

**Project Name** | Sand Lake Iron Enhanced Sand Filter

**Date** | 11/21/2019

**To** | Mike Isensee, District Administrator

**Cc** |

**From** | Carl Almer & Mike Majeski

**Regarding** | 2019 IESF Performance Summary

## Background

The following memo summarizes the results of the Sand Lake Iron Enhanced Sand Filter (IESF) for the 2019 monitoring season. The information provided in this memo is intended to provide an indication of system performance during the third year of operation and provides a basis for easement compensation to the underlying landowner of the Sand Lake IESF.

## Results

Monitoring of the Sand Lake IESF began on March 25, 2019. A logger was installed inside the outlet manhole structure to calculate discharge out of the IESF. The IESF treated runoff for much of the season, with the exception of several weeks in August and September when stage in the ditch was below the overflow elevation to the filter (as can be seen in Figure 1 where stage in the outlet structure is below the outlet overflow elevation).

Table 1 summarizes the performance of the IESF based on 2019 flow monitoring and average water quality concentrations of total phosphorus and ortho phosphorus as measured in 2018. Water quality samples were not collected in 2019 in order to minimize expenses and afford the opportunity to monitor other District BMPs. Also note that the stop logs within the Agridrain ditch-diversion structure were removed for most of the season to prevent failure of the earthen berm that controls water flow to the IESF system. This was precautionary in nature and given high rainfall during the operating season this action has little consequence on the overall amount of watershed runoff treated.

**Table 1. Sand Lake IESF Total Phosphorus Performance Summary, 2019**

Total IESF Discharge (CF)	TP Load to IESF (Lbs)	TP Load out of IESF (Lbs)	Total TP Removed (Lbs)	% TP Removal
4,183,480	71.5	11.2	60.3	84

## Discussion

Year 3 operation of the Sand Lake IESF performed as expected throughout most of the monitoring season, except for issues with the Agridrain structure that resulted in removal of the weir boards to prevent damage to the earthen berm. The integrity of the earthen berm is critical to allow ditch flow to enter the IESF system. Table 2 summarizes the IESF performance from 2017-2019. An unquantified volume of water bypassed the IESF in 2019 as a result of removal of the weir boards; however, the data collected in the outlet manhole indicate significant removal of phosphorus was achieved by the IESF compared to previous years.

**Table 2. Annual IESF Performance Comparison, 2017-2019**

<b>Year</b>	<b>Total Watershed Discharge (CF)</b>	<b>Total IESF Discharge (CF)</b>	<b>Watershed Average TP Concentration (mg/L)</b>	<b>Watershed TP Load (Lbs)</b>	<b>Total IESF TP Removed (Lbs)</b>	<b>% TP Removal (Filter)</b>	<b>% TP Removal (Watershed)</b>
2017	3,769,371	1,241,862	0.515	107.7	36.3	92	34
2018	3,374,784	2,571,264	0.274	43.4	25.3	78	58
2019	N/A	4,183,480	N/A	N/A	60.3	84	N/A

Although not measured in 2019, approximately 25 percent of the total watershed TP load in 2018 bypassed the IESF due to high flow rates in the ditch that exceeded the flow capacity of the IESF system. If flow rates in the ditch upstream of the IESF could be attenuated such that peak flows are reduced from 5 cfs to 1 cfs, a significant increase in the overall treatment of the watershed load would be realized within the IESF. Attenuation of peak flows has been on the District’s radar and renewed landowner outreach efforts are recommended to pursue control structures at the two immediate upstream road crossings (197<sup>th</sup> St. N and Ostrum Ave. N) to reduce peak flows through the ditch system.

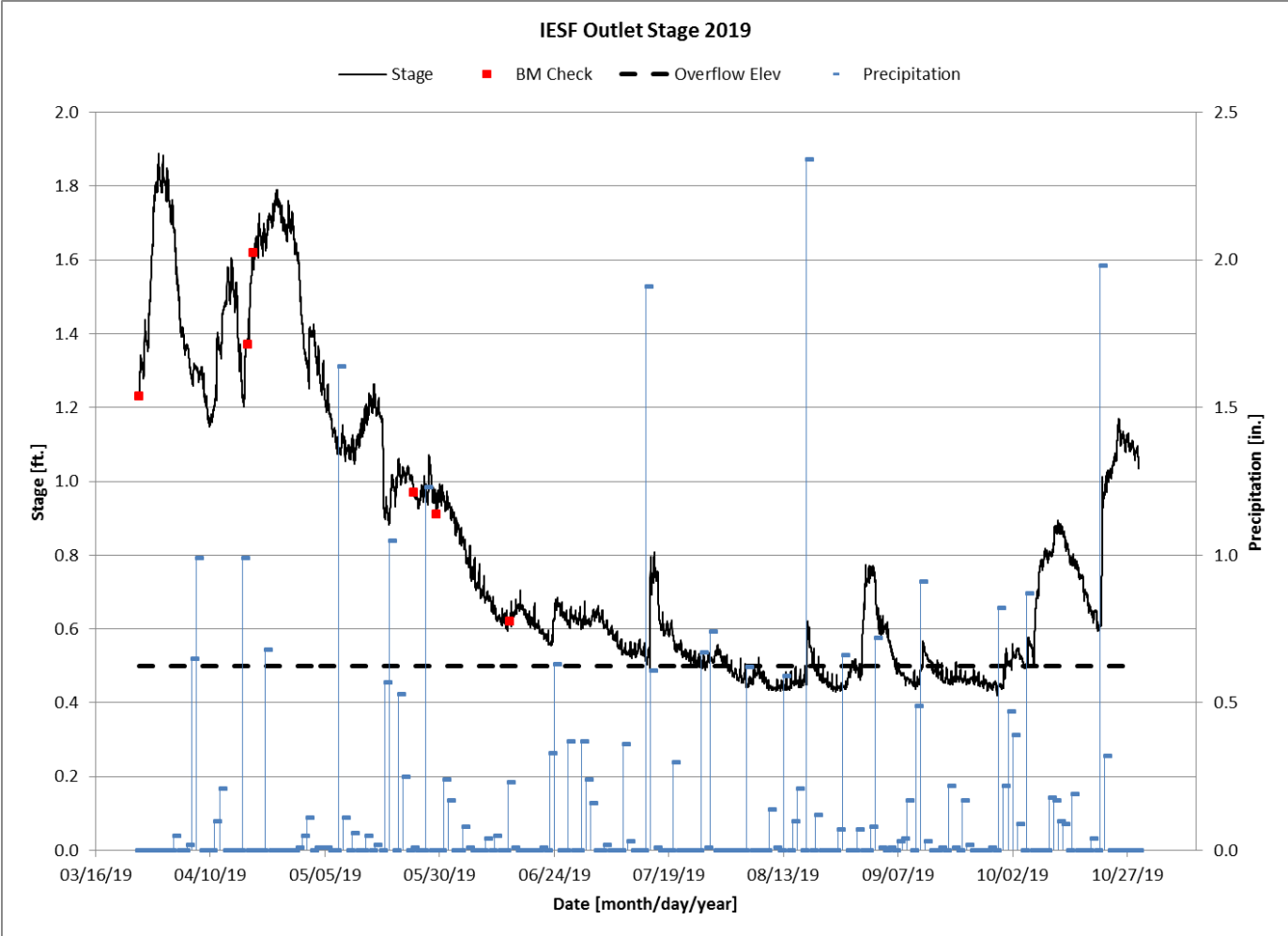


Figure 1. Sand Lake IESF outlet stage, 2019