INFORMATION REQUESTED DURING PUBLIC MEETING ON NOVEMBER 9, 2016

Background and Purpose

A public meeting was held on November 9, 2016 for the City of Allentown (City) to present information on the two available options to enable peak flows greater than 87 million gallons per day (mgd) to be managed at the City's Kline's Island Wastewater Treatment Plant (KIWWTP) without the continued use of Bypass Outfall 003. Elimination of Bypass Outfall 003 is required by the Administrative Order (AO). The two available options to eliminate the use of Bypass Outfall 003 are blending and flow equalization.

The purpose of this document is to provide additional information requested during the public meeting on the water quality benefits between blending and flow equalization.

Frequency of Use

Blending or flow equalization will be utilized, on average, approximately once per year, i.e., only during severe storm events of sufficient magnitude to cause the flow to the KIWWTP to exceed 87 mgd. During severe storm events of this magnitude, the flow and water quality of the Lehigh River are significantly different than during a typical dry day, as depicted in the two photographs below.

The photograph on the left was taken on November 14, 2016 and shows the Lehigh River during a dry day low flow condition representative of the conditions under which the Pennsylvania Department of Environmental Protection (DEP) establishes permit requirements to protect water quality. The photograph on the right was taken at the same location during Hurricane Irene and is representative of the river conditions that will exist when either blending or flow equalization occurs.

Options and Functional Comparison

As presented during the public meeting, the KIWWTP's ability to manage peak flows resulting from severe storm events is currently limited to 87 mgd, and peak flows greater than 87 mgd are discharged untreated through Bypass Outfall 003. There are two options available to eliminate the use of Bypass Outfall 003: flow equalization or blending. Both options would be sized to enable the KIWWTP to manage a peak hourly flow of 120 mgd and a total volume of 4 million gallons that would otherwise flow untreated through Bypass Outfall 003.

For the flow equalization option, all influent flow greater than 87 mgd would be temporarily diverted to a 4 million gallon storage tank that would be constructed at the KIWWTP site. During the period in which flow greater than 87 mgd is diverted to the storage tank, 87 mgd of fully treated flow would be discharged to the Lehigh River. Stored flow would be returned to the KIWWTP for treatment after the peak flow subsides.

For the blending option, all influent flow would receive preliminary, primary and disinfection treatment. All flow up to 87 mgd would also receive biological treatment. The portion of influent flow that exceeds 87 mgd would be temporarily diverted around the biological treatment process prior to disinfection. Additional preliminary and primary treatment facilities would be constructed to treat this additional flow. The existing chlorination system has sufficient capacity to disinfect this additional flow.

DEP Permit Requirements

As presented in the public meeting, the DEP establishes permit requirements to protect water quality. These requirements are based on low flow conditions in the receiving stream, i.e.; when there is limited mixing available. The KIWWTP's permit requirements established by DEP specifically to protect water quality of the Lehigh River are summarized in the following table.

Parameter	Monthly Average	Weekly Maximum	Instantaneous Maximum
Carbonaceous Biochemical Oxygen Demand (CBOD)	20 mg/L	30 mg/L	40 mg/L
Total Suspended Solids (TSS)	30 mg/L	45 mg/L	60 mg/L
Ammonia Nitrogen (NH3) - Summer	5 mg/L	n/a	10 mg/L
NH3 – Winter	15 mg/L	n/a	30 mg/L
Fecal Coliform (FC) - Summer	200 cfu/100 mL	n/a	1,000 cfu/100 mL
FC - Winter	2,000 cfu/100 mL	n/a	10,000 cfu/100 mL

Both flow equalization and blending will enable compliance with all permit requirements presented in the above table. However, due to the temporary diversion of 4 million gallons of peak wet weather flow around biological treatment in the blending option, there is a nominal difference between blending and flow equalization in the effluent concentrations of CBOD, TSS and NH3 during the one day per year on average in which the influent flow exceeds 87 mgd (and the Lehigh River is raging as shown in the photograph on the preceding page). There is no difference in the FC effluent quality of the two options because under both options all flow will be chlorinated for disinfection.

As requested during the public meeting, the specific differences in the effluent quality between the flow equalization and blending options are described below.

Effluent Quality Comparison

The following table presents the specific differences in the KIWWTP's CBOD, TSS and NH3 effluent concentrations between the options of flow equalization and blending during the one day per year on average that blending or flow equalization would occur. For ease of comparison, the monthly average permit requirements are also presented.

Option	CBOD Summer	CBOD Winter	TSS Summer	TSS Winter	NH3 Summer	NH3 Winter
Flow Equalization	5 mg/L	7 mg/L	9 mg/L	8 mg/L	2 mg/L	6 mg/L
Blending	8.8 mg/L	10.9 mg/L	14.5 mg/L	12.4 mg/L	2.3 mg/L	6.3 mg/L
Permit Requirement	20 mg/L	30 mg/L	30 mg/L	30 mg/L	5 mg/L	15 mg/L

As shown in the above table, during the one day per year on average during which either blending or flow equalization would be utilized, the CBOD, TSS and NH3 effluent concentrations for both options are significantly below the monthly average permit requirements. Therefore, both options would enable a high level of water quality protection.

As also shown in the above table, the CBOD, TSS and NH3 concentrations resulting from blending are about 4 mg/L, 5 mg/L and 0.3 mg/L greater, respectively, than from flow equalization. To analyze the impact of these higher effluent concentrations on the water quality of the Lehigh River, the difference in the in-stream concentration of each parameter resulting from blending versus flow equalization was calculated under the actual conditions during which the Lehigh River would receive KIWWTP effluent from blending or flow equalization, i.e. during a severe storm event.

During severe storm events of sufficient magnitude to cause the KIWWTP's influent flow to exceed 87 mgd, the Lehigh River flow ranges from 5,000 cubic feet per second (cfs) to in excess of 10,000 cfs. For a conservative analysis, 5,000 cfs is utilized, which is equivalent to 3,231 mgd. During a day of blending in this context, a total volume of 91 million gallons of flow would be discharged to the Lehigh River at a CBOD concentration approximately 4 mg/L greater than the 87 million gallons discharged from the flow equalization option. With CBOD concentrations of 5 mg/L under the flow equalization scenario, and 8.8 mg/L in the blending scenario, the resulting difference in the in-stream CBOD concentration between the two options is 0.005 mg/L. Measuring the in-stream impact (total impact to the Lehigh River based on flow conditions and effluent quality) is important because the basis for the permit limits is the impact to the receiving body of water. Also important is to note that the laboratory detection limit for CBOD is 2 mg/L. This means that the water quality difference between blending and flow equalization with respect to CBOD concentration in the Lehigh River – 0.005 mg/L – is not measurable.

Similarly, the resulting differences in the in-stream TSS and NH3 concentrations between the two options are below the detection limits for the TSS and NH3 tests, and are also not measureable.

Conclusion

There are no measureable differences in the Lehigh River concentrations of CBOD, TSS and NH3 resulting from blending versus flow equalization. Therefore, there are no measureable water quality benefits of flow equalization versus blending. Accordingly, there are no benefits that justify the additional cost of flow equalization versus blending.