Foth | Envirocon Joint Venture

Memorandum

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November 27, 2017

TO: Scott Hansen

CC: Jamie Dunn, Eric Ealy, Alan Buell, Denis Roznowski, Steve Garbaciak, Ken Aukerman, Kris Gamble, Scott Inman, Jim Burton, Tom Perry, Pat Carr

FR: Brian Bell, Andrea Martin

RE: Phase 2 Odor/Emission Control System Status Report #11
Ashland/NSP Lakefront Site

This report provides the performance evaluation of the Odor/Emission Control System (OECS) installed in the sediment processing tent supporting Phase 2 Wet Dredge activities. Data through the following dates are included:

Field Measured Data: November 7, 2017	Laboratory Measured Data: October 25, 2017

Monitoring the performance of the seven modules comprising the OECS was conducted by Foth Infrastructure & Environment/Envirocon Joint Venture (FE JV) personnel. Design and initial monitoring details and requirements are presented in the *Final (100%) Design for Phase 2 Wet Dredge* (FE JV, 2017a). On September 26, 2017, the FE JV received verbal confirmation that the U.S. Environmental Protection Agency had accepted recommendations outlined in Technical Memorandum #17-03 (FE JV, 2017b). Sampling in accordance with these recommendations commenced with the SUMMA canister sampling event on September 27, 2017, therefore, this status report provides data collected under the new sampling approach.

The primary goal of the OECS performance evaluation is to identify when the granular activated carbon (GAC) in the system adsorption beds should be replaced. Secondarily, the evaluation compares OECS emissions to Wisconsin Administrative Code (Wis. Admin. Code) NR 445, Control of Hazardous Air Pollutants. Both goals will be maintained under the new SUMMA canister sampling protocol. Information provided in the attachments addresses both goals. This report is structured in the following manner:

Attachment 1 OECS Performance Evaluation:

Data are evaluated as it becomes available. Field data for each module include photoionization detector (PID) measurements of total volatile organic compounds (TVOC), air flow, and other operational parameters. Data are made available daily. Approximately weekly, SUMMA canister sampling is conducted and analyzed by TestAmerica. The analytical results are made available in approximately 5 days. This attachment provides a series of trend graphs documenting module performance of TVOC reduction.

Attachment 2 Wis. Admin. Code NR 445 Comparison:

Emissions of benzene, toluene, ethylbenzene, xylene, and naphthalene are tabulated and compared to NR 445 compliance limits. Benzene is presented graphically because this constituent has the lowest annual compliance limits of the five parameters and therefore is the most sensitive to increasing emissions.

If you have any questions regarding this OECS status report, please contact Steve Garbaciak at (630) 368-3069 or e-mail at steve.garbaciak@foth.com.

References

Foth Infrastructure & Environment/Envirocon Joint Venture, 2017a. *Final (100%) Design for Phase 2 Wet Dredge* – Ashland/NSP Lakefront Site. March 2017.

Foth Infrastructure & Environment/Envirocon Joint Venture, 2017b. *Phase 2 Odor/Emission Control System – Correlation of TVOC Concentrations: Field PID Measurements versus Laboratory SUMMA Analysis and Air Filtration System and Sampling Improvements* – Ashland/NSP Lakefront Site. September 2017.

attachments

Attachment 1

OECS Performance Evaluation

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Odor/Emission Control System Log

Client's Name:	Site Location:	Project No.
NSPW	Ashland/NSP Lakefront Site	17X001

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
1	6-5-2017	The Odor Emissions Control System (OECS) operations started on 5/18/17, and consist of five Air Filters Inc. modules (AFU-1 to AFU-5). The fans for the units are turned down for the night-time hours. The AFUs were turned off for the extended holiday break from the night-time hours of 5/25/17 to re-start during the morning hours of 5/31/17. On 5/24/17, the photoionization detector (PID) monitoring instrument was changed out from MiniRAE 3000 to ppbRAE 3000. This allows the total VOC (TVOC) detection level to be lowered from 100 ppb (v/v) to 1 ppb (v/v). As a result, the PID data are more useful from 5/24/17 onwards. Excessive airborne lime dust conditions were experienced within the sediment processing tent as part of early stabilization operations of dredged materials during ramp up of processing operations. The excessive lime loading was captured on the AFU pre-filters which caused extra maintenance of the AFUs. The AFU modules/fans experienced backpressure increases due to the lime dust capture. Maintenance included removing the pre-filters and cleaning the lime fines from the filters. The carbon filter components of the AFUs were not compromised during this time period as no breakthrough of lime dust past the pre-filters was observed. The PID readings and SUMMA samples were taken and analyzed according to the *Monitoring Plan for Phase 2 Wet Dredge (Monitoring Plan)* (FE JV, 2017a). The PID values are much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations. Additional data will be evaluated to better identify a correlation. In general, after the ppbRAE 3000 PID instrument was used, the removal efficiencies for total VOCs, as measured by PID, are in the 90% to 100% range. Regarding the SUMMA canister TO-15 analysis (for sampling dates up to 5/31/17), TVOC removal efficiencies varied as measured by the TO-15 PF analysis due to a number of likely mitigating factors resulting from actual operations in the field. The effluent TVOC concentrations were quite low in comparison to site perimeter alert and action levels and NR 445 requirements. The SUMMA canister TO-15 analysis also presents some anomalous data where effluent concentrations exceed influent concentrations for some organic constituents. This may indicate actual conditions, however, it is not uncommon to see this type of anomaly when sampling extremely low concentrations.	In	Brian Bell
2	6-19-2017	Monitoring continued for the five air filter units. The TVOC PID readings were taken and SUMMA samples were collected and analyzed according to the *Monitoring Plan*. There is limited trending correlation discernable while comparing TVOC values from the PID instrument versus SUMMA canister analysis via TO-15 PF analysis. The PID values are much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations. The SUMMA canisters from the June 13-14, 2017 sampling event were not analyzed as water entered the SUMMA canister regulators via sample tubing during a storm event.	In	Brian Bell/ Andrea Martin

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		The removal efficiencies for TVOCs as measured by PID ranged from 74.5% to 100%. Regarding the SUMMA canister TO-15 PF analysis (for sampling dates through June 8, 2017), TVOC removal efficiencies varied as measured by the TO-15 PF analysis due to a number of factors resulting from operations in the field. The effluent TVOC concentrations and individual VOCs were lower than site perimeter alert and action levels and NR 445 requirements. The SUMMA canister TO-15 PF analysis at times presents anomalous data where effluent concentrations are greater than influent concentrations for some VOCs. This likely results from field conditions or when constituent concentrations are in the low parts per billion range. Regarding SUMMA TO-15 PF analysis, it should be noted that acetone is a significant contributor to the TVOC concentrations. Acetone is not a known site contaminant of concern, and is known to be both a laboratory artifact and may be contributed by use of silicone in the ductwork. The vapor-phase GAC removal efficiencies for TVOCs especially as measured by PID instrument indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF analysis is also consistent. These factors in additional to low loading of VOCs on the vapor-phase GAC as measured by SUMMA TO-15 PF analysis indicates the GAC is performing as expected and does not require removal and replacement at this time. Note: the SUMMA canister results lag field data availability by approximately 5 to 12 days. The SUMMA data evaluations on a given day are based on the most recent SUMMA data (which may be up to 12 days past). To avoid over-projecting, graphs provided in this report show no values past 6/8/17 for modules AFU-2 through AFU-5. AFU-1 graphs are presented through 6/1/17. Contrary to the AFU-1 PID readings observed on 6/6/17 and 6/8/17, the AFU-1 SUMMA results from those dates show the effluent concentrations exceeding or equal to influent concentrations. FE JV concluded the SUMMA canister results for AFU-1 do not reflect module performance on those days and should not be used as a projection basis.		
3	7/1/2017	Monitoring continued for the five air filter units. The TVOC PID readings were taken and SUMMA samples were collected and analyzed according to the *Monitoring Plan*. There is limited trending correlation discernable between TVOC values from the PID instrument versus SUMMA canister analysis via TO-15 PF analysis. The PID values are much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations. The removal efficiencies for TVOCs by vapor phase GAC as measured by PID ranged from 78% to 99%. Regarding the SUMMA canister TO-15 PF analysis (for sampling dates through 7/1/17), TVOC removal efficiencies varied due to a number of factors resulting from operations in the field. The effluent HAP concentrations and emissions are trending well below NR 445 requirements. The SUMMA canister TO-15 PF analysis at times presents anomalous data where effluent concentrations are greater than influent concentrations	In	Brian Bell/ Andrea Martin

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		for some VOCs. This likely results from field conditions or is because constituent concentrations are in the low parts per billion range which can produce anomalous values. Regarding SUMMA TO-15 PF analysis, it should be noted that acetone is a significant contributor to the TVOC concentrations. Acetone is not a known site contaminant of concern, and is known to be both a laboratory artifact and may be contributed by use of silicone in the ductwork. The acetone detection issue is being investigated with TestAmerica. The vapor-phase GAC removal efficiencies for TVOCs as measured by PID instrument indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF analysis are also relatively consistent. These factors, in addition to low loading of VOCs on the vapor-phase GAC as measured by SUMMA TO-15 PF analysis, indicate the GAC is performing as expected and does not require removal and replacement at this time due to organic loading. During the SUMMA sampling event on 6/21/17, the TO-15 PF effluent value for TVOC from AFU-5 was an anomalous result which was much greater than the influent value, including a significant detection of pentane. TestAmerica is investigating this result and the detection of pentane (in addition to acetone). AFU-1 was shut down at times due to convulsion when operating. The vapor phase GAC media for AFU-1 was removed and replaced on 7/3/17. It is suspected that lime fines have loaded onto the GAC media and caused the unit to convulse when operating. The shaking dissipated when AFU-1 was re-started. The GAC media in additional air filter units will be changed out if lime dust loading is suspected on the GAC media. Additional operations and maintenance procedures are being developed to mitigate the loading of lime dust onto the air filter units. Dust collector systems will be operational in July 2017 in closed loop air circulation systems within the sediment processing tent to filter and reduce airborne lime dust content within the tent structure. Note: the SUMMA canister results lag field data availability by approximately 5 to 12 days. The SUMMA data evaluations on a given day are based on the most recent SUMMA data (which may be up to 12 days past). To avoid over-projecting, SUMMA results graphs provided in this report show no values past 6/27/17.		
4	7/18/2017	Monitoring continued for the five air filter units. The TVOC PID readings were taken and SUMMA samples were collected and analyzed according to the *Monitoring Plan*. There is limited trending correlation discernable between TVOC values from the PID instrument versus SUMMA canister analysis via TO-15 PF analysis. The PID values are much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations. The removal efficiencies for TVOCs by vapor phase GAC as measured by PID ranged from 80 to 99%. Regarding the SUMMA canister TO-15 PF analysis (for sampling dates through 7/11/17), TVOC removal	In	Brian Bell/ Andrea Martin

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Odor/Emission Control System Log

Client's Name:	Site Location:	Project No.
NSPW	Ashland/NSP Lakefront Site	17X001

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		efficiencies varied due to a number of factors resulting from operations in the field. The effluent HAP concentrations and emissions are trending well below NR 445 requirements. The SUMMA canister TO-15 PF analysis at times presents anomalous data where effluent concentrations are greater than influent concentrations for some VOCs. These anomalies likely result from the same reasons listed previously. Regarding SUMMA TO-15 PF analysis, it should be noted that acetone is a significant contributor to the TVOC concentrations. Acetone is not a known site contaminant of concern, and is known to be both a laboratory artifact and may be present from the use of silicone in the ductwork. The vapor-phase granular activated carbon removal efficiencies for TVOCs especially as measured by PID instrument indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF are also consistent. The pre- and post-GAC treatment analysis for VOCs on the air flow, as measured by SUMMA TO-15 analysis, indicate the mass loading of TVOCs on GAC media is very low as compared to theoretical TVOC mass loading capacity on GAC media. However, the TVOC loading on GAC media as measured by PID measurements is higher. The removal efficiencies of TVOC through GAC media as measured by PID remain above 80%. The removal and replacement of the GAC media for AFU-2 through AFU-5 is being contemplated in the near future. AFU-1 media was replaced on 7/3/17, noted in Report #3. Dust collector systems are operational in July 2017 in closed loop air circulation systems within the sediment processing tent to filter and reduce airborne lime dust content within the tent structure. One diesel powered 40,000 acfm dust collector (Dust Bunny #1) was operational during this reporting period and exhausts into AFU-1 and AFU-2 influents as of 7/18/17. The dust collector acts as a pre-treatment unit for dust removal prior to treatment in the two OECS modules. A second electrically powered 20,000 acfm dust collector (Dust Bunny #2) was placed in operation on 7/19/17, and located on the south side of the sediment processing tent as a recirculating treatment system with no discharge point to the outside. A third unit (Dust Bunny #3), electrically powered and having a 40,000 acfm capacity, will be mobilized by 8/1/17 and used as a pre-treatment unit for dust removal with its exhaust vented into AFU-3 on the north side of the sediment processing tent. Note: the SUMMA canister results lag field data availability by approximately 5 to 12 days. The SUMMA data evaluations on a given day are based on the most recent SUMMA data (which may be up to 12 days past). To avoid over-projecting, SUMMA results graphs provided in this report show no values past 7/16/17.		
5	8/1/2017	Monitoring continued for the five air filter units. The TVOC PID readings were taken and SUMMA samples were collected and analyzed according to the *Monitoring Plan*. There is limited trending correlation discernable between TVOC values from the PID instrument versus SUMMA canister analysis via TO-15 PF analysis. The PID values are much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations.	In	Brian Bell/ Andrea Martin

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		The removal efficiencies for TVOCs by vapor phase GAC as measured by PID ranged from 83.4 to 98.7%. Regarding the SUMMA canister TO-15 PF analysis (for sampling dates through 7/21/17), TVOC removal efficiencies varied due to a number of factors resulting from operations in the field. The effluent HAP concentrations and emissions are trending well below NR 445 requirements. The SUMMA canister TO-15 PF analysis at times presents anomalous data where effluent concentrations are greater than influent concentrations for some VOCs. These anomalies likely result from the same reasons listed previously. Regarding SUMMA TO-15 PF analysis, it should be noted that acetone is a significant contributor to the TVOC concentrations. Acetone is not a known site contaminant of concern, and is known to be both a laboratory artifact and may be present from the use of silicone in the ductwork. The vapor-phase GAC removal efficiencies for TVOCs, especially as measured by PID instrument, indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF are also consistent. The pre- and post-GAC treatment analysis for VOCs on the air flow, as measured by SUMMA TO-15 PF analysis, indicate the mass loading of TVOCs on GAC media is very low as compared to theoretical TVOC mass loading capacity on GAC media. However, the TVOC loading on GAC media as measured by PID measurements is higher. The removal efficiencies of TVOC through GAC media as measured by PID remain above 80%. The removal and replacement of the GAC media for AFU-2 through AFU-5 was performed and completed on 7/22/17. AFU-1 media was replaced on 7/3/17, noted in Report #3. The removal and replacement of the GAC media in these modules was conducted for the following reasons: ♦ Influent and effluent SUMMA data for VOCs is inconsistent, but GAC removal efficiency was declining by a small measure. ♦ Although removal efficiencies as measured by PIDs was and has been very good for these units, overall VOC loading on GAC based on PID readings approached or exceeded theoretical loading capacity of organics on GAC. ♦ AFU-1 GAC was changed out several weeks ago. ♦ There is some lime reagent penetration into GAC media; change-out should improve air flow through the units. ♦ The estimated change-out duration for the GAC media was originally estimated to be every two months of operations; this alone did not dictate the change, but we are on-schedule by performing this GAC removal and replacement on 7/22/17. Dust collector systems are operational in July 2017 in closed loop air circulation systems within the sediment processing tent to filter and reduce airborne lime dust content within the tent structure. Dust Bunny #1 dust		

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		collector was mobilized and made operational on 7/10/17. The Dust Bunny collects airborne particulate matter using compressed-air pulsed poly filter cartridges. The Dust Bunny acts as a pre-treatment unit for dust removal prior to treatment in some of the OECS modules. Dust Bunny #1 is a diesel powered 40,000 acfm dust collector and is exhausted into AFU-1 and AFU-2 intakes. Early the week of 7/31/17, the exhaust from Dust Bunny #1 will be vented directly into AFU-1 intake only. A second electrically powered 20,000 acfm dust collector (Dust Bunny #2) was placed in operation on 7/19/17, and located on the south side and inside the sediment processing tent as a recirculating treatment system with no discharge point to the outside. A third unit (Dust Bunny #3) electrically powered and having a 40,000 acfm capacity, will be mobilized around 8/1/17 and will be used as a pre-treatment unit for dust removal with its exhaust vented into AFU-3 on the north side of the sediment processing tent. Note: the SUMMA canister results lag field data availability by approximately 5 to 12 days. The SUMMA data evaluations on a given day are based on the most recent SUMMA data (which may be up to 12 days past). To avoid over-projecting, SUMMA results graphs provided in this report show no values past 7/24/17.		
6	8/15/2017	Overview Monitoring continued for the five air filter units (AFU). The TVOC PID readings were taken and SUMMA samples were collected and analyzed according to the *Monitoring Plan*. Unit Performance The removal efficiencies for TVOCs by vapor phase GAC as measured by PID are tabulated below: **AFU** / **Removal Efficiency Range** 1 / 74 to 89 2 / 81 to 95 3 / 94 to 99 4 / 88 to 98 5 / 78 to 97 AFU-1 is trending downward somewhat and may be a candidate for GAC media removal and replacement relatively soon. The vapor-phase GAC removal efficiencies for all unit TVOCs indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF are also consistent with this interpretation.	In	Brian Bell / Andrea Martin

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		Mass loading of TVOCs on GAC media based on SUMMA TO-15 PF is very low as compared to theoretical TVOC mass loading capacity on GAC media. However, the TVOC loading on GAC media as measured by PID measurements is higher. <u>NR 445</u> The effluent HAP concentrations and emissions are trending well below NR 445 requirements. This status report indicates a revision to NR 445 emission estimates. An error was discovered in previous calculations: the hourly rate had been multiplied by 24 and presented as pounds per hour. This over-estimation of emissions was well below the NR 445 compliance limits for the 5 HAPs considered: benzene, ethylbenzene, naphthalene, toluene, and xylene; therefore, the error discovery does not change any of the compliance demonstrations. <u>Data Evaluation and Discussion</u> There is limited trending correlation discernable between TVOC values from the PID instrument versus SUMMA canister analysis via TO-15 PF analysis. The PID values are much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations. Regarding the SUMMA canister TO-15 PF analysis (for sampling dates through 8/8/2017), TVOC removal efficiencies continue to vary due to a number of factors resulting from operations in the field or unknown reasons. The SUMMA canister TO-15 PF analysis at times presents anomalous data where effluent concentrations are greater than influent concentrations for some VOCs. These anomalies likely result from the same reasons listed previously. Regarding SUMMA TO-15 PF analysis, it should be noted that acetone is a significant contributor to the TVOC concentrations. Acetone is not a known site contaminant of concern, and is known to be both a laboratory artifact and may be present from the use of silicone in the ductwork. <u>Operations Notes</u> Four dust collector units (formerly referred to as "Dust Bunny") have been installed and commenced operating according to the table shown below. Their purpose is to filter and reduce airborne lime dust content within the tent structure enhancing the AFU performance and extending AFU change-out durations. The dust collectors reduce airborne particulate matter using compressed-air pulsed poly filter cartridges and act as a pre-treatment unit for dust removal prior to treatment in some of the OECS modules. When all four units are operational, the Sediment Processing Tent (SPT) will have 140,000 cfm of dust collection air flow. As the amount of dust in the SPT drops due to these and other enhancements, the amount of dust in the air for removal should also reduce.		

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		Dust Collection System Description **Dust Collector** / **Commenced Operations** / **Description** / **Exhausts To** 1 / 7/10/2017 / 40,000 acfm diesel – to be replaced with an electric unit / AFU-2 intake 2 / 7/19/2017 / 20,000 acfm electric unit / Recirculates in SPT 3 / 8/1/2017 / 40,000 acfm electric unit / AFU-3 intake 4 / 8/16/2017 / 40,000 acfm electric unit / Recirculates in SPT		
7	8/31/2017	Overview Monitoring continued for the five air filter units. The TVOC PID readings were taken and SUMMA samples were collected and analyzed according to the *Monitoring Plan*. Unit Performance The removal efficiencies for TVOCs by vapor phase GAC as measured by PID are tabulated below: **AFU** / **Removal Efficiency Range** 1 / 39-88% 2 / 0-82% 3 / 64-98% 4 / 21-98% 5 / 16-98% The trend graphs show AFU-1 trending downward somewhat and was a candidate for GAC media removal and replacement. The GAC media was replaced in AFU-1 and the unit was brought back on-line on 8/31/17. The vapor-phase GAC removal efficiencies for all unit TVOCs indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF are also consistent with this interpretation. Mass loading of TVOCs on GAC media based on SUMMA TO-15 PF continues to be very low as compared to theoretical TVOC mass loading capacity on GAC media. However, the TVOC loading on GAC media as	In	Brian Bell/ Andrea Martin

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		measured by PID measurements is higher. Some anomalous PID readings may be occurring now with the dust collector exhaust of AFU-1, AFU-2, and AFU-3 now routed directly to the unit influents. Starting on or about 8/24/17, the TVOC removal efficiencies for AFU-2 through AFU-5 as measured by PID produced low values. Causes may include potential PID meter consistency, air flow pressure fluctuations from within the sampling ports, humidity fluctuations and impacts, and outside impacts from prevailing work area atmosphere. There are instances where a '0' value was recorded for PID meter readings; the FE JV believes the PID meter may be in error for these readings. Improvement efforts will be explored including replacing the PID meter and reconfiguring the sample ports. To ensure optimal GAC performance, the GAC media is planned to be changed out on units AFU-2 through AFU-5 on 9/5/17. NR 445 The effluent HAP concentrations and emissions are trending well below NR 445 requirements. The emissions are well below the NR 445 compliance limits for the 5 HAPs considered: benzene, ethylbenzene, naphthalene, and toluene. Data Evaluation and Discussion PID measurements continue to be much higher than the TVOC values reported by the TO-15 PF analysis, by one or two orders of magnitude for influent concentrations. A correlation between the two data sets has been considered and documented in Technical Memorandum #17-03 (FE JV, 2017b). The memorandum presents data to date showing no practical correlation between the two data sets. Regarding the SUMMA canister TO-15 PF analysis (for sampling dates through 8/31/17), TVOC removal efficiencies continue to vary due to a number of factors resulting from operations in the field or unknown reasons. The SUMMA canister TO-15 PF analysis, at times, presents anomalous data where effluent concentrations are greater than influent concentrations for some VOCs. These anomalies likely result from the same reasons listed previously. Operations Notes As documented in Technical Memorandum #17-03, two additional air filtration units are planned to be installed in the first week of September 2017. The intent of this addition is to improve overall air quality in the SPT and reduce the loads on units AFU-1 through AFU-5. Sampling stingers will also be reconfigured in a manner that is anticipated to improve data consistency. Data will be collected, analyzed, and evaluated on the two new units (labeled TIGG-1 and TIGG-2) in similar fashion to the five AFUs. Unit performance will be documented on upcoming status reports.		

<table>
<tr><th>Report #</th><th>Through Date</th><th>Performance Evaluation Results/
Action Taken</th><th>NR 445 Compliance[1]</th><th>Prepared By</th></tr>
<tr><td></td><td></td><td>Terminology of dust collector designations and exhaust routing will be changing according to the following Table 7-1. The strikeout text indicates its previous service; yellow highlights are new service and designation. The dust collector designation now follows the AFU unit number.

Table 7-1
Dust Collection System Description
<table><tr><th>Dust Collector</th><th>Commenced Operations</th><th>Description</th><th>Exhausts To</th></tr><tr><td><s>4</s>/1</td><td>8/16/2017</td><td>40,000 acfm electric unit</td><td><s>Recirculates in SPT</s> AFU-1 and Tigg-1 intake</td></tr><tr><td><s>1</s>/2</td><td>7/10/2017
8/22/2017</td><td>40,000 acfm <s>diesel – to be replaced with an</s> electric unit</td><td>AFU-2 intake</td></tr><tr><td>3</td><td>8/1/2017</td><td>40,000 acfm electric unit</td><td>AFU-3 intake</td></tr><tr><td><s>2</s>/4</td><td>7/19/2017</td><td>20,000 acfm electric unit</td><td><s>Recirculates in SPT</s> Tigg-2 intake</td></tr></table></td><td></td><td></td></tr>
<tr><td>8</td><td>9/15/2017</td><td><u>Overview</u>
Operations continued with modification. Two additional AFUs, TIGG 1 (8/31/17) and TIGG 2 (9/5/17), were installed. These are larger capacity units than the original five AFUs. Sampling on the TIGG units commenced on 9/11/17. Only PID data are available on the TIGG units for this period.

The TVOC PID readings were taken, and SUMMA samples were collected and analyzed according to the Monitoring Plan. During the two week period, the five AFUs had data gaps in both PID readings and the SUMMA TO-15 PF test results. Two AFUs were non-operational for extended periods: AFU-1 for 9 days and AFU-2 for 6 days. Operations shut down for two days during the Labor Day holiday. Additionally, on several SUMMA TO-15 PF sampling events, one or more AFUs could not be sampled or the sample was not completed due to field conditions – further contributing to the gaps. PID readings were at times extremely high leading to the suspicion that the PID monitoring unit was malfunctioning. The PID unit was replaced, and the readings immediately returned to the expected range (see further discussion below). The sampling stingers were reconfigured and tested for improvement. The data presented on the accompanying figures, which have been reformatted to show the metrics for each AFU and the TIGGs, address PID monitoring summary data through 9/15/17 and SUMMA TO-15 PF analysis summary through 9/12/17.</td><td>In</td><td>Brian Bell / Andrea Martin</td></tr>
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Unit Performance

The removal efficiencies for TVOCs by vapor phase GAC as measured by PID for the two-week period are tabulated as follows:

AFU	% Removal Efficiency Range
1	6 to 100
2	8.6 to 98.9
3	33.5 to 100
4	9.7 to 99.6
5	32.4 to 100
TIGG 1	57 to 99
TIGG 2	25 to 100

The GAC media was replaced in AFU-1, and the unit was brought back on-line on 8/31/17. The GAC media was replaced in AFU-2 through AFU-5 on 9/5/17. The vapor-phase GAC removal efficiencies for all unit TVOCs indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF are also consistent with this interpretation.

Mass loading of TVOCs on GAC media based on SUMMA TO-15 PF continues to be very low as compared to theoretical TVOC mass loading capacity on GAC media. However, the TVOC loading on GAC media, as measured by PID, is higher. Some anomalous PID readings continue, suspected due to the dust collector exhaust of AFU-1, AFU-2, and AFU-3 routed directly to the AFU influents.

Monitoring improvement efforts included replacing the PID meter and reconfiguring the sample ports. Use of a Tiger Ion PID monitoring instrument as a replacement to the Mini RAE was started on 9/12/17 and produces PID values that are more stable and consistent, more in-line with historical AFU performance to date, and more reasonable as compared to high and unstable concentration values recorded prior to 9/12/17. After the GAC media change and use of Tiger Ion PID, the removal efficiencies reported for the AFUs improved considerably. The reconfigured sampling stingers did not show a change in sampling effectiveness, however, the modifications will be kept in place.

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		NR 445 The effluent HAP concentrations and emissions are trending well below Wis. Admin. Code NR 445 requirements. The emissions are well below the NR 445 compliance limits for the five HAPs considered, which are: benzene, ethylbenzene, naphthalene, toluene, and xylene.		
9	9/29/2017	Overview The data presented on the accompanying figures, which have been reformatted to show the metrics for each AFU and the TIGGs, address PID monitoring summary data through 9/29/17 and SUMMA TO-15 PF analysis summary through 9/21/17. The SUMMA sampling and analysis scope was revised beginning 9/26/17 as approved by the agencies. Unit Performance The removal efficiencies for TVOCs by vapor phase GAC as measured by PID for the two-week period are tabulated as follows: **AFU** / **% Removal Efficiency Range** 1 / 58 to 99.8 2 / 64 to 100 3 / 64 to 100 4 / 75 to 100 5 / 62 to 100 TIGG 1 / 57 to 100 TIGG 2 / 25 to 100 The vapor-phase GAC removal efficiencies for all unit TVOCs indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF are also consistent with this interpretation. The AFU-1 removal efficiencies started trending downward somewhat, and the GAC media will be replaced in the near future, as an order for new GAC was placed. Mass loading of TVOCs on GAC media based on SUMMA TO-15 PF continues to be very low as compared to theoretical TVOC mass loading capacity on GAC media. However, the TVOC loading on GAC media, as measured by PID, is higher. Use of a Tiger Ion PID monitoring instrument as a replacement to the Mini RAE was started on 9/12/17 and continues to produce PID values that are more stable and consistent, more in-line with historical AFU performance to date, and more reasonable as compared to high and unstable concentration values recorded prior	In	Brian Bell / Andrea Martin

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
		to 9/12/17. GAC media changed on 8/31/17 for AFU-1 and on 9/5/17 for AFU-2 through AFU-5. Between the GAC changes and the use of the Tiger Ion PID, removal efficiencies reported for the AFUs improved considerably. The reconfigured sampling stingers did not show a change in sampling effectiveness, however, the modifications will be kept in place. NR 445 The effluent HAP concentrations and emissions now account for the new TIGG units and are trending well below Wis. Admin. Code NR 445 requirements. The emissions are well below the NR 445 compliance limits for the five HAPs considered, which are: benzene, ethylbenzene, naphthalene, toluene, and xylene.		
10	10/23/2017	Overview The data presented on the accompanying figures, which have been reformatted to show the metrics for 7 units (5 AFUs and 2 TIGGs), address PID monitoring summary data through 10/23/17 and SUMMA TO-15 PF analysis summary through 10/10/17. The SUMMA sampling and analysis scope was revised beginning 9/26/17 as described in Technical Memorandum #17-03 (FE JV, 2017b) and approved by the agencies. The evaluation of performance metrics was adjusted: data are analyzed for PID measured TVOC concentrations and removal efficiencies per unit, and the NR 445 evaluation for benzene, ethylbenzene, naphthalene, toluene, and xylene. Unit Performance The removal efficiencies for TVOCs by vapor phase GAC as measured by PID for the status report period (9/27/17 to 10/23/17) are tabulated as follows:	In	Brian Bell / Andrea Martin

AFU	% Removal Efficiency Range
1	0 to 100
2	5 to 100
3	0 to 100
4	68 to 100
5	78 to 100
TIGG 1	71 to 100
TIGG 2	93 to 100

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By

Where removal efficiencies approached 0%, it is believed the PID meter function contributed to these data. These readings were isolated in the context of adjacent trending. The overall trends in removal efficiency continue to be indicators of the need for GAC change out. The current status of GAC change out is tabulated as follows:

AFU	Date of GAC Change Out or Initial Operation
1	10/13/17
2	10/17/17
3	10/18/17
4	9/5/17
5	9/5/17
TIGG 1	9/12/17 (initial operation)
TIGG 2	9/11/17 (initial operation)

The vapor-phase GAC removal efficiencies for all unit TVOCs indicate the majority of TVOCs are being removed. TVOC and individual VOC effluent concentration trending by SUMMA TO-15 PF analysis are also consistent with this interpretation. The AFU-1 removal efficiencies started trending downward and the GAC media was replaced on AFU-1 on 10/13/17. AFU-2 and AFU-3 removal efficiencies started trending downward moderately and the GAC media was changed on those units on 10/17/17 and 10/18/17, respectively. After GAC media replacement for AFU-1, AFU-2, and AFU-3, they as well as AFU-4, AFU-5, TIGG-1, and TIGG-2 units continue to perform well.

The industrial dust collectors continue to operate and act as pre-filters for AFU-1, AFU-2, and AFU-3. The continual maintenance program for all AFUs and TIGG units, including changing out filters and removal of lime dust, helps keep the units operational.

NR 445

The effluent HAP concentrations and emissions now account for the new TIGG unit emissions and are trending well below Wis. Admin. Code NR 445 requirements. The emissions are well below the NR 445 compliance limits for the five HAPs considered, which are: benzene, ethylbenzene, naphthalene, toluene, and xylene.

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Odor/Emission Control System Log

Client's Name:	Site Location:	Project No.
NSPW	Ashland/NSP Lakefront Site	17X001

Report #	Through Date	Performance Evaluation Results/ Action Taken	NR 445 Compliance[1]	Prepared By
11	11/7/2017	Overview This log entry addresses the metrics for 7 units (5 AFUs and 2 TIGGs), based on PID monitoring summary data through 11/7/17 and SUMMA TO-15 PF analysis summary through 10/25/17. The SUMMA sampling and analysis scope continues in accordance with Technical Memorandum #17-03 (FE JV, 2017b), as approved by the agencies. The data are analyzed for PID measured TVOC concentrations and removal efficiencies per unit, and the NR 445 evaluation for benzene, ethylbenzene, naphthalene, toluene, and xylene. Unit Performance The removal efficiencies for TVOCs by vapor phase GAC as measured by PID for the status report period (10/24/17 to 11/7/17) are tabulated as follows:	In	Brian Bell / Andrea Martin

AFU	% Removal Efficiency Range
1	67-100
2	28-76
3	37-91
4	0-86
5	0-100
TIGG 1	67-100
TIGG 2	50-100

Due to overall GAC media removal efficiency downward trending, the GAC media contained in AFU-4 and AFU-5 was removed and replaced on 11-6-17 through 11-7-17.

Where removal efficiencies are listed as 0% or approaching 0%, it is believed the PID meter function contributed to these data. As the mechanical dredging is nearing completion, and while dredge production and inventory in the Sediment Processing Tent is ramping down, the TVOC concentrations in the air stream influent to the AFU modules continues to trend downward. The magnitude of concentrations measured by the Ion Science Tiger PID meter for both pre-treated and post-treated TVOC concentrations is nearing the meter's detection threshold of 100 ppb TVOCs. The meter's capability to accurately quantify the readings within these lower concentration ranges is not robust, and therefore anomalous removal efficiency data is sometimes presented (effluent readings exceeding influent readings) as well as very low removal efficiencies.

The low removal efficiencies were generally isolated to the context of associated decreasing trends in influent concentrations. The overall trends in removal efficiency, however, continue to be indicators of the need for GAC change out. The current status of GAC change out is tabulated as follows:

AFU	Date of Latest GAC Change Out
1	10/13/17
2	10/17/17
3	10/18/17
4	11/7/17
5	11/7/17
TIGG 1	9/12/17 (initial operation)
TIGG 2	9/11/17 (initial operation)

The vapor-phase GAC removal efficiencies for all unit TVOCs indicate the majority of TVOCs are being removed. The AFU-4 and AFU-5 removal efficiencies showed overall removal efficiency trending downward during this reporting period and the GAC media was replaced for these units as indicated above.

The industrial dust collectors continue to operate and act as pre-filters for AFU-1, AFU-2, and AFU-3. The continual maintenance program for all AFUs, including changing out filters and removal of lime dust, helps keep the units operational. The TIGG units were taken offline on 11-8-17 because total mass rates and concentrations of VOCs in the SPT atmosphere were dropping considerably due to nearing the completion of mechanical dredging; the additional air flow and VOC/odor controls provided by the TIGG units for the SPT were no longer required (above that provided by the five AFUs). The dust collectors will be removed from service when stabilization activities using pebble lime are completed.

To potentially address the lower TVOC concentration ranges currently monitored by PID meters, a backup Mini-RAE PID with a detection threshold of 1 ppb will be used as a check instrument to the Ion Science Tiger PID meter currently in use (detection level of 100 ppb). The Mini-RAE had been used previously at the site, and it may be better suited to the lower TVOC concentration ranges currently experienced and monitored. The results will be provided accordingly.

<u>NR 445</u>
The effluent HAP concentrations and emissions are trending well below Wis. Admin. Code NR 445 requirements. The emissions are well below the NR 445 compliance limits for the five HAPs considered, which are: benzene, ethylbenzene, naphthalene, toluene, and xylene.

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Odor/Emission Control System Log

Client's Name:	Site Location:	Project No.
NSPW	Ashland/NSP Lakefront Site	17X001

Notes:

1. In – facility emissions are in compliance with Wisconsin Administrative Code (Wis. Admin. Code) NR 445.
   Out – facility emissions are not in compliance with Wisconsin Administrative Code NR 445. See comments under "Performance Evaluation Results/Action Taken" column.

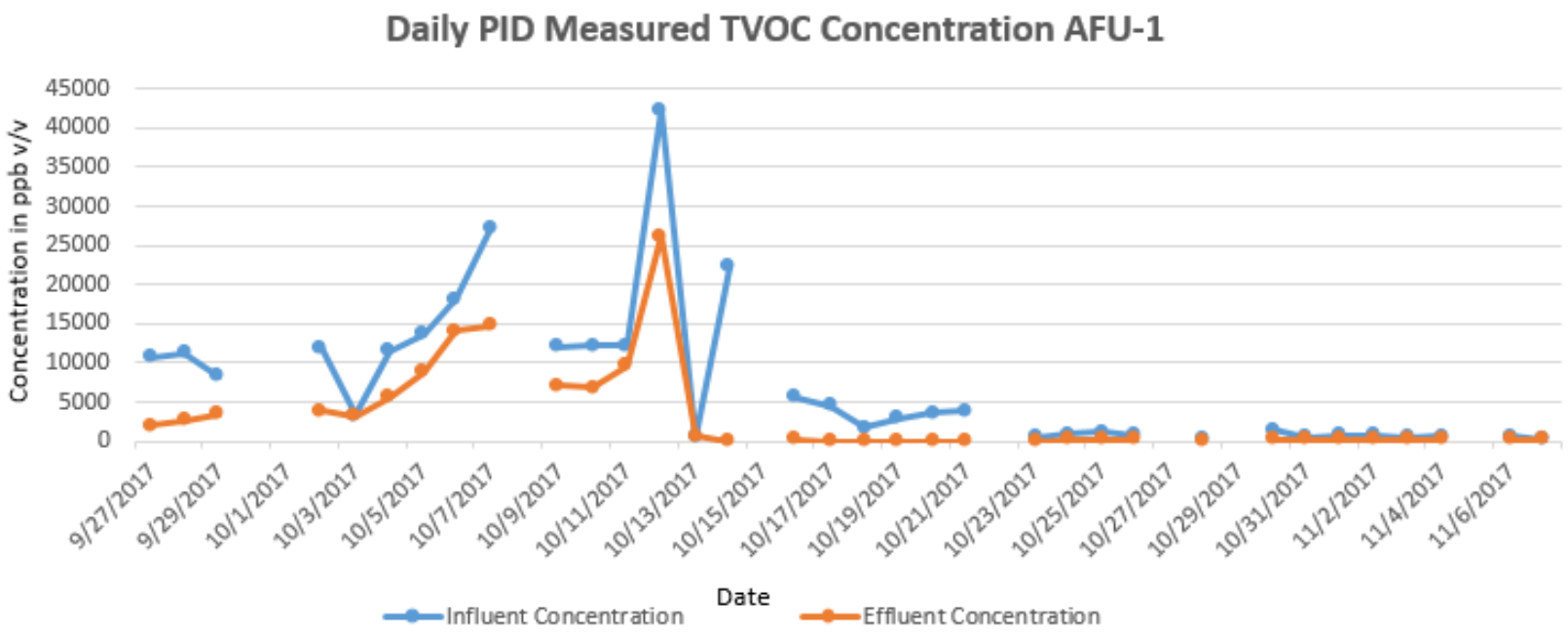
Reference(s):

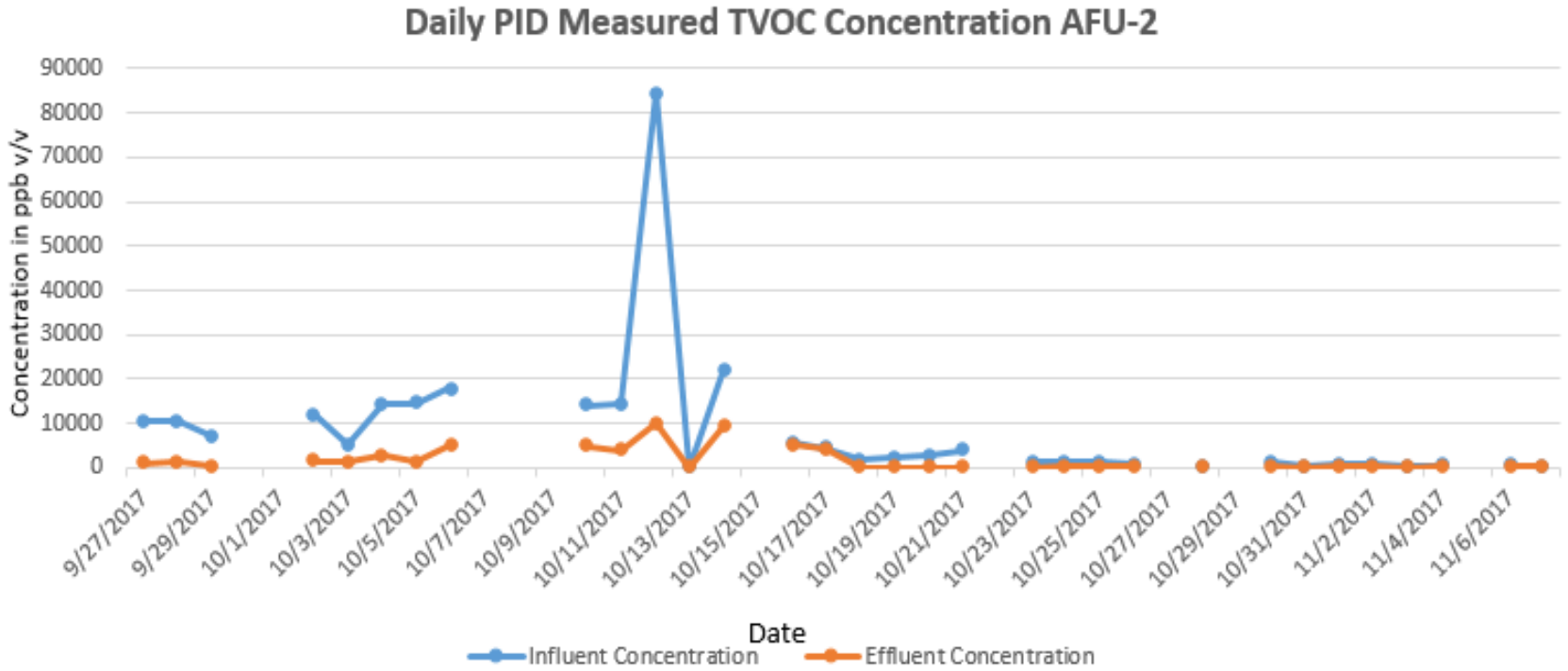
Foth Infrastructure & Environment/Envirocon Joint Venture, 2017a. *Monitoring Plan for Phase 2 Wet Dredge* – Ashland/NSP Lakefront Site. March 2017.

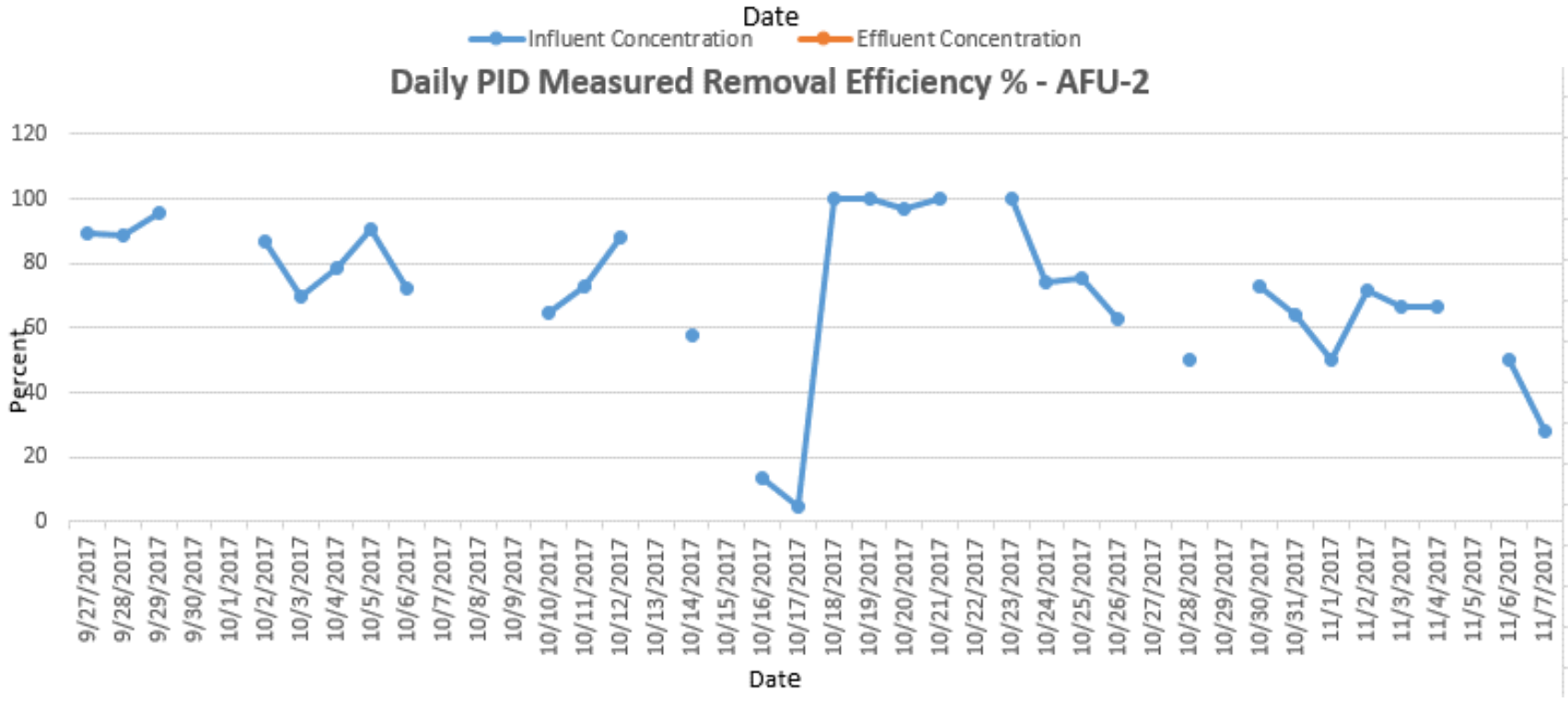
Foth Infrastructure & Environment/Envirocon Joint Venture, 2017b. Technical Memorandum #17-03 to Scott Hansen regarding *Phase 2 Odor/Emission Control System – Correlation of TVOC Concentrations: Field PID Measurements versus Laboratory SUMMA Analysis and Air Filtration System and Sampling Improvements* Ashland/NSP Lakefront Site. September 1, 2017.

Abbreviations:

AFU – air filter unit
GAC – granular activated carbon
HAP – hazardous air pollutant
NR 445 – Wisconsin Administrative Code Chapter NR 445 Hazardous Air Pollutants
OECS – odor/emission control system
PID – photoionization detector
ppb – parts per billion volume to volume
SPT – Sediment Processing Tent
TVOC – total volatile organic compound







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Field data thru 11/7/2017; Lab data thru 10/25/2017

NORTHERN STATES POWER COMPANY		
Figure 1: AFU-1 and AFU-2 Performance Metrics		
Ashland/NSP Lakefront Site		
Odor/Emissions Control System Performance thru 11/7/2017		
November 2017	Revision Date:	
Drawn by: AKM	Checked by: B.Bell	Project ID: 17X001

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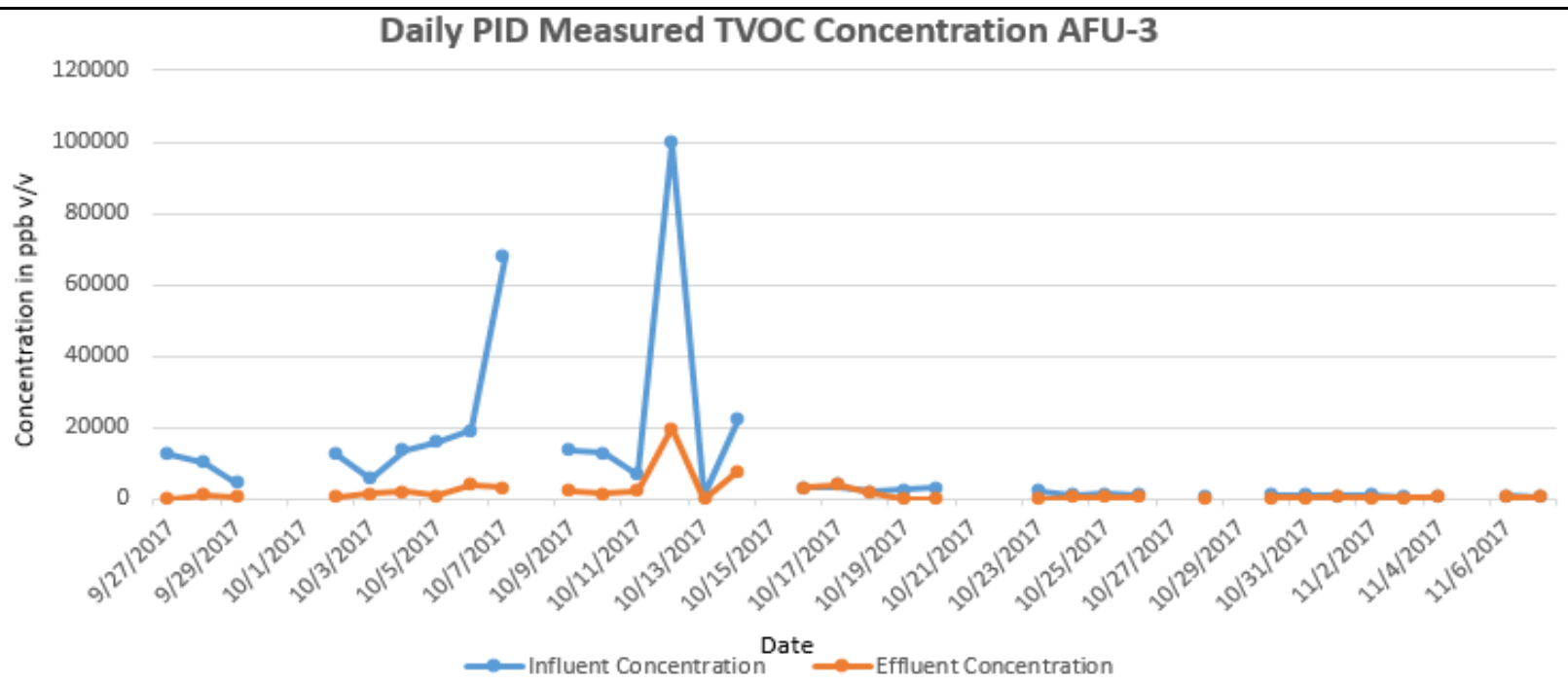

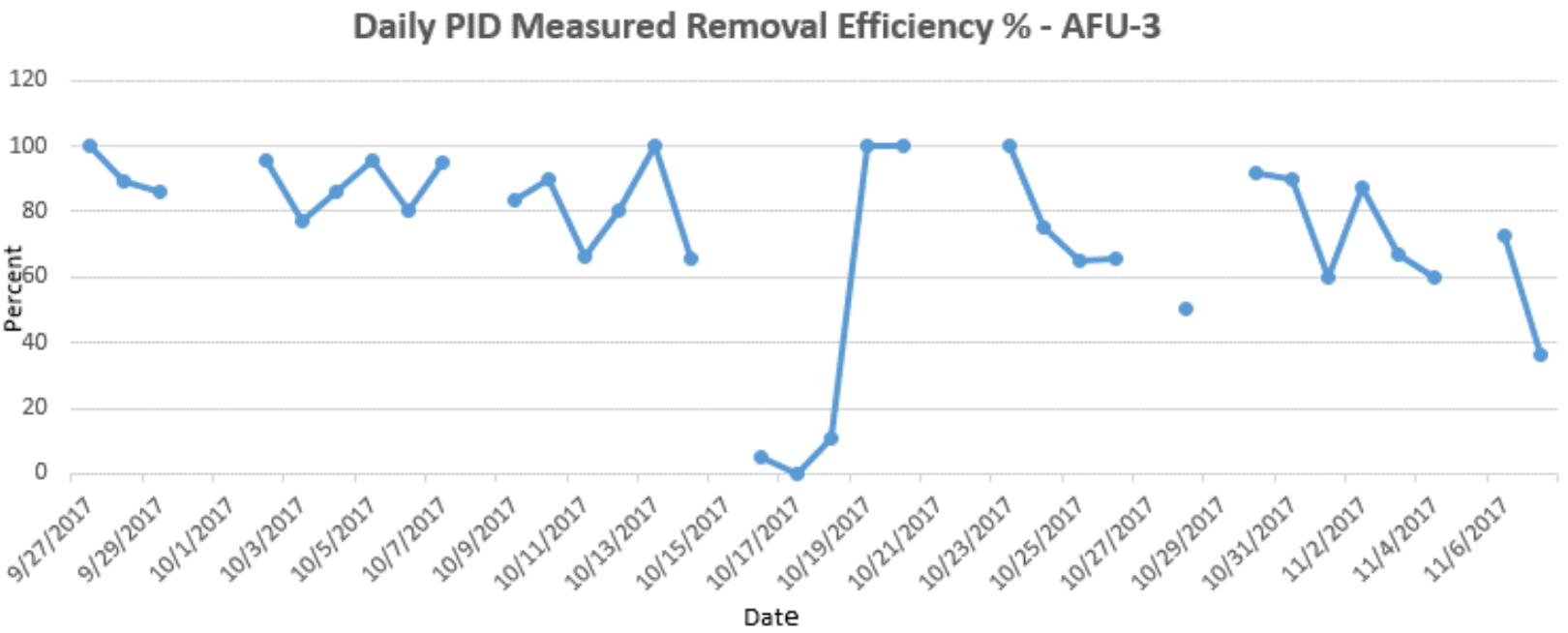

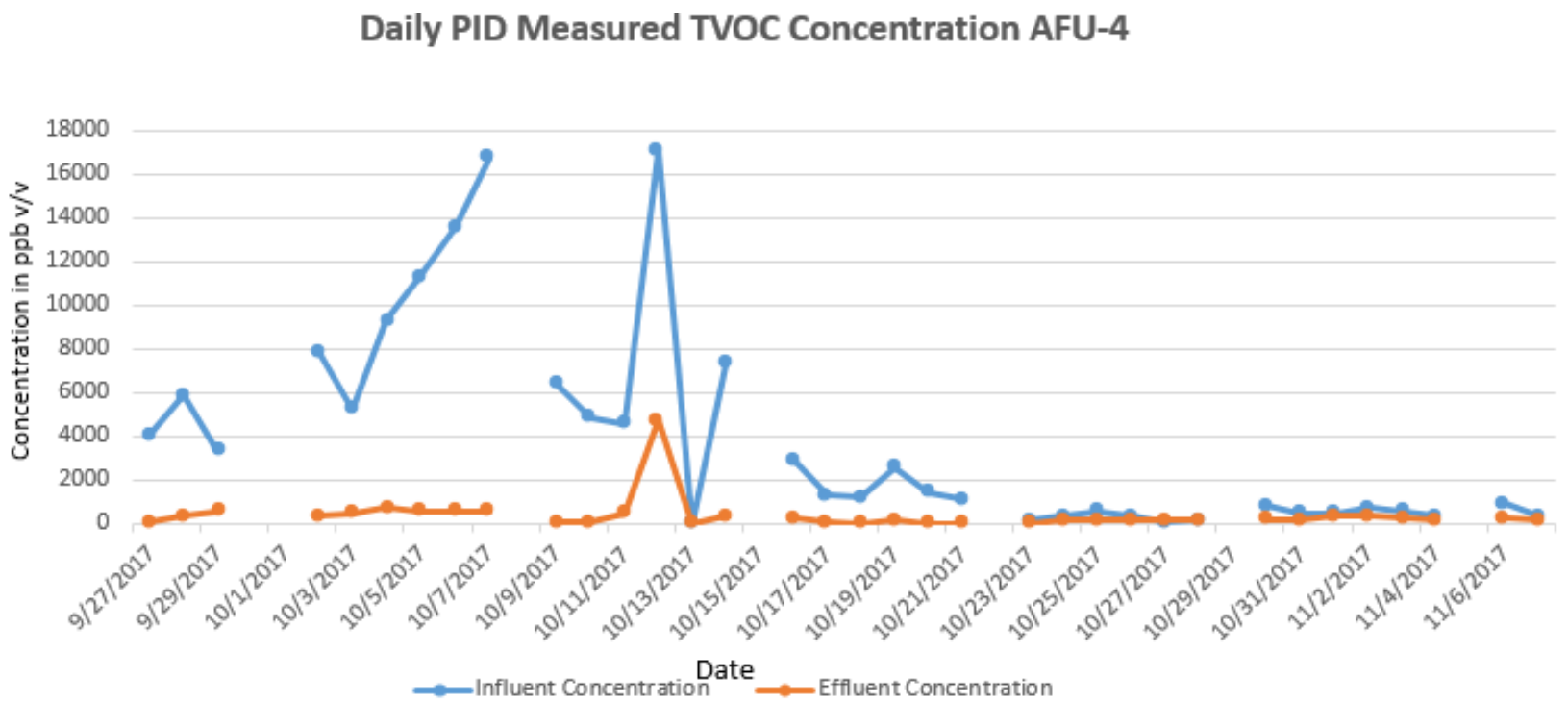

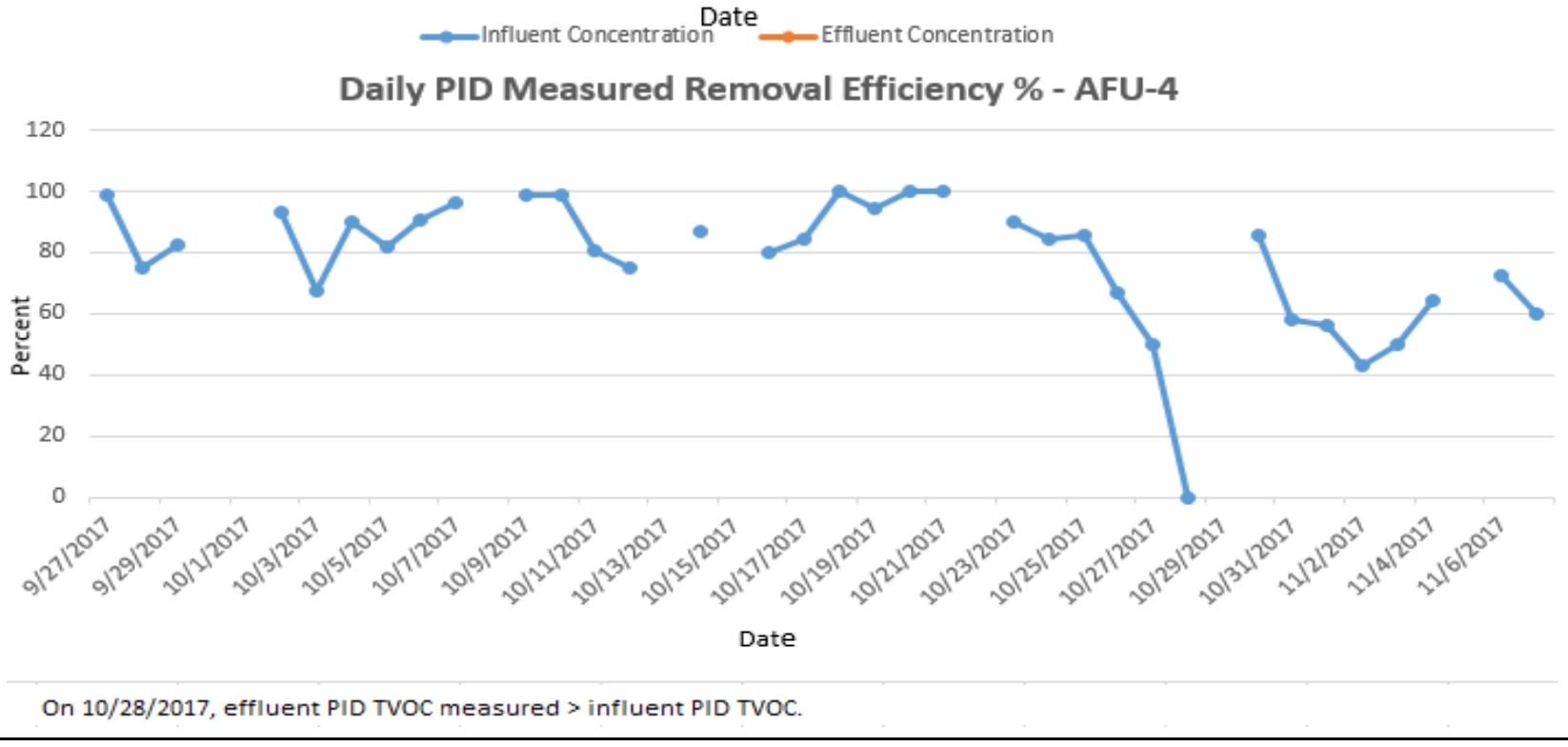

On 10/28/2017, effluent PID TVOC measured > influent PID TVOC.

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Field data thru 11/7/2017; Lab data thru 10/25/2017

NORTHERN STATES POWER COMPANY		
Figure 2: AFU-3 and AFU-4 Performance Metrics		
Ashland/NSP Lakefront Site		
Odor/Emissions Control System Performance thru 11/7/2017		
43040		Revision Date:
Drawn by: AKM	Checked by: B.Bell	Project ID: 17X001

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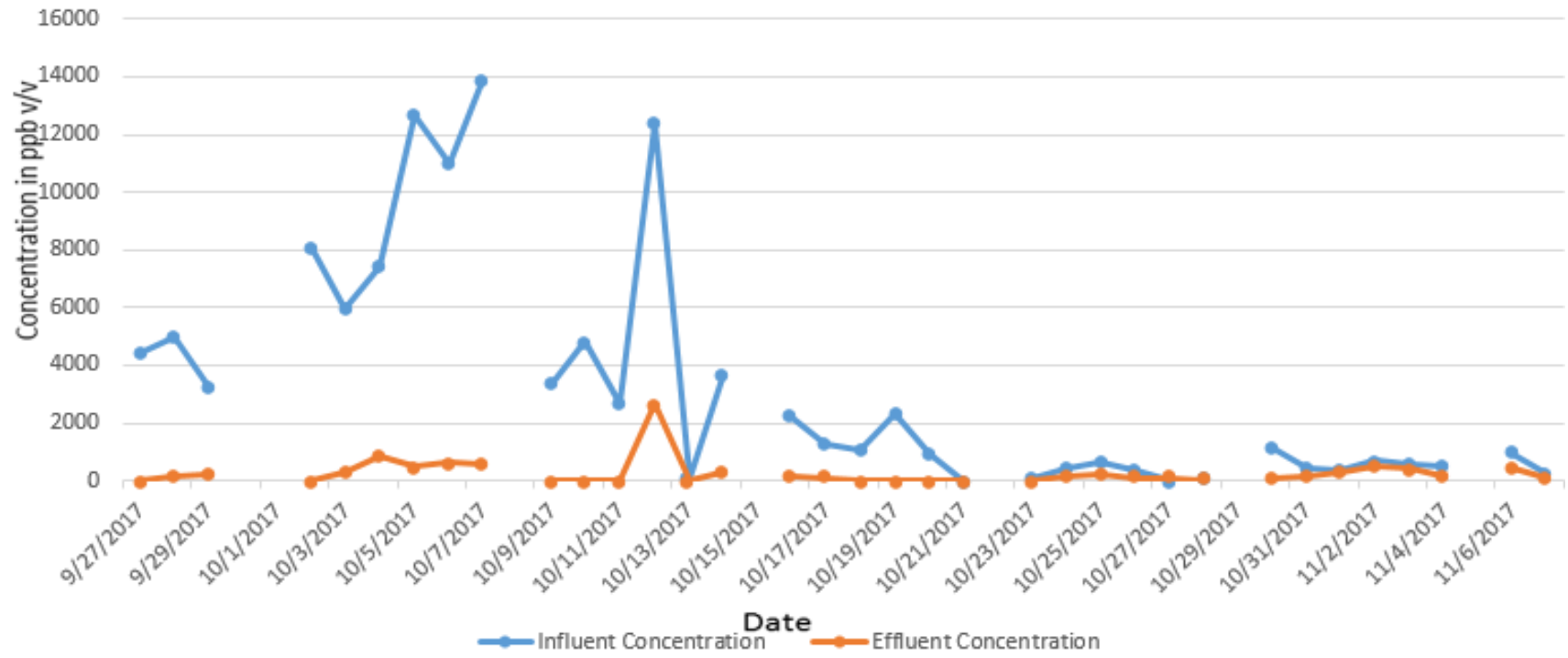

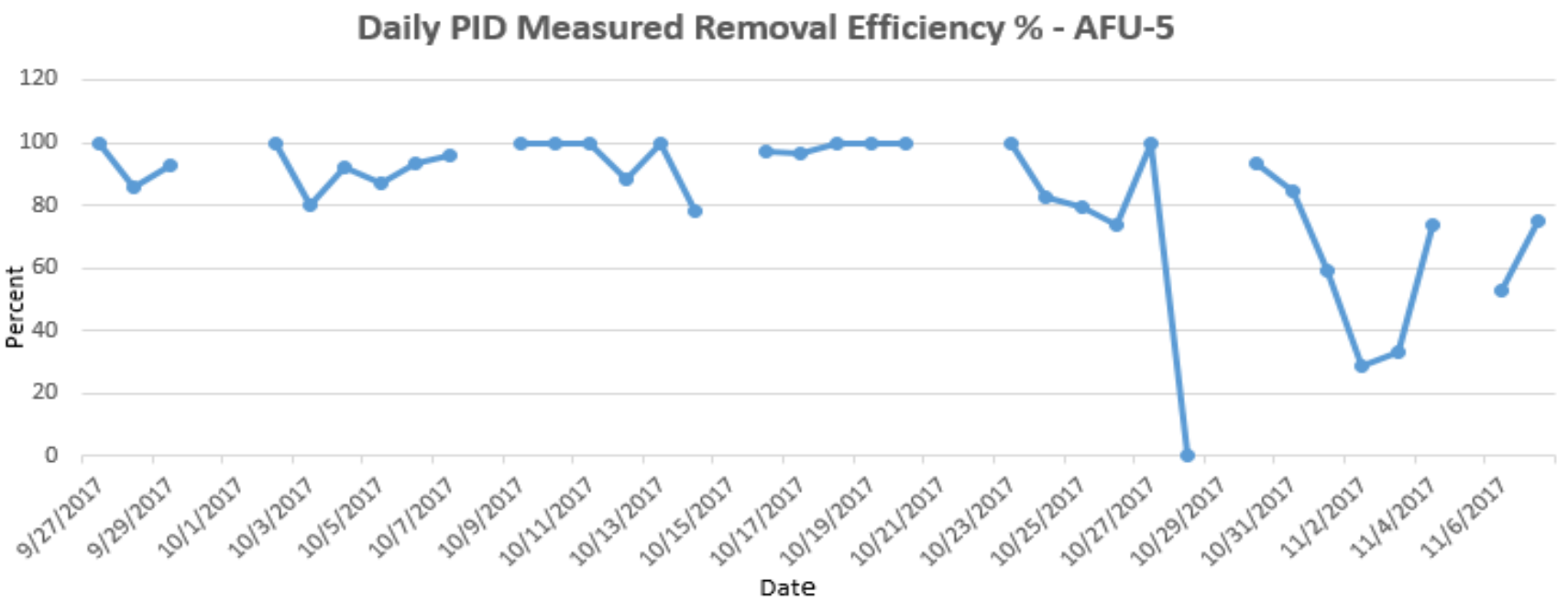

On 10/28/2017, effluent PID TVOC measured > influent PID TVOC.

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Field data thru 11/7/2017; Lab data thru 10/25/2017

NORTHERN STATES POWER COMPANY		
Figure 3: AFU-5 Performance Metrics		
Ashland/NSP Lakefront Site		
Odor/Emissions Control System Performance thru 11/7/2017		
43040		Revision Date:
Drawn by: AKM	Checked by: B.Bell	Project ID: 17X001

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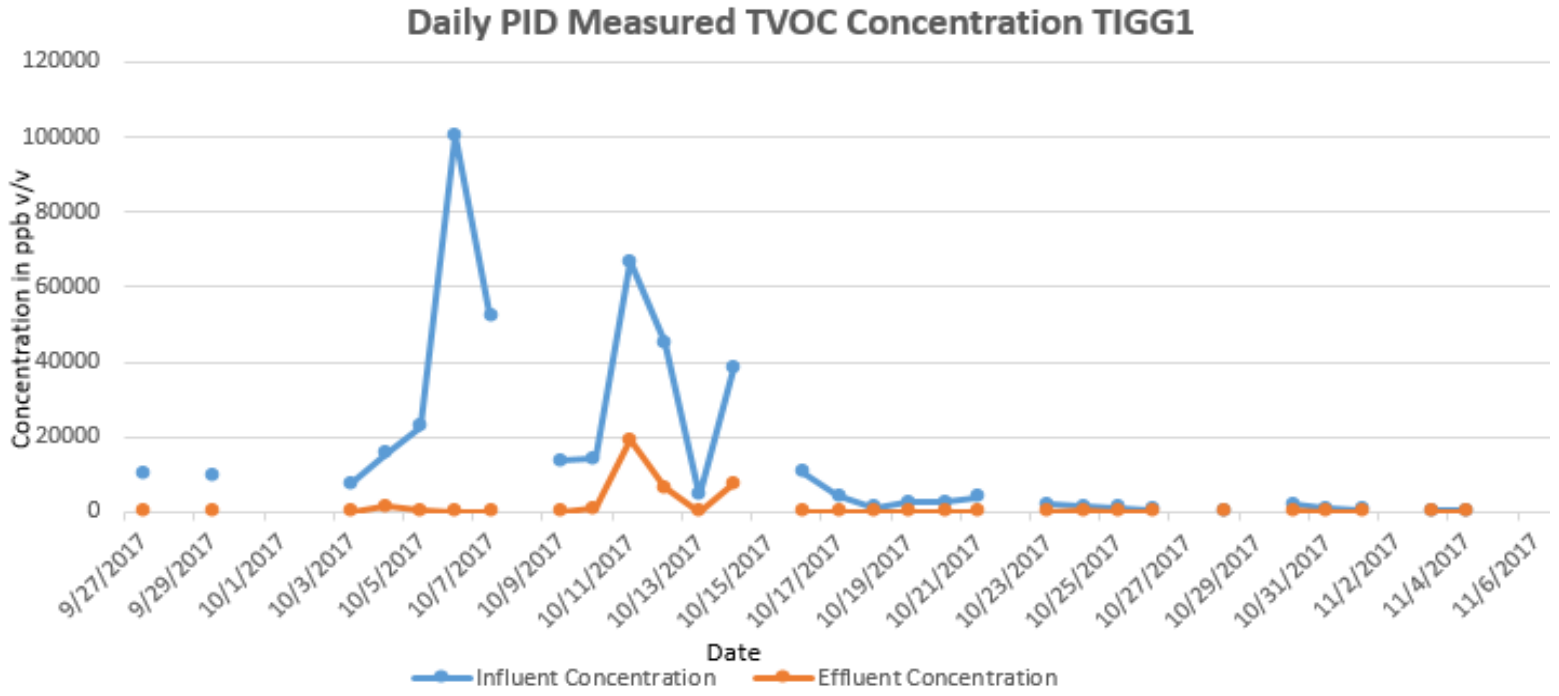

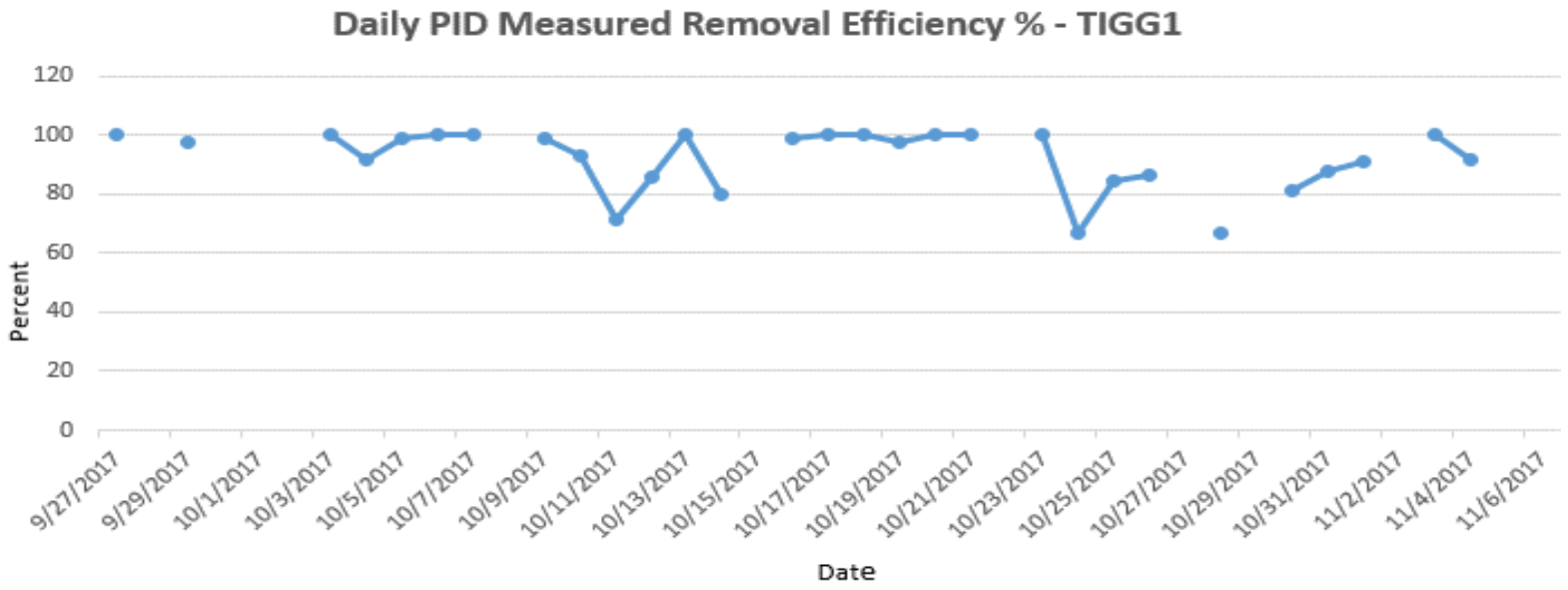

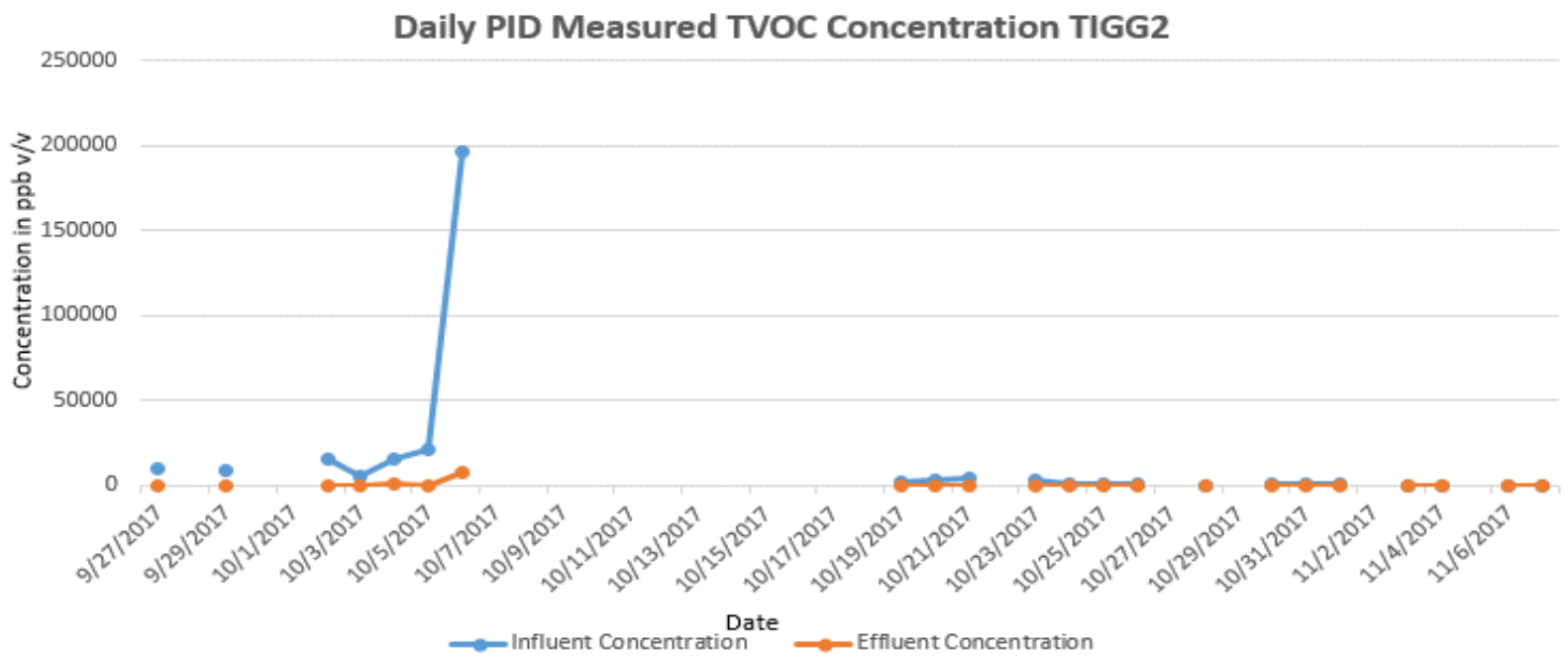

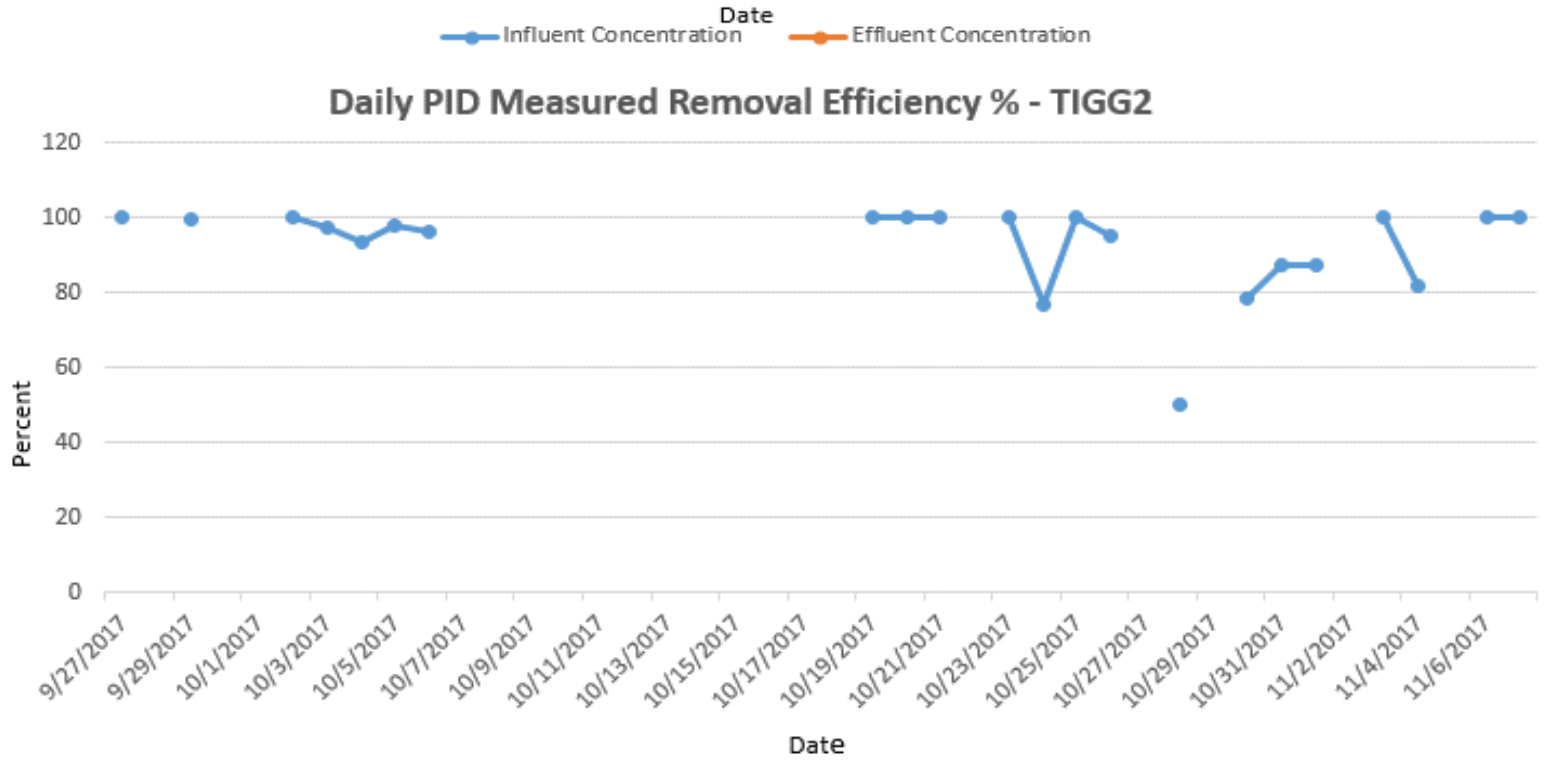

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Field data thru 11/7/2017; Lab data thru 10/25/2017

NORTHERN STATES POWER COMPANY		
Figure 4: TIGG1 and TIGG2 Performance Metrics		
Ashland/NSP Lakefront Site		
Odor/Emissions Control System Performance thru 11/7/2017		
November 2017	Revision Date:	
Drawn by: AKM	Checked by: B.Bell	Project ID: 17X001

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Attachment 2

Wis. Admin. Code NR 445 Comparison

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Client:	NSPW	Project ID.:	17X001
Project:	Ashland/NSP Lakefront Site - Odor / Emissions Control System for Phase 2		
Prepared by:	AKM	Date:	11/14/2017
Checked by:	MCC2	Date:	11/15/2017

NR 445.07 Table A Emission Thresholds, Standards, and Control Requirements for All Sources of Hazardous Air Contaminants

Parameter	Allowable emission rate (30 ft stack)	
Benzene	936	lb/yr
Ethylbenzene	90.6	lb/hr - 24 hr avg
	730,000	lb/yr
Naphthalene	10.9	lb/hr - 24 hr avg
Toluene	39.3	lb/hr - 24 hr avg
	292,000	lb/yr
Xylene	90.6	lb/hr - 24 hr avg

(Notes moved to bottom of table)

	Emissions rate in lb/hr (24 hr avg) [2]				Annual Emissions in lb/yr [3,4]		
	Ethylbenzene	Naphthalene	Toluene	Xylene	Benzene	Ethylbenzene	Toluene
Limit-->	90.6	10.9	39.3	90.6	936	730,000	292,000
5/18/2017	5.01E-05	0.00E+00	1.80E-04	1.66E-04	2.68E-03	1.20E-03	4.31E-03
5/19/2017	5.22E-05	0.00E+00	1.87E-04	1.71E-04	5.46E-03	2.46E-03	8.80E-03
5/20/2017	5.46E-05	0.00E+00	1.70E-04	1.52E-04	8.07E-03	3.77E-03	1.29E-02
5/21/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.07E-03	3.77E-03	1.29E-02
5/22/2017	5.46E-05	0.00E+00	1.88E-04	1.73E-04	1.09E-02	5.08E-03	1.74E-02
5/23/2017	4.05E-04	1.94E-03	3.06E-04	7.98E-04	1.35E-02	1.48E-02	2.47E-02
5/24/2017	3.15E-03	1.18E-02	5.63E-03	3.92E-03	1.85E-02	9.04E-02	1.60E-01
5/25/2017	1.63E-03	5.94E-03	3.09E-03	2.04E-03	2.10E-02	1.30E-01	2.34E-01
5/26/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-02	1.30E-01	2.34E-01
5/27/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-02	1.30E-01	2.34E-01
5/28/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-02	1.30E-01	2.34E-01
5/29/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-02	1.30E-01	2.34E-01
5/30/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-02	1.30E-01	2.34E-01
5/31/2017	1.11E-03	7.41E-03	2.95E-04	1.94E-03	2.43E-02	1.56E-01	2.41E-01
6/1/2017	1.77E-03	1.32E-02	4.45E-04	3.05E-03	2.76E-02	1.99E-01	2.52E-01
6/2/2017	1.51E-03	1.12E-02	3.94E-04	2.63E-03	3.06E-02	2.35E-01	2.61E-01
6/3/2017	7.72E-04	5.72E-03	1.62E-04	1.30E-03	3.18E-02	2.54E-01	2.65E-01
6/4/2017	1.16E-03	8.87E-03	2.57E-04	1.94E-03	3.37E-02	2.81E-01	2.71E-01
6/5/2017	7.30E-04	5.40E-03	1.89E-04	1.27E-03	3.51E-02	2.99E-01	2.76E-01
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6/7/2017	5.61E-04	4.71E-03	2.92E-04	1.24E-03	3.92E-02	3.19E-01	2.88E-01
6/8/2017	2.06E-03	7.96E-03	3.38E-04	3.33E-03	4.32E-02	3.69E-01	2.97E-01
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6/11/2017	2.61E-03	6.64E-03	4.03E-04	4.16E-03	5.75E-02	5.59E-01	3.26E-01
6/12/2017	2.76E-03	7.32E-03	4.31E-04	4.41E-03	6.25E-02	6.25E-01	3.37E-01
6/13/2017	2.77E-03	7.79E-03	4.42E-04	4.45E-03	6.76E-02	6.92E-01	3.47E-01
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6/17/2017	1.78E-03	1.12E-02	1.07E-03	3.35E-03	9.53E-02	8.37E-01	4.18E-01
6/18/2017	1.49E-03	9.99E-03	9.04E-04	2.81E-03	1.02E-01	8.73E-01	4.39E-01
6/19/2017	1.64E-03	1.09E-02	9.81E-04	3.08E-03	1.10E-01	9.12E-01	4.63E-01
6/20/2017	1.79E-03	6.29E-03	5.11E-03	5.60E-03	1.16E-01	9.55E-01	5.85E-01
6/21/2017	4.34E-03	2.53E-02	7.09E-03	1.14E-02	1.47E-01	1.06E+00	7.56E-01
6/22/2017	3.10E-03	5.42E-03	8.30E-04	5.23E-03	1.56E-01	1.13E+00	7.76E-01
6/23/2017	2.85E-03	4.73E-03	6.98E-04	4.76E-03	1.63E-01	1.20E+00	7.92E-01
6/24/2017	2.82E-03	4.56E-03	6.88E-04	4.70E-03	1.69E-01	1.27E+00	8.09E-01
6/25/2017	2.75E-03	4.44E-03	6.70E-04	4.59E-03	1.76E-01	1.34E+00	8.25E-01
6/26/2017	2.83E-03	4.58E-03	6.86E-04	4.72E-03	1.82E-01	1.40E+00	8.41E-01
6/27/2017	9.01E-03	1.92E-02	2.47E-03	1.45E-02	2.00E-01	1.62E+00	9.01E-01
6/28/2017	9.15E-03	1.98E-02	2.58E-03	1.48E-02	2.21E-01	1.84E+00	9.62E-01

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Client:	NSPW	Project ID.:	17X001
Project:	Ashland/NSP Lakefront Site - Odor / Emissions Control System for Phase 2		
Prepared by:	AKM	Date:	11/14/2017
Checked by:	MCC2	Date:	11/15/2017

NR 445.07 Table A Emission Thresholds, Standards, and Control Requirements for All Sources of Hazardous Air Contaminants

Parameter	Allowable emission rate (30 ft stack)		(Notes moved to bottom of table)
Benzene	936	lb/yr	
Ethylbenzene	90.6	lb/hr - 24 hr avg	
	730,000	lb/yr	
Naphthalene	10.9	lb/hr - 24 hr avg	
Toluene	39.3	lb/hr - 24 hr avg	
	292,000	lb/yr	
Xylene	90.6	lb/hr - 24 hr avg	

	Emissions rate in lb/hr (24 hr avg) [2]				Annual Emissions in lb/yr [3,4]		
	Ethylbenzene	Naphthalene	Toluene	Xylene	Benzene	Ethylbenzene	Toluene
Limit-->	90.6	10.9	39.3	90.6	936	730,000	292,000
6/29/2017	9.11E-03	1.97E-02	2.52E-03	1.47E-02	2.40E-01	2.06E+00	1.02E+00
6/30/2017	9.01E-03	1.92E-02	2.47E-03	1.45E-02	2.58E-01	2.27E+00	1.08E+00
7/1/2017	4.60E-03	9.88E-03	1.26E-03	7.41E-03	2.67E-01	2.39E+00	1.11E+00
7/2/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-01	2.39E+00	1.11E+00
7/3/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-01	2.39E+00	1.11E+00
7/4/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-01	2.39E+00	1.11E+00
7/5/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.67E-01	2.39E+00	1.11E+00
7/6/2017	9.73E-03	2.05E-02	2.80E-03	1.59E-02	2.90E-01	2.62E+00	1.18E+00
7/7/2017	7.46E-03	4.30E-02	2.70E-03	1.12E-02	3.19E-01	2.80E+00	1.24E+00
7/8/2017	8.99E-03	5.10E-02	3.15E-03	1.35E-02	3.51E-01	3.01E+00	1.32E+00
7/9/2017	8.74E-03	4.96E-02	3.07E-03	1.31E-02	3.82E-01	3.22E+00	1.39E+00
7/10/2017	9.10E-03	5.15E-02	3.19E-03	1.36E-02	4.15E-01	3.44E+00	1.47E+00
7/11/2017	1.22E-02	4.64E-02	3.89E-03	1.86E-02	4.40E-01	3.73E+00	1.56E+00
7/12/2017	1.07E-02	4.07E-02	3.41E-03	1.63E-02	4.61E-01	3.99E+00	1.65E+00
7/13/2017	1.95E-03	1.21E-02	4.60E-04	3.00E-03	4.65E-01	4.04E+00	1.66E+00
7/14/2017	4.20E-03	1.91E-02	1.24E-03	6.51E-03	4.74E-01	4.14E+00	1.69E+00
7/15/2017	5.00E-03	2.34E-02	1.43E-03	7.71E-03	4.85E-01	4.26E+00	1.72E+00
7/16/2017	3.52E-03	1.83E-02	9.72E-04	5.44E-03	4.92E-01	4.34E+00	1.74E+00
7/17/2017	5.32E-03	2.49E-02	1.52E-03	8.21E-03	5.03E-01	4.47E+00	1.78E+00
7/18/2017	5.27E-03	2.45E-02	1.51E-03	8.12E-03	5.14E-01	4.60E+00	1.82E+00
7/19/2017	4.79E-03	2.37E-02	1.35E-03	7.40E-03	5.24E-01	4.71E+00	1.85E+00
7/20/2017	6.05E-03	4.94E-02	2.19E-03	1.10E-02	5.44E-01	4.86E+00	1.90E+00
7/21/2017	5.04E-03	4.10E-02	1.88E-03	9.25E-03	5.62E-01	4.98E+00	1.95E+00
7/22/2017	1.07E-03	9.88E-03	5.58E-04	2.21E-03	5.69E-01	5.00E+00	1.96E+00
7/23/2017	6.65E-04	7.78E-03	4.28E-04	1.57E-03	5.75E-01	5.02E+00	1.97E+00
7/24/2017	3.33E-03	2.45E-02	1.28E-03	6.05E-03	5.84E-01	5.10E+00	2.00E+00
7/25/2017	3.38E-03	2.48E-02	1.30E-03	6.14E-03	5.93E-01	5.18E+00	2.03E+00
7/26/2017	3.13E-03	2.29E-02	1.21E-03	5.69E-03	6.02E-01	5.25E+00	2.06E+00
7/27/2017	3.11E-03	2.29E-02	1.24E-03	5.67E-03	6.11E-01	5.33E+00	2.09E+00
7/28/2017	7.45E-03	3.30E-02	2.87E-03	1.14E-02	6.47E-01	5.51E+00	2.16E+00
7/29/2017	7.15E-03	3.24E-02	2.75E-03	1.10E-02	6.81E-01	5.68E+00	2.23E+00
7/30/2017	4.98E-03	2.24E-02	1.92E-03	7.64E-03	7.04E-01	5.80E+00	2.27E+00
7/31/2017	7.52E-03	3.28E-02	2.90E-03	1.15E-02	7.40E-01	5.98E+00	2.34E+00
8/1/2017	3.50E-03	2.53E-02	1.34E-03	6.35E-03	7.52E-01	6.06E+00	2.37E+00
8/2/2017	3.82E-03	2.75E-02	1.45E-03	6.92E-03	7.65E-01	6.16E+00	2.41E+00
8/3/2017	3.69E-03	2.65E-02	1.40E-03	6.69E-03	7.77E-01	6.24E+00	2.44E+00
8/4/2017	1.33E-03	1.14E-02	8.59E-04	2.24E-03	8.21E-01	6.28E+00	2.46E+00
8/5/2017	1.95E-03	1.62E-02	1.19E-03	3.36E-03	8.74E-01	6.32E+00	2.49E+00
8/6/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.74E-01	6.32E+00	2.49E+00
8/7/2017	1.83E-03	1.53E-02	1.10E-03	3.15E-03	9.22E-01	6.37E+00	2.52E+00
8/8/2017	9.49E-03	4.49E-02	3.21E-03	1.57E-02	9.44E-01	6.59E+00	2.59E+00
8/9/2017	1.14E-02	5.38E-02	3.82E-03	1.89E-02	9.71E-01	6.87E+00	2.69E+00

Foth | Envirocon Joint Venture

Client:	NSPW	Project ID.:	17X001
Project:	Ashland/NSP Lakefront Site - Odor / Emissions Control System for Phase 2		
Prepared by:	AKM	Date:	11/14/2017
Checked by:	MCC2	Date:	11/15/2017

NR 445.07 Table A Emission Thresholds, Standards, and Control Requirements for All Sources of Hazardous Air Contaminants

Parameter	Allowable emission rate (30 ft stack)		(Notes moved to bottom of table)
Benzene	936	lb/yr	
Ethylbenzene	90.6	lb/hr - 24 hr avg	
	730,000	lb/yr	
Naphthalene	10.9	lb/hr - 24 hr avg	
Toluene	39.3	lb/hr - 24 hr avg	
	292,000	lb/yr	
Xylene	90.6	lb/hr - 24 hr avg	

	Emissions rate in lb/hr (24 hr avg) [2]				Annual Emissions in lb/yr [3,4]			
	Ethylbenzene	Naphthalene	Toluene	Xylene	Benzene	Ethylbenzene	Toluene	
Limit-->	90.6	10.9	39.3	90.6	936	730,000	292,000	
8/10/2017	1.09E-02	5.16E-02	3.68E-03	1.81E-02	9.96E-01	7.13E+00	2.77E+00	
8/11/2017	7.80E-03	4.98E-02	2.62E-03	1.16E-02	1.02E+00	7.32E+00	2.84E+00	
8/12/2017	8.35E-03	5.40E-02	2.95E-03	1.26E-02	1.05E+00	7.52E+00	2.91E+00	
8/13/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.05E+00	7.52E+00	2.91E+00	
8/14/2017	8.27E-03	5.35E-02	2.92E-03	1.24E-02	1.08E+00	7.72E+00	2.98E+00	
8/15/2017	1.05E-02	7.06E-02	3.47E-03	1.54E-02	1.11E+00	7.97E+00	3.06E+00	
8/16/2017	1.10E-02	7.41E-02	3.68E-03	1.62E-02	1.14E+00	8.23E+00	3.15E+00	
8/17/2017	1.06E-02	7.11E-02	3.55E-03	1.56E-02	1.17E+00	8.49E+00	3.24E+00	
8/18/2017	1.06E-03	1.10E-02	4.56E-04	1.66E-03	1.18E+00	8.51E+00	3.25E+00	
8/19/2017	8.81E-03	5.74E-02	2.91E-03	1.29E-02	1.20E+00	8.72E+00	3.32E+00	
8/20/2017	1.04E-03	1.07E-02	4.53E-04	1.63E-03	1.21E+00	8.75E+00	3.33E+00	
8/21/2017	2.84E-03	2.21E-02	1.03E-03	4.16E-03	1.21E+00	8.82E+00	3.35E+00	
8/22/2017	8.08E-04	8.48E-03	2.54E-04	1.26E-03	1.22E+00	8.84E+00	3.36E+00	
8/23/2017	4.50E-03	1.99E-02	1.56E-03	6.15E-03	1.24E+00	8.94E+00	3.40E+00	
8/24/2017	2.85E-03	2.37E-02	9.73E-04	4.31E-03	1.25E+00	9.01E+00	3.42E+00	
8/25/2017	3.82E-02	3.21E-02	1.96E-02	4.03E-02	1.59E+00	9.93E+00	3.89E+00	
8/26/2017	2.27E-03	1.95E-02	7.61E-04	3.45E-03	1.59E+00	9.98E+00	3.91E+00	
8/27/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.59E+00	9.98E+00	3.91E+00	
8/28/2017	2.71E-03	2.30E-02	9.12E-04	4.10E-03	1.60E+00	1.00E+01	3.93E+00	
8/29/2017	8.30E-02	3.65E-02	3.27E-02	1.13E-01	1.90E+00	1.20E+01	4.71E+00	
8/30/2017	6.10E-02	3.01E-02	2.39E-02	8.28E-02	2.11E+00	1.35E+01	5.29E+00	
8/31/2017	4.56E-02	1.56E-02	3.53E-02	4.31E-02	2.70E+00	1.46E+01	6.13E+00	
9/1/2017	4.83E-02	2.99E-02	3.65E-02	4.69E-02	3.30E+00	1.58E+01	7.01E+00	
9/2/2017	9.46E-03	2.39E-02	4.31E-03	1.21E-02	3.35E+00	1.60E+01	7.11E+00	
9/3/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E+00	1.60E+01	7.11E+00	
9/4/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.35E+00	1.60E+01	7.11E+00	
9/5/2017	3.82E-02	2.94E-02	2.85E-02	3.76E-02	3.82E+00	1.69E+01	7.80E+00	
9/6/2017	4.77E-02	3.38E-02	3.59E-02	4.67E-02	4.42E+00	1.80E+01	8.66E+00	
9/7/2017	2.87E-02	3.43E-02	1.98E-02	3.00E-02	4.73E+00	1.87E+01	9.13E+00	
9/8/2017	4.99E-03	1.66E-02	1.71E-03	6.44E-03	4.80E+00	1.89E+01	9.17E+00	
9/9/2017	4.51E-03	1.79E-02	1.78E-03	6.25E-03	4.86E+00	1.90E+01	9.22E+00	
9/10/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.86E+00	1.90E+01	9.22E+00	
9/11/2017	7.64E-03	2.99E-02	2.88E-03	9.71E-03	4.95E+00	1.91E+01	9.29E+00	Note 6
9/12/2017	2.61E-03	1.12E-02	1.23E-03	2.52E-03	5.07E+00	1.92E+01	9.32E+00	
9/13/2017	5.21E-03	1.55E-02	2.83E-03	6.80E-03	5.32E+00	1.93E+01	9.38E+00	
9/14/2017	6.31E-03	2.14E-02	3.43E-03	8.15E-03	5.62E+00	1.95E+01	9.47E+00	
9/15/2017	5.25E-03	1.77E-02	2.87E-03	6.81E-03	5.84E+00	1.96E+01	9.53E+00	
9/16/2017	7.19E-03	2.24E-02	3.86E-03	9.33E-03	6.16E+00	1.98E+01	9.63E+00	
9/17/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.16E+00	1.98E+01	9.63E+00	
9/18/2017	6.93E-03	2.28E-02	3.78E-03	8.98E-03	6.48E+00	2.00E+01	9.72E+00	
9/19/2017	2.38E-03	1.32E-02	1.39E-03	3.08E-03	6.56E+00	2.00E+01	9.75E+00	
9/20/2017	3.47E-03	1.73E-02	2.07E-03	4.50E-03	6.79E+00	2.01E+01	9.80E+00	

Foth | Envirocon Joint Venture

Client:	NSPW	Project ID.:	17X001
Project:	Ashland/NSP Lakefront Site - Odor / Emissions Control System for Phase 2		
Prepared by:	AKM	Date:	11/14/2017
Checked by:	MCC2	Date:	11/15/2017

NR 445.07 Table A Emission Thresholds, Standards, and Control Requirements for All Sources of Hazardous Air Contaminants

Parameter	Allowable emission rate (30 ft stack)		(Notes moved to bottom of table)
Benzene	936	lb/yr	
Ethylbenzene	90.6	lb/hr - 24 hr avg	
	730,000	lb/yr	
Naphthalene	10.9	lb/hr - 24 hr avg	
Toluene	39.3	lb/hr - 24 hr avg	
	292,000	lb/yr	
Xylene	90.6	lb/hr - 24 hr avg	

	Emissions rate in lb/hr (24 hr avg) [2]				Annual Emissions in lb/yr [3,4]			
	Ethylbenzene	Naphthalene	Toluene	Xylene	Benzene	Ethylbenzene	Toluene	
Limit-->	90.6	10.9	39.3	90.6	936	730,000	292,000	
9/21/2017	9.92E-03	1.64E-02	1.41E-02	6.74E-03	7.22E+00	2.03E+01	1.01E+01	
9/22/2017	1.20E-02	2.07E-02	1.63E-02	7.91E-03	7.69E+00	2.06E+01	1.05E+01	
9/23/2017	1.24E-02	2.14E-02	1.71E-02	8.30E-03	8.15E+00	2.09E+01	1.09E+01	
9/24/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.15E+00	2.09E+01	1.09E+01	
9/25/2017	1.12E-02	2.07E-02	1.52E-02	7.85E-03	8.58E+00	2.12E+01	1.13E+01	
9/26/2017	1.26E-02	2.09E-02	1.74E-02	8.27E-03	9.07E+00	2.15E+01	1.17E+01	
9/27/2017	1.06E-01	4.55E-02	5.58E-02	6.47E-02	9.91E+00	2.40E+01	1.31E+01	Note 7
9/28/2017	1.02E-01	4.50E-02	5.41E-02	6.20E-02	1.08E+01	2.65E+01	1.44E+01	Note 7
9/29/2017	9.32E-02	3.38E-02	4.89E-02	5.69E-02	1.15E+01	2.87E+01	1.55E+01	Note 7
9/30/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E+01	2.87E+01	1.55E+01	
10/1/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.15E+01	2.87E+01	1.55E+01	
10/2/2017	1.02E-01	4.53E-02	5.40E-02	6.25E-02	1.23E+01	3.12E+01	1.68E+01	
10/3/2017	8.84E-02	4.46E-02	4.70E-02	5.40E-02	1.31E+01	3.33E+01	1.80E+01	
10/4/2017	7.92E-02	4.15E-02	4.17E-02	4.87E-02	1.38E+01	3.52E+01	1.90E+01	
10/5/2017	1.07E-01	3.71E-02	4.09E-02	9.78E-02	1.44E+01	3.77E+01	1.99E+01	
10/6/2017	1.05E-01	3.69E-02	3.93E-02	9.67E-02	1.49E+01	4.03E+01	2.09E+01	
10/7/2017	8.68E-02	3.01E-02	2.78E-02	8.47E-02	1.53E+01	4.23E+01	2.16E+01	
10/8/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.53E+01	4.23E+01	2.16E+01	
10/9/2017	4.74E-02	1.77E-02	1.53E-02	4.62E-02	1.55E+01	4.35E+01	2.19E+01	
10/10/2017	3.95E-02	2.90E-02	1.34E-02	3.41E-02	1.58E+01	4.44E+01	2.22E+01	
10/11/2017	3.69E-02	2.94E-02	1.20E-02	3.26E-02	1.60E+01	4.53E+01	2.25E+01	
10/12/2017	4.24E-02	3.18E-02	1.41E-02	3.69E-02	1.63E+01	4.63E+01	2.29E+01	
10/13/2017	3.67E-02	2.67E-02	1.27E-02	3.12E-02	1.65E+01	4.72E+01	2.32E+01	
10/14/2017	4.23E-02	3.08E-02	1.40E-02	3.69E-02	1.68E+01	4.82E+01	2.35E+01	
10/15/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.68E+01	4.82E+01	2.35E+01	
10/16/2017	3.88E-02	2.75E-02	1.35E-02	3.30E-02	1.70E+01	4.92E+01	2.38E+01	
10/17/2017	1.22E-01	5.54E-02	3.23E-02	1.09E-01	1.73E+01	5.21E+01	2.46E+01	
10/18/2017	9.36E-02	4.83E-02	2.48E-02	8.38E-02	1.75E+01	5.43E+01	2.52E+01	
10/19/2017	1.26E-01	5.00E-02	3.29E-02	1.11E-01	1.78E+01	5.74E+01	2.60E+01	
10/20/2017	1.08E-01	4.92E-02	2.89E-02	9.44E-02	1.81E+01	6.00E+01	2.67E+01	
10/21/2017	6.40E-02	4.83E-02	1.61E-02	6.38E-02	1.82E+01	6.15E+01	2.71E+01	
10/22/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.82E+01	6.15E+01	2.71E+01	
10/23/2017	1.15E-01	5.39E-02	3.04E-02	1.02E-01	1.85E+01	6.43E+01	2.78E+01	
10/24/2017	9.70E-02	5.06E-02	2.56E-02	8.74E-02	1.88E+01	6.66E+01	2.84E+01	
10/25/2017	1.75E-03	4.93E-03	6.90E-04	1.64E-03	1.88E+01	6.66E+01	2.84E+01	
10/26/2017	1.78E-03	5.05E-03	7.16E-04	1.67E-03	1.88E+01	6.67E+01	2.85E+01	
10/27/2017	1.02E-04	3.90E-04	8.28E-05	1.14E-04	1.88E+01	6.67E+01	2.85E+01	
10/28/2017	5.42E-04	1.64E-03	2.68E-04	5.31E-04	1.88E+01	6.67E+01	2.85E+01	
10/29/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+01	6.67E+01	2.85E+01	
10/30/2017	1.68E-03	4.66E-03	6.61E-04	1.57E-03	1.88E+01	6.67E+01	2.85E+01	
10/31/2017	1.37E-03	3.76E-03	5.82E-04	1.29E-03	1.88E+01	6.68E+01	2.85E+01	
11/1/2017	1.29E-03	3.72E-03	5.37E-04	1.21E-03	1.88E+01	6.68E+01	2.85E+01	

Foth | Envirocon Joint Venture

Client:	NSPW	Project ID.:	17X001
Project:	Ashland/NSP Lakefront Site - Odor / Emissions Control System for Phase 2		
Prepared by:	AKM	Date:	11/14/2017
Checked by:	MCC2	Date:	11/15/2017

NR 445.07 Table A Emission Thresholds, Standards, and Control Requirements for All Sources of Hazardous Air Contaminants

Parameter	Allowable emission rate (30 ft stack)		(Notes moved to bottom of table)
Benzene	936	lb/yr	
Ethylbenzene	90.6	lb/hr - 24 hr avg	
	730,000	lb/yr	
Naphthalene	10.9	lb/hr - 24 hr avg	
Toluene	39.3	lb/hr - 24 hr avg	
	292,000	lb/yr	
Xylene	90.6	lb/hr - 24 hr avg	

	Emissions rate in lb/hr (24 hr avg) [2]				Annual Emissions in lb/yr [3,4]		
	Ethylbenzene	Naphthalene	Toluene	Xylene	Benzene	Ethylbenzene	Toluene
Limit-->	90.6	10.9	39.3	90.6	936	730,000	292,000
11/2/2017	7.85E-04	1.95E-03	3.02E-04	7.26E-04	1.88E+01	6.68E+01	2.85E+01
11/3/2017	7.91E-04	2.19E-03	2.96E-04	7.35E-04	1.88E+01	6.68E+01	2.85E+01
11/4/2017	1.72E-03	4.81E-03	6.89E-04	1.62E-03	1.88E+01	6.69E+01	2.85E+01
11/5/2017	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.88E+01	6.69E+01	2.85E+01
11/6/2017	1.42E-03	3.61E-03	5.27E-04	1.30E-03	1.88E+01	6.69E+01	2.85E+01
11/7/2017	1.50E-03	3.80E-03	5.67E-04	1.40E-03	1.88E+01	6.69E+01	2.86E+01

Notes

1. Values appearing in red highlight are those that exceed the applicable limit.
2. Emission rates (24 hr avg) and annual emissions include 5 modules. Emission rate is 0 when system is offline.
3. Annual emissions are the cumulative emissions since start of operations.
4. Annual emissions = $\sum$ E rate $AU_{1\text{-}5+TIGGs}$ x hrs operating
5. Operations are anticipated to span 4 months, therefore the cumulative sum of emissions will be annual emissions.
6. Beginning on 9/11/2017, emissions rates and total emissions include TIGG1 and TIGG2 performance.
7. Status report 10 revised these dates. A new sampling and calculation methodology was implemented on 9/27/2017.

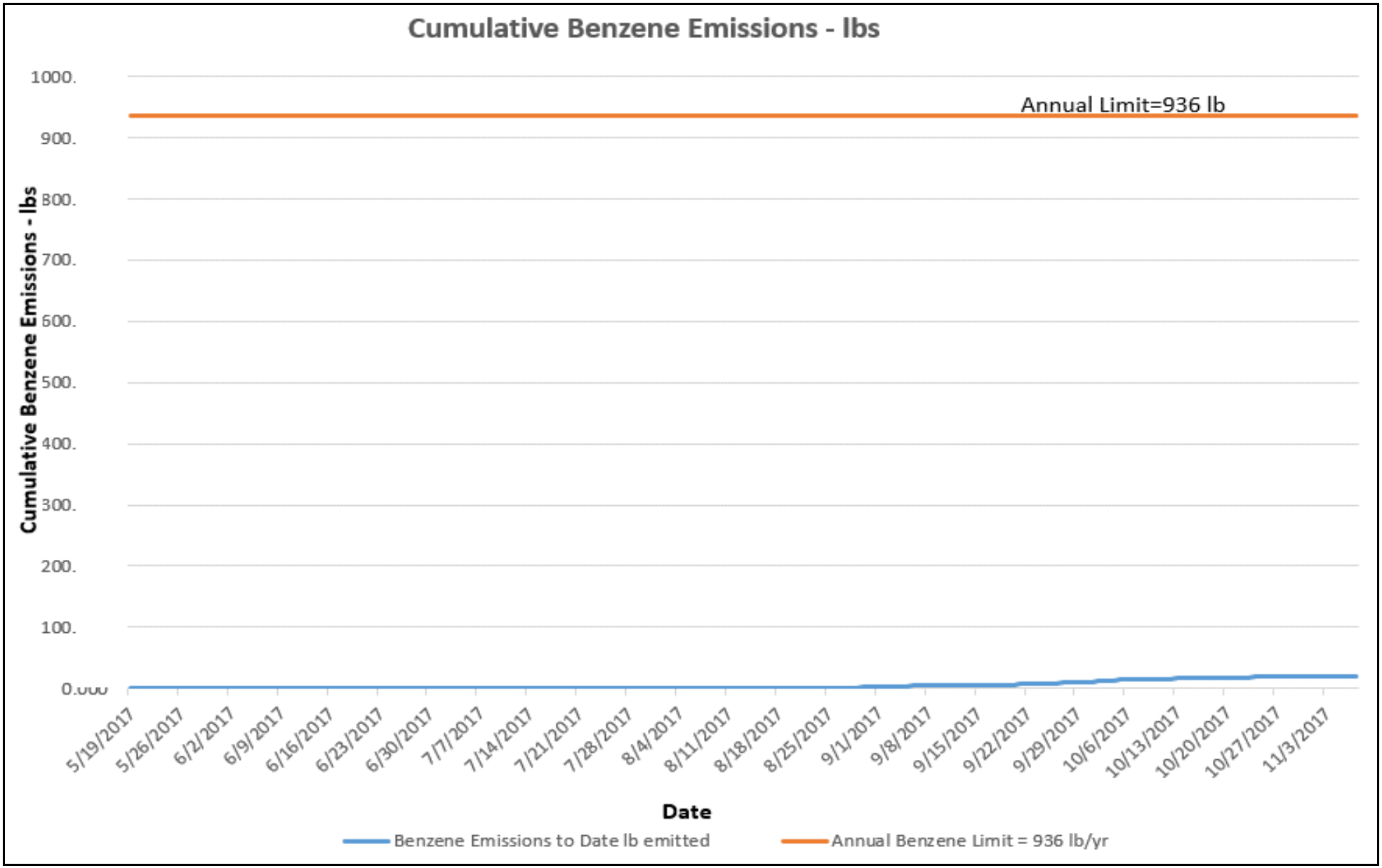

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Figure A2-1: NR445 Benzene Evaluation		
Ashland/NSP Lakefront Site		
Odor/Emissions Control System Performance thru 11/7/2017		
November 2017	Revision Date:	
Drawn by: AKM	Checked by: B.Bell	Project ID: 17X001