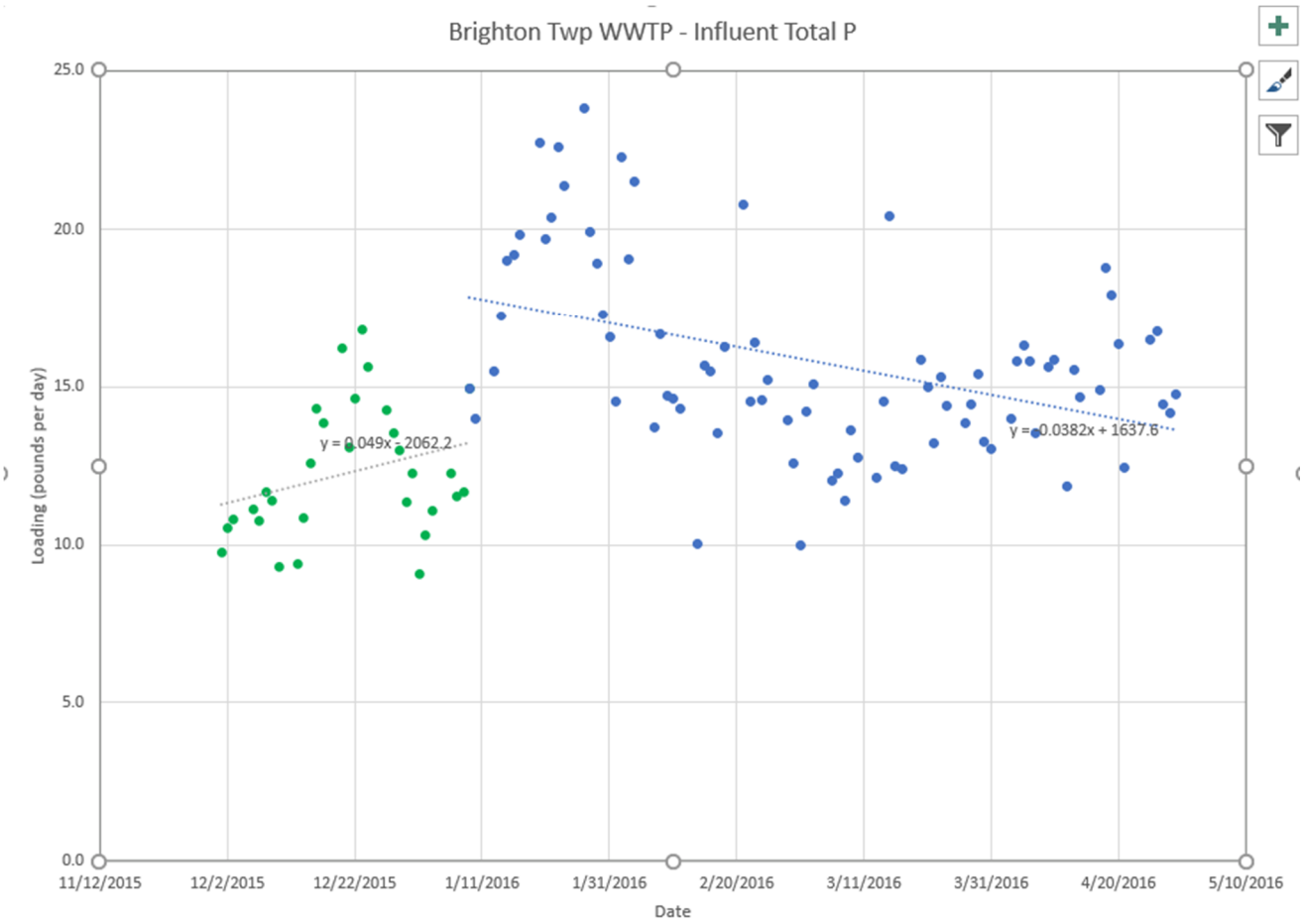


Total Phosphorus –There was a spike in the TP loading shortly after the flow increased and then it has settled down but remained elevated over what was seen in December.

Initial loading from 12/1/15 to 1/9/16 was 12.2 ppd (average concentration 5.17 mg/l)

(0.138 mgd x 4.54 mg/l x 8.34 = 4.54 ppd) + 12.2 ppd = 17.4 ppd (compared to 15.8 ppd observed at WWTP)

This suggests that there is additional phosphorus being discharged at the plant; just not as concentrated as it was previously.

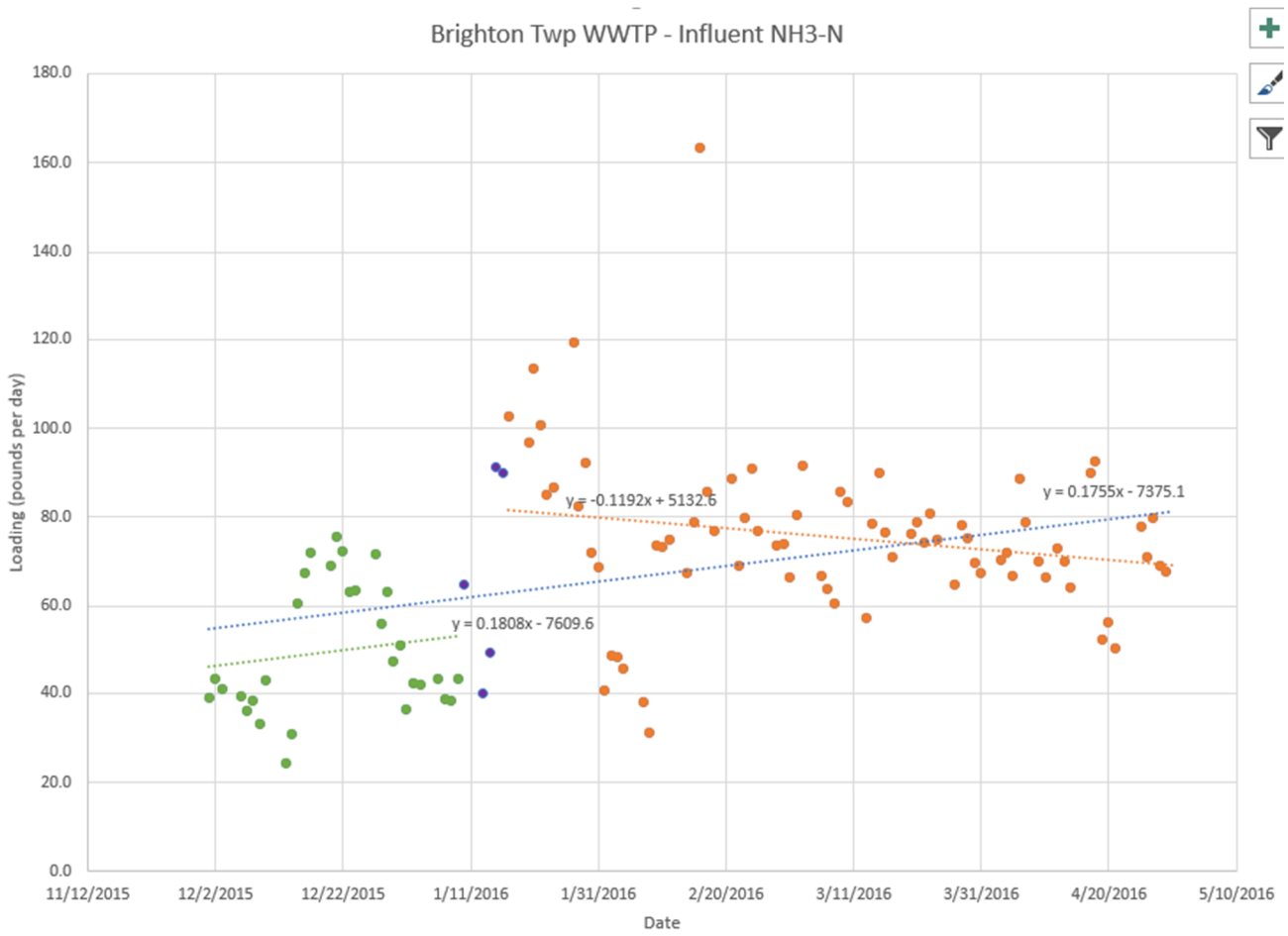


NH3-N – The trending on ammonia is similar to the TP. Not as defined as the TP, but the pattern is similar.

Initial loading from 12/1/15 to 1/9/16 was 49.7 ppd (average concentration 21.0 mg/l)

(0.138 mgd x 21.5 mg/l x 8.34 = 24.7 ppd) + 49.7 ppd = 74.4 ppd. (compared to 74.5 ppd observed at WWTP)

This suggests that there is additional nitrogen in the form of ammonia is being discharged at the plant and is consistent with effluent typically experienced at the treatment facility.



Summary

It appears from both the flow data and from the wastewater nutrient data (BOD5, Total Suspended Solids, Total Phosphorus and Nitrogen) that the plant is receiving an additional source(s) of sanitary flow. Our analysis over the time frame of December 1st, 2015 to April 30th, 2016, indicates that the nutrient's concentration has remained fundamentally constant; while the loadings at the WWTP have increased in proportion to the additional flow. This would not be the case if I/I were the contributing factor. If I/I were the main factor, loadings at the plant would be expected to remain constant while concentrations decreased since I/I typically has little nutrient value.